Due to a continuous program of research and development, some procedures, specifications and parts may be altered in a constant effort to improve machines.

Periodic revisions may be made to this publication and mailed automatically to distributors. It is recommended that customers contact their distributor or dealer for information on the latest revision.

MODEL 250 AND 250 SERIES B LOADERS AND TD-20 SERIES B CRAWLER TRACTOR CHASSIS

FORM ISS-1050-1

MAY, 1968

(Includes Revision No. 1 (9-'69), Revision No. 2 (10-'70), and Revision No. 3 (7-'71)

PRINTED IN UNITED STATES OF AMERICA

INTERNATIONAL

MODEL 250 AND 250 SERIES B LOADERS AND TD-20 SERIES B

CRAWLER TRACTOR CHASSIS

INDEX

This manual is divided into major sections covering various components of the MODEL 250 and 250 SERIES B LOADERS AND TD-20 SERIES B TRACTOR. These sections are also indexed by title with thumb index tabs as shown below and to the right. To use this manual, grasp the right-hand side of book between thumb and fingers. Bend book back and find the pages containing the corresponding section index tab. Section identification is also contained in the upper corner of each page.

GENERAL

The instructions contained in this service manual are for the information and guidance of servicemen who are responsible for overhauling and repairing the MODEL 250 and 250 SERIES B Loaders and TD-20 SERIES B crawler tractor.

This manual provides the serviceman with a fast, convenient reference to information on maintenance and repairs, as well as descriptions of the major units and their functions in relation to other components of the tractor.

Each section of the manual is provided with a contents page, and where applicable with a paragraph to show any special torques and specifications necessary for inspection and/or assembly. A general specification table and a standard torque chart are provided in section 1.

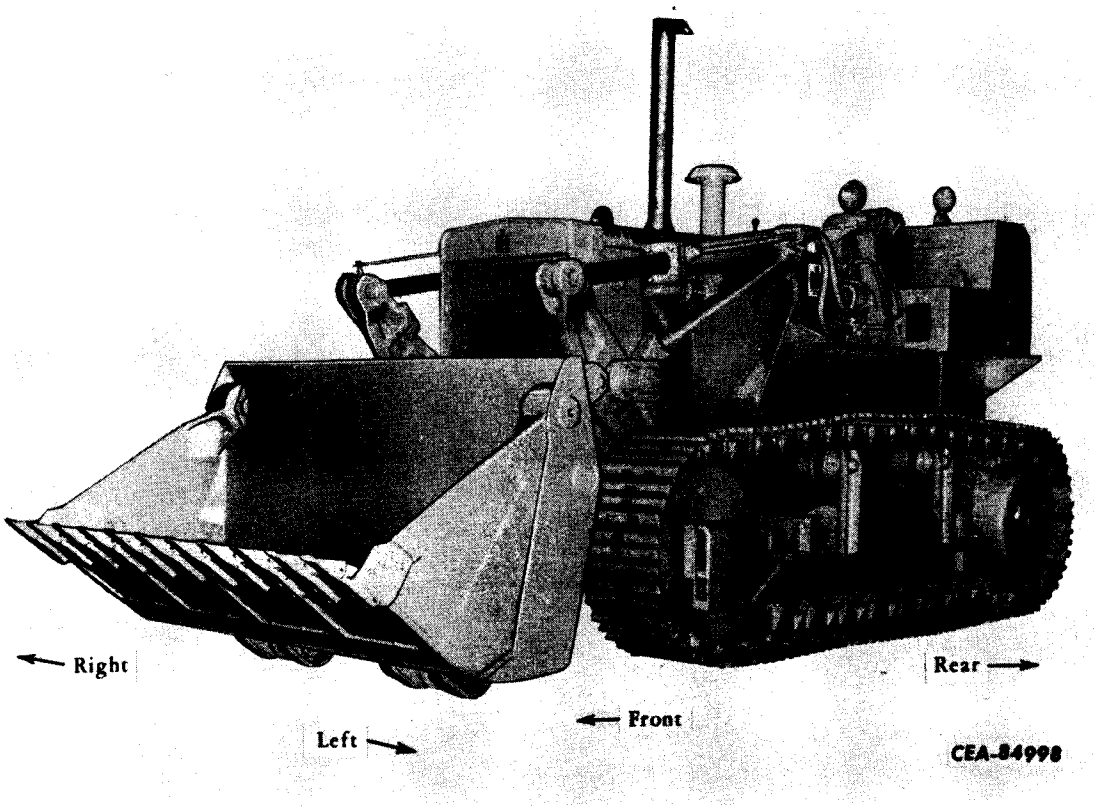
LUBRICATION

Instructions on the lubrication of each assembly are given in the lubrication chart in the operator's manual. When assembling any parts, always coat all wearing surfaces with the lubricant specified in the chart. Except for such installations as taper pins, etc., whose surfaces should be clean and dry, use sufficient quantities of lubricant to prevent any danger of seizing, scoring or excessive wear when the assembly is first operated. Failure to provide "starting lubrication" may result in serious damage.

Always use new gaskets and seals. When installing a leather seal, be sure to install it as specified in the instructions. Be extremely careful not to damage the seal in any way during installation.

SERVICE TOOLS

IH Construction Equipment machines are designed so that few service tools are required other than those in the mechanic's tool kit. Wherever the application of inexpensive special service equipment will facilitate work, it is shown. Otherwise, it is assumed that servicemen will select from their tool kits such tools



Illust. 1
MODEL 250 SERIES B LOADER with Drott 4-IN-1 Bucket.

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as are required. Information regarding special tool equipment is given in the "Service Tool Manual," ISS-1002. The IH Construction Equipment distributors have most of this equipment and are in an excellent position to service these tractors.

SERVICE PARTS

IH Construction Equipment tractors deserve genuine IH service parts. The best material obtainable and experience gathered through many years of manufacturing power equipment, enable International Harvester to produce quality that will not be found in imitation or "just as good" repair parts. No serviceman can afford to guarantee a repair job that is not serviced with genuine IH parts. No owner should be satisfied with other than genuine IH parts.

For the correct service parts to be used on a tractor, always refer to the parts catalog for the particular tractor. The loose-leaf parts catalogs are accurate and are continually being brought up to date by the issuance of new pages covering any changes in part numbers.

SERIAL NUMBERS

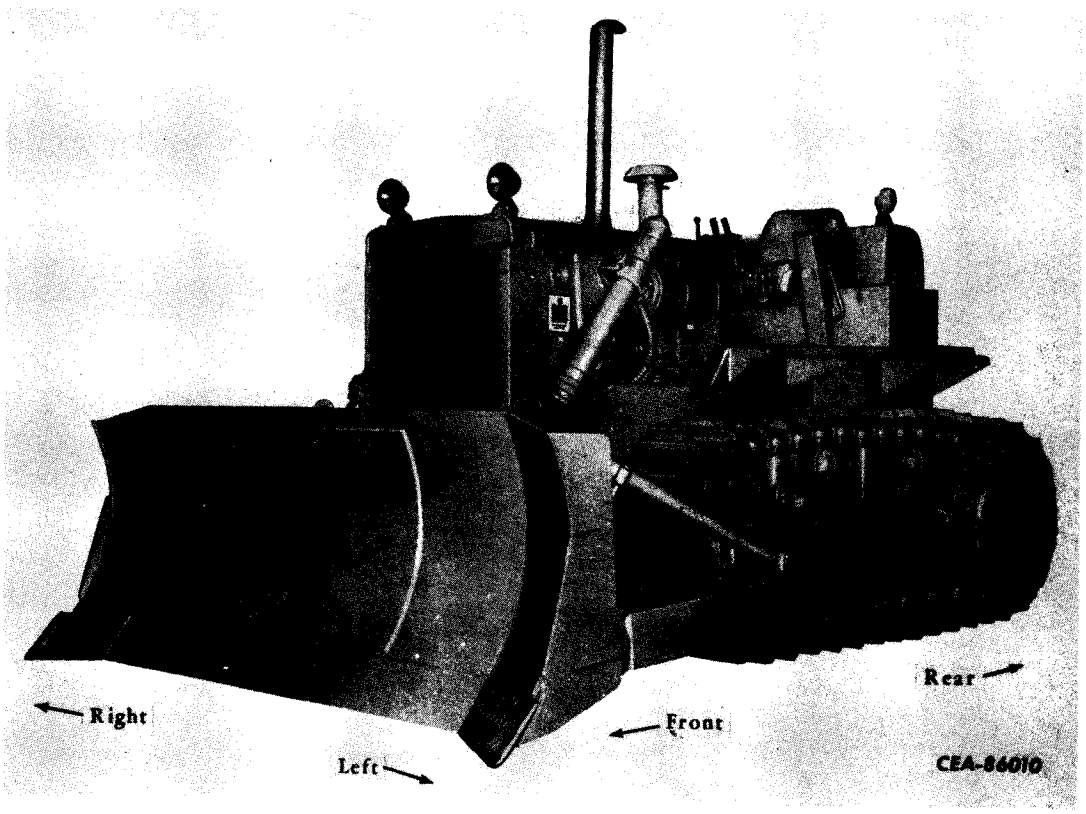
Engine and chassis serial numbers can be located readily on IH Construction Equipment tractors; engine numbers being stamped on the right hand side of the engine where they are easily visible and tractor chassis numbers on name plates attached to the left hand seat side sheet.

ENGINE

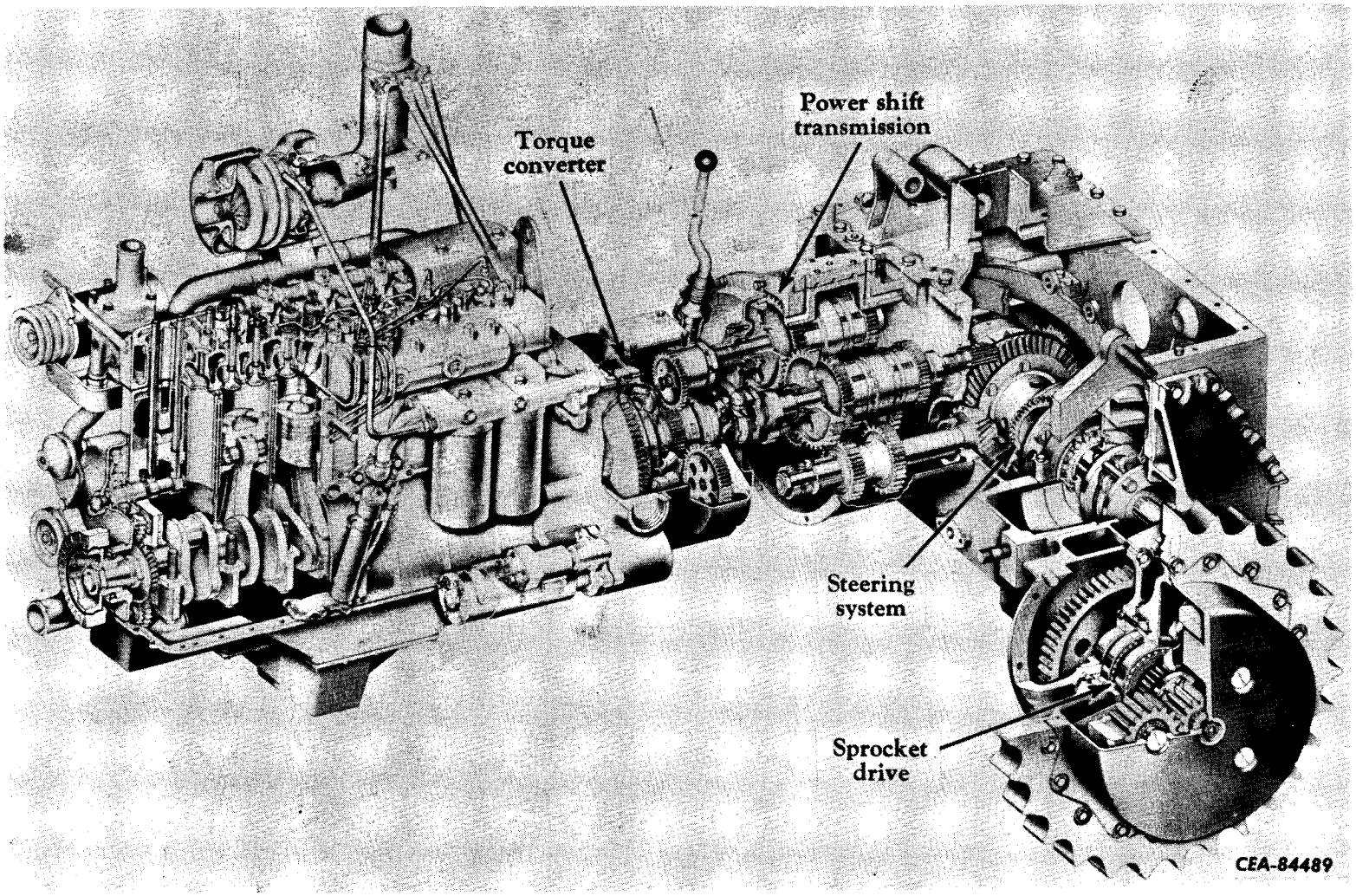
Instructions for removal and installation of the engine are covered in this manual. For detailed information on repair and adjustment of the MODEL 250 or 250B Loaders or TD-20 SERIES B engine, refer to the "429 Series Diesel Engine Manual," ISS-1503.

DIESEL FUEL SYSTEM

If detailed information on the diesel fuel systems of the tractor or loader is desired, refer to the Diesel Injection Pump Manual, ISS-1042 for units equipped with Roosa-Master injection pump or to the ISS-1052 pump manual for units equipped with Model RD injection pump.



Illust. 2
TD-20 SERIES B Crawler Tractor with Tractor Equipment.



Cutaway View of Power Train
(Model 250 Series Loaders Shown, TD-20 SERIES B Crawler Tractor Similar).

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GENERAL DATA

ENGINE SPEEDS (RPM):

Full load	2300 ± 10
High idle (engine in chassis)	*
Low idle	775 ± 25

* The actual high idle speed for each individual machine is stamped on the chassis serial number plate located on the left hand seat side sheet.

	TD-20 (Series B)	Model 250 Loaders
TRACKS:		
Track frame	Oscillating	Rigid
Tread (center-to-center of tracks), inches	74	76
Width of standard track shoe, inches	20	18
Number of track shoes (each side)	40	43
Length of tracks on ground, inches	95.7	107
Area of ground contact, square inches	3828	3852
TRACTOR DIMENSIONS (INCHES):		
Length (over-all):		
Bucket on ground and rolled back (4-in-1, including teeth)	———	216
Bucket on ground and rolled back (skid shovel)	———	207-1/2
Over-all length without blade	164-3/8	———
Width:		
Over-all (with standard track shoe)	94	———
Width of bucket	———	96
Height (over-all):		
Less exhaust pipe, air cleaner pipe and lights	———	92-7/8
To top of exhaust pipe	128.5	———
Drawbar height:		
Ground to center of clevis	18	———
Center line of clevis to bottom of track shoe	———	19-1/8 or 21-5/8
Ground clearance	17.6	18-5/8
WEIGHTS (INCLUDING FUEL AND WATER) APPROXIMATE POUNDS:		
4-in-1	———	40,475
Skid shovel	———	39,200
Basic tractor	31,100	———

GENERAL DATA

STANDARD TORQUE DATA FOR NUTS AND BOLTS

(For special torque data refer to specification paragraph of the pertinent section of this manual.)

Recommended torques, in foot-pounds, for standard application nuts and bolts shown below are applicable, provided:

A. All threads are lubricated with engine oil or chassis grease. (Refer to NOTE.)

B. Joints are rigid; for example, no gaskets or compressible materials are used.

NOTE: Multiply standard assembly torques by the following factors:

1) .85 when metallic plated bolts or nuts are used.
2) .75 when parkerized bolts or nuts are used.
3) .70 when Molykote, white lead or similar mixtures are used as lubricants.
4) .90 when hardened surfaces are used under the nut or bolt head.
5) 1.20 when Loctite is used for plain bolts and nuts on the threads.
6) 1.25 when taper head bolts are used with bolt heads torqued.
7) 1.40 when Loctite is used for taper head bolts on the threads with bolt heads torqued.

When re-using bolts and nuts in service, use minimum torque values.

BOLT SIZE	IH TYPE 5		IH TYPE 8	
	MIN.	MAX.	MIN.	MAX.
1/4	9	10	12	14
5/16	19	21	27	30
3/8	33	37	45	50
7/16	53	60	75	85
1/2	80	90	115	130
9/16	115	130	160	180
5/8	160	180	220	250
3/4	290	320	400	450
7/8	420	470	650	730
1	630	710	970	1090
1-1/8	850	950	1380	1550
1-1/4	1200	1350	1940	2180
1-1/2	2000	2300	3300	3700
1-3/4	3300	3700	5300	6000
2	5000	5500	8000	9000

BOLT TYPE IDENTIFICATION CHART

IH Type	Obsolete IH Type	SAE Grade	DESCRIPTION	BOLT HEAD MARKING
5	2	5	WILL HAVE 3 equally spaced RADIAL LINES Quenched and tempered medium carbon steel	
8	4	8	WILL HAVE 6 equally spaced RADIAL LINES Quenched and tempered medium carbon alloy or medium carbon boron steel	

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GENERAL DATA

LOCTITE GRADE "B," PLASTIC GASKET, PIPE SEALANT, AND LOCQUIC RECOMMENDATION AND APPLICATION DATA

Special Loctite data, if any, is shown in the specific section of this manual that is affected.

LOCTITE

Loctite is a lock or seal for metal parts. It is furnished as a liquid plastic. Contact with air keeps it liquid. When confined between mating parts, the exclusion of air causes the liquid Loctite to set by chemical action.

LOCQUIC

Locquic is a priming rinse used to speed the setting of Loctite and also must be used on zinc or cadmium plated parts for preparing the surface, enabling the Loctite sealant to completely set. Locquic Grade "T" is available in six ounce pressure spray cans.

LOCTITE APPLICATION

PIPE THREADS: Use Loctite pipe sealant.

STUD THREADS: Use Loctite plastic gasket. Run a strip of plastic gasket the full thread length of the stud. Do the same to the hole thread.

BOLT THREADS: Fill the first two or three leading threads in area of engagement with Loctite Grade "B." (Yellow color.)

NOTE: Loctite, in any form, is not to be used when the following threaded hardware or method of attaching is used.

1. Exhaust pipe mounting hardware.
2. Elastic stop nuts.
3. When lock washers are used.
4. When bolt or nut retaining lock plates are used.
5. On items requiring frequent service (500 hours or less), such as filler caps, adjusting screws, wheel stud clamp retaining nuts, etc.
6. On brass pipe plugs and fittings in air systems.

PART PREPARATION FOR LOCTITE

PLAIN, PHOSPHATE COATED, OR PLATING OTHER THAN ZINC OR CADMIUM: Clean the surfaces where Loctite is to be applied to remove heavy coating of oil, grease, and dirt (rust or light oil film are not detrimental). Normal shop practice of cleaning or degreasing is adequate. Allow surface to dry before applying Loctite. Care must be used on blind tapped holes to remove chips and oil.

ZINC OR CADMIUM PLATED PARTS OR FOR QUICK SETTING: To assure setting of Loctite on zinc or cadmium surfaces and quick setting on other surfaces at least one of the mating surfaces should be sprayed with Locquic Grade "T." Locquic Grade "T" is an effective rinse for oily parts. Allow surfaces to dry before applying Loctite Grade "B."

EXTREME COLD TEMPERATURE APPLICATIONS

A. Without special precautions, Loctite products can be applied and will cure at temperatures down to 50°F; at that temperature ultimate strength will be obtained within 72 hours.

B. At temperatures from 50°F to 32°F, only a job-identified product such as Stud Lock or Retaining Compound with the use of Locquic Primer Grade T can be recommended. Letter grades such as A, AV, AVV do not have the faster cure mechanism of job-identified products and consequently cannot be recommended for applications at these temperatures since they will exhibit only limited cure.

C. At temperatures below 32°F, no Loctite products can be recommended for applications.

It is recommended, in temperatures below 50°F. that heat not exceeding 100°F. be applied to the parts being loctited for length of time specified below.

SETTING (before placing in service)

1. Normal time is three to four hours.
2. With regular Locquic Grade "T" - two to ten minutes. Full cure: 30 minutes to 3 hours.
3. With regular Locquic Grade "N" - two to three hours.

Once cured, Loctite can be used on equipment operating at temperatures as low as -65°F.

REMOVAL

Parts difficult to remove can be pre-heated to approximately 400° to 500°F prior to removal.

GENERAL DATA

FLEXIBLE (OR MARMAN PIPE AND TUBING COUPLINGS

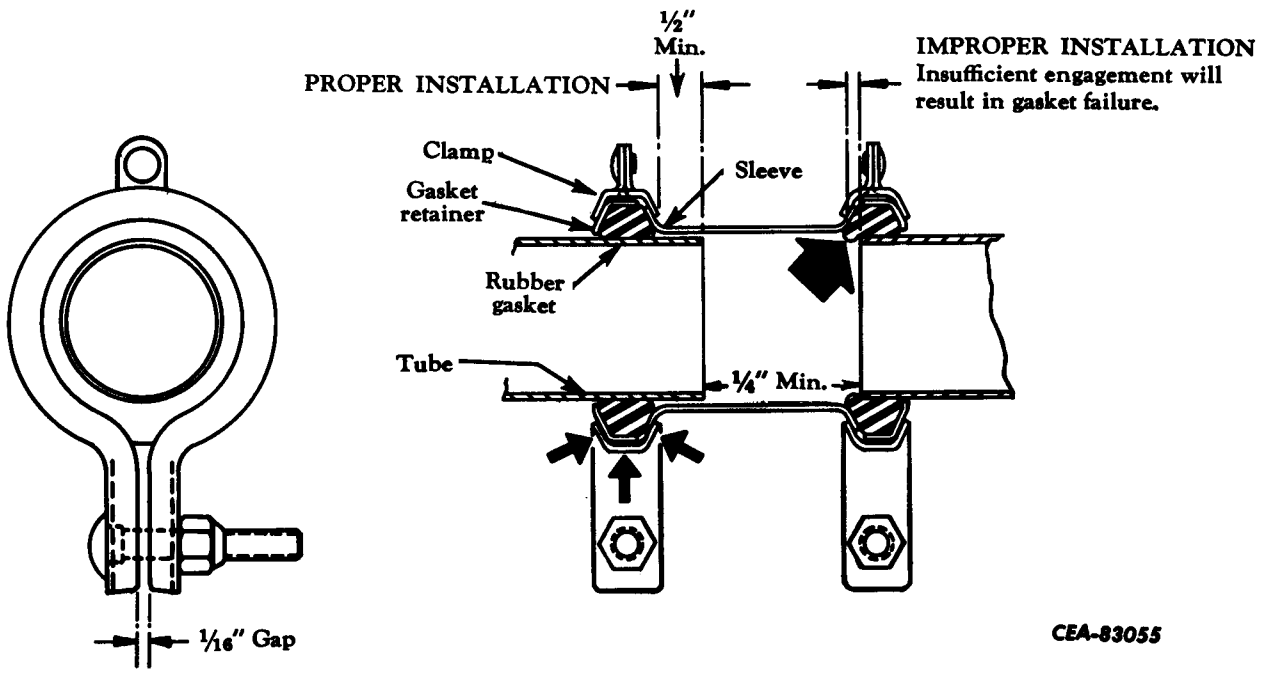
The flexible (or Marman) coupling used to connect hydraulic tubing or pipe consists of a flared sleeve, two rubber gaskets contained in two metal retainers and two V-band coupling clamps (Illust. 1).

Torque applied to the nut and bolt on each clamp produces a radial load which causes the inclined sides of the clamp to compress the rubber gasket axially and radially (Illust. 1). The flexibility of this type of joint permits up to a 4° of angular misalignment and still maintains a leakproof seal. It also permits axial movement of the tube.

Install one end of the joint but do not tighten until the other end of the assembly has been installed. This allows for positioning and aligning the connected components. However, in the process, the sleeve may accidentally be moved too far in one direction, creating the situation shown in Illust. 1. The right side of the illustration shows the gasket improperly clamped on the edge of the tube. Axial movement or vibration of the tube may work it loose from the joint or damage the rubber gasket, causing a suction leak or oil leak. To make a good seal, the ends of the tubes must extend past the rubber gasket into the sleeve. Exact tube measurement is not necessary as long as the 1/2 inch min. is obtained as shown in Illusts. 1 and 2. There should be no less than 1/4 inch between the ends of the tubes in the sleeve.

To avoid the situation shown in Illust. 1, install the gasket assemblies on the tubes in their approximate assembled position, then mark the tube on the retainer side of the gasket assembly. The position of the tube ends can then be easily located in the final assembly. Be sure the gasket assemblies are installed on the tubes so that the exposed gaskets face the joint (Illust. 1 and 2). Before tightening the clamps make sure the flared ends of the sleeve are within the clamp all the way around. The clamps must be tightened so there is a minimum gap of 1/16" between the ends of the clamp (Illust. 1).

NOTE: Tube or pipe O.D. surface under rubber gasket must be smooth and free of tool marks or nicks. Use an internal wrench for installation of short pipe nipples. Replace rubber gaskets every time couplings are removed.



Illust. 1
Flexible Tube Coupling Assembly.

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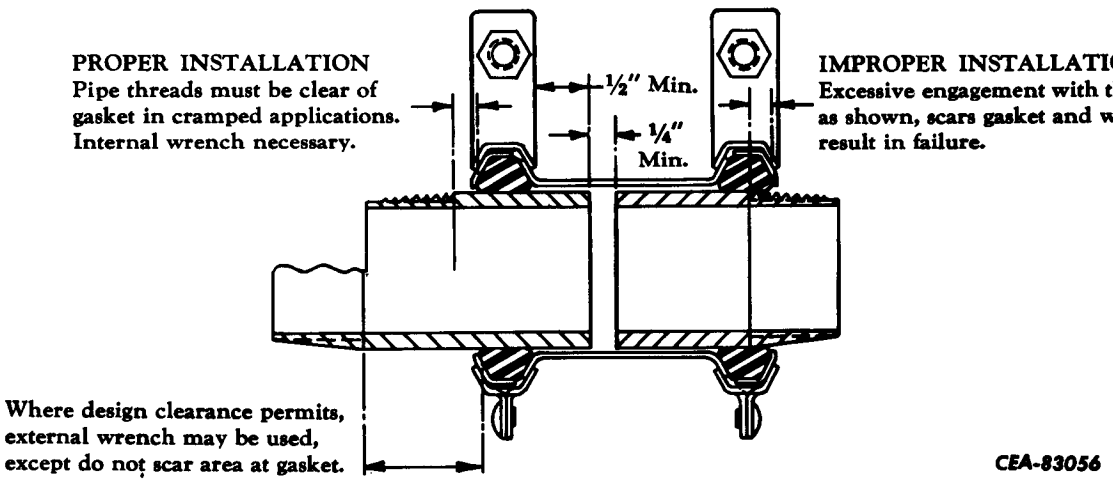
GENERAL DATA



Illust. 2
Flexible Pipe Coupling Assembly.

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

CONTENTS

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GENERAL

1. DESCRIPTION

The cooling system used on the TD-20 SERIES B tractors and the MODEL 250 and 250B Loaders are a closed-type system that permits operation at extreme angles without loss of coolant through the overflow pipe. The closed-type system also permits operation at higher engine temperatures without boiling. Extra care must be taken that all connections are tight.

A centrifugal water pump circulates the coolant from the radiator lower tank through the crankcase and cylinder head water jackets, past the thermostat into the radiator upper tank and down through the tubes of the radiator core to the lower water tank where the cycle is repeated. Hoses provide the connections between the radiator inlet and outlet headers and the water pump.

The pressure type system is controlled by a pressure relief valve located on the upper tank next to the radiator filler cap. The relief valve is set to open at approximately six pounds pressure per square inch. For servicing the pressure relief valve, refer to the operator's manual.

Operation

When the engine is started cold, the by-pass type thermostat is closed, preventing circulation of low temperature coolant through the radiator core. The coolant circulates only through the water pump and engine water passages. This circulation during the warm-up period prevents formation of steam pockets. When the engine reaches operating temperature, which is determined by thermostat specifications, the coil of the thermostat expands and opens the passage for the coolant to flow from the engine water passages through the radiator and back to the water pump. The temperature of the coolant controls the extent of the thermostat opening which, in turn, controls the amount of coolant circulation.

2. SPECIFICATIONS

Cooling system capacity, gals.	Refer to operator's manual.
Water pump type	Centrifugal
Thermostat opening range	179° F - 181° F

Special Nut and Bolt Torque Data (Foot-Pounds)
(Torques given are for bolts and nuts lubricated with SAE-30 engine oil).

Fan shroud mounting bolts	20-25

NOTE: Except for the special torques shown, all bolts and nuts are to be torqued to the amount shown in the "STANDARD TORQUE DATA CHART" in Section 1, "GENERAL."

3. CHECKING MECHANICAL PROBLEMS

PROBABLE CAUSE	REMEDY
Defective Cooling System	
1. Insufficient water	Add water; inspect for leaks.
2. Faulty thermostat	Test. If necessary, replace.
3. Dirty water	Drain and clean system.
4. Defective connections	Replace swelled, worn or loose hose connections.
5. Radiator defective	Repair. If necessary, replace.
6. Fan defective	Inspect and replace if necessary.
7. Defective pressure relief valve	Replace.
8. Defective water pump	Inspect for leaking seals and internal damage and repair.
9. Dirty or scaled coolant passages	Clean and flush passages.
10. Radiator clogged	Flush out radiator.
11. Fan belt slippage	Check the tension; replace if greasy or worn.

RADIATOR

4. REMOVAL

1. LOADERS ONLY: Raise the bucket and install the safety bar. Shut off the engine.

TD-20 SERIES B ONLY: Lower the blade to the ground.

2. Drain the radiator.

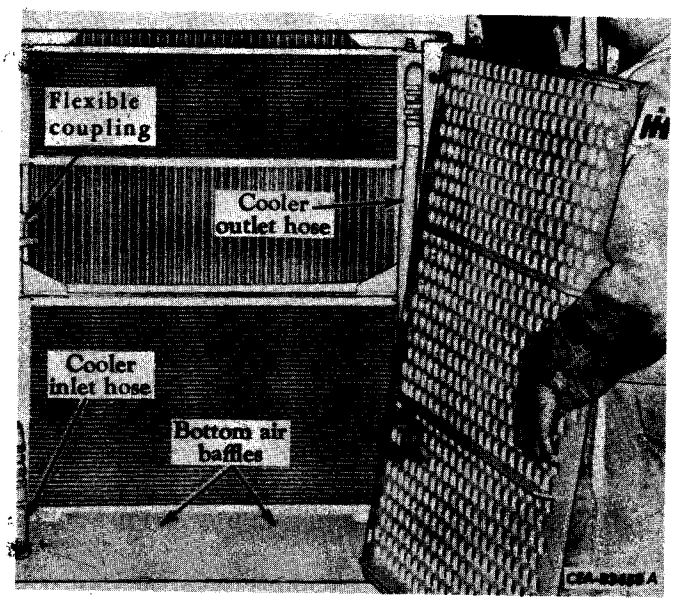
3. Remove the hood side door on each side of the unit (snap on type). Remove the engine side sheet on each side of the unit.

4. Remove the exhaust pipe extension. Disconnect the air cleaner and mounting brackets at the underside of the hood. Remove the hood.

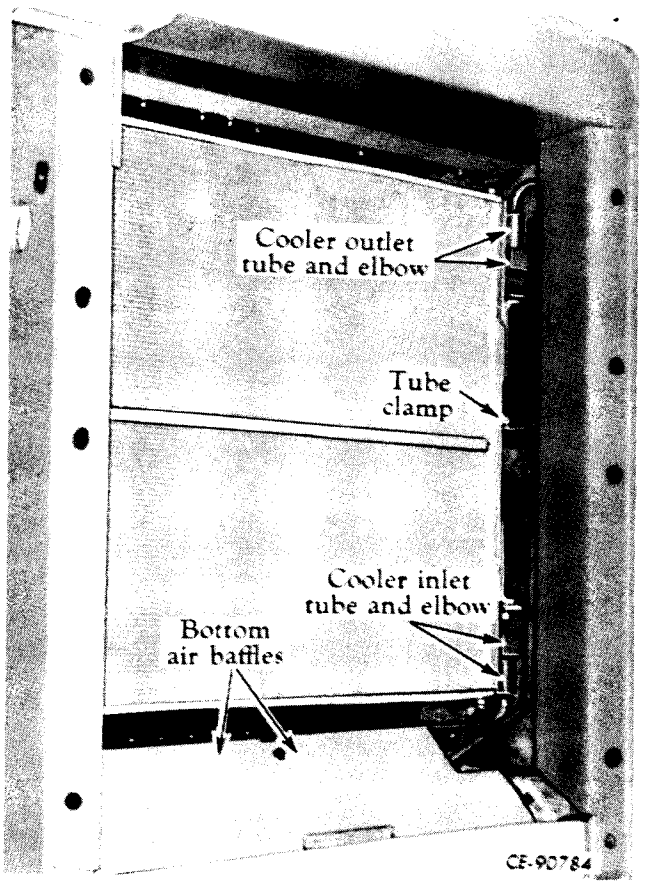
5. RIGID TYPE OIL COOLERS: Remove the radiator guard door. Remove the two bottom air baffles (one piece on earlier machines). Remove the two grommets from the cooler hoses (Illust. 1).

HINGE TYPE OIL COOLER: Remove the radiator guard door. Remove the two bottom air baffles (Illust. 2). Disconnect the oil cooler inlet and outlet tubes at the hose connections below the bottom air baffles.

6. RIGID TYPE OIL COOLERS: Disconnect the cooler hoses at the safety filter mounted to the left hand side of the frame. Cap hoses to prevent dirt from entering (Illust. 1 and 6).



Illust. 1
Removing the Radiator Guard Door (Rigid Type Oil Coolers).



Illust. 2
Hinge Type Oil Cooler and Connections.

7. RIGID TYPE OIL COOLERS: Loosen the clamps of the flexible tube coupling securing the cooler nipples and push the coupling sleeve down onto the lower nipple. Remove the upper cooler mounting cap screws, lock washers and flat washers and remove the cooler with outlet hose. Remove the mounting hardware and remove the lower cooler with inlet hose (Illust. 1).

HINGE TYPE OIL COOLER: Disconnect the tube clamp (Illust. 2) from the radiator guard. Remove the hardware securing the oil cooler to the radiator side channels. Remove the oil cooler with tubes from the radiator. To replace the sealing ring and seal used between each of the tube and elbow assemblies, separate the assemblies by pulling off the tube with a twisting motion.

8. Remove the finger guard and fan shrouds.

9. Disconnect the radiator outlet hose at the outlet elbow and the inlet hose at the radiator upper tank.

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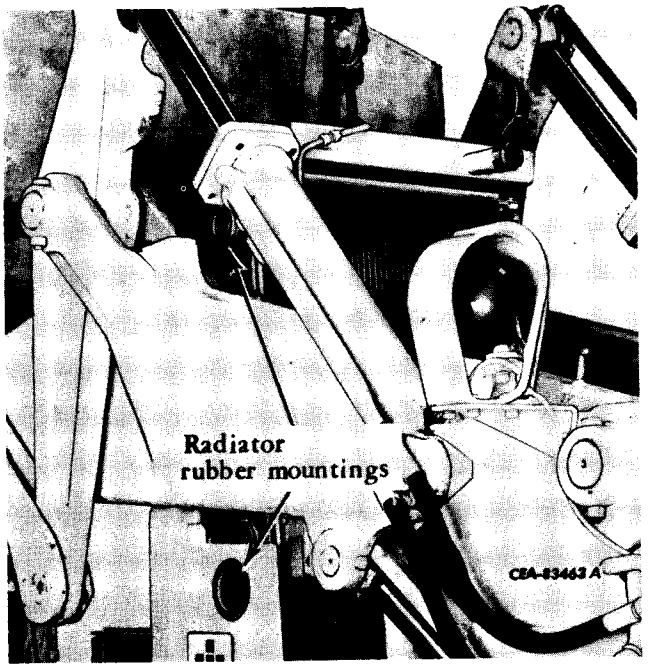
RADIATOR

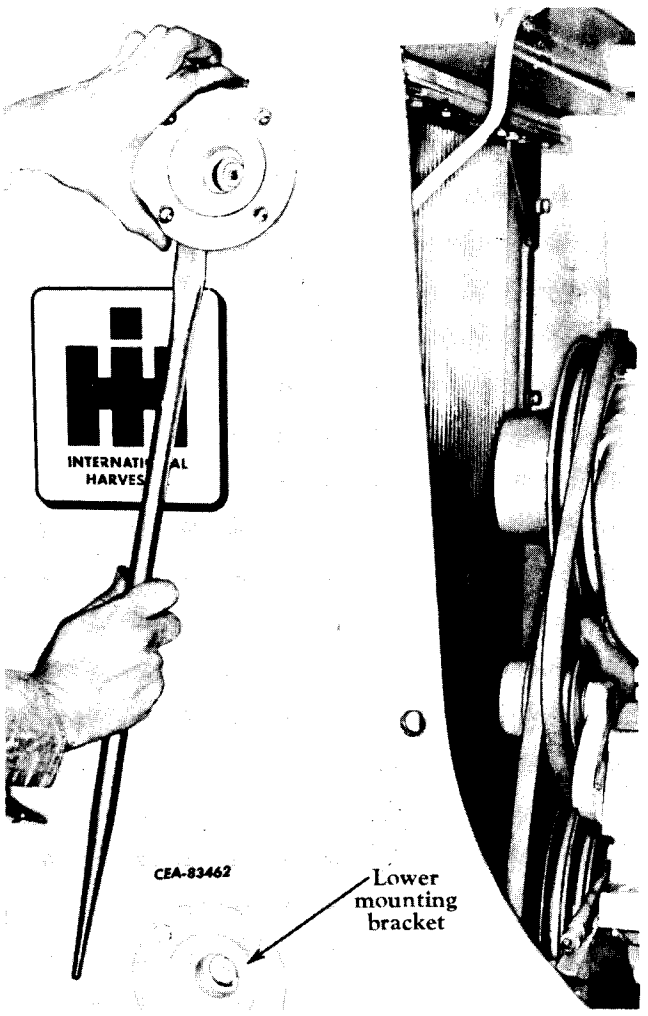
10. Remove the cap screws and lock washers securing the fan to the hub and remove the fan.

11. With the filler cap removed, a piece of bar stock with a provision for attaching a hoist can be inserted into the filler cap opening to support the radiator assembly for lifting out of the unit. Be careful not to damage the radiator core pins when positioning the bar in the upper tank. Place some tension on the hoist sling.

12. Remove the cap screws securing the mounting brackets to the radiator guard and pry the brackets free of the rubber mountings (two brackets on each side of radiator guard) (Illust. 3). It is not necessary to remove the rubber mountings (34, Illust. 5) to remove the radiator (refer to Illust. 4).



Illust. 4
Removing the Radiator Assembly.



Illust. 3
Removing the Radiator Mounting Bracket.

13. TD-20 SERIES B ONLY: Carefully hoist the radiator assembly up and remove from the front of the tractor.

LOADERS ONLY: Carefully hoist the radiator assembly up and remove from the rear of the loader (Illust. 4). If the hoisting equipment available is not sufficient to raise the radiator over the rear of the loader, remove the radiator as follows:

(a) Remove the two lower mounting brackets (upper mounting brackets still in position at this point) (Illust. 3).

(b) Attach a hoist to the lift arm cross member. Remove the safety bar and lower the bucket to the ground.

(c) Connect hoist to radiator upper tank.

(d) Remove the two upper mounting brackets (Illust. 3). Lift the radiator up and out over the radiator guard and bucket.

RADIATOR

5. DISASSEMBLY

(Ref. Nos. Refer to Illust. 5)

Inspect the radiator assembly carefully to determine its serviceability. If it is necessary to repair or replace the radiator core (39), proceed as follows:

1. Remove the cap screws, nuts and washers securing the upper tank (16) to the radiator core and side channels. Remove the two stiffeners (18).

2. Remove the mounting bar (17) and top air baffle (22) from the upper tank. Lift off the upper tank and gasket.

3. Turn the core over so the lower tank (25) is up. Remove the cap screws, nuts and washers securing the lower tank to the core and side channels. Remove the lower tank, stiffeners (18) and gasket. Remove the side channels from the core.

6. INSPECTION AND REPAIR

1. Flush the water tanks thoroughly with water. Flush out the core with water under pressure, both inside and outside. If the core is greasy, clean it with steam cleaning equipment. Clean all other radiator parts.

2. Inspect the water tanks for cracks. Examine the radiator core tubes and fins for damage. Straighten bent fins, if possible, to avoid air flow restrictions.

3. Examine all hoses for cracks or ruptures and install new hoses when in doubt.

4. Inspect the rubber mountings in the side channels for damage and replace if necessary. The rubber mountings can be removed using a slide hammer threaded into the 3/8" NF nut of the mounting. Do not allow the threaded rod of the slide hammer to enter below the nut as it may contact and damage the radiator core fins. If the rubber mountings are removed, it will be easier to install the new mountings when securing the radiator assembly to the radiator guard.

5. If necessary, the pressure valve (15) can be replaced by removing the housing (13) from the upper tank. Install the new valve and secure the housing (13) using new gaskets (14) (Illust. 5).

6. Inspect the seals on each of the side channels for deterioration and damage. If replacement is necessary, remove all the old adhesive and cement new seals to the channels with Minnesota Mining and Manufacturing adhesive Number EC-711, EC-847, EC-870 or equivalent.

7. Be sure the overflow pipe (10, Illust. 5) is open and not crimped or dented to the extent of impairing its capacity.

7. REASSEMBLY

(Ref. Nos. Refer to Illust. 5)

NOTE: When installing cap screws, refer to the standard torque chart in Section 1, "GENERAL" for the proper torque unless otherwise stated.

1. Place the radiator core on end. Position the lower gasket (40) and water tank on the core.

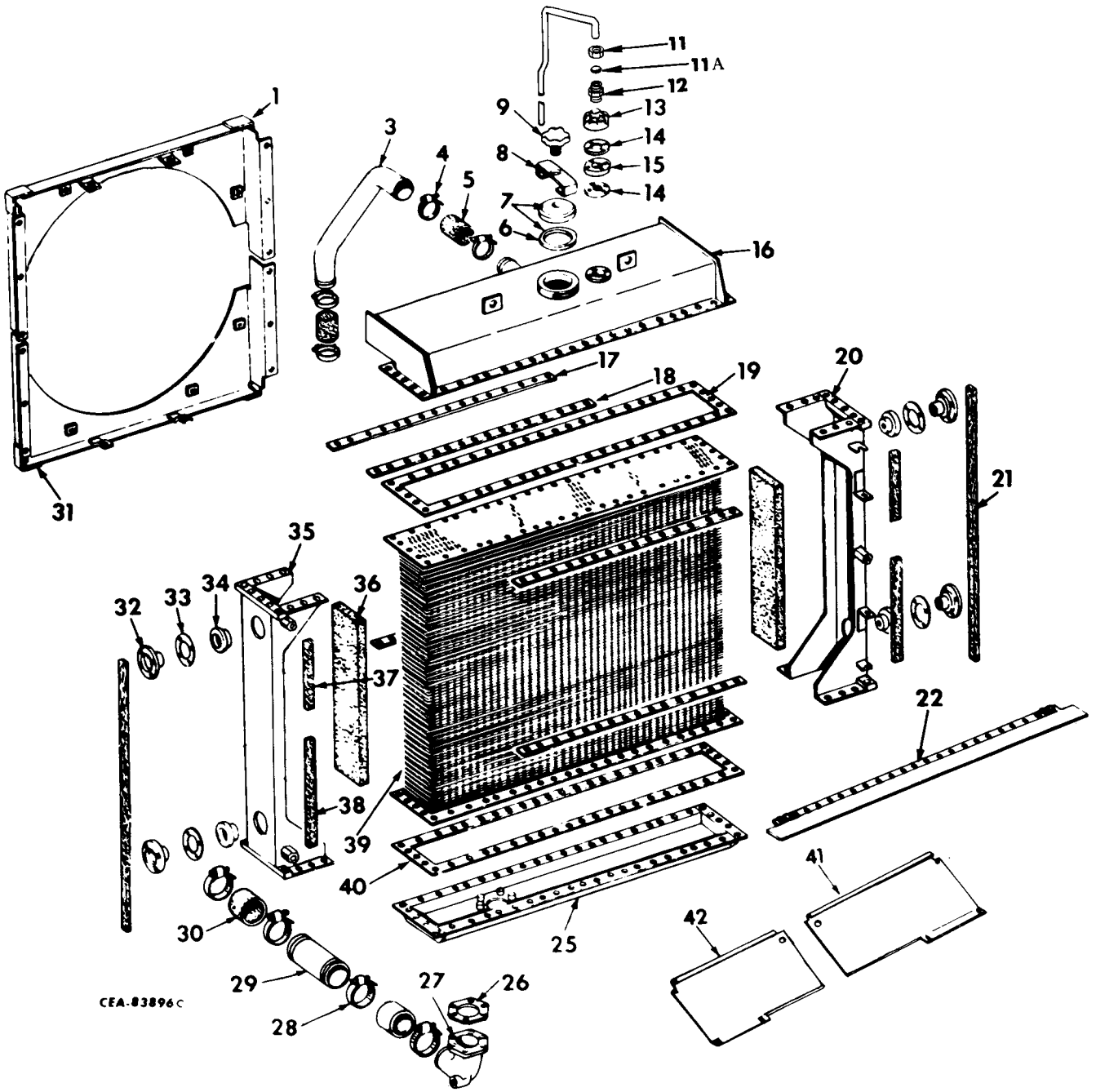
2. Position the two lower stiffeners (18) against the underside of the core flange and install the cap screws, nuts and washers to hold them in position.

(Continued on page 6)

Legend for Illust. 5.

1. Fan shroud (upper).
3. Inlet pipe.
4. Hose clamp.
5. Inlet hose.
6. Gasket.
7. Radiator cap.
8. Cap clamp.
9. Clamp handle.
10. Overflow pipe.
11. Nut.
11A. Sleeve.
12. Connector.
13. Valve housing.
14. Gasket.
15. Pressure valve.
16. Upper tank.
17. Mounting bar.
18. Core stiffener.
19. Gasket.
20. Side channel (LH).
21. Side channel seal.
22. Air baffle (top).
25. Lower tank.
26. Gasket.
27. Outlet elbow.
28. Hose clamp.
29. Outlet pipe.
30. Outlet hose.
31. Fan shroud (lower).
32. Mounting bracket.
33. Bracket spacer.
34. Rubber mounting.
35. Side channel (RH).
36. Core snubber.
37. Side channel upper seal.
38. Side channel lower seal.
39. Radiator core.
40. Gasket.
41. Bottom air baffle (RH).
42. Bottom air baffle (LH).

RADIATOR



Illust. 5
Exploded View of Radiator Assembly (Loaders Shown, TD-20 SERIES B Similar).

RADIATOR

7. REASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 5)

3. Be sure the seals (21, 36, 37 and 38) are properly seated on the side channels. Position the side channels between the flanges of the core (39) and secure to the lower water tank. Tighten all the cap screws, nuts and washers. Turn the assembly over so the lower tank is down.

4. Install a new upper gasket (19) on the core and place the upper tank on the core. Position the mounting bar (17) on the rear flange of the upper tank and the air baffle (22) on the front flange.

5. Position the stiffeners (18) against the underside of the core flange. Install and tighten all the cap screws, nuts and washers.

8. INSTALLATION

1. Hoist the radiator assembly into position between the sides of the radiator guard. With the aid of the hoist, raise and lower the assembly as necessary to align the mounting holes in the guard with the openings in the radiator frame or radiator rubber mountings.

2. Place the spacers on the brackets and insert the mounting brackets into the rubber mountings in the radiator frame. Secure the brackets to the guard with the cap screws. If the rubber mountings were removed in disassembly of the radiator, install the mountings and brackets as follows:

(a) Place the spacer and rubber mounting on the bracket and coat the leading edge of the mounting with Dow Corning No. 55 Pneumatic Grease (MIL-4343A) (or equivalent).

(b) Position the bracket and rubber mounting assembly in position against the radiator guard and, using two cap screws (180 degrees apart) long enough to start in the mounting threads of the guard, tighten evenly until the regular cap screws can be inserted.

(c) Use the regular mounting screws to seat the assembly.

(d) Install the three remaining rubber mountings, brackets and spacers in the same manner. Remove the hoist.

3. Connect the radiator inlet and outlet hoses and secure with the hose clamps.

4. Secure the fan to the fan hub with the cap screws and lock washers.

5. Position the fan shrouds on the radiator and secure with the mounting bolts using 20-25 ft. - lbs. torque. Install the finger guard.

6. HINGE TYPE OIL COOLER: Install a new sealing ring in the groove of each oil tube elbow. Install a new seal in the bore of each oil tube. The seals must be bottomed in the bore with the stamped part number down. Install the tubes to the elbows being careful not to damage the ring or seal (Illust. 2).

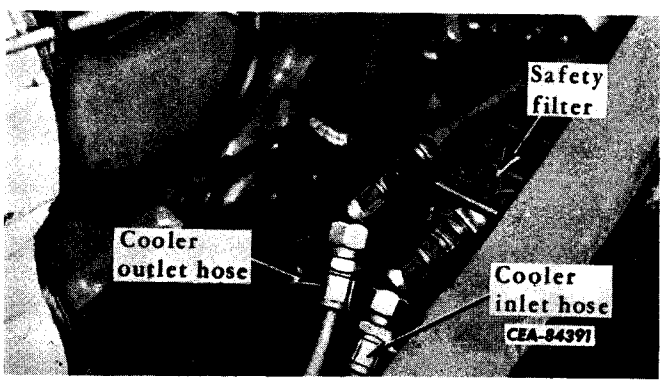
7. RIGID TYPE OIL COOLERS: Install the lower cooler with inlet hose and flexible coupling attached (Illust. 1). Install the upper cooler with outlet hose attached. Connect the cooler nipples with the flexible coupling (refer to Section 1, "GENERAL" for the proper method of installing a flexible coupling). Connect the cooler hoses at the safety filter (Illust. 6).

HINGE TYPE OIL COOLER: Position the oil cooler with tubes attached on the front of the radiator and secure it to the radiator side channels with the mounting hardware. Secure the tube clamp to the radiator guard (Illust. 2).

8. RIGID TYPE OIL COOLERS: Install the rubber grommet to the cooler hose opening in each of the bottom air baffles (Illust. 1). Then position the cooler hoses into the grommets. Secure the bottom air baffles to the radiator guard. Install the radiator guard door.

HINGE TYPE OIL COOLER: Connect the oil cooler inlet and outlet tubes to the hose connections. Install the two bottom air baffles. Install the radiator guard door.

9. Install the hood. Connect the air cleaner and mounting brackets to the underside of the hood. Install the exhaust pipe extension.



Illust. 6
Oil Cooler Hose Connections used with Rigid Type Oil Coolers.

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RADIATOR

10. Install the engine side sheets and the hood side doors.

11. Be sure the drain valve is closed and tight and refill the radiator.

12. Start the engine and check for leaks. After the engine is up to operating temperature, recheck the coolant level and add if necessary (refer to the operator's manual procedure and type of coolant).

13. Check the main frame oil level and add the proper amount for operation (refer to the operator's manual for the proper grade and level).

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

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CONTENTS

1. GENERAL DESCRIPTION

A 24-volt negatively grounded electrical system is used, consisting of a lighting system and a starting system. Four 6-volt batteries connected in series are used to supply the 24-volts required for starting. A master switch is used to cut-out the electrical system to prevent accidental starting.

The headlights and rear lights are the sealed beam type and are controlled by the light switch on the instrument panel.

A 15 amp fuse is located in a housing mounted on the front of the instrument panel. Any time a short circuit or overload condition occurs in the electrical wiring, the fuse will break the circuit and prevent damage to the electrical system.

As a guide for identifying the various electrical units and for tracing the electrical cables and connections, refer to the pertinent wiring diagram in this section.

NOTE: The wiring diagrams shown are for the later units only. For wiring diagrams on earlier units, refer to the pertinent parts catalog.

For Delco-Remy part number and specifications of the cranking motor, alternator (or generator) and voltage regulator refer to service manual ISS-1503. For detailed instructions on repair, test and adjustment of these components, refer to Delco-Remy service manual, form no. 1.2.

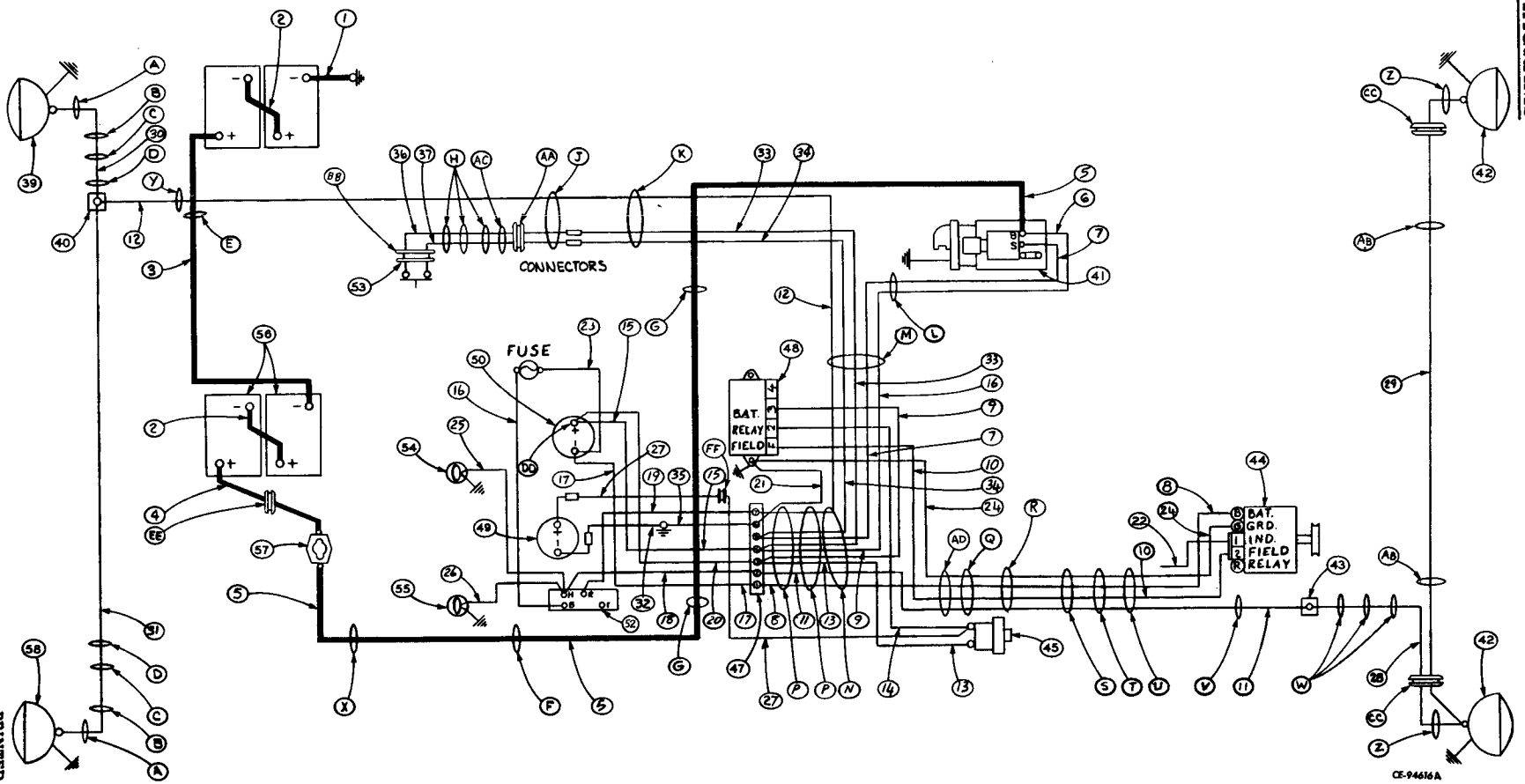
Delco-Remy manuals may be purchased from United Motors Service, Division of General Motors Corp., Detroit, Michigan.

2. SPECIFICATIONS

Special Bolt and Nut Torque Data (Foot-Pounds)
(Torques given are for bolts and nuts lubricated with SRE-30 engine oil).

Light switch mounting nut	15-20
Starting switch mounting nut	15-20
Instrument panel light assembly mounting nut	15-20

TD-20 SERIES B TRACTOR
(TD-20 BP-22995 UP)
(TD-20 BPS-22995 UP)



Illust. 1
Wiring Diagram.

All cables are black unless otherwise noted.

NOTE: The cables shown in the wiring diagram are numbered according to the most logical sequence for locating and checking electrical wiring problems.

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3. WIRING DIAGRAMS

Legend for Illust. 1

Ref. No.	Description
1.	STRAP, negative terminal on battery to ground.
2.	CABLE, battery to battery (short).
3.	CABLE, battery to battery (long).
4.	CABLE, positive (+) terminal on battery to master switch.
5.	CABLE, master switch to "B" terminal on solenoid.
6.	CABLE, terminal strip to "B" terminal on solenoid (red).
7.	CABLE, terminal strip to "S" terminal on solenoid (white).
8.	CABLE, terminal strip to "B" terminal on alternator (brown).
9.	CABLE, terminal strip to No. 3 terminal on regulator (orange).
10.	CABLE, "F" terminal on regulator to No. 2 terminal on alternator (lt. green).
11.	CABLE, terminal strip to front light junction block (dk. green).
12.	CABLE, terminal strip to rear light junction block.
13.	CABLE, terminal strip to engine oil pressure switch (yellow).
14.	CABLE, No. 2 terminal on regulator to engine oil pressure switch (lt. blue).
15.	CABLE, terminal strip to positive (+) terminal on ammeter (red).
16.	CABLE, fuse housing to "B" terminal on light switch (orange).
17.	CABLE, terminal strip to negative (-) terminal on ammeter (brown).
18.	CABLE, terminal strip to "H" terminal on light switch (dk. green).
19.	CABLE, terminal strip to "R" terminal on light switch (rear light) (dk. blue).
20.	CABLE, terminal strip to positive (+) terminal on ammeter (yellow).
21.	CABLE, terminal strip to regulator LH mounting bolt.
22.	CABLE, No. 1 terminal on alternator to dummy cable.
23.	CABLE, negative (-) terminal on ammeter to fuse housing.
24.	CABLE, "G" terminal on alternator to mounting bolt on regulator.
25.	CABLE, "H" terminal on light switch to LH instrument panel light.
26.	CABLE, "H" terminal on light switch to RH instrument panel light.
27.	CABLE, positive on hourmeter to pressure switch.
28.	CABLE, front lamp junction block to RH front light.
29.	CABLE, RH to LH front light.
30.	CABLE, rear light junction block to LH rear light.
31.	CABLE, rear light junction block to RH rear light.
32.	CABLE, hourmeter to ground (on instrument panel).
33.	CABLE, terminal strip to connector (red).
34.	CABLE, terminal strip to connector (white).
35.	CABLE, terminal strip to ground screw on panel.
36.	CABLE, starting switch to connector.
37.	CABLE, starting switch to connector.
39.	LIGHT ASSEMBLY, rear.
40.	BLOCK, rear light junction (mount on LH seat side sheet).
41.	MOTOR, cranking.
42.	LIGHT ASSEMBLY, headlight.
43.	BLOCK, front light junction (mount on fan shroud).
44.	ALTERNATOR ASSEMBLY (24 volt).
45.	SWITCH, engine oil pressure.
47.	STRIP, feed through terminal.
48.	REGULATOR ASSY, voltage (24 volt).
49.	HOURMETER.
50.	AMMETER.
52.	SWITCH, lighting.
53.	SWITCH, starting safety.
54.	LIGHT, LH instrument panel.
55.	LIGHT, RH instrument panel.
56.	BATTERY, dry charged (6 volt).
57.	SWITCH, master.
58.	LIGHT, auxiliary rear flood.
A.	CLIP, (on rear inner bolt of lamp bracket).
B.	CLIP, on top inner bolt on front of fuel tank.
C.	CLIP, on top of rear bolt of side sheet.
D.	CLIP, on bottom rear bolt of seat side sheet.
E.	CLIP, on tapped block on LH side of battery box support channel.
F.	CLIP, on bottom bolt of brake pedal bracket.
G.	CLIP, on RH and LH upper bolts on T.C. housing.
H.	CLIP, (welded inside PS gear selector box).

(Continued on next page)

3. WIRING DIAGRAMS - Continued

Legend for Illust. 1 - Continued

Ref. No.	Description
J.	CLIP, on LH rear bolt of seat frame support cross bar.
K.	CLIP, on bolt securing fuel lines clamp to LH fender.
L.	CLIP, on bolt of engine of engine oil filter header.
M.	CLIP, on LH front bolt of P.T.O. cover.
N.	CLIP, on inner bolt of pressure tubes clamp on dash.
P.	CLIP, (welded on dash).
Q.	CLIP, on top rear bolt of eng. push rod rear cover.
R.	CLIP, on 3rd from front top bolt of engine push rod rear cover.
S.	CLIP, top rear bolt of engine push rod front cover.
T.	CLIP, on 2nd from front top bolt of eng. push rod front cover.
U.	CLIP, on alternator bracket rear mounting bolt.
V.	CLIP, on RH front top stud of water pump.
W.	CLIP, on RH bottom center and top fan shroud mounting bolts.
X.	CLIP, on RH bottom bolt of seat frame support cross bar.
Y.	CLIP, on LH bolt of battery box support channel.
Z.	CLIP, on lamp swivel bolt.
AB.	CLIP, welded on radiator guard header plate.
AC.	CLIP, between service cover and housing assy, of gear selector lower rear bolt.
AD.	CLIP, on upper mtg. bolt of flange on oil cooler tube to flywheel housing.
AA.	GROMMET, on rear of LH side of frame.
BB.	GROMMET, on starting safety switch lock cam bracket.
CC.	GROMMET, on sides of radiator guard top header.
DD.	INSULATOR, (on + terminal of ammeter.
EE.	GROMMET, on RH seat side sheet.
FF.	GROMMET, on dash (used w/T.C. oil temp. capillary tube).
	HARNESS, cranking motor (consists of Ref. Nos. 6 and 7).
	HARNESS, instrument panel (consists of Ref. Nos. 15, 16, 17, 18, 19, 20 and 35).
	HARNESS, power shift housing cable (consists of Ref. Nos. 36 and 37).
	HARNESS, starting safety switch cable (consists of Ref. Nos. 33 and 34).
	HARNESS, regulator to alternator (consists of Ref. Nos. 8, 9, 10, 11, 13, 14, 21, 22 and 24).

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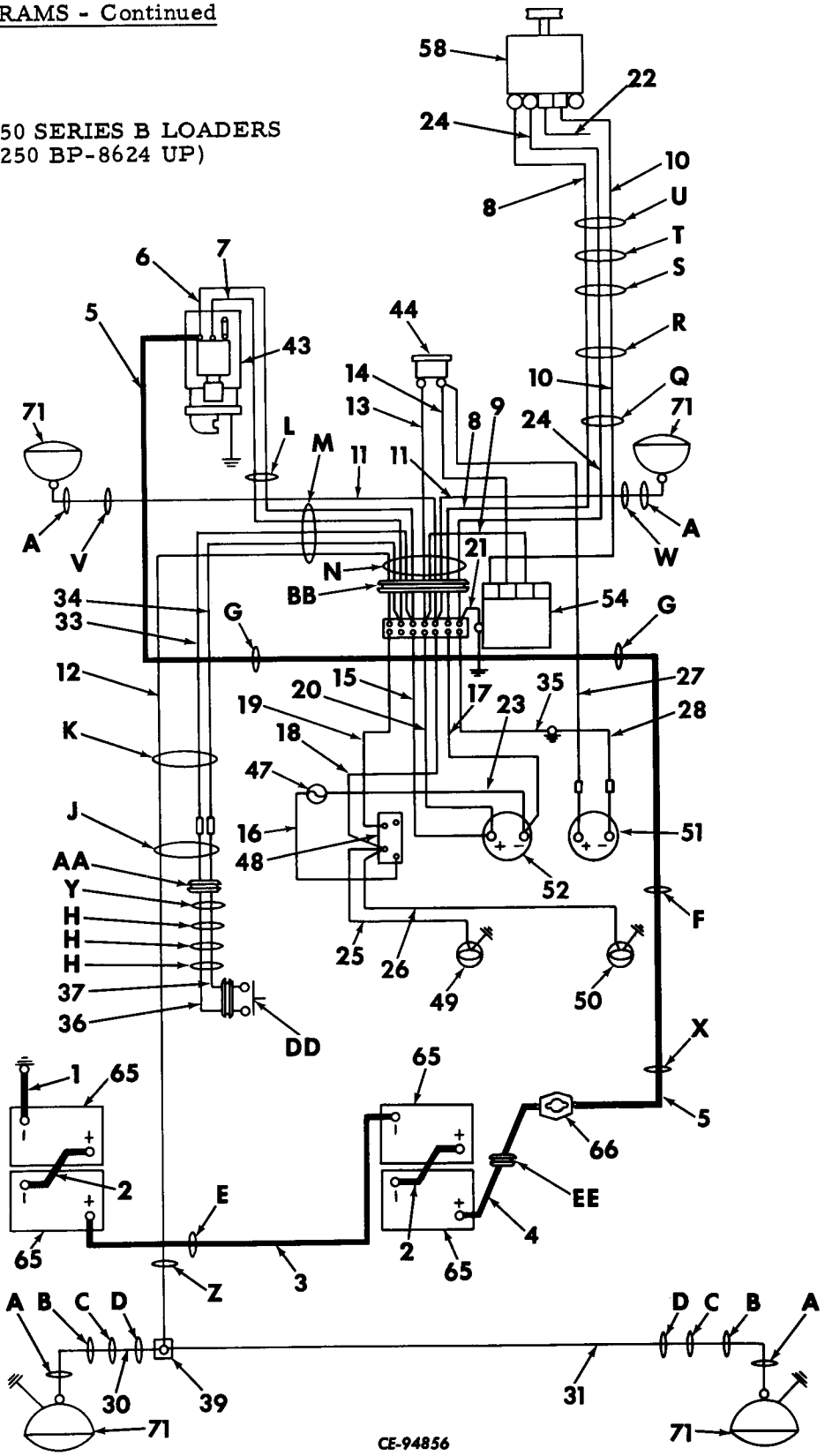
3. WIRING DIAGRAMS - Continued

MODEL 250 SERIES B LOADERS
(L-250 BP-8624 UP)



Illust. 2
Wiring Diagram.

3. WIRING DIAGRAMS

Legend for Illust. 2

Ref. No.	Description
1.	CABLE, negative (-) terminal on battery to ground.
2.	CABLE, battery to battery (short).
3.	CABLE, battery to battery (long).
4.	CABLE, positive terminal on battery to master switch.
5.	CABLE, master switch to "B" terminal on cranking motor solenoid.
6.	CABLE, terminal strip barrier to battery terminal on solenoid (red).
7.	CABLE, terminal strip barrier to switch terminal on solenoid (violet).
8.	CABLE, terminal strip barrier to "B" terminal on alternator.
9.	CABLE, "A" terminal on generator to "G" terminal on regulator (brown).
10.	CABLE, "F" terminal on generator to "F" terminal on regulator (blue).
11.	CABLE, terminal strip barrier to front light (green).
12.	CABLE, terminal strip barrier to rear light junction block.
13.	CABLE, terminal strip barrier to engine oil pressure switch (yellow).
14.	CABLE, terminal strip barrier to torque converter oil temperature sending unit (orange).
15.	CABLE, terminal strip barrier to positive (+) terminal on ammeter (red).
16.	CABLE, fuse housing to "B" terminal on light switch.
17.	CABLE, terminal strip barrier to negative (-) terminal on ammeter (pink).
18.	CABLE, terminal strip barrier to light switch (front lights) (green).
19.	CABLE, terminal strip barrier to light switch (rear lights) (white).
20.	CABLE, terminal strip barrier to negative (-) terminal on hourmeter (yellow).
21.	CABLE, terminal strip barrier to torque converter oil temperature gauge (orange).
22.	CABLE, No. 1 term on alternator to dummy cable.
23.	CABLE, negative terminal on ammeter to fuse housing.
24.	CABLE, "G" terminal on alternator to terminal strip.
25.	CABLE, light switch to RH instrument panel light.
26.	CABLE, light switch to LH instrument panel light.
27.	CABLE, positive on hourmeter to pressure switch.
28.	CABLE, (-) on hourmeter to ground.
30.	CABLE, junction block to LH rear light.
31.	CABLE, junction block to RH rear lamp light.
33.	CABLE, starting switch to terminal strip barrier (red).
34.	CABLE, starting switch to terminal strip barrier (white).
35.	CABLE, instrument panel grounding.
36.	CABLE, starting switch to connector (red).
37.	CABLE, starting switch to connector (violet).
39.	BLOCK, rear light junction (mount on LH side sheet).
43.	MOTOR, cranking.
44.	SWITCH, pressure.
46.	BARRIER, terminal strip.
47.	HOUSING, fuse.
48.	SWITCH, lighting.
49.	LIGHT, LH instrument panel.
50.	LIGHT, RH instrument panel.
51.	HOURMETER, electric.
52.	AMMETER.
54.	REGULATOR ASSY, voltage (24 volt).
57.	UNIT, torque converter oil temperature sending.
58.	ALTERNATOR ASSY (24 volt).
65.	BATTERY, dry charged (12 volt).
66.	SWITCH, master.
70.	CABLE, fuse housing to lighting switch.
71.	HEADLIGHT and REAR LIGHT ASSY.
A.	CLIP, rear inner bolt of light bracket.
B.	CLIP, (on top inner bolt on front seat of fuel tank).
C.	CLIP, (on top rear bolt of seat side sheet).
D.	CLIP, (on bottom rear bolt of seat side sheet).
E.	CLIP, terminal strip to rear light junction block cable (on tapped block on LH bolt of battery box support channel).
F.	CLIP, (on bottom bolt of brake pedal bracket).
G.	CLIP, (on LH and RH upper bolts on torque converter housing).
H.	CLIP.

(Continued on next page)

3. WIRING DIAGRAMS

Legend for Illust. 2 - Continued

Ref. No.	Description	Ref. No.	Description
J.	CLIP, (on LH rear bolt of seat frame support crossbar).	U.	CLIP, (on alternator rear mounting bolt).
K.	CLIP, (on bolt securing fuel lines clamp to LH fender).	V.	CLIP, (on top center bolt of air cleaner on LH firewall).
L.	CLIP, (on rear bolt of engine oil filtering header).	W.	CLIP, (on firewall upper LH bolt).
M.	CLIP, (on LH front bolt of power take-off cover).	X.	CLIP, (on RH bottom bolt of seat frame support crossbar).
N.	CLIP, cable harness (on firewall RH bottom).	Y.	CLIP, starter cable (between service cover and gear selector hand lever housing at lower rear cover mounting bolt clip section to be inside of selector housing).
P.	CLIP, on upper mounting bolt of flange on oil cooler tube to flywheel housing.	Z.	CLIP, on LH bolt or battery box support channel.
Q.	CLIP, (on top rear bolt of engine tappets rear cover).	AA.	GROMMET, (on rear of LH side of front frame).
R.	CLIP, (on third from front top bolt of engine tappets rear cover).	BB.	GROMMET, (on firewall).
S.	CLIP, (on top rear bolt of engine tappets front cover).	DD.	SWITCH, starting.
T.	CLIP, (on second from front top bolt of engine tappets front cover).		

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

CONTENTS

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1. DESCRIPTION

The tractor and loader are powered by the 429 SERIES turbocharged diesel engine. This engine is a six cylinder direct-starting, four-cycle, valve-in-head type.

2. REMOVAL

NOTE: Disconnected hydraulic lines must be capped with the correct size plastic cap. If caps are not available, use tape or rubber stoppers. Openings must never be plugged with rags. This practice could introduce dirt or lint into critical hydraulic components. Tag disconnected hydraulic lines and electrical cables to facilitate correct and faster installation.

1. Except for the following items, perform the complete procedure described in the removal of the radiator in section 2, "COOLING SYSTEM."

(a) RIGID TYPE OIL COOLERS: Do not remove the oil coolers. They will come off with the radiator. Disconnect hoses at coolers and remove the hoses.

HINGE TYPE OIL COOLER: Do not remove the oil cooler. It will come off with the radiator. Disconnect the cooler oil tubes at their hose connections below the radiator bottom air baffles.

(b) Do not remove the fan shroud or the fan (finger guard does have to be removed).

(c) Do not remove the radiator mounting brackets (radiator will come off with the radiator guard).

2. Close the fuel shut-off valve at the diesel fuel tank.

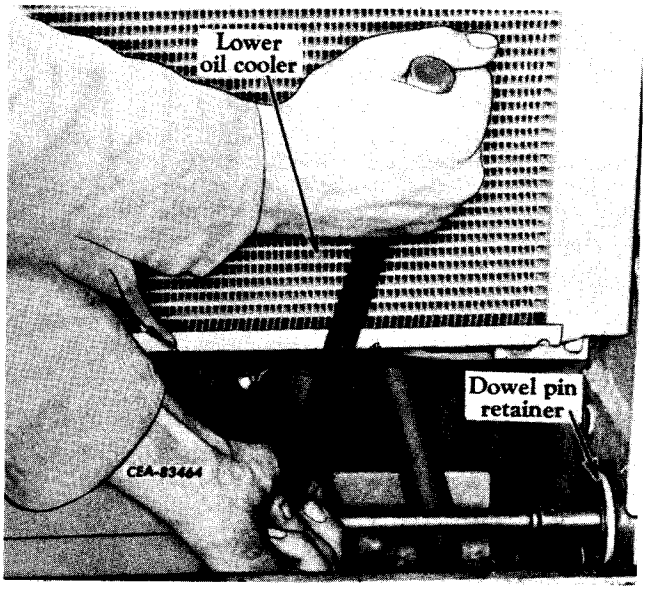
3. Drain the blade or loader hydraulic system at the oil supply tank.

4. Disconnect the electrical system master switch to prevent accidental starting.

5. TD-20 SERIES B ONLY: Disconnect the headlight wiring.

6. Attach a hoist to the engine hood mounting holes in the top of the radiator guard. Place some tension on the hoist sling.

7. On loader machines, remove the cap screw, lockwasher and retainer securing each of the four radiator guard dowel pins to the inner side of the front frame (Illust. 1). On dozer machines, a retainer bolt passes through the dowel pin from the outside and threads into the front frame.



Illust. 1
Removing the Radiator Guard Dowel Pin Retainer Cap Screw (Unit with Rigid Type Oil Coolers Shown).

8. Remove the 16 cap screws securing the radiator guard to the front frame. Using a spacer that will encircle the dowel pin, insert a bolt thru the spacer and into the dowel pin. Tighten the bolt to pull the dowel pin from the front frame (Illust. 2). Remove the remaining three dowel pins in the same manner.

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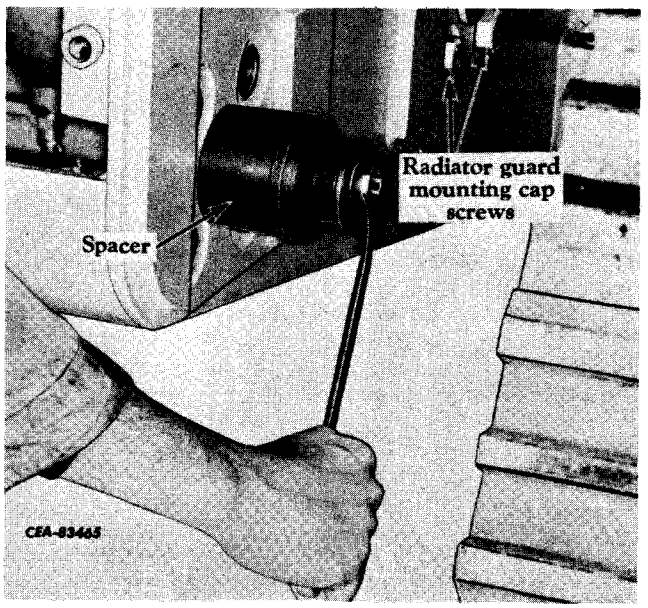


Illust. 2
Removing the Radiator Guard Dowel Pin.

2. REMOVAL - Continued

9. LOADERS ONLY: With the hoist, move the radiator guard and radiator assembly forward until all clearance with the front frame is utilized. Raise the radiator guard to clear the radiator outlet elbow and lower the assembly between the lift arm crossmember and front frame into a skid.

TD-20 SERIES B ONLY: With the hoist, remove the radiator guard and radiator assembly out the front of the tractor being careful to clear the front of the front frame.

10. Remove the cap screws and lock washers securing the safety filter housing bracket to the left hand side of the front frame and allow the filter assembly to lay in the frame to provide clearance for engine removal (Illust. 5).

11. Remove the air cleaner. Remove the platforms in the operator's compartment.

12. Remove the rear cover from the underside of the front frame. Working through the rear cover opening, disconnect the transmission-to-flywheel housing hose at the bottom of the transmission and quickly cap the fitting on the transmission cover.

NOTE: If the transmission is to be removed or if any work is to be done within the rear frame, drain the rear frame before disconnecting the transmission-to-flywheel housing hose.

13. Tie back the steering levers with a heavy rope.

14. Make all the necessary disconnects to remove the platform support (2, Illust. 3) and remove the support with engine control linkage attached.

15. Remove the clips securing the wiring to the flywheel housing and torque converter housing. Disconnect all the oil lines at the torque converter housing to allow the converter to be removed with the engine.

16. TD-20 SERIES B ONLY: Disconnect the hydraulic oil lines at the equipment pump mounted to the flywheel housing.

LOADERS ONLY: Disconnect the hydraulic oil lines at the equipment pump (4, Illust. 3) mounted to the torque converter housing.

17. Remove the universal joint (3, Illust. 3) from between the torque converter and transmission.

NOTE: Before removing the cap screws securing the universal joint, it is recommended that the bearing caps be wired to prevent the bearings from falling off the spider trunnions.

18. Disconnect the wiring at the cranking motor and generator. Disconnect the wiring and indicator lines that run from the instrument panel or dash to the engine. Tag all wires and lines for proper installation.

19. Disconnect the diesel fuel supply pipe at the auxiliary filter and the return pipe at the junction block on the engine. Disconnect these pipes at the fuel tank outlet and return rear pipes and remove the pipes.

20. Remove the cranking motor to provide sufficient clearance between the engine and sides of the front frame.

21. Check for a gap between the trunnion mounting shaft shoulder and the edge of the shaft bushing on the right hand side of the unit. Place a six to eight foot pry bar between the flywheel housing and the front frame to move the flywheel housing away from the frame member (Illust. 3 and 4). If the flywheel housing can be moved far enough away to obtain a .119 inch gap or more, a spacer must be welded to the shaft upon installation of the engine as described in Par. 3, "INSTALLATION."

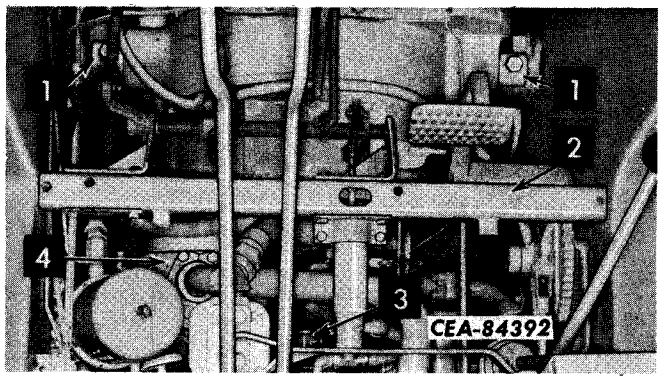
22. Remove the cap screws and flat washers securing the engine front support to the front frame.

23. Remove the cap screws securing the trunnion mounting shaft (1, Illust. 3) (on each end of the flywheel housing) to the front frame.

NOTE: A spreader bar must be used removing the engine from the unit. The angularity of the engine during lifting or lowering must not exceed 15 degrees from horizontal.

24. Attach the hoist to the lifting eyes on the engine. Lift the engine slightly from the mounting pads, then move the engine forward as far as possible. Cock the engine to align one of the trunnion mounting shafts with the opening in the front frame and use a pry bar to free the shaft from the flywheel housing. Remove the shaft from between the flywheel hous-

ing and front frame. Cock the engine in the other direction and remove the other shaft in the same manner. On the TD-20 SERIES B TRACTORS, the mounting shafts can remain in the flywheel housing.



Illust. 3
Engine and Chassis Disconnect Points.

1. Trunnion mounting shafts.
2. Platform support.
3. Universal joint.
4. Equipment pump.

NOTE: LOADERS ONLY: If the trunnion mounting shaft cannot be freed with a pry bar, the loader lift arm must be supported. Then the lift cylinder disconnected at the lift arm and lowered to clear the opening in the frame for using a slide hammer to pull the mounting shaft.

25. TD-20 SERIES B ONLY. Lift the engine (with torque converter) up and forward from the front frame.

LOADERS ONLY: Lift the engine (with torque converter) up and forward until it is up to the lift arm, then turn the engine 90 degrees and lower onto a skid that will properly hold the engine and converter assembly.

3. INSTALLATION

NOTE: When installing cap screws, refer to the standard torque data chart in Section 1, "GENERAL" for the proper torque.

NOTE: Before installing the torque converter assembly to the rear of the engine, be sure there is no sealing ring being used in the groove located directly behind the teeth of the converter drive housing. If there is one, it must be removed as it is no longer necessary and could even cause damage if used on machines that have the latest type engine flywheel without drilled oil passages.

1. If a .119 inch or more gap was found between the trunnion mounting shaft and bushing before removal of the engine, a spacer (refer to the parts catalog) must be welded to the right hand mounting shaft as shown in Illust. 4.

NOTE: A spreader bar must be used to install the engine in the unit. The angularity of the engine during lifting and lowering must not exceed 15 degrees from horizontal.

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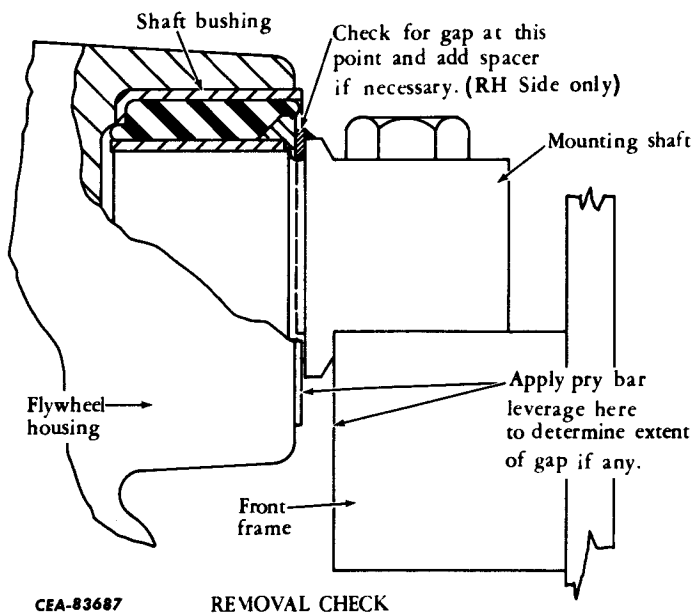
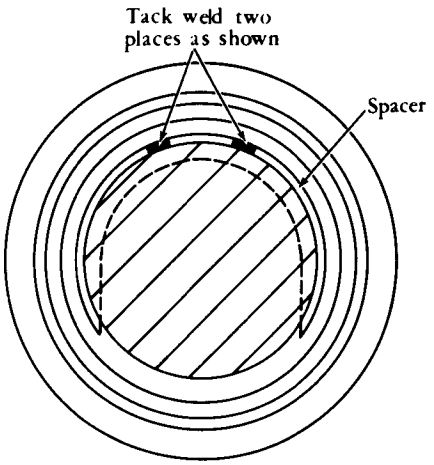




Illust. 4
Engine Mounting Shaft Gap Check and Spacer Installation Procedure.

3. INSTALLATION - Continued

2. TD-20 SERIES B ONLY: Install the trunnion mounting shafts. Carefully position the engine (with torque converter) in the front frame. Secure the engine front support and the trunnion mounting shafts (1, Illust 3) to the front frame with the cap screws. Use flat washers on the front support.

LOADERS ONLY: Carefully position the engine (with torque converter attached) in the front frame. As the rear of the engine nears the mounting pads, insert the trunnion mounting shafts (1, Illust. 3) in the openings in the front frame. Then maneuver the engine to insert the shafts into their bushings in the flywheel housing. Secure the engine front support and the trunnion mounting shafts to the front frame with the cap screws. Use flat washers on the front support.

3. Install the cranking motor.

4. Install the diesel fuel supply and return pipes. Connect these pipes at the front to the auxiliary filter and to the junction block on the engine. Connect them at the rear to the fuel tank outlet and return rear pipes.

5. Connect the wiring to the cranking motor and generator. Connect all wiring and lines removed at the engine or at the dash and instrument panel.

6. Install the universal joint (3, Illust. 3) between the torque converter and transmission.

◆ CAUTION: REMOVE THE WIRE USED TO KEEP THE BEARINGS FROM FALLING FROM THE SPIDER TRUNNIONS. IF INSTALLING A NEW SPIDER AND BEARING ASSEMBLY REMOVE THE SOFT IRON STRAP ATTACHED TO THE BEARING CAPS. THIS WILL ELIMINATE THE POSSIBILITY OF THE STRAPS OR WIRE BREAKING LOOSE FROM THE CAPS AND CAUSING PERSONAL INJURY WHEN THE ENGINE IS RUNNING.

7. Connect the hydraulic oil lines at the equipment pump (4, Illust. 3) mounted on the torque converter or engine flywheel.

8. Connect all the oil lines removed at the torque converter. Install the clips (with wiring) to the flywheel and torque converter housings.

9. Install the platform support (2, Illust. 3). Reconnect all the items that had to be disconnected to facilitate removal of the support.

10. Remove the rope holding the steering levers in the pivot position.

11. Working through the rear cover opening in the underside of the front frame, connect the transmission-to-flywheel housing hose at the bottom of the transmission cover. Install the rear cover to the underside of the front frame.

12. Install the left hand and right hand front platforms. Connect the linkage to the decelerator pedal.

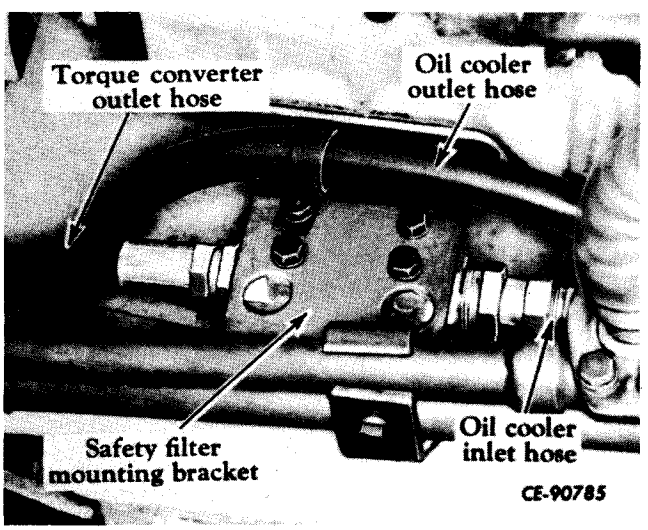
13. Install the air cleaner.

14. Secure the safety filter and mounting bracket to the left hand side of the front frame with the cap screws and lock washers (Illust. 5).

15. Position the radiator and radiator guard assembly on the front frame. Install the 16 cap screws which secure the guard to the front frame but do not tighten until the four dowel pins are driven into place.

16. On loader machines, secure the dowel pins to the inner face of the front frame with the retainers, lock washers and cap screws (Illust. 1). On dozer machines, insert the retainer bolt through the dowel and thread into the front frame.

17. Perform the steps necessary under installation of the radiator in Section 2, "COOLING SYSTEM" to complete installation. Connect the cooler hoses or tubes.



Illust. 5
Safety Filter and Connections (Units with Hinge Type Oil Cooler Shown, Others Similar).

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18. TD-20 SERIES B ONLY: Connect the headlight wiring.

19. Open the diesel fuel shut-off valve at the fuel tank.

20. Be sure the water drain valve is closed and tight and fill the radiator.

21. Check the crankcase oil level (refer to the operator's manual for the correct grade and amount).

22. Check the main frame oil level and add the proper amount for operation (refer to the operator's manual for the proper grade and level).

23. Connect the electrical system master switch.

24. Be sure the drain plug is installed and fill and vent the blade or loader hydraulic system as described in the pertinent instruction manual.

25. Start the engine and check for leaks. After the engine is up to operating temperature, recheck the coolant level and add if necessary.

26. Perform the adjustments as described in Par. 4, "ENGINE IDLE ADJUSTMENTS."

27. Install the quick disconnect platform.

4. ENGINE IDLE ADJUSTMENTS

◆ CAUTION: THE FOLLOWING ADJUSTMENTS MUST BE MADE BY TWO MEN. ONE MAN MUST BE AT THE CONTROLS WHILE THE OTHER DOES THE CHECKING. THE BRAKE PEDAL MUST BE APPLIED AND LOCKED AND THE MANUAL HI-LO SHIFT LEVER MUST BE IN THE "NEUTRAL" POSITION UNTIL ALL ADJUSTMENTS ARE PERFORMED AND THE ENGINE IS SHUT OFF.

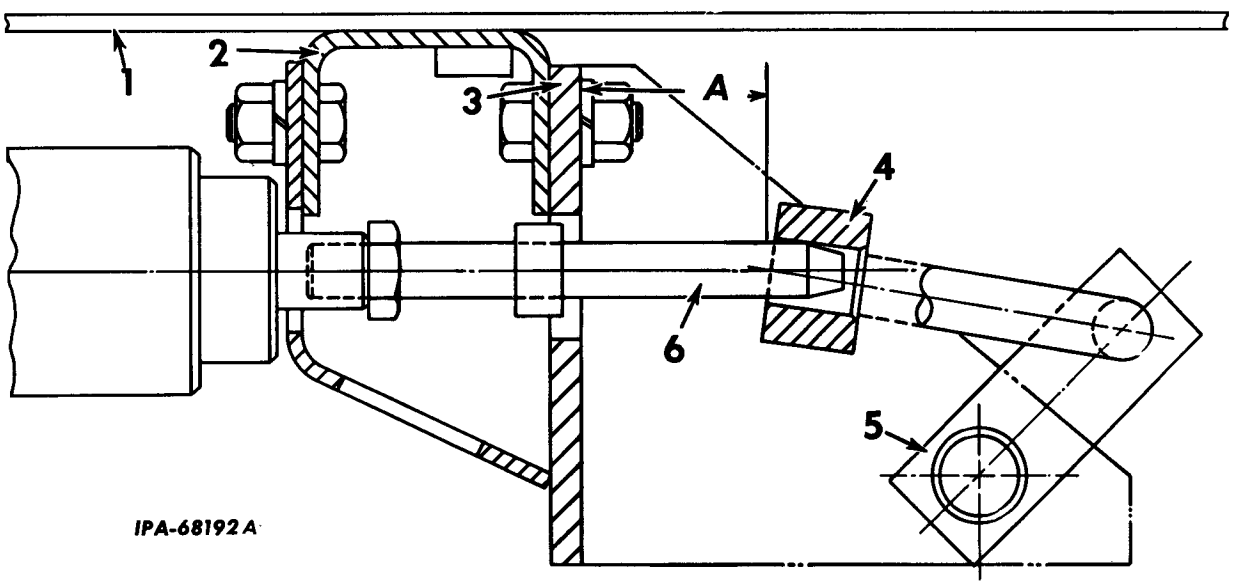
With the decelerator pedal and linkage completely assembled, perform adjustments in the following sequence. Unless otherwise designated, the following procedure is good for all units.

Engine Shut-off, Low Idle and High Idle Adjustments (Roosa-Master Injection Pump)

1. Remove the quick disconnect platform. Disconnect the governor control rod (1, Illust. 7) at the injection pump.

2. TRACTORS WITH AUTOMATIC DECELERATOR: Place the governor control hand lever in the shut-off position. Adjust the clevis (3, Illust. 7) until distance "A," Illust. 6 (front of

(Continued on next page)



Illust. 6
Cross Section of Governor and Decelerator Control Linkage (Tractors Equipped with Automatic Decelerator).

1. Platform.
2. Platform support.
3. Cross shaft bracket.
4. Decelerator guide.
5. Governor control cross shaft.
6. Decelerator cylinder adjuster.

4. ENGINE IDLE ADJUSTMENTS - Continued

Engine Shut-off, Low Idle and High Idle Adjustments (Roosa-Master Injection Pump) - Continued

the cross shaft bracket (3) to the rear of the decelerator guide (4) measured at the decelerator cylinder adjuster center-line) is 1.55 inches. Tighten the jam nut and install the clevis (3, Illust. 7).

TRACTORS WITHOUT AUTOMATIC DECELERATOR: Measure the length of the control rod (8, Illust. 7) (center of clevis pin hole-to-center of rod cotter pin hole). This distance must be 9-1/2 inches for the Model 250 loader or ten inches for the TD-20 Series B crawler tractor. If necessary, disconnect and adjust the clevis (3) to obtain the proper length. Connect the clevis and move the governor control hand lever to the shut-off position.

3. With the injection pump lever in the "OFF" position, adjust the clevis on the front of the control rod (1, Illust. 7) to the proper pin position (still maintaining the dimension obtained in step 2). Tighten the jam nut and temporarily connect the clevis to the pump lever.

4. Start the engine and lock the transmission gear selector hand lever in the "NEUTRAL" position with the safety lock lever. Move the governor control hand lever to the low idle position. Disconnect the clevis on the pump lever and move the pump lever forward until the idle speed remains constant with forward movement of the lever. Check the engine rpm (refer to Section 1, "GENERAL" for correct low idle). If not within specification, adjust the low idle screw in the pump cover to bring the speed within specification. Then move the pump lever to the rear until the engine speed just begins to increase; at this point, move the pump lever forward 1/32 to 3/32 of an inch (measured at the pump lever clevis pin hole). Install the governor control rod, adjusting its clevis for pin alignment, if necessary.

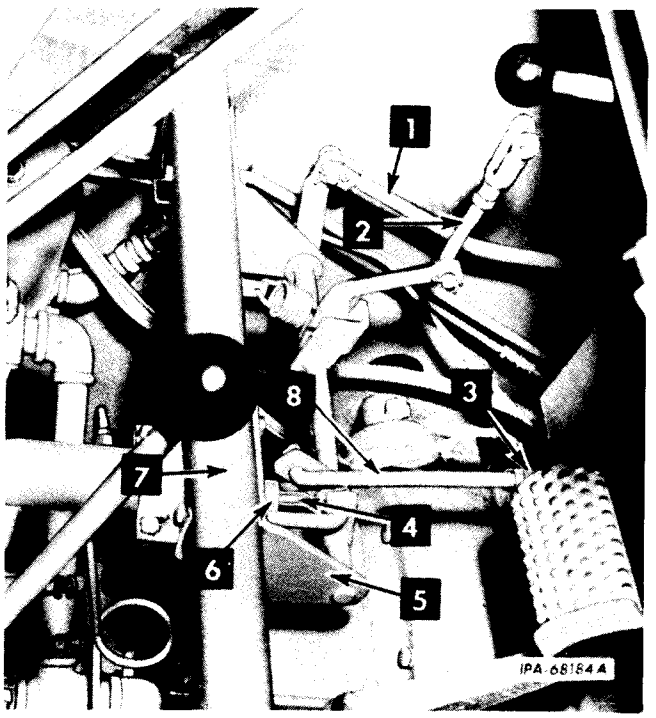
5. The preceding adjustments will also determine "HIGH IDLE" position. If the high idle speed (refer to Section 1) is to be checked on tractors with an automatic decelerator, the transmission gear selector hand lever must be moved from the "NEUTRAL" position to bypass the automatic deceleration.

Engine Shut-off, Low Idle and High Idle Adjustments (International R. D. Injection Pump)

1. Remove the quick disconnect platform. Disconnect the governor control rod (1, Illust. 7) at the injection pump.

2. TRACTORS WITH AUTOMATIC DECELERATOR: Place the governor control hand lever in the low idle position. Adjust the clevis (3, Illust. 7) until distance "A" Illust. 6 (front of the cross shaft bracket (3) to the rear of the decelerator guide (4) measured at the decelerator cylinder adjuster center-line) is .85 of an inch. Secure the clevis.

TRACTORS WITHOUT AUTOMATIC DECELERATOR: Measure the length of the control rod (8, Illust. 7) (center of clevis pin hole-to-center of rod cotter pin hole). This distance must be 10-3/4 inches for the Model 250 loader or 11-1/4 inches for the TD-20 Series B crawler tractor. If necessary, disconnect and adjust the clevis (3) to obtain the proper length. Connect the clevis and move the governor control hand lever to the low idle position.



Illust. 7
Engine Idle Adjustment Points (Earlier Unit Shown, Later Units Similar).

1. Governor control rod.
2. Decelerator pedal pick-up lever rod.
3. Control rod adjustable clevis.
4. Decelerator cylinder adjuster (if equipped).
5. Cross shaft bracket.
6. Decelerator guide (if equipped).
7. Platform support.
8. Control rod.

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4. ENGINE IDLE ADJUSTMENTS - Continued

Engine Shut-off, Low Idle and High Idle Adjustments (International R. D. Injection Pump) - Continued

3. Move the control lever on the pump towards shutoff until the internal shutoff cam contacts the spring loaded shutoff lever in the pump (this should occur about 10 degrees from the shutoff stop and can be determined by "feel"). The clevis in the control rod (1, Illust. 7) must be adjusted so it can be secured to the pump control lever with the control lever in this position to 1/8 of an inch towards high idle from this position.

4. Place the governor control hand lever in the shutoff position. The pump control lever should contact its stop and the control lever spring flex to not more than 1/2 of an inch. Move the governor control hand lever to the top notch of the ratchet, at this point the pump control lever spring should flex approximately 1/2 of an inch.

Start the engine and lock the transmission gear selector hand lever in the "NEUTRAL" position with the safety lock lever. Move the governor control hand lever to the low idle position and check the engine rpm (refer to Section 1, "GENERAL" for the correct low idle). If not within specifications, adjust the low idle screw on the pump cover to obtain the specified rpm.

5. The preceding adjustments will also determine "HIGH IDLE" position. If the high idle speed (refer to Section 1) is to be checked on tractors with an automatic decelerator, the transmission gear selector hand lever must be moved from the "NEUTRAL" position to bypass the automatic deceleration.

Decelerator Pedal Adjustment

6. Place the governor control lever up in the "HIGH IDLE" position and depress the decelerator pedal. With the decelerator pedal fully depressed, the engine rpm must be between 850 to 950 rpm.

7. If the engine rpm is not between 850 to 950 rpm, the decelerator pick-up lever rod (2, Illust. 7) must be adjusted. Disconnect the rod clevis from the decelerator pedal. Loosen the jam nut and turn the rod clevis to the left or right depending on whether engine rpm decrease or increase is necessary. Tighten the jam nut and connect the clevis to the decelerator pedal.

8. Repeat Step 7 until the proper engine rpm is obtained.

Automatic Decelerator Adjustment (Ref. Nos. Refer to Illust. 7)

9. With the engine running, the governor control lever in the high idle position and the transmission gear selector hand lever locked in the "NEUTRAL" position, adjust the decelerator cylinder adjuster as follows.

10. Reach in through the access hole in the cross shaft bracket (5) and loosen the jam nut on the adjuster (4).

11. Place a wrench on the flats of the adjuster (4) and turn the adjuster until the engine rpm is 1050 to 1150 rpm. (To decrease the engine rpm, turn the adjuster out; to increase the engine rpm, turn the adjuster in.) When the correct engine rpm is obtained, hold the adjuster in place and tighten the jam nut.

12. Install the platform.

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

CONTENTS

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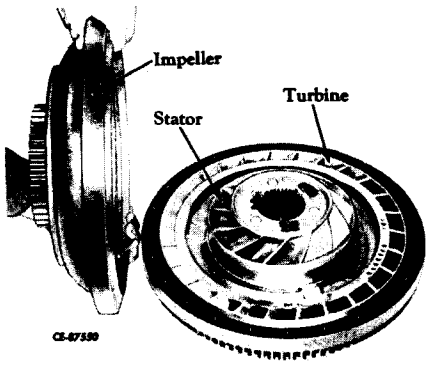
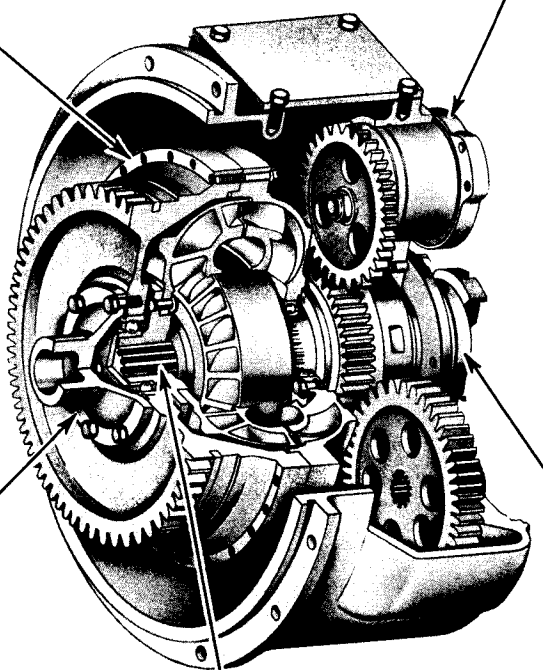
MODEL 250 SERIES LOADERS AND TD-20 SERIES B CRAWLER TRACTOR TORQUE CONVERTER SERVICE CHART

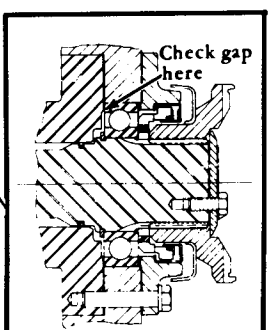


Inspect the impeller, stator and turbine for signs of rubbing. If this condition exists, it is an indication that one or more of the bearings in the converter need replacement. If the blades are excessively worn or damaged, the entire assembly must be replaced.

INPUT PUMP

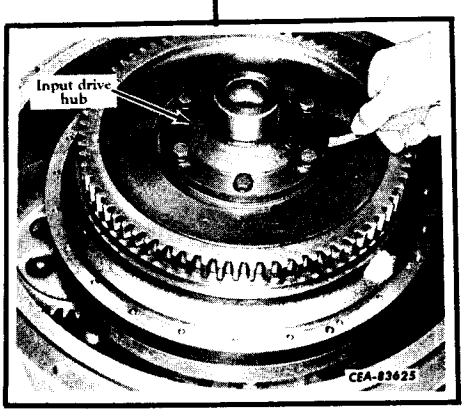
Pump Flow:
GPM at 2300 rpm rated engine speed
(2435 pump rpm) 24-35±1





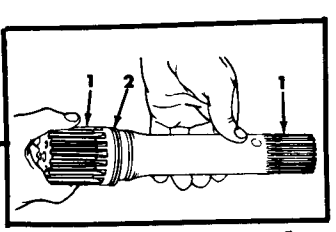
Output shaft end gap (In.) .000-.004
(Refer to manual text for instructions.)

Input drive hub gap (Inch) 005-.015
(Refer to manual text for instructions.)



OUTPUT SHAFT

1. Inspect splines for excessive wear, burrs or damage and replace if necessary. Slight burrs can be removed with a fine oilstone.
2. Inspect the sealing ring groove for nicks, wear and grooving.



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1. DESCRIPTION

General

The torque converter automatically varies the output required at the tracks to meet the changing load requirements of the tractor. Engine power is transferred by the converter with little change in torque when the load is light. When a heavy load is encountered, the torque multiplication becomes greater, but with a resulting loss of tractor speed. It is important to note that the converter does not increase engine horsepower, but does increase the amount of torque available at the tracks.

The converter has three basic parts (Illust. 1). The IMPELLER is bolted to the converter drive housing and the drive housing is driven by the engine flywheel. The STATOR is splined to the stationary ground sleeve hub and contains a row of stationary blades, sometimes called guide blades or reactor blades. The TURBINE is splined to the output shaft. The three parts are contained in the converter housing. The housing is filled with fluid held at a constant pressure during operation to suppress vacuum pockets which form at the blades under high fluid velocities. There is no direct mechanical connection between the impeller and turbine or stator.

Operation

The impeller draws fluid from the opening surrounding the hub and ejects it from its blades at high velocity. The turbine is positioned opposite the impeller and its blades receive the full impact of this velocity. Fluid exits from the turbine in the opposite direction of rotation from that of the impeller and the curved blades of the stator (positioned between the impeller and turbine) re-directs the flow back to the impeller in the same direction as the impeller is moving, completing the cycle.

Torque multiplication is determined by the speed of the turbine in relation to the impeller. A ball thrown at a paddle will strike it with more force if the paddle is stationary than it will if the paddle is moving in the same direction as the ball. Similarly, when the turbine is rotating as fast as the impeller, the fluid passes easily through the turbine applying little or no force to the blades. As the output shaft slows down, the fluid strikes the turbine blades with more force. The maximum striking force of the fluid is reached when the turbine is stopped. This occurs in the tractor when the output shaft is stalled by a heavy load.

The reservoir for the torque converter fluid is in the rear main frame. The flow from the reservoir to the converter and from the converter back into the lubricating system is covered in Section 6, "TRANSMISSION (POWER SHIFT)." For testing the converter inlet pressure refer to the "CHECKING TRANSMISSION OIL PRESSURE" paragraph in Section 6.

2. SPECIFICATIONS

Make and size:	
MODEL 250 and 250B Loaders	Rockford (13 inches)
TD-20 SERIES B	Rockford (14 inches)
Type	Single stage with fixed stator
Fluid temperature:	
Normal	180°-220°F
Maximum	250°F
Input pump flow:	
GPM at 2300 rpm rated engine speed (2435 pump rpm)	24.35 ± 1

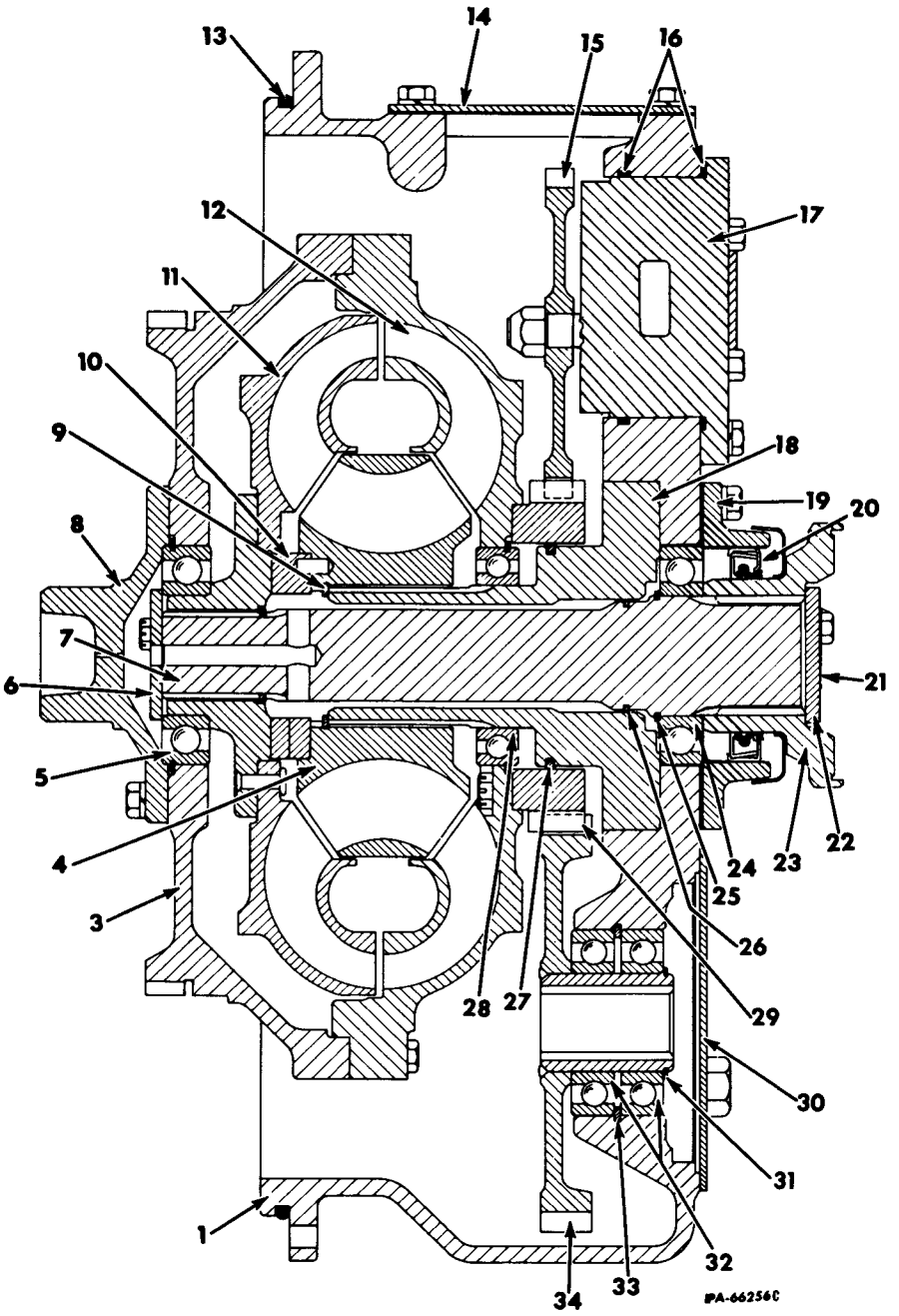
Special Nut and Bolt Torque Data (Foot-Pounds)
(Torques given are bolts and nuts lubricated with SAE-30 engine oil).

Impeller-to-accessory drive gear cap screws	27-30
Converter input pump drive gear nut	45-55
Pressure filter hold-down bolt: (Hex-head type)	55 max.
(Cross bar type)	10-15

NOTE: Except for the special torque shown, all bolts and nuts are to be torqued to the amount shown in the "STANDARD TORQUE DATA CHART" in Section 1, "GENERAL."

(Continued on next page)

2. SPECIFICATIONS - Continued



Illust. 1
Cross Section of Hydraulic Torque Converter
(MODEL 250 and 250B Loaders Shown, TD-20 SERIES B Similar).

1. Converter housing.
3. Drive housing.
4. Stator.
5. Turbine hub bearing.
6. Retainer washer.
7. Output shaft.
8. Input hub.
9. Snap ring.
10. Thrust washer.
11. Turbine.
12. Impeller.
13. "O" ring.

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Legend for Illust. 1 - Continued

14. Pump inspection cover.
15. Pump drive gear.
16. Pump "O" rings.
17. Input pump.
18. Ground sleeve hub.
19. Bearing retainer.
20. Oil seal.
21. Locking plate.
22. Retainer washer.
23. Output flange.
24. Output shaft bearing.
25. Snap ring.
26. Seal ring (hook type).
27. Seal ring (hook type).
28. Impeller hub bearing.
29. Accessory drive gear.
30. Power take-off cover. (TD-20 Series B Only.)
31. Snap ring. (MODEL 250 Loaders Only.)
32. Gear bearings. (MODEL 250 Loaders Only.)
33. Snap ring. (MODEL 250 Loaders Only.)
34. Accessory driven gear. (MODEL 250 Loaders Only.)

3. CHECKING MECHANICAL PROBLEMS

PROBABLE CAUSE	REMEDY
Loss of Fluid from Torque Converter	
1. Leaking connections	Operate the engine at part throttle and inspect all lines and connections for leaks. Tighten or replace parts as necessary.
2. Leaking converter	Check all the bolts and nuts and gasket joints while the system is under pressure. Replace parts as necessary.
Torque Converter Overheating	
1. Operating too long in low efficienty ranges	Review operating instructions in the operator's manual.
2. Low basic pressure	Check for broken lines or loose connections on the pressure side of the system. Check for excessive fluid leaking.
3. Low oil level	Check the level in the rear main frame.
4. Thermo by-pass valve inoperative (if equipped)	Discard the valve assembly. Refer to instructions in the "INSPECTION AND REPAIR" paragraph in Section 6, "TRANSMISSION (POWER SHIFT)."
5. Converter by-pass valve sticking	Remove valve and clean. Inspect bore and spring.
Loss of Power	
1. Low oil level	Check the level in the rear main frame.
2. Low basic pressure	Refer to Cause 2 under "Torque Converter Overheating" problem.
3. Converter input pump inoperative	Test the input pump as described in Par. 8, "INSTALLATION." Inspect pump for damaged parts and replace as necessary.
4. Converter by-pass valve sticking	Remove valve and clean. Inspect bore and spring.
5. Engine not up to rated performance	Refer to "CHECKING MECHANICAL PROBLEMS" in the engine service manual.
Grinding or Scraping Noise Inside Coverter Housing	
1. Bearing failure allowing the turbine or impeller blades to strike the fixed stator	Replace bearings, turbine or impeller as necessary.

4. REMOVAL

(Ref. Nos. Refer to Illust. 2)

◆ CAUTION: BE SURE THE BLADE OR BUCKET HAS BEEN LOWERED TO THE GROUND.

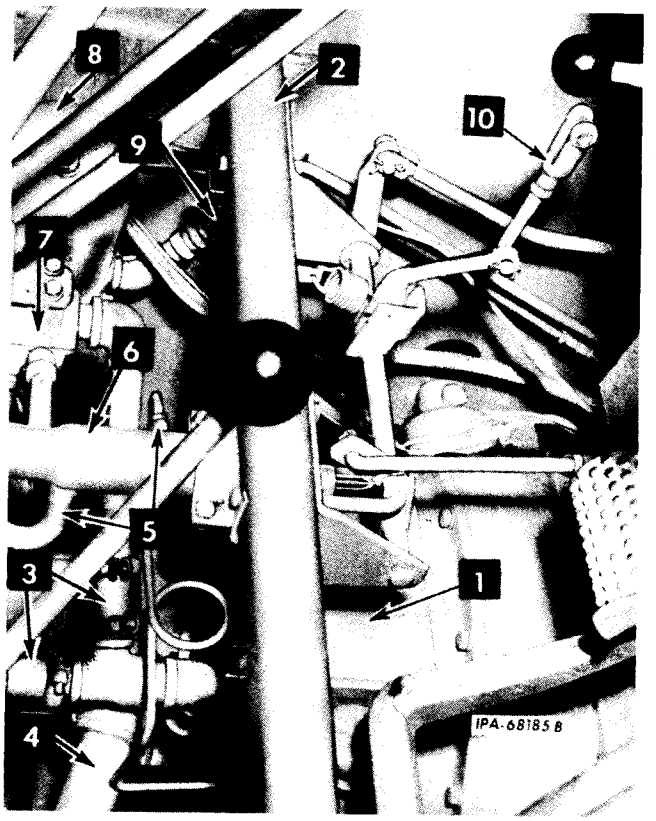
NOTE: When disconnecting hydraulic lines for any reason, they should be properly capped with the correct size plastic cap. If these caps are not available, tape or clean rubber corks may be used. Hydraulic openings must never by plugged with rags. This practice could easily introduce dirt or lint into critical hydraulic components of the machine. Tag disconnected lines to facilitate correct and faster installation.

1. Drain the equipment hydraulic system (refer to the pertinent instruction or operator's manual).

2. Disconnect the pick-up lever rod (10) at the decelerator pedal. Remove the platforms.

3. Disconnect all the linkage necessary to facilitate removal of the platform support (2). Remove the support with linkage attached. If equipped with a decelerator cylinder (6) disconnect the lines (5) at the cylinder and remove the cap screw and washers securing the cylinder to the seat support bar. This will allow the cylinder to be removed with the platform support. Also disconnect the cylinder drain tube (5) at the transmission and remove the tube.

4. Remove the cables clipped to the converter housing. Tie back the steering levers. Push down the brake pedal and lock with the pawl.



Illust. 2
Transmission and Torque Converter Hydraulic Piping with Flexible Coupling (Loaders Shown, TD-20 SERIES B Similar).

1. Inspection cover.
2. Platform support.
3. Flexible coupling.
4. Equipment pump inlet tube.
5. Decelerator cylinder inlet hose and drain tube.
6. Decelerator cylinder.
7. Suction filter.
8. Pressure filter case.
9. Pressure filter inlet hose.
10. Pick-up lever rod.

5. Disconnect the pressure filter inlet hose (9) at the filter base. Unthread the pressure

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filter hold-down bolt securing the filter case to the base and remove the case (8) with bolt. Lift the spring and element from the base. On later units, also disconnect the clutch pressure gauge tube (Illust. 3) at the base. Remove the filter base mounting hardware and allow the base to lay in the frame.

6. SUCTION FILTER WITH FLEXIBLE COUPLING: Disconnect the flexible coupling at the suction filter inlet. Disconnect the flexible coupling (3) at the suction tee. Remove the hardware securing the filter to the seat support bar and remove the filter (7) with piping.

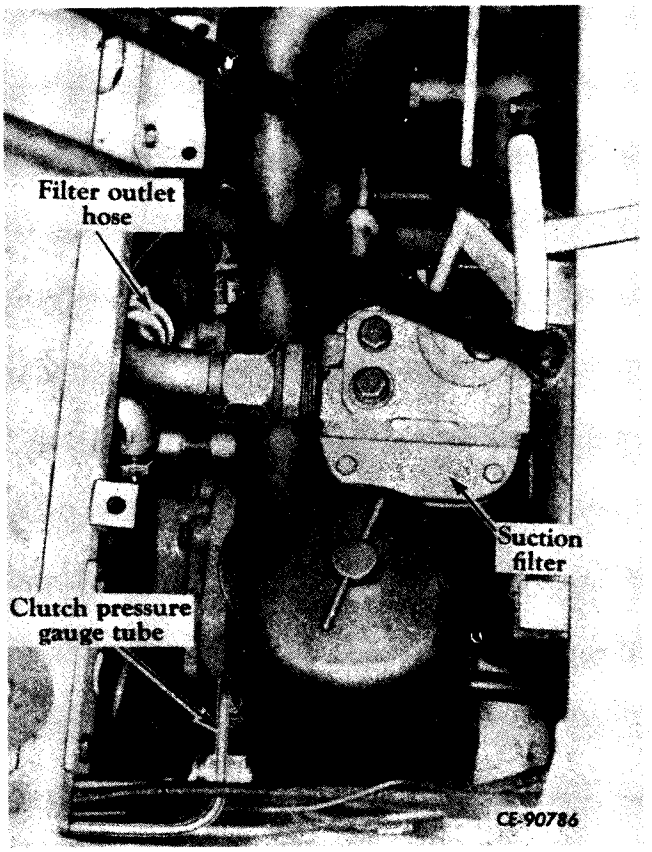
SUCTION FILTER WITHOUT FLEXIBLE COUPLING: Disconnect the inlet and outlet hoses at the suction filter (Illust. 3). Remove the hardware securing the suction filter to the seat support bar and remove the filter. Disconnect the suction filter outlet hose at the tee in the converter and remove the outlet hose.

7. Remove the rear cover from the underside of the front frame. Disconnect all the necessary hoses and/or tubing between the converter housing and the transmission and oil cooler to facilitate removal of the converter.

8. LOADERS ONLY: Disconnect the inlet and outlet tubes at the equipment pump. Disconnect the rear of the inlet tube (4) and remove the tube to provide clearance for pump removal. Insert an eyebolt into one of the inlet tube mounting holes in the top of the pump and attach a hoist. Remove the pump mounting bolts and free the pump from the converter housing. Lower the pump until it rests in the front frame and transfer the hoist sling to one of the pump mounting holes. Remove the eyebolt from the pump. Lift the pump out the top of the unit.

TD 20 (SERIES B) ONLY: Disconnect the equipment pump inlet hose at the pump and move the hose to facilitate converter removal.

9. Remove the cap screws which secure the universal joint to the torque converter output flange and to the transmission drive yoke, and remove the universal joint assembly. Slide the transmission drive yoke off of the forward clutch shaft.



Illust. 3
Suction Filter Piping without Flexible Coupling.

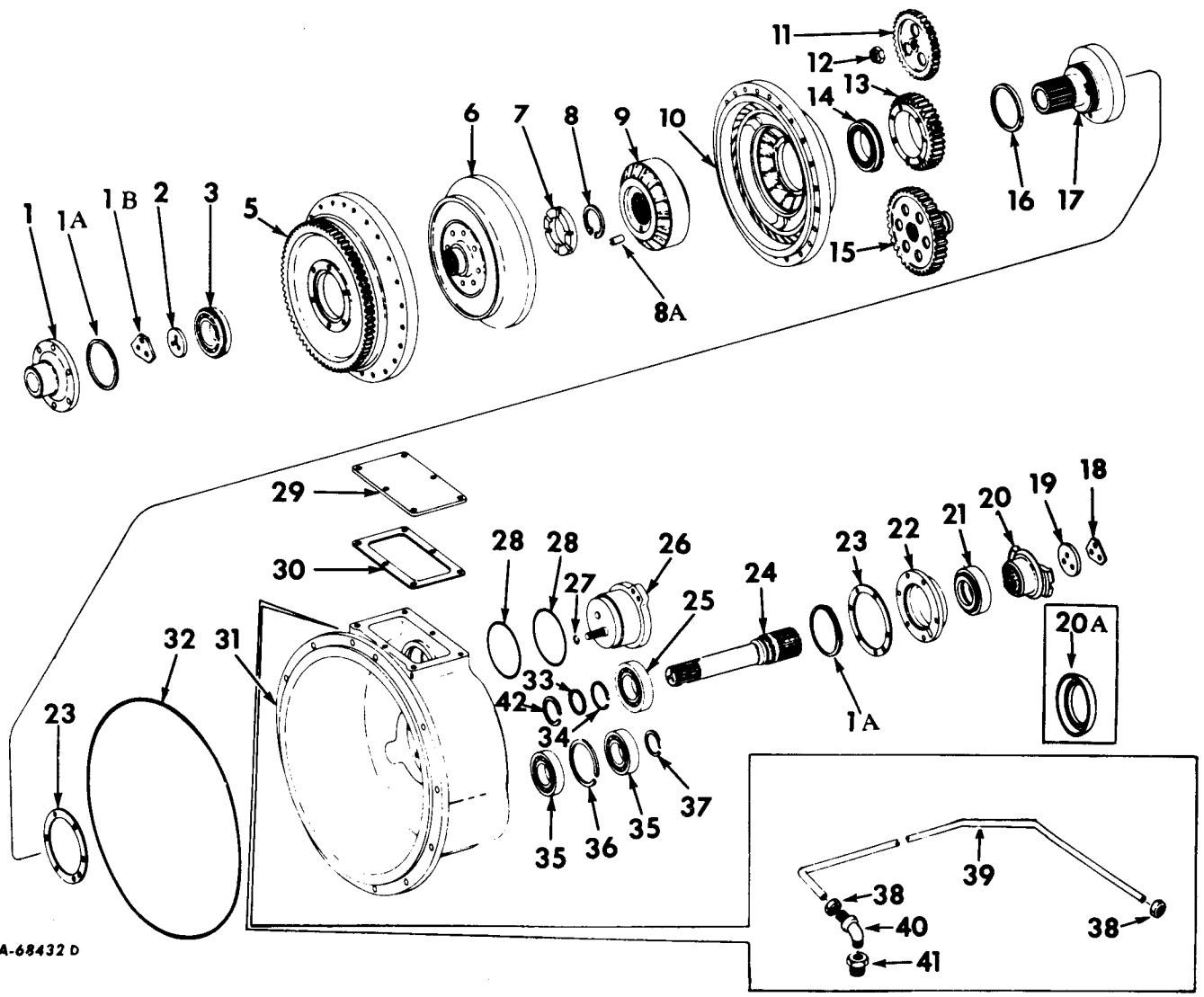
NOTE: Before removing the cap screws securing the universal joint it is recommended that the bearing caps be wired to prevent the bearings from falling off the spider trunnions.

10. Remove the two center cap screws and lock washers securing the input pump inspection cover (1) to the converter housing and insert eyebolts for attaching a hoist. Place a slight tension on the chain. Remove the cap screws and washers securing the converter to the flywheel housing. Move the torque converter back so the converter drive housing clears the flywheel housing and hoist the converter out of the tractor.

NOTE: Cover the opening at the flywheel housing to prevent dirt and dust from entering.

5. DISASSEMBLY

(Ref. Nos. Refer to Illust. 4)



Illust. 4
Exploded View of Torque Converter (Loaders Shown, TD-20 SERIES B Similar).

Before starting to disassemble the torque converter, thoroughly clean the outside of the converter housing with plain steam (no caustic soda). Select a clean, dust-free location. Cleanliness is very important when repairing the converter.

When a converter is to be moved or shipped from one location to another, always be sure that all the fluid openings are covered. Water or foreign material entering the converter will cause serious damage. The teeth of the converter drive housing (5) must also be protected from damage.

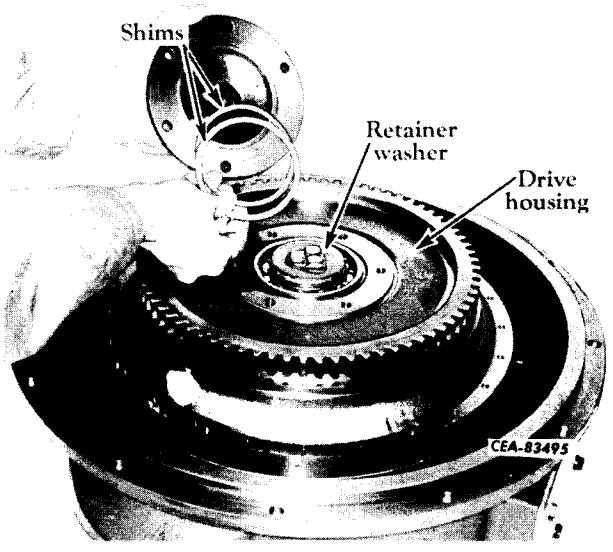
1. Place the converter on a bench so the drive housing (5) is up. Block under the housing (31) to clear the output flange (20).

2. Remove the six cap screws and lock washers securing the input drive hub (1) to the drive housing and remove the hub and shims (1A). Keep the shims with the hub to facilitate reassembly (Illust. 5).

Legend for Illust. 4.

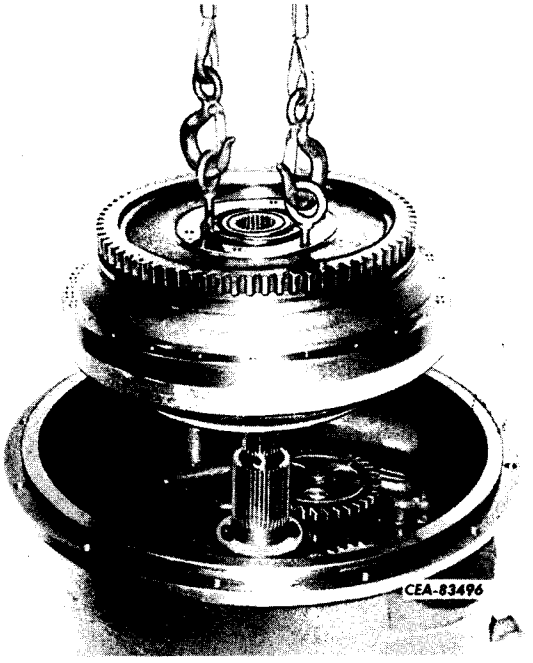
1. Input drive hub.
1A. Shim
1B. Locking plate.
2. Retainer washer.
3. Turbine hub bearing.
5. Drive housing.
6. Turbine.
7. Thrust washer.
8. Snap ring.
8A. Dowel.
9. Stator.
10. Impeller.
11. Input pump drive gear.
12. Gear retaining nut.
13. Accessory drive gear.
14. Impeller hub bearing.
15. Accessory driven gear. (MODEL 250 Loaders Only.)
16. Seal ring.
17. Ground sleeve hub.
18. Locking plate.
19. Retainer washer.
20. Output flange assembly.
20A. Dust shield (if equipped).
21. Oil seal.
22. Bearing retainer.
23. Gasket.
24. Output shaft.
25. Output shaft bearing.
26. Input pump.
27. Snap ring (if equipped).
28. Pump "O" rings.
29. Pump inspection cover.
30. Cover gasket.
31. Housing.
32. Housing "O" ring.
33. Seal ring.
34. Snap ring.
35. Accessory driven gear bearings. (MODEL 250 Loader Only.)
36. Snap ring. (MODEL 250 Loaders Only.)
37. Snap ring. (MODEL 250 Loaders Only.)
38. Nut.
39. Converter vent pipe.
40. Elbow.
41. Reducer bushing.
42. Turbine hub snap ring (if equipped).

3. Bend back the tabs of the locking plate (1B). Remove the three cap screws and lift off the locking plate and retainer washer (2) (Illust. 5).



Illust. 5
Removing the Input Drive Hub and Shims.

4. Insert two eyebolts into the drive housing and lift the drive housing with the impeller, stator, and turbine assemblies from the converter housing (Illust. 6). Lower the assembly onto the bench. Remove the hoist and eyebolts and turn the assembly over so the drive housing is down.

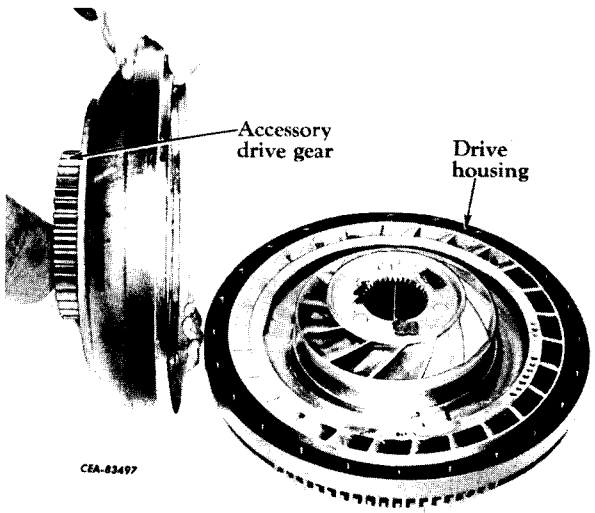


Illust. 6
Lifting the Drive Housing from the Converter Housing.

(Continued on next page)

5. DISASSEMBLY - Continued

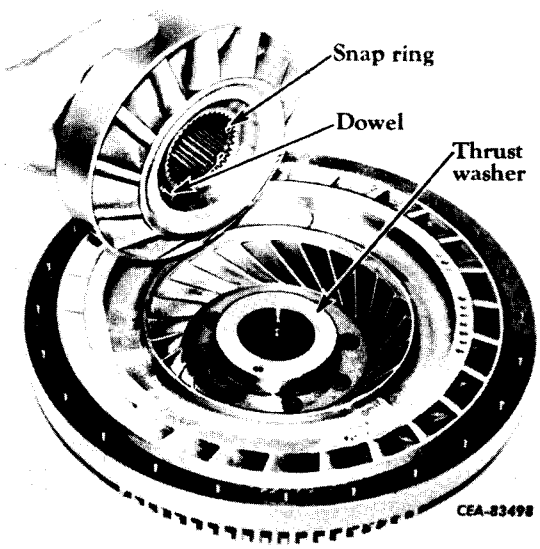
(Ref. Nos. Refer to Illust. 4)



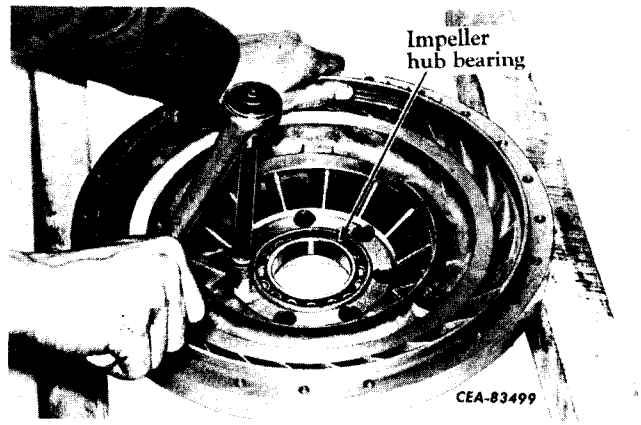
Illust. 7
Removing the Impeller.

5. Using an air gun, remove the cap screws securing the impeller (10) to the drive housing and lift the impeller with the accessory drive gear (13) and bearing (14) from the drive housing (Illust. 7).

6. Lift the stator (9) from the turbine. Remove the thrust washer (7) from the turbine (Illust. 8).



Illust. 8
Removing the Stator.

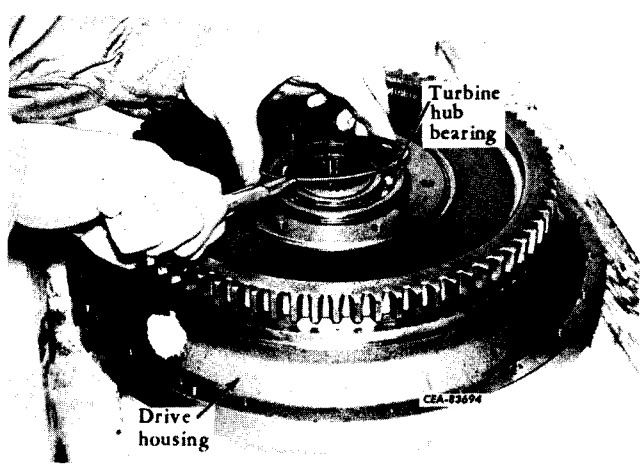


Illust. 9
Removing the Accessory Drive Gear Mounting Screws.

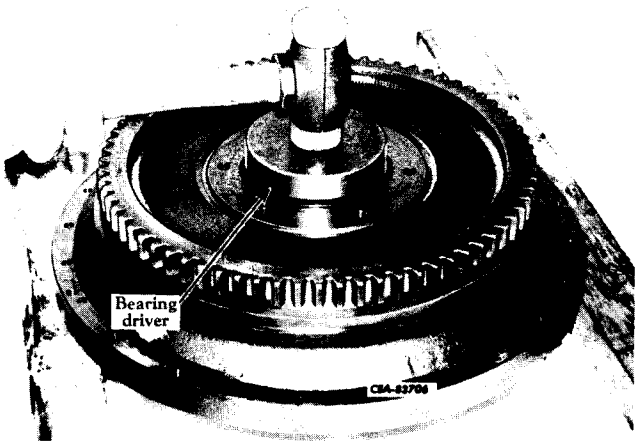
7. To replace the impeller hub bearing (14), place the impeller on blocks with the accessory drive gear (Illust. 7) down. Remove the seven cap screws securing the accessory drive gear to the impeller (Illust. 9). Then using a suitable drive tap the bearing out of the impeller hub.

NOTE: The impeller hub bearing cannot be driven out the blade side of the impeller because of the bearing outer race returning ring.

8. If the drive housing, turbine or turbine hub bearing (3) need replacement proceed as follows. Place the drive housing on blocks so they will not interfere with turbine removal and remove the turbine hub bearing outer race retaining ring (Illust. 10). If the retaining ring will not clear the counterbore in the drive housing, turn the assembly over and tap on the



Illust. 10
Removing Bearing Outer Race Retaining Ring.

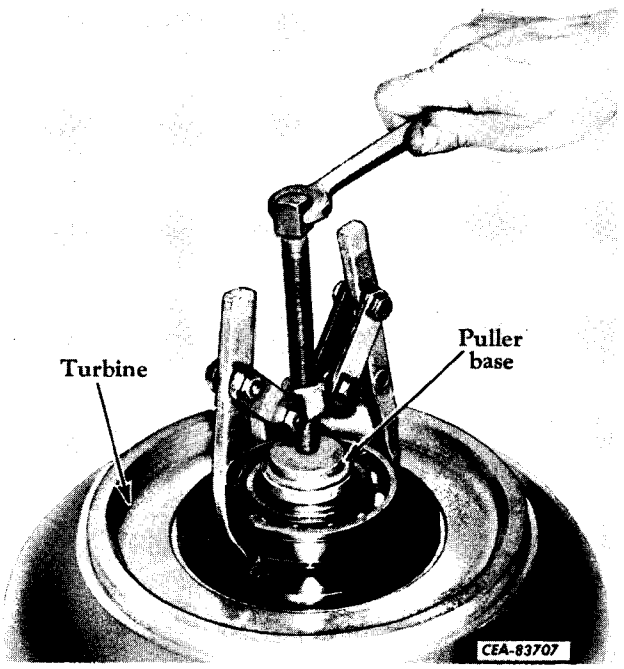


Illust. 11
Removing the Turbine and Bearing from the Drive Housing.

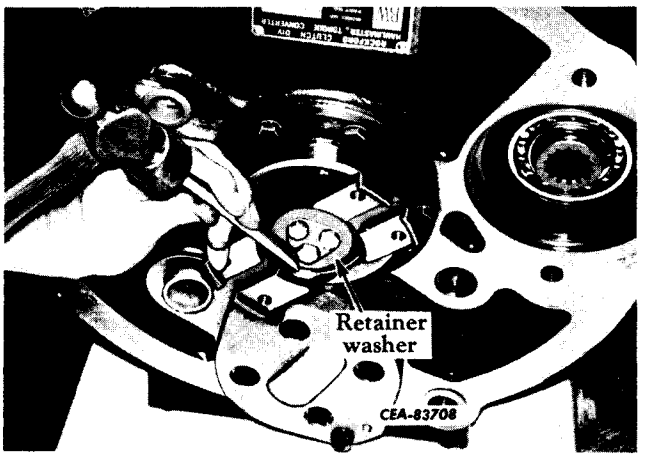
turbine to move the bearing out sufficiently for snap ring removal.

Using a suitable driver that will cover both races of the bearing, drive the bearing with turbine from the drive housing (Illust. 11). Use a bearing cup puller to remove the bearing from the turbine hub (Illust. 12).

9. Place the converter housing (31) on its side with the pump inspection cover (29) down. Block the sides of the housing.



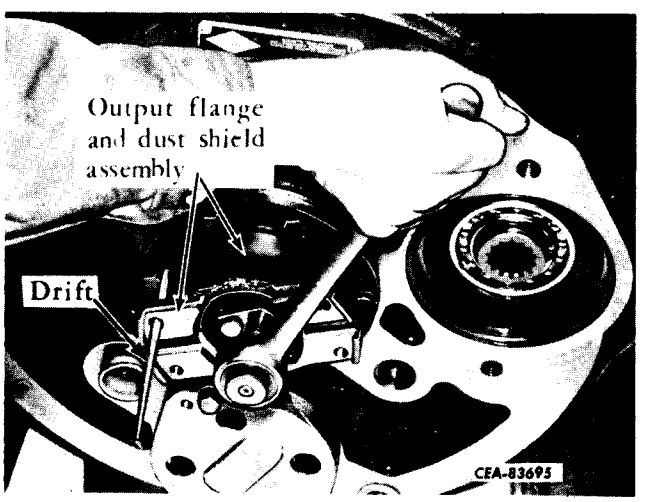
Illust. 12
Removing the Turbine Hub Bearing.



Illust. 13
Bending Back Locking Plate Tabs.

10. Bend back the locking plate tabs (Illust. 13). Wedge a drift between the dust shield and retainer mounting bolt to keep the output flange (20) from turning as the retainer washer cap screws are removed (Illust. 14). Remove the locking plate (18) and retainer washer (19). Slide the output flange and dust shield assembly from the output shaft.

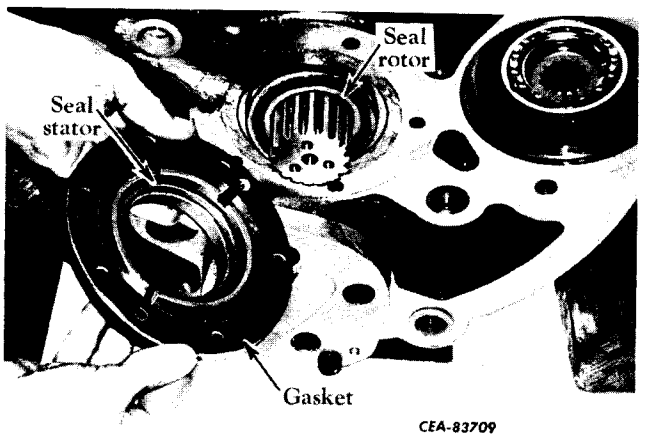
(Continued on next page)



Illust. 14
Removing Retainer Washer Mounting Screws.

5. DISASSEMBLY - Continued

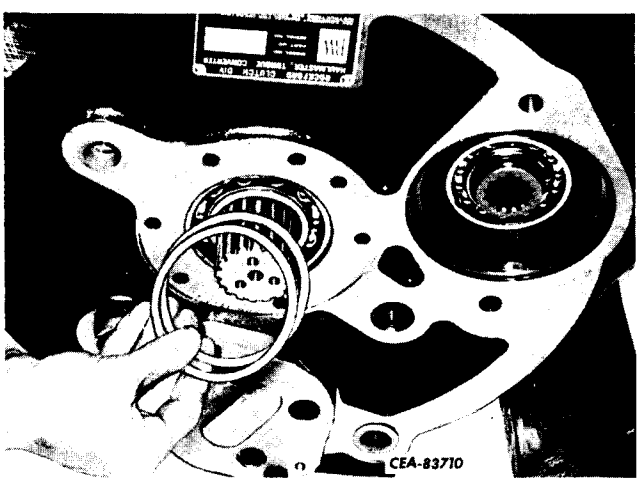
(Ref. Nos. Refer to Illust. 4)



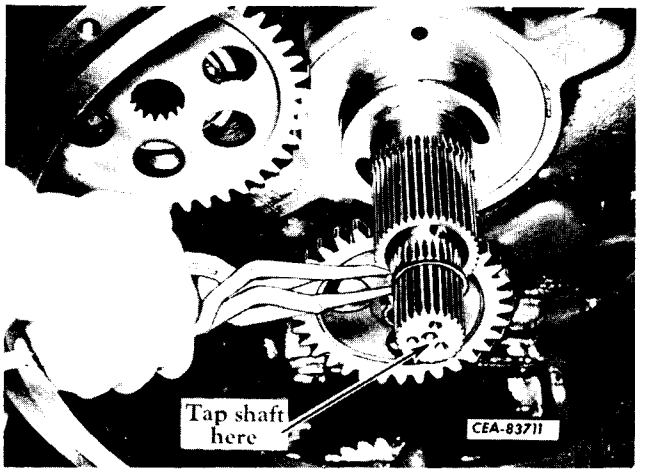
Illust. 15
Removing the Output Shaft Bearing Retainer on Units with Metal Face Type Oil Seal.

11. UNITS WITH METAL FACE TYPE OIL SEAL: Remove the cap screws and lock washers securing the bearing retainer (22) to the ground sleeve hub (17) and remove the retainer with the oil seal stator. Discard the retainer gasket (23). Slide the seal rotor from the shaft (Illust. 15). If oil seal replacement is necessary, the seal stator can be tapped out the rear of the retainer.

UNITS WITH LIP TYPE OIL SEAL: Remove the cap screws and washers securing the bearing retainer (22) to the ground sleeve hub (17) and remove the retainer with oil seal (21). Discard the retainer gasket (23). The oil seal can easily be tapped out the rear of the retainer if replacement is necessary.



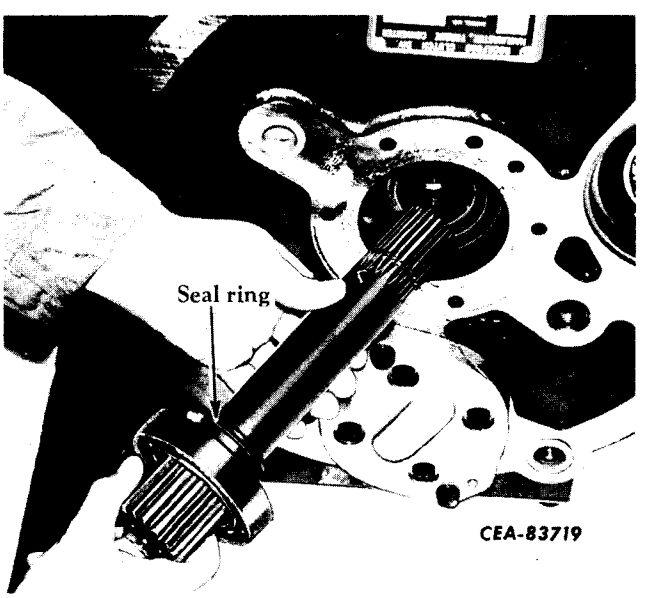
Illust. 16
Removing the Bearing Retainer Shims.



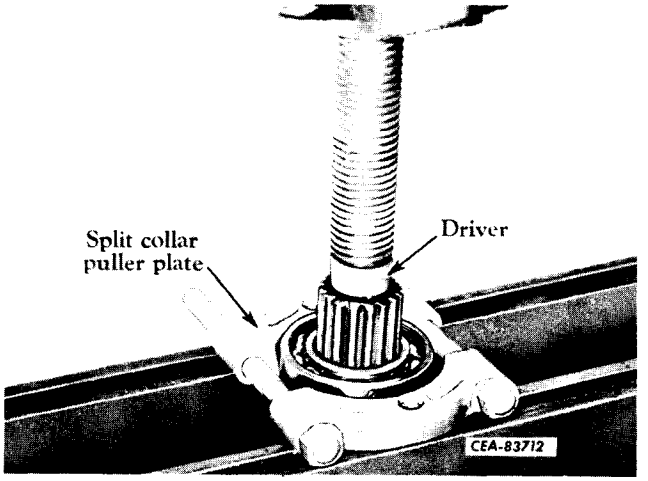
Illust. 17
Removing the Turbine Hub Snap Ring.

12. Remove the bearing retainer shims (1A) from the bore in the converter housing (Illust. 16). Keep these shims with the bearing retainer to facilitate proper installation. These shims are the same type as those used with the input drive hub (1) and can easily become intermixed.

13. Remove the turbine hub snap ring (42) (if equipped) from the output shaft (24). Using a soft hammer, tap on the end of the shaft until the bearing (25) is free of the housing bore (Illust. 17). Remove the output shaft with bearing, snap ring (34) and seal ring (33) out the rear of the converter housing (Illust. 18).



Illust. 18
Removing the Output Shaft.

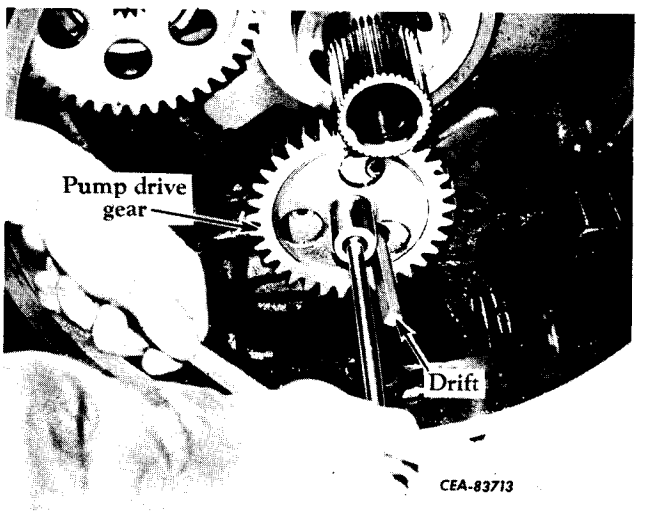


Illust. 19
Removing the Output Shaft Bearing.

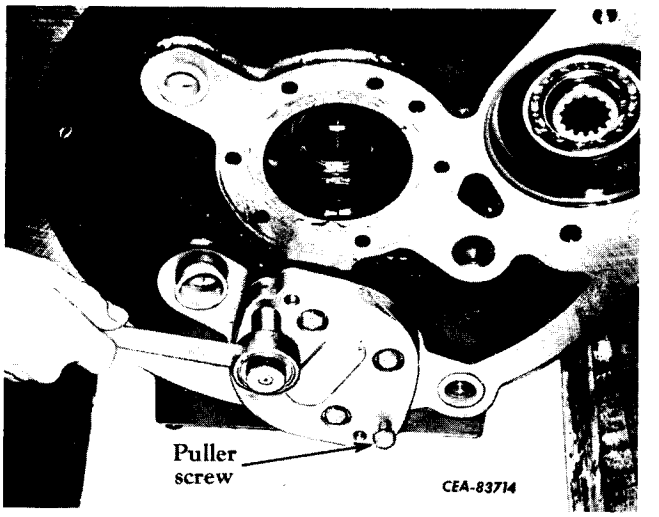
14. Remove the seal ring (Illust. 18) from the output shaft. If bearing or shaft replacement is necessary, proceed as follows. Remove the snap ring (34) from the shaft. Support the shaft in a press under the bearing and press the shaft from the bearing. Use a support that will contact both bearing races such as a split collar puller plate. Use a driver to protect the shaft (Illust. 19).

15. Position a drift in the pump idler gear opening to keep the drive gear (11) from turning and remove the gear nut (12). (Illust. 20.) Slide the gear from the pump shaft.

NOTE: If equipped, do not remove the snap ring (27) from the pump shaft unless replacement it necessary. When the snap ring is removed, it cannot be reused as the removal



Illust. 20
Removing the Input Pump Drive Gear Nut.



Illust. 21
Removing the Input Pump.

operation stretches the snap ring out of shape making it unusable.

16. Remove the two input pump mounting cap screws and lock washers. Use two cap screws (approximately 1-3/4 inches long) in the puller holes provided to pull the pump from the converter housing. Tighten the puller screws evenly. When one becomes hard to turn, do the other. Removing the pump in a cocked position could result in damage to the aluminum pump flange (Illust. 21).

17. Remove the "O" ring (28) from the groove in the converter housing and the other "O" ring (28) from the pump body (Illust. 22).

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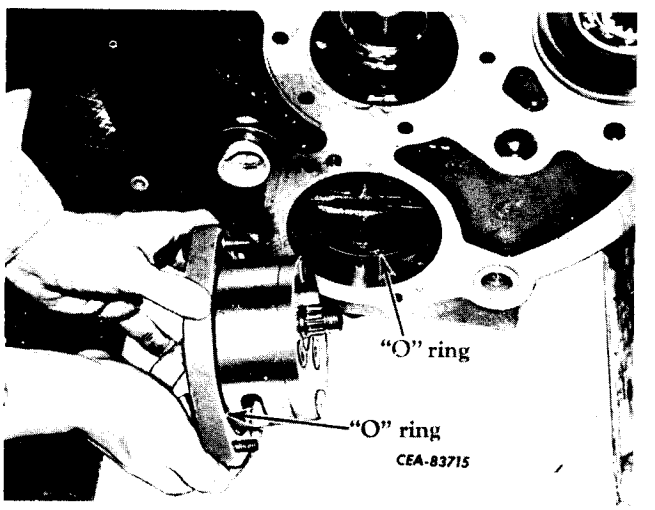
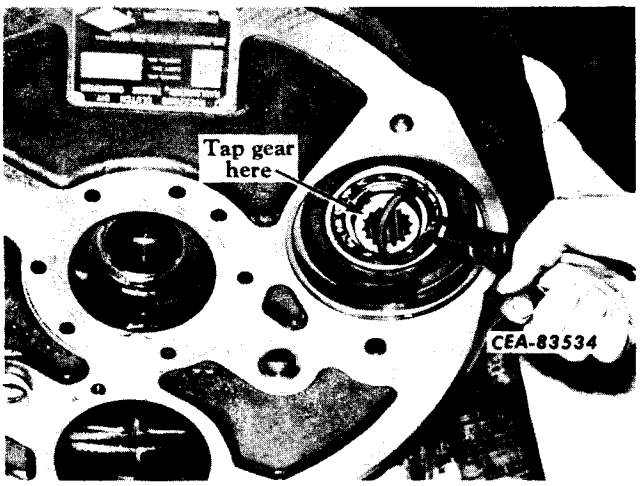


Illust. 22
Input Pump Removed.

5. DISASSEMBLY - Continued

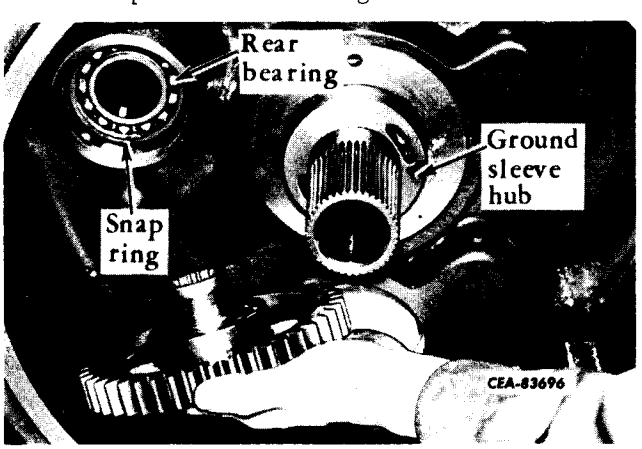
(Ref. Nos. Refer to Illust. 4)



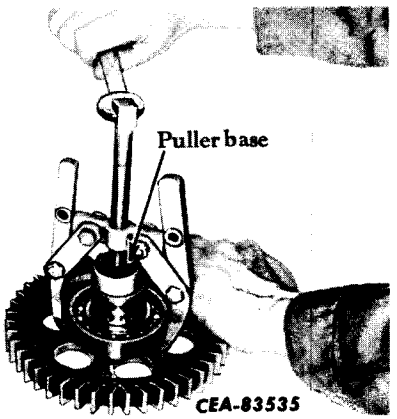
Illust. 23
Removing the Equipment Pump Accessory Gear Snap Ring.

18. LOADERS ONLY: Remove the snap ring (37) from the equipment pump accessory gear hub and tap the gear with front bearing from the housing (Illust. 23 and 24). If front bearing replacement is necessary, it can be removed with a bearing cup puller (Illust. 25). The rear bearing (35) can be driven or pressed out the rear of the housing. A snap ring (36) prevents the bearing from being removed out the front of the housing (Illust. 24).

19. Remove the seal ring (16) from the ground sleeve hub (Illust. 24). If the hub needs to be replaced, place converter housing in a press with the splined end of the ground sleeve hub



Illust. 24
Removing the Equipment Pump Accessory Gear.



Illust. 25
Removing the Equipment Pump Accessory Gear Front Bearing.

facing down. Block up on inside of housing as close to the outside diameter of the ground sleeve hub as possible without contacting the sleeve hub. Insert a steel plug, approximately 3-1/4 inches in diameter, on the rear of the sleeve hub and press out. Remove the gasket (23).

6. INSPECTION AND REPAIR

1. Thoroughly clean all parts in mineral spirits or with plain steam (no caustic soda in the steam) and dry with compressed air. Do not spin bearings with the compressed air blasts. If cleaned with steam, oil parts immediately thereafter.

2. Inspect all bearings for excessive wear or damage and replace if necessary. Bearings that are to be re-used should immediately be lubricated with clean oil and wrapped in clean paper until ready for assembly.

3. Inspect and clean all hoses and piping removed when removing the converter. Flush and clean all oil lines and the oil coolers to assure a clean hydraulic system.

4. Inspect the "O" ring (32, Illust. 4) on the converter housing and all the sealing rings for wear or damage and replace parts as necessary. Inspect the piston hook type seal ring grooves and sealing surfaces for wear and grooving.

5. Inspect the oil seal (21, Illust. 4) for hardening and fatigue. If equipped with metal face type oil seal, inspect the sealing surfaces between the rotor and stator for wear. A new oil seal must be handled and installed as described in Par. 7, "REASSEMBLY."

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6. Inspect all splines and gear teeth for excessive wear, burrs or damage and replace if necessary. Slight burrs can be removed with a fine oil stone. Be sure the dust shield (20A, Illust. 4) is properly tack welded to the output flange.

7. Inspect the impeller, stator and turbine for signs of rubbing. If this condition exists, it is an indication that one or more of the bearings in the converter need replacement. If the blades are excessively worn or damaged, the entire assembly must be replaced.

8. If it was removed, pack the ground sleeve hub (17, Illust. 4) in dry ice or freeze to a temperature of -25° F for approximately 30 minutes prior to assembly.

7. REASSEMBLY

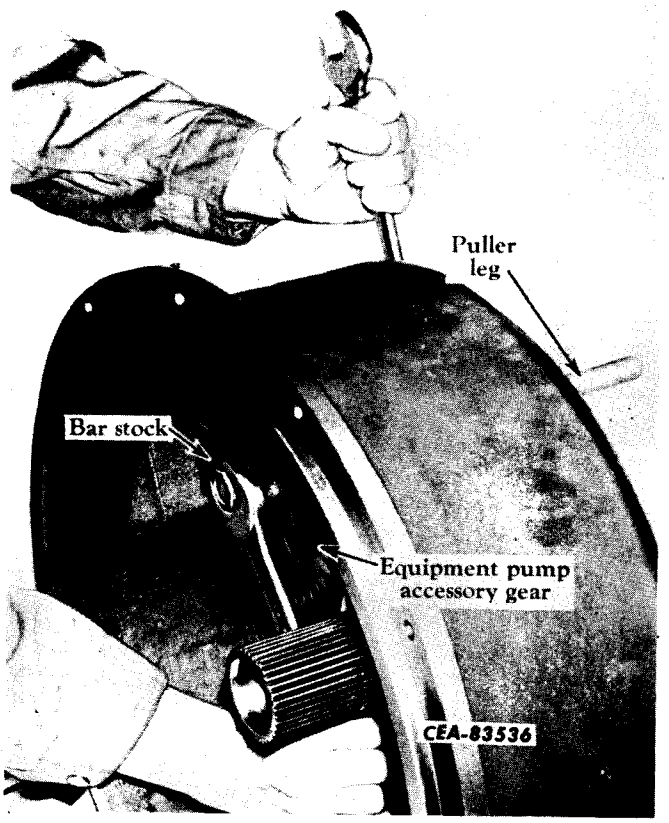
(Ref. Nos. Refer to Illust. 4)

1. If the ground sleeve hub was removed, proceed as follows. Place the converter housing (31) in a press with its output or rear side down. Position the gasket (23) in the housing. Insert two guide bolts (3/8-16 UNC x 2-1/2 inches with bolt heads cut off) into the frozen ground sleeve hub. Using the shoulder of the ground sleeve hub, press the hub into the converter housing. Remove the guide screws when the ground sleeve hub is properly seated in the housing and install the seal ring (16) on the hub. Be sure to hook the seal ring and coat lightly with hydraulic oil.

2. LOADERS ONLY: Be sure the snap ring (36) is properly seated in the housing bore (Illust. 24). Tap the rear bearing (35) into the bore from the output end of the housing until it bottoms on the snap ring. Start the gear (15) with front bearing (35) into the bore from the input end of the housing using a soft hammer.

Insert a standard puller leg through the gear and position a piece of bar stock on the leg behind the gear. Secure with nut. Place a 1-3/4 inch socket on the leg and against the rear bearing. Install a nut and draw the gear into the rear bearing until the snap ring groove in the gear hub appears. Install the snap ring (37) (Illust. 26).

3. Install the "O" ring (28) into the bore of the housing (31) and coat the bore and "O" ring lightly with heavy grease. Install the "O" ring (28) on the input pump body against the pump cover (Illust. 22).



Illust. 26
Installing the Equipment Pump Accessory Gear.

4. Be sure to position the input pump (26) correctly in the converter housing as it is hard to turn the pump once it is started in the housing bore. Start the pump in by hand, then tap into place using a soft hammer. Secure with the two mounting cap screws and lock washers.

NOTE: If the pump becomes cocked as it is tapped into position, do not continue to force it into place in this manner. Insert longer cap screws and alternately tighten until the regular mounting screws can be used.

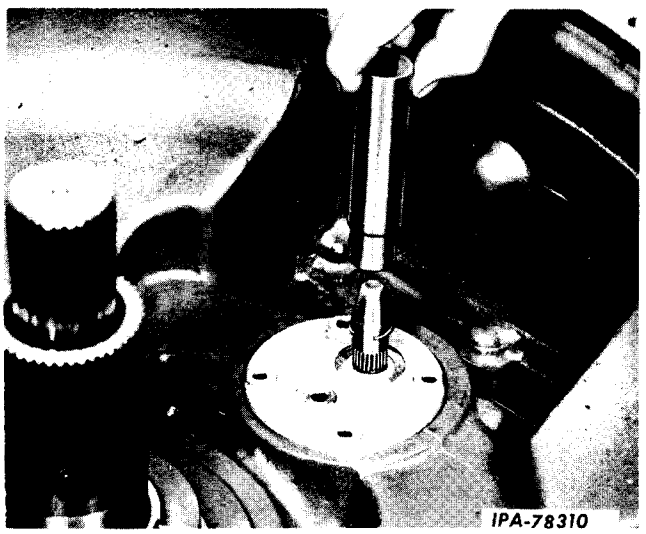
5. Install the gear (11) on the pump shaft with the gear hub toward the pump. On pumps equipped with snap ring (27), the gear counterbore must fit over the snap ring to be properly positioned. Secure the gear to the shaft with the stop nut (12). Use a drift to keep gear from turning (Illust. 20). Torque the nut from 45-55 ft. -lbs.

(Continued on next page)

7. REASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 4)

NOTE: If pump is equipped with snap ring (27) and it was removed, install a new snap ring using assembly tool 1 020 449 R91. Place the tool sleeve over the pump shaft. Install the new snap ring on the sleeve and, using the tool driver, slowly tap the snap ring into the groove on the pump shaft. (Illust. 27.)



Illust. 27
Installing Input Pump Gear Snap Ring
Using Assembly Tool, 1 020 449 R91.

6. Place the snap ring (34) on the output shaft. Press the shaft into the bearing (25) with the output end of the shaft entering the bearing and seating the bearing against the snap ring (34). The bearing must be held in the press so both races are supported.

7. Install the piston hook type seal ring (33) in the groove in the shaft, being sure seal ring is hooked. Coat the seal ring lightly with hydraulic oil.

8. Insert the output shaft (24) into the ground sleeve hub (17) from the output end of the converter housing. Using a suitable driver against the outer race of the bearing (25) seat the bearing against the ground sleeve hub.

9. Install the snap ring (42) (if equipped) in the groove on the output shaft (Illust. 17).

10. UNITS WITH LIP TYPE OIL SEAL: If the oil seal (21) was removed, press the new oil seal into the retainer until it is flush with the rear face of the retainer. The seal lip should face toward the converter when the retainer is installed.

UNITS WITH METAL FACE TYPE OIL SEAL: If the oil seal (21) was replaced, the proper method of handling the new metal face type oil seal must be followed.

A. Do not remove the seal from its box until ready to install.

B. Be extremely careful not to nick either seal face.

C. Clean seal faces just prior to their contacting each other.

1. It is usually easier to clean these faces when they are dry.

2. Seal rotor face is molycoated to permit a few minutes running until the oil can reach the seal faces. Some of this is likely to rub off during the final cleaning.

3. Clean rags should be used to wipe the seal faces. The paper pads in the seal box are often the cleanest available in your service shop so these will suffice. If oil is used to wipe the seal faces, it must be clean and be kept in a closed container.

4. Subsequent assembly procedures following the installation of the seal rotor may cause chips or dirt to fall onto the rotor seal face. Step C above is therefore very important.

D. The oil seal should remain square to the bore within .010 per inch.

E. Install the seal stator using a driver that will fully support the back of the seal cup (absolute minimum would be where only 50 percent of the cup contacts the driver). Place the retainer in a press and press the seal stator (sealing surface down) into the retainer until it bottoms. Install the seal rotor on the end of the output shaft so the lip is to the rear or output end of the shaft (Illust. 15).

11. An output shaft end gap of .000 to .004 inch must be maintained in the converter assembly. Proceed as follows for checking and obtaining the proper end gap (Illust. 28).

(a) Be sure the output shaft bearing is bottomed on the ground sleeve hub. Install virgin lead (approximately 1/16 inch thick) on the bearing cup.

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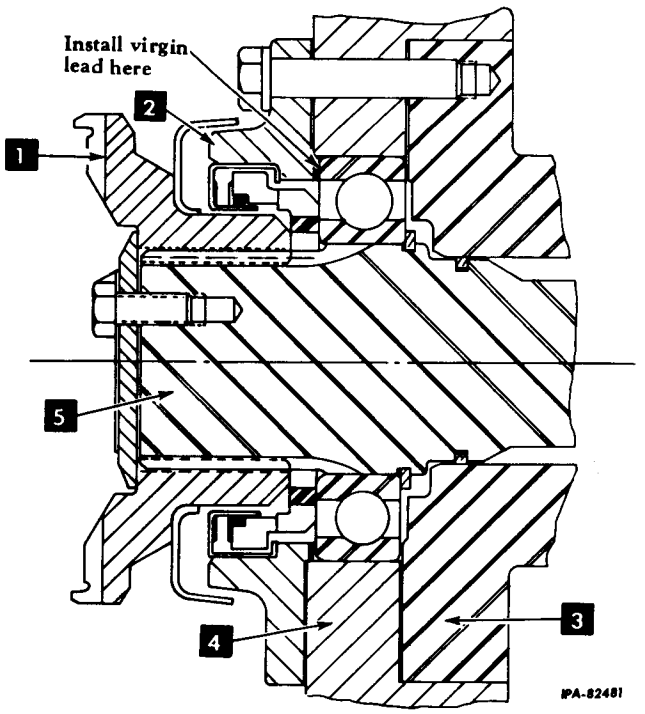


Illust. 28
Cross Section of Output End of Torque Converter (Metal Face Type Oil Seal Shown, Lip Type Oil Seal Similar).

1. Output flange.
2. Bearing retainer.
3. Ground sleeve hub.
4. Converter housing.
5. Output shaft.

(b) Install the bearing retainer and retainer gasket (do not install shims) and tighten the mounting bolts to standard torque.

(c) Remove the bearing retainer and compressed lead. With a micrometer, carefully measure the thickness of the compressed lead. This measurement, less .004 inch is the amount of shims (1A, Illust. 4) to be installed between the output shaft bearing cup and the retainer.

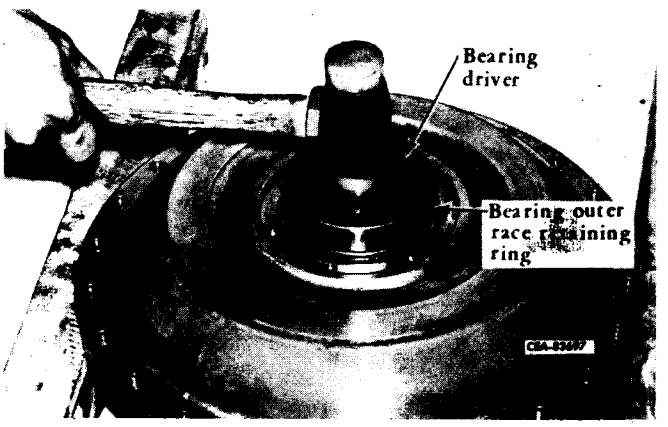
NOTE: The shim pack should never be the same or greater than the thickness of the gap measurement (compressed lead).

12. Install the shims (1A) in the bore of the converter housing and up against the output shaft bearing cup.

13. Place the gasket (23) on the bearing retainer and secure the bearing retainer to the ground sleeve hub (17) with the cap screws and washers.

14. Place the output flange with dust shield (20) over the splines of the shaft. Install the retainer washer (19) and locking plate (18) on the output flange and secure with cap screws. Bend up the tabs of the locking plate to prevent cap screws from loosening.

15. Block the impeller (10) so the blades are down and, using a driver that will cover both races of the bearing (14), tap the bearing into the impeller hub until the retaining ring of the bearing bottoms (Illust. 29).



Illust. 29
Installing the Impeller Hub Bearing.

16. Secure the accessory drive gear (13) to the impeller with the seven cap screws (Illust. 9).

NOTE: Be sure to torque the accessory drive gear mounting cap screws from 27-30 ft. - lbs. A loose cap screw will cause premature converter failure.

17. Place the turbine (6) in a press so the blades are down. Remove the retaining ring from the turbine hub bearing (3). Pressing on the inner race of the bearing, install the bearing (retaining ring groove up) on the turbine hub until it bottoms.

Place the turbine on the bench with the blades down and position the drive housing (5) over the bearing with the gear teeth up. Using a soft hammer, tap the drive housing onto the bearing until the groove in the bearing appears and install the retaining ring (Illust. 10).

18. Position the drive housing on the bench so the turbine is up. Be sure the snap ring (8) and dowel (8A) are in position in the stator (9).

(Continued on next page)

7. REASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 4)

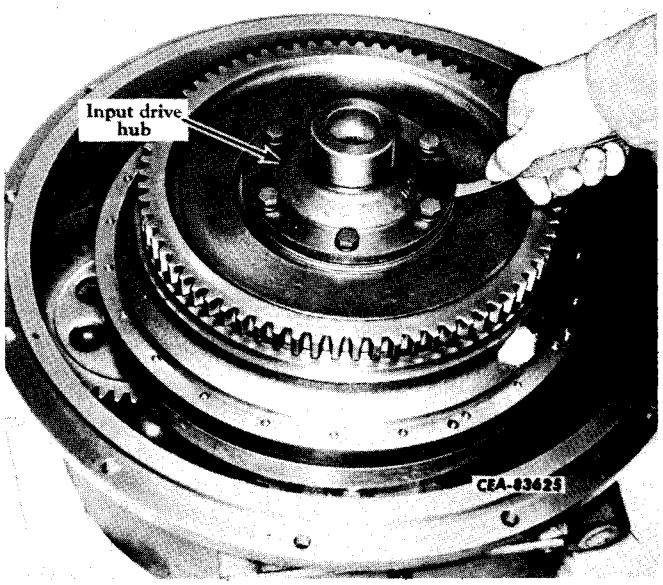
Place the thrust washer on the stator dowel (8A) and place the assembly into the turbine so the thrust washer is down (Illust. 8).

19. Install the impeller over the turbine and secure to the drive housing with the cap screws.

20. Turn the complete assembly over so that the accessory drive gear (13) is down. Secure a hoist to the input drive hub mounting holes on the drive housing (5) and lower this assembly into the converter housing (31) (Illust. 6).

As the assembly is lowered into the converter housing the stator splines will engage with the ground sleeve hub splines; then the turbine hub will engage the output shaft splines and finally the accessory drive gear must mesh with the input pump drive gear and the equipment pump gear. If at each point when contact is made the hoist sling becomes slack, place a slight strain on the sling and rotate the drive housing (5) to engage properly, then continue to lower the assembly onto the housing.

21. Install the retainer washer (2) and locking plate (1B) on the output shaft and secure with the three cap screws. Bend up the tabs of the locking plate (Illust. 5).



Illust. 30
Checking Input Drive Hub Gap.

22. Install the original amount of shims (1A) and the input drive hub (1) and tighten the mounting bolts to the standard torque to assure bottoming of the turbine hub bearing. Then loosen the mounting bolts and retighten only finger tight.

Check the clearance between the hub (1) and housing (5) (Illust. 30). There must be a clearance of .005-.015 inch. If necessary, add shims (1A) until a clearance of .005-.015 inch is obtained without having the input hub mounting belts tightened. When the correct gap is obtained, tighten bolts to standard torque.

23. Install the "O" ring (32) on the housing flange.

8. INSTALLATION

(Ref. Nos. Refer to Illust. 2)

NOTE: All gaskets and any collapsed hoses or damaged connections must be replaced with new.

1. Remove the covering from the flywheel housing.

NOTE: Before installing the converter assembly as described in the next step, be sure there is no sealing ring being used in the groove located directly behind the teeth of the converter drive housing (3, Illust. 1). If there is one, it must be removed as it is no longer necessary and could even cause damage if used on machines that have the latest type engine flywheel without drilled oil passages.

2. Lower the converter into position. Move the converter toward the flywheel housing by hand until some mounting cap screws can be started. Secure the converter housing to the flywheel housing with the cap screws and washers.

NOTE: As the converter housing enters the flywheel housing, be sure the "O" ring (32, Illust. 4) is properly seated in the groove of the converter housing.

3. Remove the hoist and eyebolts from the inspection cover (1) and install the cover securing cap screws and lock washers.

4. LOADERS ONLY: With the aid of a hoist, position the equipment pump on the lower left hand side of the converter housing and secure.

5. Place the transmission drive yoke over the splines of the forward clutch shaft. Position the universal joint assembly and secure to the torque converter output flange and to the transmission drive yoke.

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◆ CAUTION: REMOVE THE WIRE USED TO KEEP THE BEARINGS FROM FALLING FROM THE SPIDER TRUNNIONS. IF INSTALLING A NEW SPIDER AND BEARING ASSEMBLY, REMOVE THE SOFT IRON STRAP ATTACHED TO THE BEARING CAPS. THIS WILL ELIMINATE THE POSSIBILITY OF THE STRAPS OR WIRE BREAKING LOOSE FROM THE CAPS AND CAUSING PERSONAL INJURY WHEN THE ENGINE IS RUNNING.

6. LOADERS ONLY: Install and secure the equipment pump inlet tube (4). Connect the outlet line at the pump.

TD-20 SERIES B ONLY: Connect the equipment pump inlet hose at the pump.

7. Connect all the hoses and tubing between the converter housing and the transmission and oil cooler that was disconnected to facilitate removal of the converter. Install the rear cover to the underside of the front frame.

8. SUCTION FILTER WITHOUT FLEXIBLE COUPLING: Connect the suction filter outlet hose to the tee in the converter housing. Install and secure the suction filter to the seat support bar. Connect the inlet and outlet hoses to the suction filter (Illust. 3).

SUCTION FILTER WITH FLEXIBLE COUPLING: Install the suction filter (7) with piping. Connect the flexible coupling (3) at the suction tee and at the suction filter inlet (refer to Section 1, "GENERAL" for the proper method of installing a flexible coupling).

9. Secure the pressure filter base to the front frame. Position the element and spring on the pressure filter base. Be sure the "O" ring on the hold-down bolt and in the filter case (8) are in place and in good condition. Secure the filter case to the base using a maximum of 55 ft. -lbs. torque on hex-hd type hold-down bolt or from 10-15 ft. -lbs. torque on the cross bar type hold-down bolt. Connect the inlet hose (9) to the filter base. On later units also connect the clutch pressure gauge tube (Illust. 3) to the base.

10. Install the electrical cables and clip to the converter housing.

11. Install the platform support (2) with linkage attached. Connect all the linkage that was disconnected to facilitate platform support removal. If equipped with a decelerator cylinder (6), install the cylinder drain tube (5) between the decelerator cylinder and the transmission. Connect the inlet hose (5) to the decelerator cylinder and secure the cylinder at the rear to the seat support bar with the cap screw and washers.

12. Untie the steering levers. Release the brake pedal.

13. Fill and vent the equipment hydraulic system as described in the pertinent instruction or operator's manual.

14. Check the fluid level in the rear main frame and, if low, fill with the proper fluid as described in the operator's manual.

15. Run the engine and check for leaks. Check the input pump suction line for air leaks.

16. Install the two front platforms. Connect the decelerator pick-up lever rod to the decelerator pedal.

17. Perform the engine idle adjustments as described in Section 4, "ENGINE."

18. Install the rear platform.

NOTE: After one hour of operation, disassemble and clean the safety and suction filters. Remove the pressure filter case and inspect the filter element. Replace the element, if necessary.

Testing the Converter Input Pump

19. Stop the engine.

20. Convert a flow meter between the pump and pressure filter.

21. Start and run the engine until the converter oil temperature gauge remains within the "RUN" range.

22. Accelerate the engine until the rated engine speed is obtained and check the pump flow (refer to Par. 2, "SPECIFICATIONS").

23. Stop the engine. Remove the flow meter and connections. Reconnect the pump hydraulic lines.

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

CONTENTS

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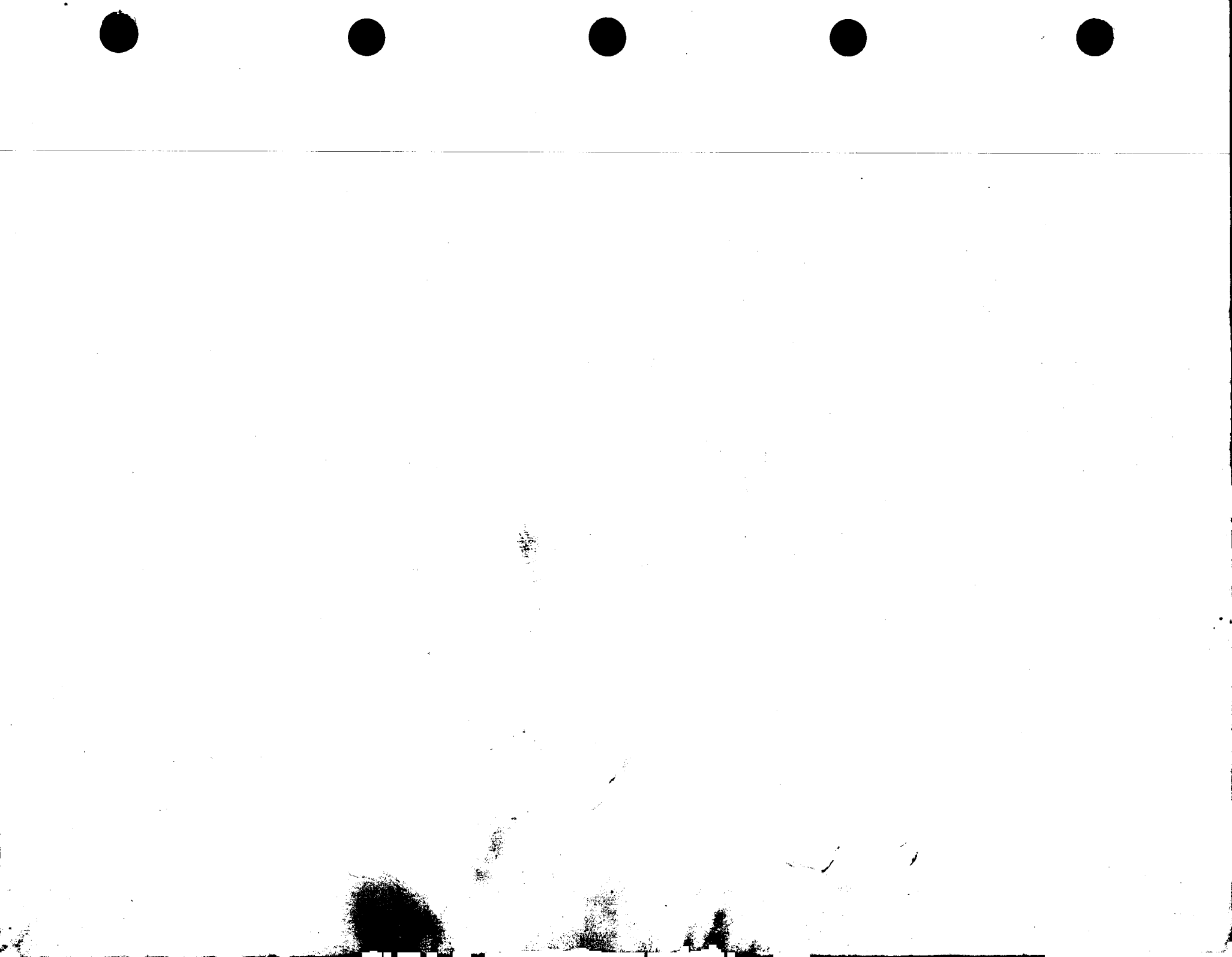
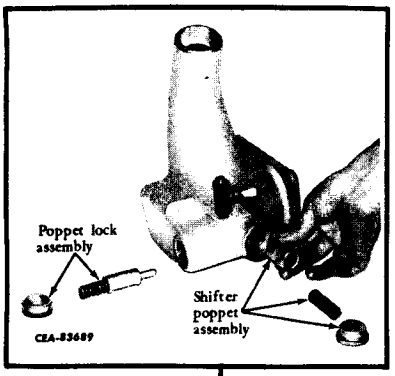
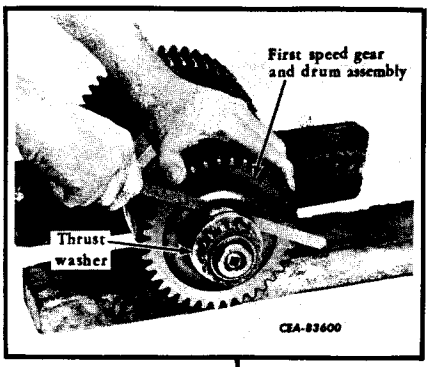


TD-20 SERIES B, 250 AND 250 SERIES B LOADER POWER SHIFT TRANSMISSION SERVICE CHART

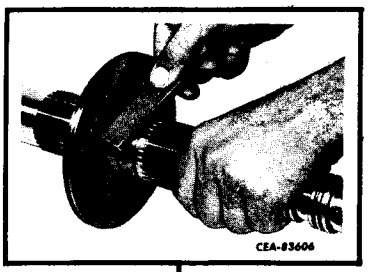


HI-LO SHIFTER LEVER SPRINGS

Free Length Inches	Test Length Inches	Test Load Pounds	No. of Coils
Poppet:			
2	1 11/32	67	12½
Poppet lock:			
1 15/16	1 ½	31	12



Clutch pack gear and drum assembly end play (Inch):
New clutch pack assy..... .010-.030
Used clutch pack assy..... .010-.040
(Refer to manual text for instructions.)

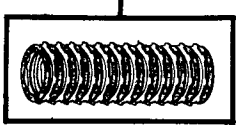


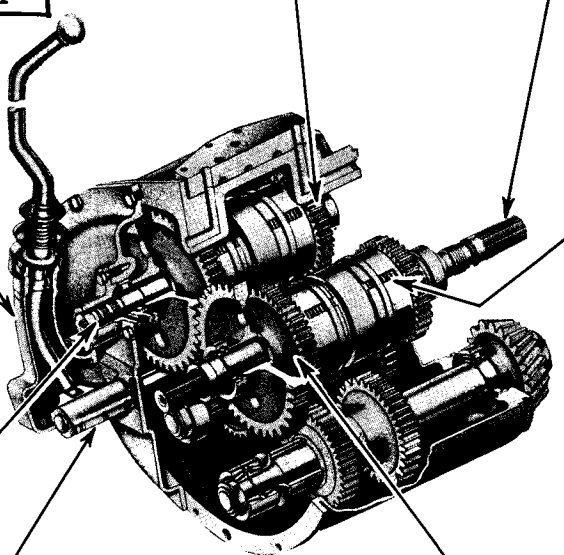
CLUTCH SHAFT

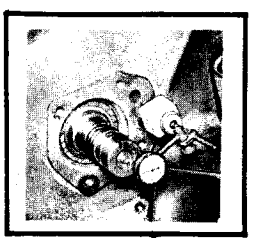
Using an oilstone, remove any burrs that might damage sealing surfaces or increase wear to close tolerance parts.

CLUTCH PLATES

Inspect clutch plates for excessive wear and warpage.
Minimum allowable thickness for internally splined bronze clutch plates (Inch).. .008



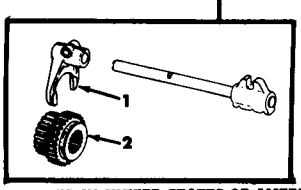


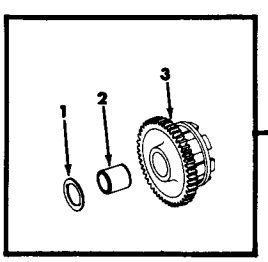


Reverse clutch shaft end play (Inch)..... .030-.040
(Refer to manual text for instructions.)

HI-LO SHIFTER FORK AND DRIVING GEAR

Inspect the hi-lo shifter fork fingers for misalignment or wear and the shifter fork slot in the driving gear for wear.
1. Width of shifter fork fingers (Inch). .365-.375
2. Width of slot in driving gear (Inch). .380-.390





FIRST AND SECOND SPEED DRIVE GEAR, BUSHING AND THRUST WASHER

1. Inspect the first and second speed drive gear and drum assemblies for excessive wear or damage.
2. First and second speed drive gear bushing (If equipped):
   Inside diameter (assembled in gear) (Inches)..... 2.254-2.257
   Maximum allowable running clearance (Inch)..... .009
3. Thrust washer minimum allowable thickness (Inch):
   First speed drive gear..... .388
   Second speed drive gear..... .054

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1. DESCRIPTION

The power shift transmission is designed to provide high speed shifting by the use of hydraulic actuated clutches. The transmission has two forward and two reverse speeds in low range and two forward and two reverse speeds in high range. Shifting from one range to another is controlled by the hi-lo shifting lever (9, Illust. 9) mounted on the transmission front cover.

The transmission is coupled, by a universal joint, to the torque converter which is attached to the flywheel on the engine. Gears are mounted on four shafts; the reverse clutch shaft, the forward clutch shaft, the spline shaft and the bevel pinion shaft.

The range selector valve of earlier transmissions was operated by mechanical linkage. The transmission gear selector lever was mechanically connected to the rotary type range selector valve used to select the various transmission gear ranges. Later transmissions have a range selector valve which is hydraulically controlled. The transmission gear selector lever aligns ports in a pilot control valve which directs oil

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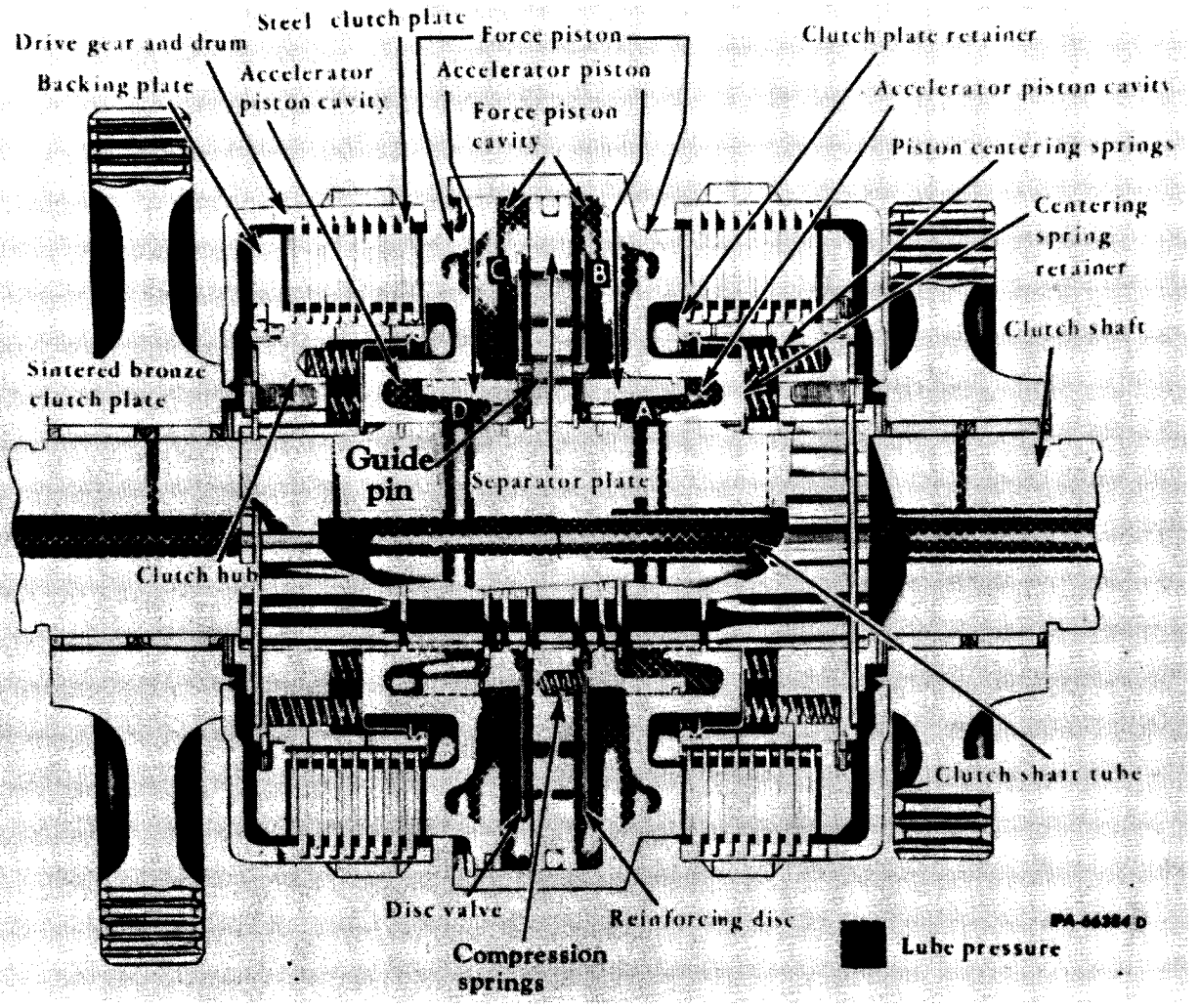


Illust. 1
Flow of Oil Through Clutch in Neutral Position.

1. DESCRIPTION - Continued

to operate the spool type range selector valve used to select the various transmission gear ranges.

Bevel Pinion Shaft

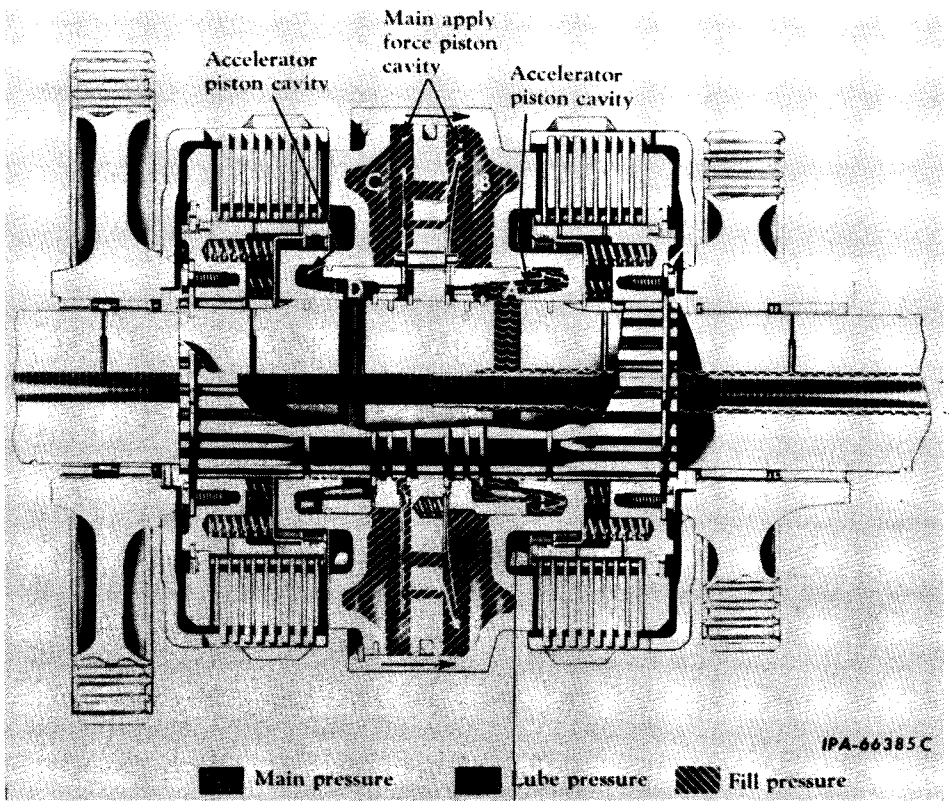
The shaft consists of the high and low range gears which are keyed to the shaft. The shaft is supported at the rear by a straight roller bearing and at the front of a double-row taper roller bearing. The pinion gear is splined to the rear of the pinion shaft and held in place by a nut. A shim pack is provided between the front bearing cage and the transmission case front cover for setting the cone center of the pinion and bevel gear.

Spline Shaft

The spline shaft rotates on two straight roller bearings. The rear bearing is mounted in the transmission case and the front bearing is in the transmission cover. The first and second speed driven gears are held in position on the spline shaft by snap rings and are in constant mesh with the first and second speed drive gears on the clutch shafts. The hi-lo driving gear slides freely on the shaft and drives the bevel pinion shaft when brought into mesh with either the high or low range driven gear by the use of the hi-lo shifting lever.

Forward and Reverse Clutch Shafts

The forward clutch shaft rotates on a straight roller bearing at the rear and a ball bearing at the front. The reverse clutch shaft has a straight roller bearing at each end. The reverse drive gear is keyed to the front of the forward clutch shaft and the reverse driven gear is keyed to the front of the reverse clutch shaft. Each shaft consists of first and second speed drive gears which ride on caged roller bearings and are welded to the dual hydraulic clutch pack assemblies. Earlier drive gears were equipped with bushings instead of roller bearings.



Illust. 2
Flow of Oil Through Clutch in Travel Position.

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Forward and Reverse Hydraulic Clutch Operation

The hydraulic clutch is actually two clutches on a common shaft with a common apply force piston between them. The clutches allow the simple transfer of oil from the disengaged clutch into the cavity created by the engaging clutch. This allows a low volume of main pressure to actuate the clutch for high speed shifting.

The heart of the clutch is contained in two pistons; the accelerator piston and the force piston. Pump oil volume is not needed to fill the applying clutch cavity and only a relatively low volume is needed to pressurize the clutch.

In neutral, all accelerator and force piston cavities are filled with oil at lube pressure (10 to 25 psi). A selector valve, located on the top of the transmission case, directs the oil to the accelerator piston cavities and, in turn, to the force piston cavities. From this valve, oil is directed through the inside of a tube pressed in the clutch shaft and a cross drilled shaft hole and on the outside of the tube and through a cross drilled shaft hole to fill both clutch piston cavities. Once the pistons are filled with oil, they remain full under lube pressure. Other small cross drilled shaft holes furnish a constant supply of lube oil to the bushing beneath the drive gear and drum assemblies and to the clutch hubs for distribution through the clutch plates. In neutral, neither clutch is engaged; the drive gear and drum assemblies are free and no torque is transmitted through the clutch. (Illust. 1.)

Upon application of a clutch, main oil pressure (approximately 200-230 psi) is directed through the clutch shaft for the specific side of the clutch desired and enters the accelerator piston cavity. In Illust. 2, main oil pressure enters the accelerator piston (A) through the cross drilled hole in the clutch shaft. During this phase, main pressure also lubricates the clutch plates and the bushing under the drive gear and drum assembly on the activated side.

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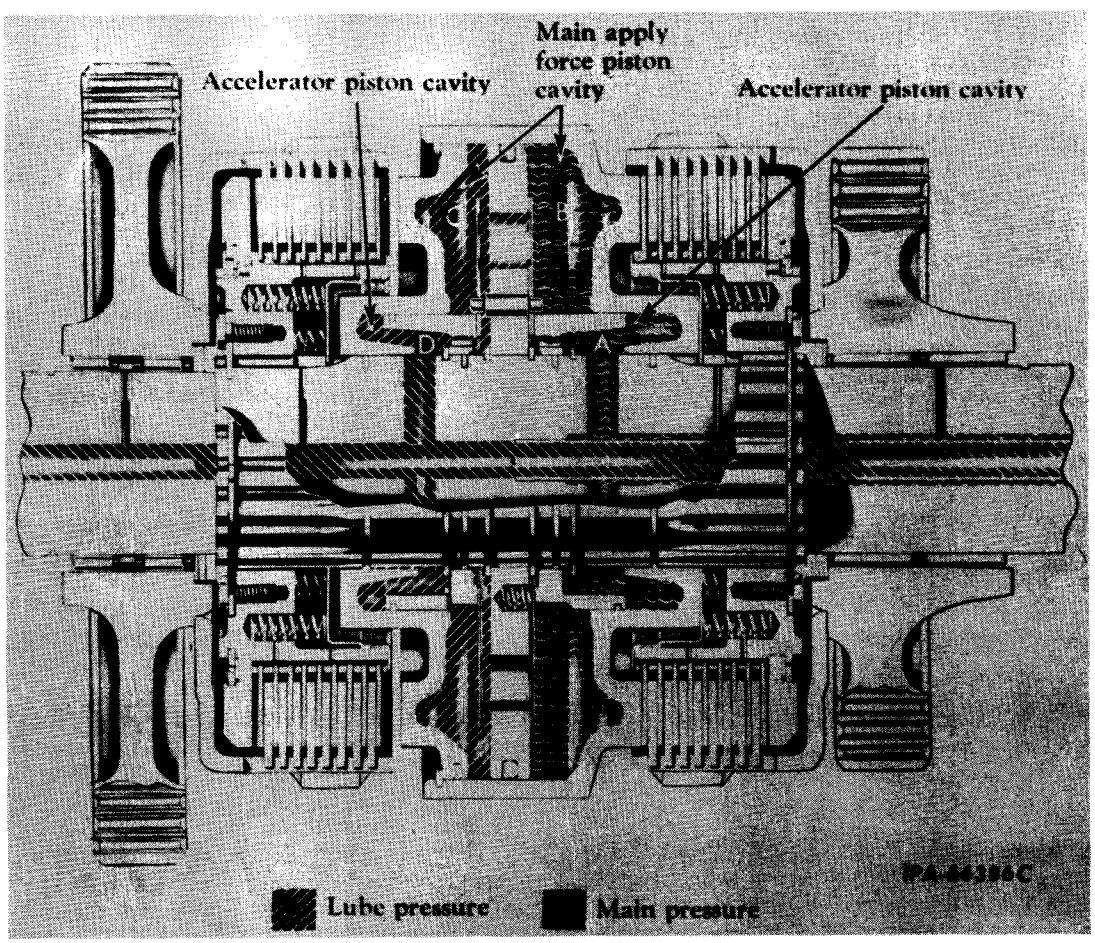

Illust. 3
Flow of Oil Through Clutch in Engaged Position.

1. DESCRIPTION - Continued

Forward and Reverse Hydraulic Clutch Operation - Continued

NOTE: Lube oil pressure remains in the cavities (C and D) on the unapplied side and lubricates the clutch plates and bushing under the drive gear and drum assembly.

Oil entering the accelerator piston cavity (A) performs three functions: (1) Forces the accelerator piston, reinforcing disc and disc valve against the separator plate; (2) Forces the accelerator piston to push the guide pins (knock-off dowel pins on clutch packs with swagged type guide pins) against the opposite accelerator piston, positioning this piston, reinforcing disc and disc valve away from the separator plate; (3) Starts to move the force piston to the right. As a result, the force piston cavity (B) expands and the area in the opposite force piston cavity (C) contracts in an equal amount. At this time, oil in the non-applied force piston cavity (C) enters the holes in the separator plate, pushes open the disc valve and enters the applying force piston cavity (B). This fill pressure puts the clutch in its primary engagement position. Simultaneously, main oil pressure passes through the orifice in the applied accelerator piston and pressurizes the force piston cavity (B). When the force piston cavity is pressurized, the clutch is in its full engaged position. The reinforcing disc and disc valve in area "B" are now flat against the separator plate (Illust. 3).

When the transmission is returned to neutral, main pressure on the applied clutch is released and oil pressure in the disengaging clutch is regulated by the lube pressure system. An immediate pressure drop occurs within the disengaging accelerator piston cavity (A). Simultaneously, the compressed piston centering springs in the clutch hub return the common apply force piston to its axially centered position or neutral. Lubrication of all parts is now controlled by the lube pressure system.

If the selector valve on the transmission is positioned to direct main pressure into the left hand clutch instead of neutral, the right hand clutch is disengaged and the left hand clutch is immediately applied.

NOTE: On later assemblies, compression springs located in bored holes in the separator plate are used to keep the reinforcing disc and disc valve on the unactivated side of the clutch pack assembly away from the separator plate. This allows for faster transfer of oil between the force piston cavities during the "travel phase" resulting in smoother clutch operation.

Gear Shifter Mechanism (Hydraulically Controlled Transmission)

The gearshift hand lever, located at the left hand side of the operator, is directly connected to the spool of the pilot control valve located within the control tower. This valve is connected through hoses to the range selector valve assembly on the top of the transmission case. Movement of the gearshift hand lever positions the pilot control valve spool to allow main pressure oil to activate the spool (of the range selected) in the range selector valve assembly. Main pressure oil within the range selector valve assembly is then allowed to engage the side of the clutch pack selected (Illust. 5).

Gear Shifter Mechanism (Mechanically Controlled Transmission)

The gearshift lever, located on the left hand side of the operator, is connected through linkage to the range selector valve assembly on the top of the transmission case. Movement of the gearshift lever positions the selector valve to allow main pressure oil to engage the side of the clutch pack selected (Illust. 4).

Hi-Lo Shift Lever

The hi-lo shifting lever (on the transmission cover) is held in position by a poppet lock in the hi-lo shifter housing. To shift from one range to another, the engine must be running and the gearshift lever must be in neutral position. At this time, main pressure oil from the pump passes through a drilled hole in the selector valve and through a tube to the shifter housing. Here it releases the poppet lock from the hi-lo shifter poppet. (Illust. 4.) On hydraulically controlled transmissions, the main pressure oil from the pilot control valve is directed through a hose to the shifter housing for releasing the poppet lock (Illust. 5).

Hydraulic Oil Flow (Illust. 4) (Mechanically Controlled Transmission)

The rear main frame is the source of supply for the transmission, torque converter, steering boosters and pivot brakes. The oil is drawn through an oil intake pipe, located at the bottom of the rear main frame, by the suction developed by the pump located in the right hand side of the torque converter. The oil leaves the pump at approximately 200-230 psi and enters the hydraulic valve spacer (not shown) on top of the transmission case. From here, the oil is directed through drilled passages to the main regulator valve in the main regulating

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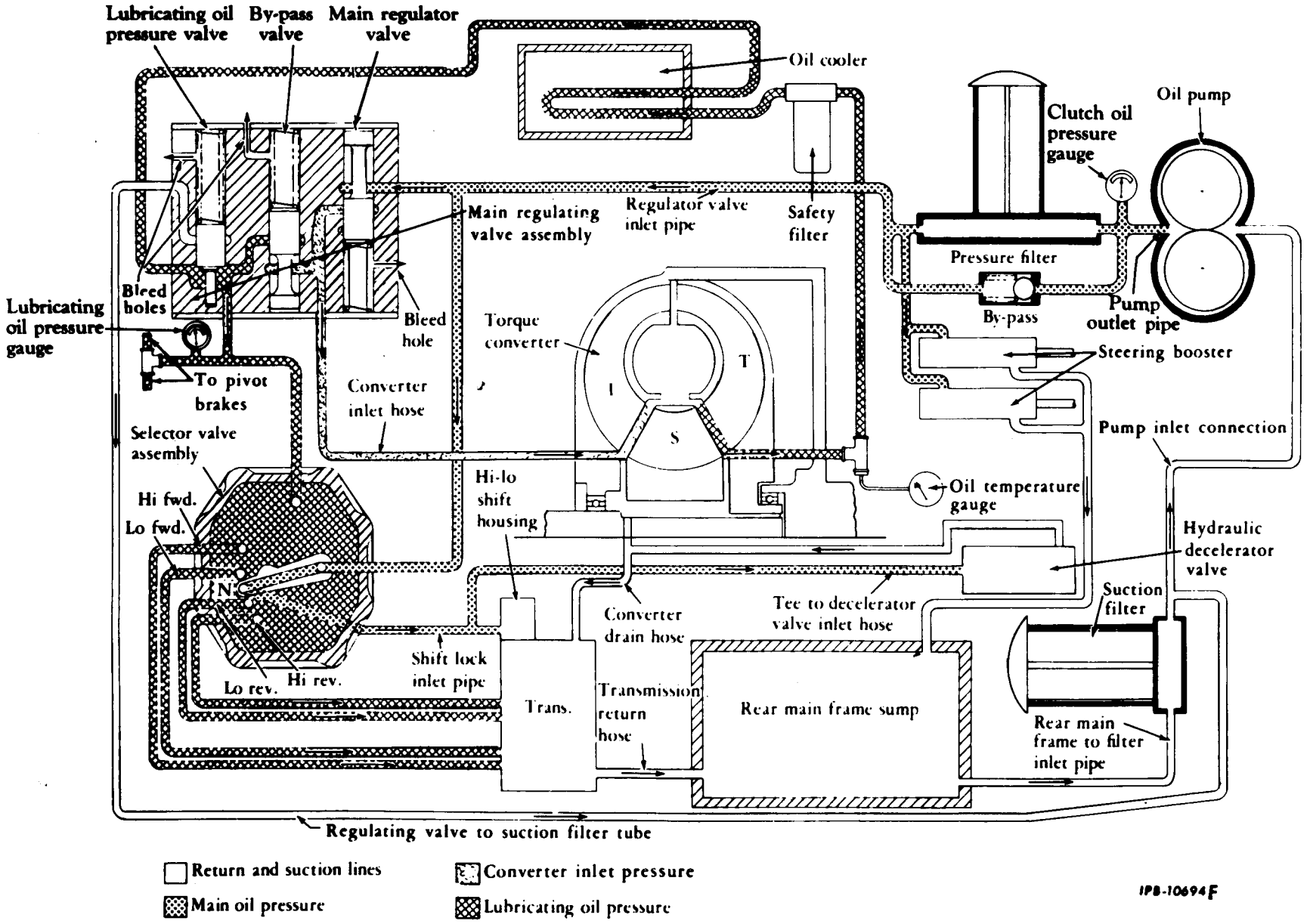

Illust. 4
Hydraulic Oil Flow with Transmission in Neutral
(Mechanically Controlled Transmission).

1. DESCRIPTION - Continued

**Hydraulic Oil Flow (Illust. 4)
(Mechanically Controlled Transmission) - Continued**

valve assembly, to the selector valve and to the steering boosters. (Refer to Section 7, "STEERING SYSTEM," for operation of the steering boosters.)

Through drilled passages in the main regulating valve assembly, hydraulic valve spacer and transmission case, oil at lubricating pressure (10 to 25 psi) fills the selector valve and transmission clutch shafts for lubrication of the transmission clutches. This pressure is maintained by the oil passing through the by-pass valve in the main regulating valve housing and also by the return oil from the oil cooler. When this pressure is over 25 psi, the lubricating valve opens and the excess oil is returned to the suction side of the oil pump. When the selector valve is in the neutral position, as shown in Illust. 4, the main oil pressure from the pump is directed through an outlet hose to the hi-lo shift lever lock and hydraulic decelerator valve. When the selector valve is moved to any other position, main oil pressure is directed to the clutch shaft to engage the clutch desired. (Refer to "Forward and Reverse Hydraulic Clutch Operation" in this paragraph.)

When oil pump pressure at the main regulating valve exceeds 230 psi, the main regulating valve opens and allows the oil to enter the torque converter. Oil pressure in the torque converter is maintained between 50 to 80 psi by the by-pass valve in the main regulator housing. The oil on the output side of the torque converter is directed through the air cooled oil coolers and to the lubricating oil pressure valve in the main regulating valve housing. This oil cooler outlet oil along with any excess pressure oil from the converter by-pass valve is returned to the suction side of the oil pump through the lubricating oil valve or is directed to the selector valve for clutch lubrication if the pressure at the valve is under 25 psi.

NOTE: For the flow of the oil inside of the torque converter, refer to Section 5, "HYDRAULIC TORQUE CONVERTER."

**Hydraulic Oil Flow (Illust. 5)
(Hydraulically Controlled Transmission)**

The rear main frame is the source of supply for the oil that enters the transmission, torque converter, steering boosters and pivot brakes. The oil is drawn through an oil intake pipe located at the bottom of the rear main frame and through the suction filter by the suction developed by the pump located in the right hand side of the torque converter. The oil leaves the pump at approximately 200-230 psi, passes through the pressure filter, and enters the transmission case. From here, oil under 200-230 psi is directed through drilled passages in the transmission case and the hydraulic valve spacer (mounted on the transmission case) to the main regulating valve assembly and the range selector valve assembly. Hydraulic lines from the pressure filter base also direct the 200-230 psi pressure oil to the transmission clutch pressure gauge and to the steering boosters. (Refer to Section 7, "STEERING SYSTEM," for operation of the steering boosters.)

MAIN REGULATING VALVE ASSEMBLY: When oil pressure at the main spool valve exceeds 230 psi, the valve opens and allows the oil to enter the torque converter. Oil pressure in the torque converter is maintained between 50 to 80 psi by the by-pass valve in the main regulating valve housing. The oil on the output side of the torque converter is directed through the oil cooler (mounted on the front of the radiator) and to the lubricating oil pressure valve in the main regulating valve housing. This oil cooler outlet oil along with any excess pressure oil from the converter by-pass valve is directed through drilled passages to the range selector valve assembly. The lubricating oil pressure valve maintains the pressure of this oil between 10 to 25 psi. When the pressure exceeds 25 psi, the lubricating oil pressure valve opens and the excess oil is returned to the suction side of the converter input pump through a hose. Hydraulic lines connected to the top of the main regulating valve housing directs the lubricating pressure oil to the oil pressure gauge and to the rear main frame for cooling the pivot brakes.

NOTE: For the flow of oil inside of the torque converter, refer to Section 5, "HYDRAULIC TORQUE CONVERTER."

RANGE SELECTOR VALVE ASSEMBLY: This assembly consists of a lock-out spool and two range spools which are hydraulically controlled. The lock-out spool is not utilized in this particular system and its ports in the valve housing are plugged. The lock-out spools only function in this system is to separate the lubricating pressure oil and the main pressure oil passages within the selector valve housing. Spool position within the housing is maintained by the centering spring at each end of the spool.

In "neutral," the range spools are centered in the housing by the springs and the equal oil

(Continued on page 8)

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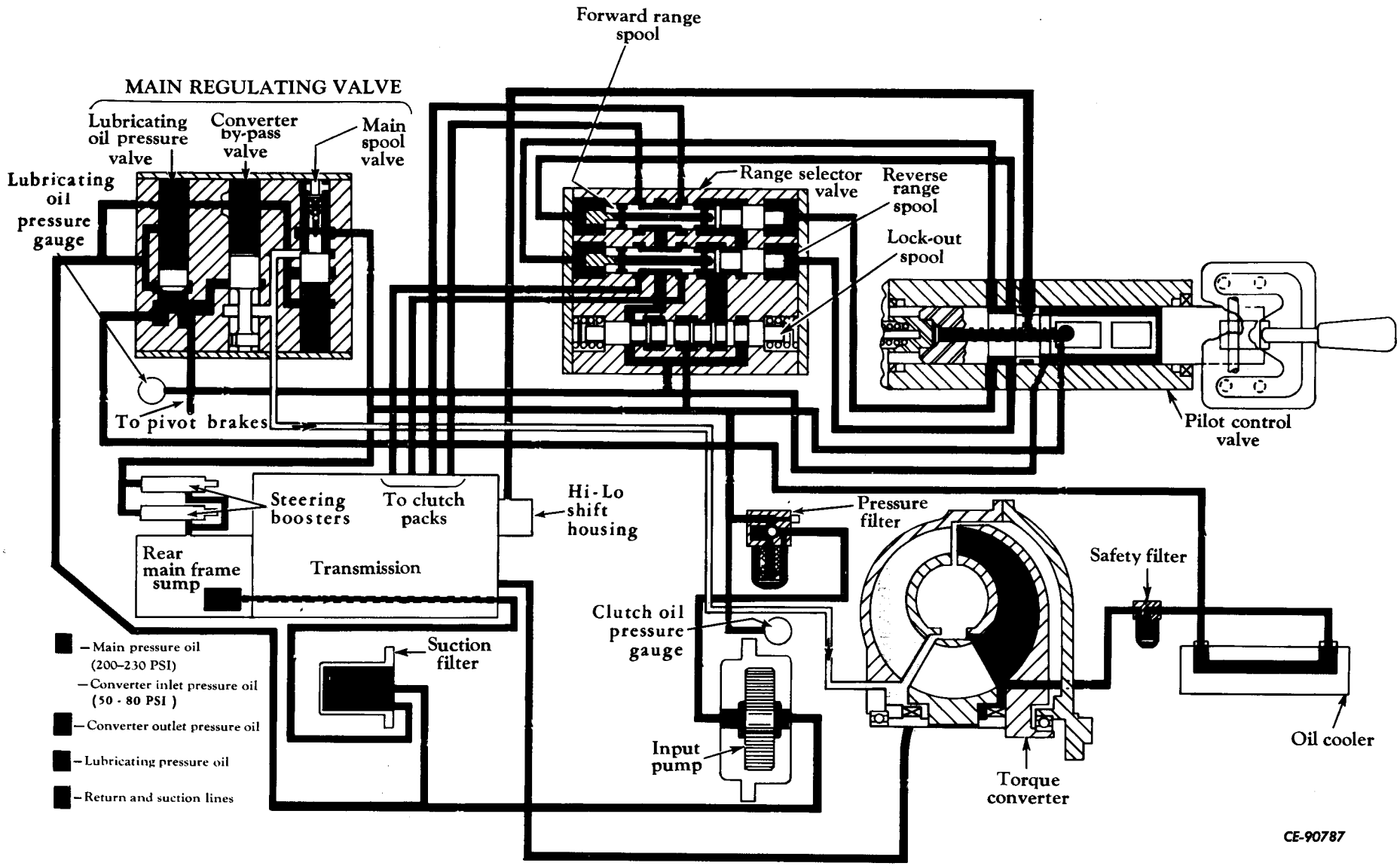

Illust. 5
Hydraulic Oil Flow with Transmission in Neutral
(Hydraulically Controlled Transmission).

1. DESCRIPTION - Continued

Hydraulic Oil Flow (Illust. 5) (Hydraulically Controlled Transmission) - Continued

pressure being exerted on each end of the spools. Under this condition, the oil from the lubricating oil pressure valve enters the openings not covered by the spool lands and, through internal passages, is directed to the transmission clutch shafts to provide lubrication for cooling the clutch plates. Under all conditions this lubricating pressure oil within the selector valve housing is also directed by a hose to the pilot control valve located inside the gear shifter tower. In "neutral," the main pressure oil within the range selector valve housing (oil supplied by the pressure filter outlet) is kept from engaging the transmission clutch packs by the range spools. Under all conditions, main pressure oil within the selector valve housing is directed by a hose to the pilot control valve.

PILOT CONTROL VALVE ASSEMBLY: This valve is manually operated by the gear selector hand lever. Main pressure oil from the range selector valve assembly enters the center of the pilot control valve spool and exists through a cross drilled hole into the port of the valve housing to which it is aligned. Lubricating pressure oil from the range selector valve flows between the valve spool and the housing entering all ports not covered by the spool lands. This oil then exists through tubing and hoses to the ends of the range spools in the range selector valve assembly. In "neutral" the main pressure oil is directed through an outlet hose to the lock in the hi-lo shift housing to allow movement of the shift lever. When the gear selector hand lever is placed in a speed range, the pilot control valve spool is positioned to allow the main pressure oil to act upon the end of the range spool in the speed range selected. This pressure, being higher than the lubricating oil pressure at the opposite end of the spool, upsets the pressure balance and moves the spool. The main pressure oil within the range selector valve housing is then directed to the clutch shaft to engage the selected clutch pack (refer to "Forward and Reverse Hydraulic Clutch Operation" in this paragraph for the flow of oil after it enters the clutch shaft.)

2. SPECIFICATIONS

Transmission

Type	Power shift
Number of forward speeds	2*
Number of reverse speeds	2*

*Actually four speeds when used in conjunction with the hi-lo shifting mechanism.

Forward and Reverse Clutch Packs

Number of internal splined clutch plates (sintered bronze)	18
Number of external splined clutch plates (steel)	16
Minimum allowable thickness for internally splined bronze clutch plates, inch	.088
Reverse clutch shaft end play, inch	.030 - .040
First speed drive gear thrust washer minimum allowable thickness, inch	.388
Second speed drive gear thrust washer minimum allowable thickness, inch	.054
First and second speed drive gear bushing inside diameters (assembled in gear), inches (if equipped)	2.254 - 2.257
First and second speed drive gear bushing maximum allowable running clearance, inch (if equipped)	.009
Gear and drum assembly end play:	
New clutch pack assembly (inch)	.010 - .030
Used clutch pack assembly (inch)	.010 - .040

Hi-Lo Fork and Driving Gear

Width of slot in driving gear, inch	.380 - .390
Width of shifter fork fingers, inch	.365 - .375

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Springs

	Free Length Inches	Test Length Inches	Test Load Pounds	Number of Coils
Main regulating valve:				
Main spool valve spring (internal)	59/64	21/32	3-1/2 - 4-1/2	12
By-pass valve spring. Approx.	3-21/32	2-15/64	74-1/2 to 82-1/2	10-3/4
Main regulating spring (outer)	3-21/64	2-5/32	121 - 134	10
Main pressure regulating spring (inner)	3	2-5/32	43	13-1/2
Lube valve spring	4-1/8	2-13/64	13-1/2 - 15-1/2	15
Pilot control valve indexing springs	31/32	21/32	18-3/4	10
Range selector valve centering springs (hydraulically operated valve)	1-11/64	1	20	6
Range Selector Valve (mechanically operated):				
Detent spring	1-3/8	57/64	15 - 17	10
Wiper spring	15/16	11/16	3 - 4	5
Hi-lo shifter lever poppet spring	2	1-11/32	67	12-1/2
Poppet lock spring	1-15/16	1-1/2	31	12
Clutch pack release spring				
Inner	.299	.180	2	7
Outer	.250	.180	12	4

Special Nut and Bolt Torque Data (Foot-Pounds)
(Torques given are for bolts and nuts lubricated with SAE-30 engine oil).

Spline shaft nut	500 to 550
Bevel pinion shaft front nut	500 to 550
Bevel pinion shaft rear nut	500 to 550
Bevel pinion shaft front bearing retainer	300 to 350
Transmission pressure filter hold-down bolt: (Hex head type)	55 max.
(Cross bar type)	10 - 15
Safety filter mounting bolts	23 - 26
Suction filter mounting bolts:	
3/8 inch	23 - 26
1/2 inch	56 - 63
Range selector valve range spool plugs	5 - 7
Pilot control valve detent housing cap screws	19 - 21
Pilot control valve spool extension	5 - 7

NOTE: Except for the special torques shown, all bolts and nuts are to be given a standard torque. Refer to the "STANDARD TORQUE DATA CHART" in Section 1, "GENERAL."

3. CHECKING MECHANICAL PROBLEMS

PROBABLE CAUSE	REMEDY
Main Oil Pressure Gauge Shows Low or High Pressures	
1. Pressure gauge malfunction	Replace gauge.
2. Plugged suction or pressure filter	Clean suction filter. Replace pressure filter element.
3. Air leakage at suction filter	Tighten fittings or replace "O" rings.
4. Air entry into suction line	Replace Marmon clamp gasket (if equipped). Replace "O" rings in system.

(Continued on next page)

3. CHECKING MECHANICAL PROBLEMS - Continued

PROBABLE CAUSE	REMEDY
Main Oil Pressure Gauge Shows Low or High Pressures - Continued	
5. Main regulating valve springs malfunctioning	Remove and replace with new.
6. Wrong number of washers at main regulating valve spring locating	Refer to Par. 10 in this section.
7. Binding of lube valve, by-pass valve or main pressure valve in regulator housing	Check valves. Install new valve body gasket.
8. Charging pump malfunctioning	Replace pump.
Low Oil Pressure When in Forward or Reverse Speed	
1. Contaminated or restricted oil lines	Clean or replace oil lines.
2. Shims or "O" ring leaking at reverse clutch shaft manifold	Replace with new shims or "O" rings.
3. Tachometer drive plug "O" ring leaking	Replace "O" ring.
4. "O" ring at clutch shaft end cover leaking	Replace "O" ring.
5. Oil leakage past cover and case gasket at reverse manifold	Replace gasket.
6. Hook type seal rings on shaft leaking	Replace seal rings.
7. Clutch piston seal ring leaking	Replace seal ring.
Slow or Erratic Clutch Engagement	
1. Low oil level	Add oil to proper level.
2. Clogged filters	Remove and clean suction and safety filters. Replace pressure filter element.
3. Faulty hydraulic oil pump	Replace worn parts or replace pump.
4. Internal oil leaks	Check for damaged or worn sealing rings in clutch packs.
5. External oil leaks	Check all gaskets, lines and connections.
6. Low main oil pressure	Clean main regulator valve and bore; check spring tension.
7. Selector hand lever improperly adjusted (mechanically controlled transmission)	Adjust as described in Par. 9.
8. Contaminated or restricted oil lines	Clean or replace oil lines.
9. Binding of main pressure valve in regulator housing	Check valve. Install new valve body gasket.
10. Range selector valve wiper seal ring leaking (mechanically controlled transmission)	Replace seal ring.
Noise in Transmission	
1. Bearings worn or broken. Worn drive gear and drum bushings or roller bearings	Install new.
2. Foreign material in oil	Drain, flush and refill with clean oil. Clean suction and safety filters. Replace pressure filter element.
3. Gears badly worn	Install new gears.
4. Bevel gear and pinion not in proper mesh	Adjust to proper clearance.
High Oil Temperature	
1. Clogged oil cooler	Remove and clean.
2. Improper tractor operation	Operate in correct range.
3. Improper torque converter operation	Refer to "CHECKING MECHANICAL PROBLEMS" in Section 5.
4. Low or high oil level	Add or drain to proper level.

PROBABLE CAUSE	REMEDY
5. Oil leakage	Check all gaskets, lines and connections and replace parts as necessary.
6. Faulty thermo by-pass valve (if equipped)	Discard valve assembly. Refer to instructions in Par. 6, "INSPECTION AND REPAIR."
7. Faulty hydraulic oil pump	Replace worn parts or replace pump.
8. Temperature gauge malfunction	Replace gauge or sending unit.
9. Air entry into suction line	Replace Marmon clamp gasket (if equipped). Replace "O" rings in system.

4. REMOVAL

NOTE: It is suggested that Par. 3, "CHECKING MECHANICAL PROBLEMS" be reviewed and the pressure checks in Par. 10, "CHECKING TRANSMISSION OIL PRESSURE" be taken before removing the transmission. In this manner, hydraulic malfunctions can be pinpointed and corrected at time of teardown.

◆ CAUTION: BE SURE THE BUCKET OR BLADE HAS BEEN LOWERED TO THE GROUND.

NOTE: When disconnecting hydraulic lines for any reason, they should be properly capped with the correct size plastic cap. If these caps are not available, tape or clean rubber corks may be used. Hydraulic openings must never be plugged with rags. This practice could easily introduce dirt or lint into critical hydraulic components of the machine. Tag all disconnected oil lines to facilitate easier installation.

1. Drain the rear main frame. Drain the equipment hydraulic system.

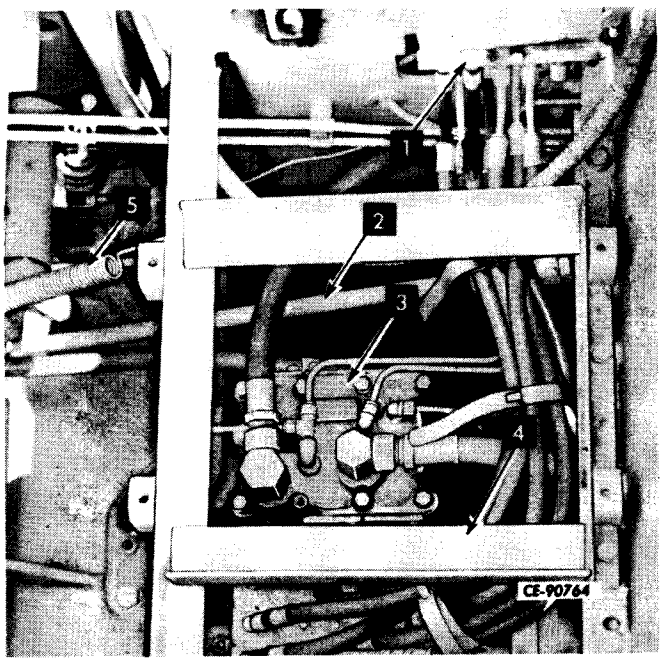
2. Remove the seat bottom cushion. Remove the mounting hardware and lift off the seat frame.

3. Disconnect the battery cables and remove the batteries and battery support (4, Illust. 6).

4. Remove the side cover enclosing the equipment control valve on the RH fender. Reach in through the cover opening to remove the nuts and lock washers securing the two operating lever guides to the seat side sheet. Remove the guides and the two flat washers that are between the seat side sheet and operating lever. Disengage the operating lever from the brake pedal pawl and the opening in the seat front support and lift out the operating lever.

5. Remove the cap screws, lock washers, flat washers and nuts securing the seat front support to the seat support bar and seat side sheets and remove the seat front support.

(Continued on next page)



Illust. 6
Transmission Disconnect Points (Hydraulically Controlled Transmission Shown).

1. Control tower hydraulic manifold.
2. Steering brake pull rod.
3. Main regulating valve assembly.
4. Battery support.
5. Steering booster return spring.

4. REMOVAL - Continued

6. Disconnect the decelerator pedal pick-up lever rod (10, Illust. 7) at the pedal by removing the cotter and end pin. Remove the platforms.

7. UNITS WITH DECELERATOR CYLINDER: Disconnect the decelerator cylinder hydraulic lines (5, Illust. 7) at both ends and remove. Disconnect the governor control linkage necessary to facilitate removal of the platform support (2). Remove the cap screw and washer securing the decelerator cylinder (6) at the rear to the seat support bar. Remove the cap screws and washers securing the platform support to the front frame and remove the support with decelerator cylinder, and control linkage attached.

UNITS WITHOUT DECELERATOR CYLINDER: Disconnect any linkage necessary to facilitate removal of the platform support (2, Illust. 8). Remove the cap screws and washers securing the platform support to the front frame and remove the support with linkage attached.

8. VERTICAL PRESSURE FILTER: Unthread the pressure filter hold-down bolt securing the filter case (8, Illust. 7 or 8) to the base and remove the case with bolt. Lift the spring and element from the base.

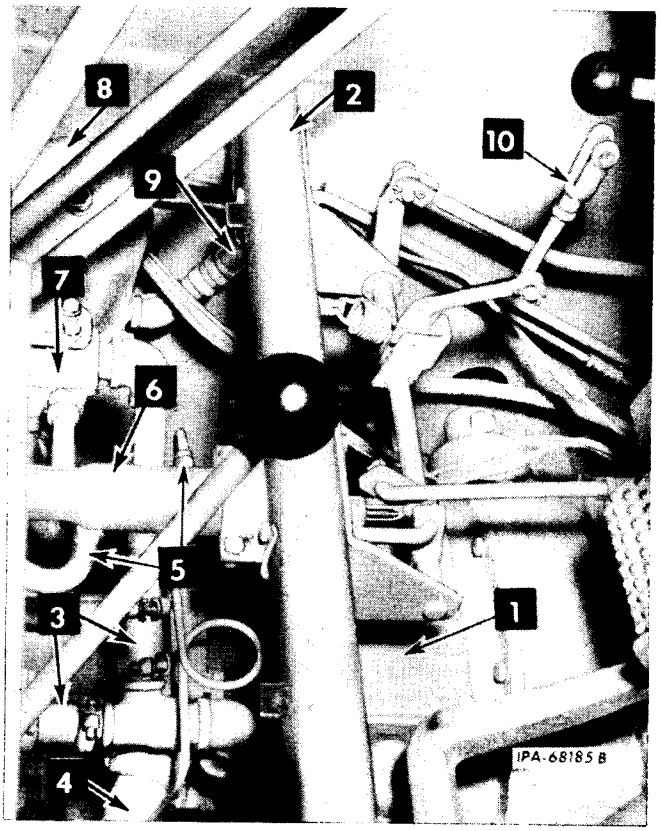
HORIZONTAL PRESSURE FILTER: Disconnect the hydraulic lines at the filter base. Remove the pressure filter assembly.

9. Disconnect and remove the steering booster return springs (5, Illust. 6). Disconnect the steering booster valve operating rods and the steering brake pull rods (2) at the steering levers.

10. Disconnect the hoses at the suction filter (7, Illust. 7 or 8). On earlier units, tubing was used instead of hoses. On these units, the flexible couplings (3, Illust. 7) at the suction filter inlet and at the suction tee must be disconnected.

11. Remove the cap screws and lock washers securing the seat support bar to the front frame and remove the support bar with suction filter and steering levers.

12. LOADER S ONLY: Disconnect the inlet tube (4, Illust. 7) at the top of the equipment pump. Disconnect the rear of the inlet tube at the hose connection and remove the inlet tube.

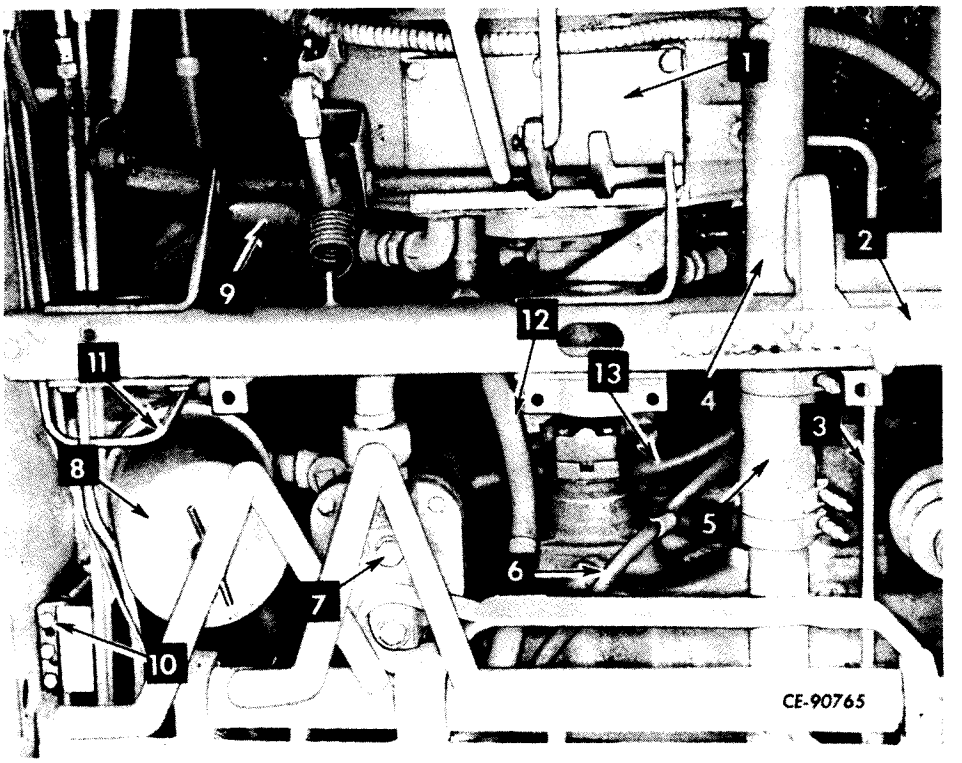


Illust. 7
Transmission and Torque Converter Hydraulic Piping for Earlier Units (Loaders Shown, TD-20 SERIES B Similar).

1. Inspection cover.
2. Platform support.
3. Flexible coupling.
4. Equipment pump inlet tube.
5. Decelerator cylinder lines.
6. Decelerator cylinder.
7. Suction filter.
8. Filter case.
9. Filter inlet hose.
10. Pick-up lever rod.

TD-20 SERIES B ONLY: Disconnect the equipment pump inlet and outlet lines at the pump. Disconnect the inlet tube (4, Illust. 8) at the connecting hose (5) and remove the inlet tube.

13. VERTICAL PRESSURE FILTER: Disconnect the pressure filter inlet hose (9, Illust. 7 or 8) at the filter base. Disconnect



Illust. 8
Transmission and Torque Converter Hydraulic Piping for Later Units
(TD-20 SERIES B Shown, Loaders Similar).

1. Inspection cover.
2. Platform support.
3. Converter vent tube.
4. Equipment pump inlet tube.
5. Connecting hose.
6. Hi-lo shifter housing inlet hose.
7. Suction filter.
8. Filter case.
9. Filter inlet hose.
10. Test connection header block.
11. Clutch pressure gauge tube.
12. Converter inlet hose.
13. Transmission case-to-pump inlet tee hose.

the clutch pressure gauge tube (11, Illust. 8) at the pressure filter base (at the main regulating valve on earlier units). Disconnect the other end of the tube and remove the tube. Remove the cap screws and washers securing the filter base to the front frame and allow the base to lay in the front frame.

14. If equipped with a test connection header block (10, Illust. 8), disconnect the three test connection tubes at the main regulating valve (3, Illust. 6).

15. Remove the rear cover from the underside of the front frame.

16. LOADER S ONLY: Disconnect the outlet line from the bottom of the equipment pump. Insert an eyebolt into one of the inlet tube mounting holes in the top of the pump and attach a hoist. Remove the pump mounting bolts and free the pump from the converter housing. Lower the pump until it rests in the front frame, and transfer the hoist sling to one of the pump mounting holes. Remove the eyebolt from the pump. Raise the pump out the top of the unit.

17. Remove the cap screws securing the universal joint to the converter output flange and the transmission drive yoke. Remove the universal joint. Slide the transmission drive yoke off the forward clutch shaft.

NOTE: Before removing the cap screws securing the universal joint, wire or tape the bearing caps to prevent them from falling off the spider trunnions.

18. Disconnect all the necessary hoses and tubing between the converter housing and the transmission and oil cooler to facilitate converter removal.

(Continued on next page)

4. REMOVAL - Continued

19. Remove the two center cap screws and washers securing the input pump inspection cover (1, Illust. 7 or 8) to the top of the converter housing and insert eyebolts for attaching a hoist. Place a slight tension on the hoist sling. Remove the cap screws and washers securing the converter housing to the flywheel housing. Move the converter back so the converter drive housing clears the flywheel housing and hoist the converter out of the unit. Cover the opening at the flywheel housing to prevent dirt and dust from entering.

20. MECHANICALLY CONTROLLED TRANSMISSION: Disconnect the transmission gear selector lower links from the lever on the range selector valve. Move the links out of the way.

HYDRAULICALLY CONTROLLED TRANSMISSION: Remove the cap screws and lock washers securing the hydraulic manifold (1, Illust. 6) to the control tower housing and allow the manifold with hoses attached to lay on the transmission. Discard the manifold mounting "O" rings.

21. Bend the torque converter vent tube (3, Illust. 8) out of the way (if equipped).

22. LOADERS ONLY: Disconnect the equipment pump outlet rear tube at the control valve. Remove the mounting hardware securing the tube bracket on the transmission case and remove the tube.

23. Disconnect all the hoses and the tubing necessary at the main regulating valve (3, Illust. 6) and the transmission case to facilitate transmission removal.

24. Remove the cover from the rear of the unit directly below the diesel fuel and hydraulic oil tanks. Disconnect the operating rod from each of the steering boosters and remove the rods. Disconnect the steering brake pull rods at each of the bellcranks and remove the pull rods (2, Illust. 6).

25. Push the brake pedal forward and lock with the locking pawl.

26. Remove one of the upper transmission cover-to-transmission case bolts and one of the bolts securing the main regulating valve to the top of the transmission case and attach a hoist. Remove the cap screws securing the transmission to the rear main frame and remove the transmission from the tractor. Transmissions on earlier units are secured to the rear main frame studs with nuts. On these units it may be necessary to use pry bars to push the transmission free of the studs.

27. Lower the transmission assembly on a bench with the shafts in a horizontal position and block the case on each side. It is also desirable to keep the hoist attached with a slight tension on the chain.

NOTE: Cover the opening in the main frame to prevent dirt and dust from entering.

28. Remove the main regulating valve and range selector valve assemblies from the transmission case. On hydraulically controlled transmissions, disconnect the hose (6, Illust. 8) from the hi-lo shifter housing and remove the range selector valve with manifold (1, Illust. 6) and hoses attached.

5. DISASSEMBLY

Hi-Lo Shift Lever Assembly
(Ref. Nos. Refer to Illust. 9)

1. MECHANICALLY CONTROLLED TRANSMISSION: Disconnect the shifter lock tube (17) from the hi-lo shifter housing (10) and transmission cover (27) and remove the tube.

2. Remove the shift lever ball (1). Remove the upper and lower shift lever boot clamps and remove the boot (3).

3. Remove the rivet securing the spring stop (5) to the shift lever and remove the spring stop, spring (6), spring washer (7) and swivel cap (8) from the shift lever.

4. Remove the swivel shaft (26) securing the shift lever to the shifter housing and pull the lever (9) from the housing.

5. Remove the cap screws and washers securing the shifter housing (10) to the transmission cover and remove the housing and gasket (24).

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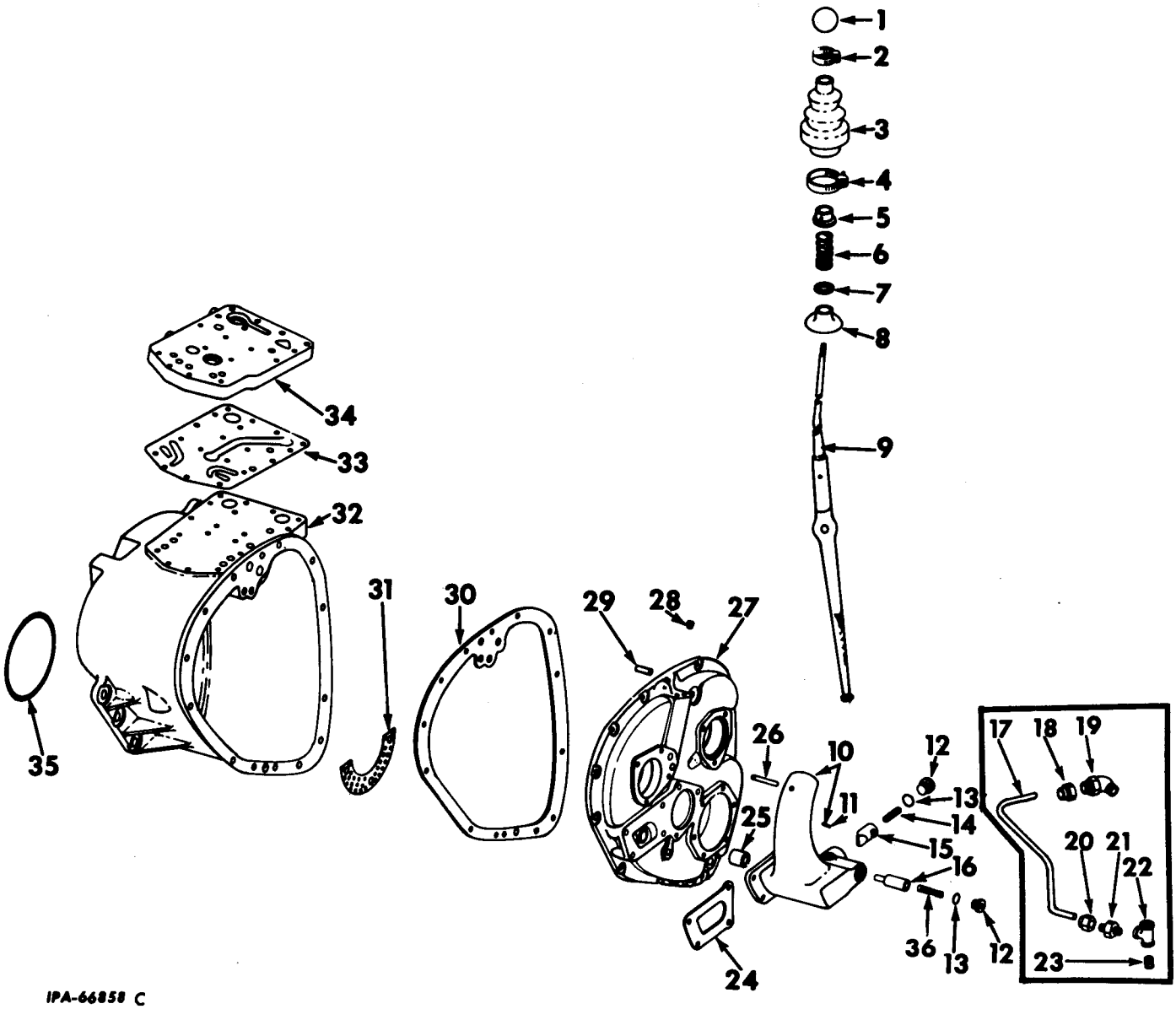


Illust. 9
Exploded View of Transmission Hi-Lo Shifting Lever and Linkage.

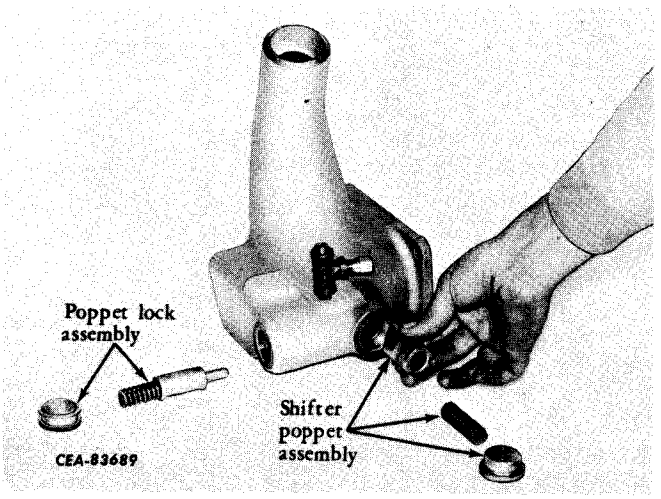
1. Hand lever ball.
2. Clamp.
3. Boot.
4. Clamp.
5. Spring stop.
6. Spring.
7. Washer.
8. Swivel cap.
9. Hi-lo shift lever.
10. Lever housing.
11. Poppet guide pin.
12. Plug.
13. Gasket.
14. Poppet spring.
15. Poppet.
16. Poppet lock.
17. Shifter lock tube.*
18. Nut.*
19. Elbow.*
20. Nut.*
21. Connector.*
22. Tee.*
23. Nipple.*
24. Gasket.
25. Bushing.
26. Swivel shaft.
27. Transmission cover.
28. Plug.
29. Dowel pin.
30. Gasket.
31. Oil screen.
32. Transmission case.
33. Gasket.
34. Hydraulic valve spacer.
35. Transmission case "O" ring.
36. Poppet lock spring.

* Used with mechanically controlled transmission only.

5. DISASSEMBLY - Continued

Hi-Lo Shift Lever Assembly - Continued
(Ref. Nos. Refer to Illust. 9)

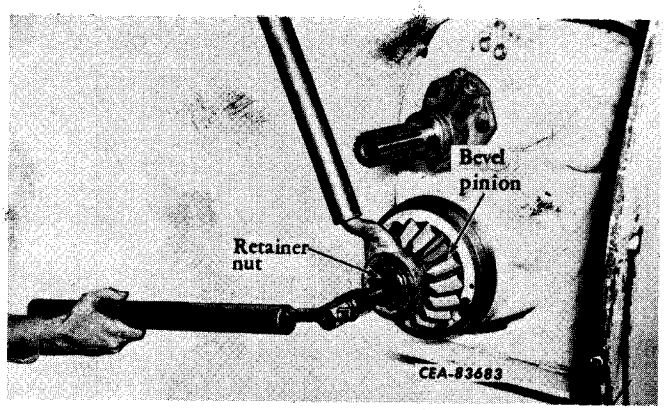
6. If desired, the shifter poppet (15), poppet lock (16) and springs (14 and 36) can be removed for inspection by removing the two pipe plugs (12) with gaskets (13) from the shifter housing (Illust. 10).



Illust. 10
Disassembling the Shift Lever Housing.

Transmission Case and Cover

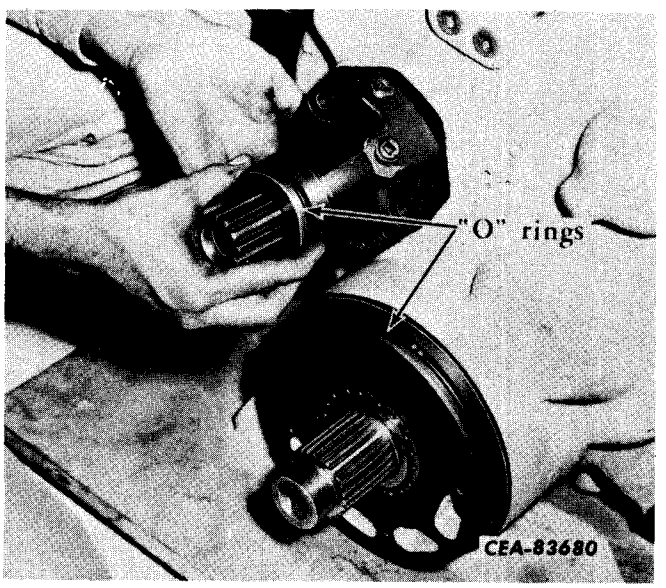
7. Insert a 3/4 inch drive in the end of the pinion shaft and remove the pinion shaft rear nut with a box-end wrench. With the aid of a puller, remove the bevel pinion from the shaft splines (Illust. 11).



Illust. 11
Removing the Bevel Pinion Rear Nut.

8. Remove the three cap screws and washers securing the forward clutch shaft hydraulic manifold to the rear of the transmission case. Remove the manifold with "O" rings and sealing rings. Remove the "O" ring from the rear of the transmission case (Illust. 12).

NOTE: The four hook type seal rings should be left in the clutch shaft to protect the ring grooves in the shaft during further disassembly.



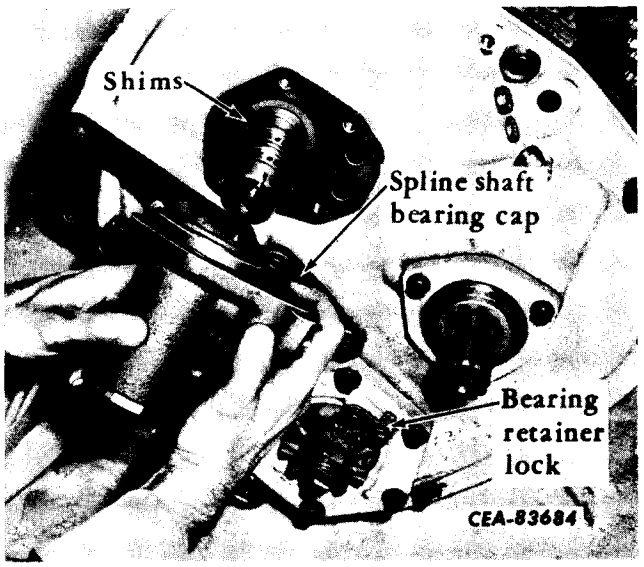
Illust. 12
Removing the Forward Clutch Shaft Hydraulic Manifold.

9. Remove the cap screws and washers securing the reverse clutch shaft manifold to the transmission cover and remove the manifold. Remove the shims and keep them with the hydraulic manifold. The shims are used to obtain the clutch shaft end play (Illust. 13).

NOTE: Earlier transmissions have shims installed between the hydraulic manifold and front cover. Later transmissions have shims between the hydraulic manifold flange and front bearing cup as shown in Illust. 13. Also on the later transmissions "O" rings (49) and a sealing ring (48) are used with the manifold to seal off the oil passages (Illust. 29).

10. Remove the cap screws and washers securing the spline shaft bearing cap (Illust. 13) to the front cover and remove the cap with sealing ring.

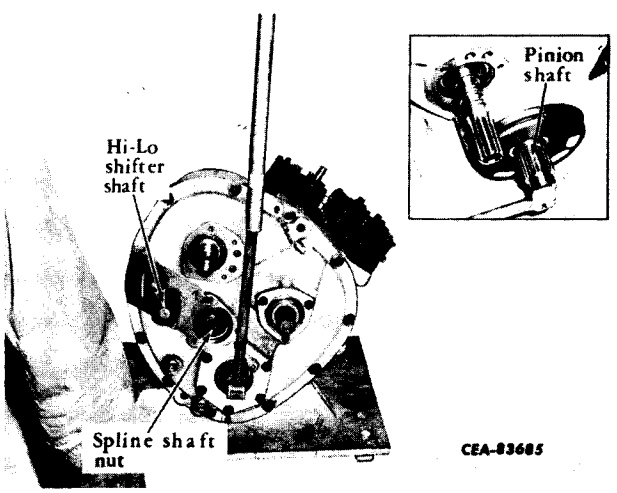
11. Remove the cap screws and washers securing the lock to the pinion shaft bearing cage and the bearing retainer. Remove the lock (Illust. 13).



Illust. 13
Removing the Reverse Clutch Shaft Hydraulic Manifold.

12. Remove the bearing retainer using a 1-1/2 inch socket and a breaker bar. Remove the "O" ring from the bearing retainer.

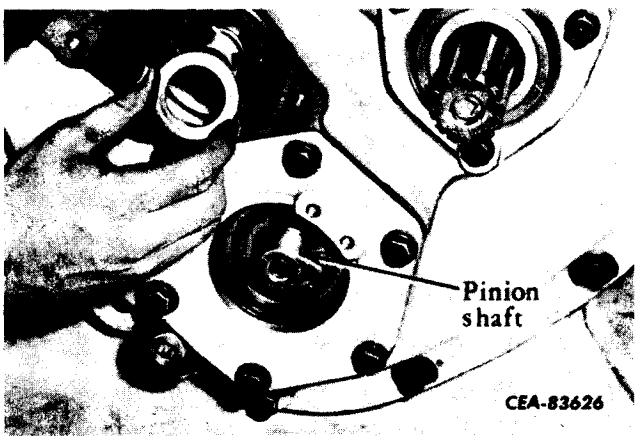
13. Place a 3/4 inch square drive breaker bar in the rear of the pinion shaft. Place an extension over the breaker bar handle to hold the pinion shaft from turning while removing the pinion shaft front nut. Remove the front nut using a socket, breaker bar and extension (Illust. 14).



Illust. 14
Removing the Pinion Shaft Front Nut.

To remove the spline shaft nut (Illust. 14), hold the bevel pinion shaft as described previously. Place the high and low gear in mesh with the low range driven gear on the bevel pinion shaft by pushing the hi-lo shifter shaft in against the transmission front cover. This will keep the spline shaft from turning as the nut is loosened with a socket, breaker bar and extension.

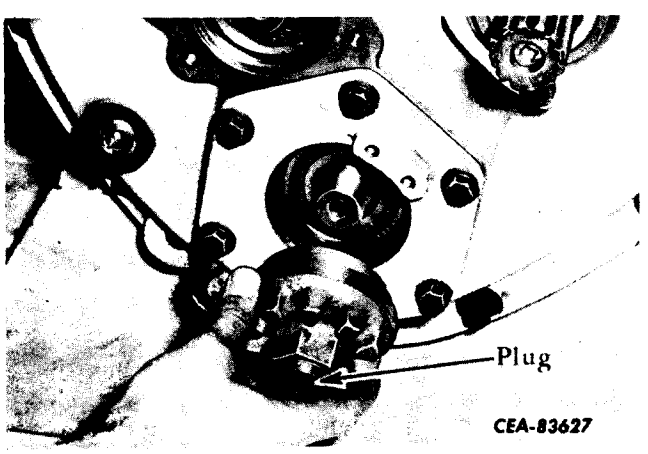
14. Remove the spline shaft front bearing plate. This plate is part of the bearing and is not serviced separately (Illust. 15).



Illust. 15
Removing the Spline Shaft Front Bearing Plate.

15. Reinstall the bearing retainer. It will be used later in disassembly to facilitate pinion shaft removal. Remove the plug with gasket from the retainer (Illust. 16).

(Continued on next page)



Illust. 16
Installing the Pinion Shaft Front Bearing Retainer.

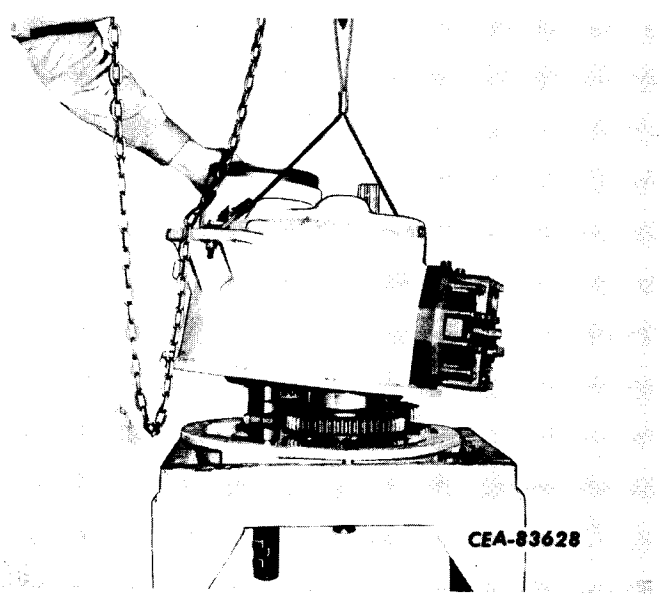
5. DISASSEMBLY - Continued

Transmission Case and Cover - Continued

16. Place the transmission in a TD-24 crawler tractor transmission stand or up on blocks with the transmission cover down and none of the shafts touching the floor.

17. Remove the cap screws, washers and nuts securing the transmission case to the transmission cover and remove the case (Illust 17). Remove the cover gasket. The rear bearing outer races on the four transmission shafts will remain in the case and can easily be removed if necessary. To remove the bevel pinion shaft rear bearing outer race from the case, it will first be necessary to remove the retaining snap ring.

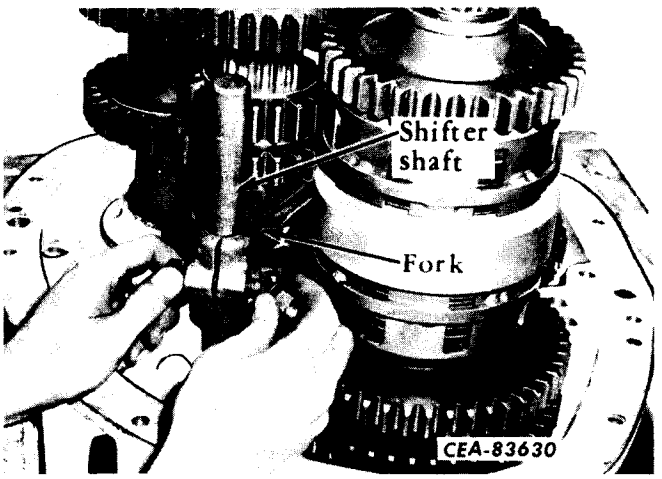
NOTE: If the transmission case and cover will not separate easily, insert two puller screws in the holes provided in the cover until the case is free of the cover dowels.



Illust. 17
Removing the Transmission Case.

18. Remove the cap screw washer and nut securing the shifter shaft to the fork. Tap the shifter shaft out of the fork using a brass hammer. Remove the fork from the hi-lo drive gear collar (Illust. 18).

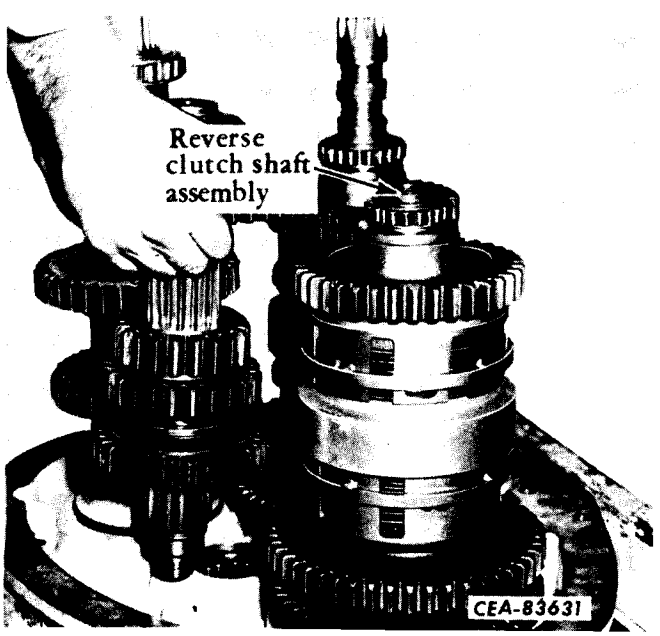
19. Lift the spline shaft from the front cover. Lift the reverse clutch shaft from the front cover. The front bearing outer races of these shafts will remain in the front cover (Illust. 19).



Illust. 18
Removing the Shifter Fork Lock Screw.

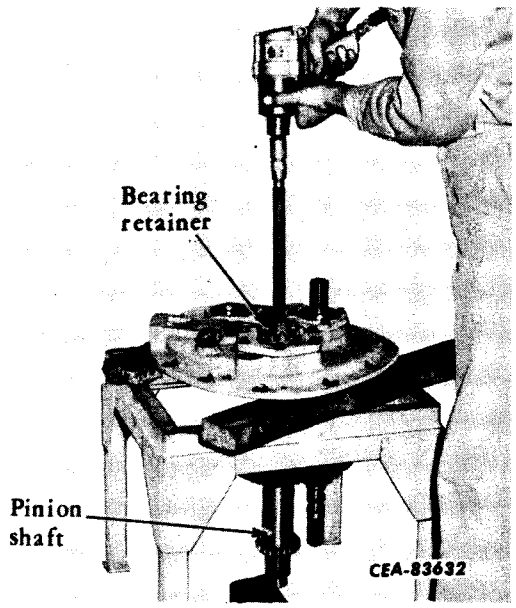
◆ CAUTION: BE CAREFUL WHEN PERFORMING THE FOLLOWING STEP AS THE PINION SHAFT AND FORWARD CLUTCH SHAFT ARE ONLY HELD IN THE COVER BY THE PRESS FIT OF THEIR FRONT BEARINGS. IT MAY BE POSSIBLE FOR EITHER SHAFT TO FALL FREE OF ITS BEARING WHEN THE COVER IS TURNED OVER.

20. Place the front cover with the two remaining shafts in the stand or on blocks with the shafts extending down. Screw a standard



Illust. 19
Removing the Spline Shaft.

puller screw into the front bearing retainer until it bottoms on the pinion shaft. Use a socket and air wrench to push the shaft out of the front bearing assembly. Remove the bearing retainer (Illust. 20).



Illust. 20
Removing the Bevel Pinion Shaft.

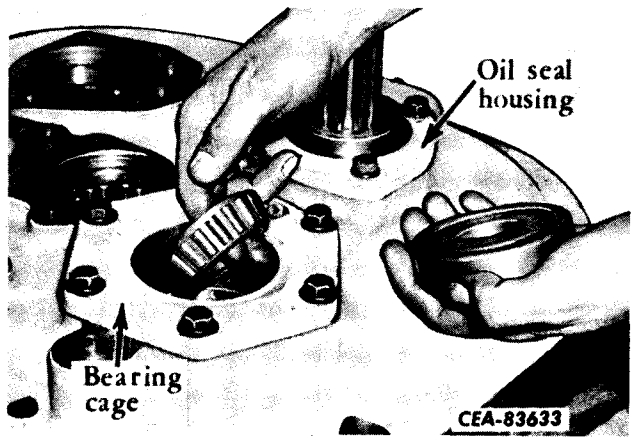
21. Remove the pinion shaft front bearing assembly from the bearing cage. The bearing assembly consists of two taper roller bearings and a spacer (Illust. 21).

22. Remove the cap screws and lock washers securing the bearing cage (Illust. 21) to the front cover. The bearing cage is held in the front cover by the pressure of the "O" ring on its outside diameter and can be tipped out from the underside of the cover using a wooded block and hammer. Keep the shims that fit between the bearing cage and cover with the bearing cage to facilitate proper reassembly of the pinion shaft.

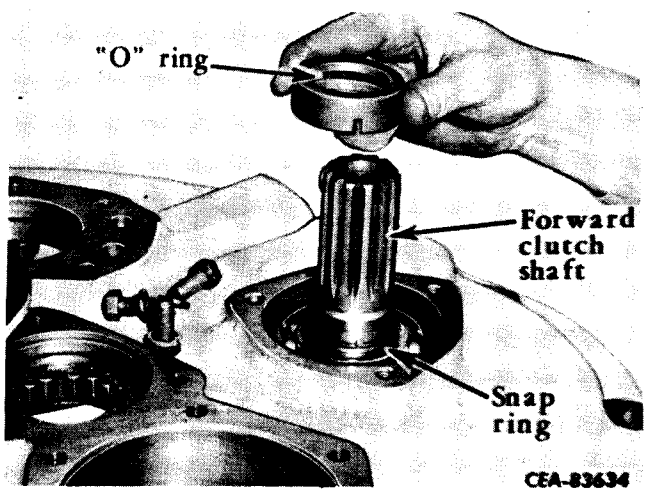
23. METAL FACE TYPE OIL SEAL: Remove the cap screws and washers securing the oil seal housing (Illust. 21) to the front cover and remove the housing with sealing ring and oil seal stator from the forward clutch shaft. Remove the oil seal rotor from the shaft. Remove the snap ring from the shaft (Illust. 22).

NOTE: Do not remove the seal stator from the housing. Inspect the seal stator and housing for serviceability. If serviceable, wrap until ready for assembly. If either part is not serviceable, a lip type conversion oil seal must be installed as described in Par. 7, "REASSEMBLY" under "Transmission Case and Cover."

LIP TYPE OIL SEAL: Remove the cap screws and washers securing the oil seal housing (170017A) to the front cover and remove the housing with "O" ring (16) and oil seal (150015A). Remove the snap ring (11) from the shaft. The wear sleeve (14A) used with the conversion oil seal must be cut from the shaft when replacement is necessary (Illust. 30).



Illust. 21
Removing the Pinion Shaft Front Bearing Assembly.



Illust. 22
Removing the Forward Clutch Shaft Oil Seal Rotor (Shafts with Metal Face Type Oil Seal).

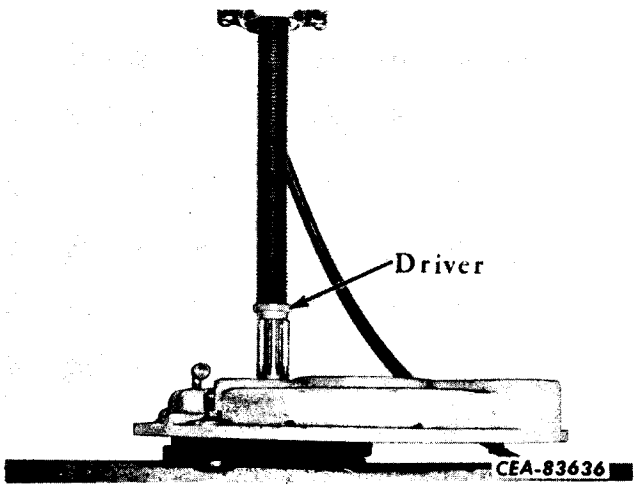
24. Support the shaft and cover assembly in a press on the reverse drive gear and press the shaft from the ball bearing. The gear will be partially pressed off as the shaft is freed from

(Continued on next page)

5. DISASSEMBLY - Continued

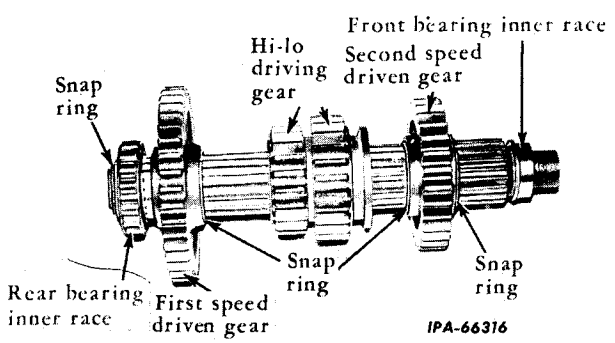
Transmission Case and Cover - Continued

the bearing. Use a driver to protect the shaft (Illust. 23). If bearing replacement is necessary, reverse the cover in the press and press it out of the cover.



Illust. 23
Removing the Forward Clutch Shaft.

Spline Shaft
(Ref. Nos. Refer to Illust. 27)

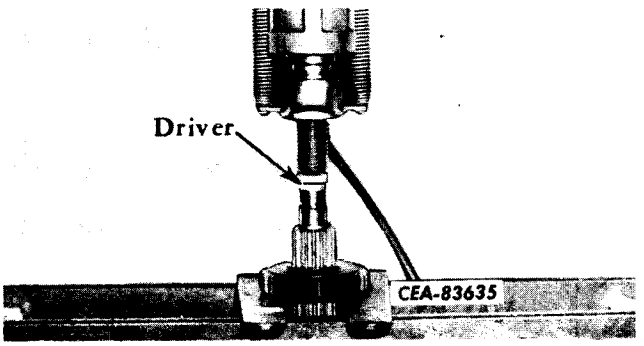


Illust. 24
Spline Shaft Assembly.

25. Install a bearing split collar puller plate behind the front bearing inner race (Illust. 24). Support the shaft assembly in a press on the puller plate and press the shaft from the bearing inner race.

26. Remove the second speed driven gear outer snap ring (9) and the rear bearing snap ring (3) from the shaft.

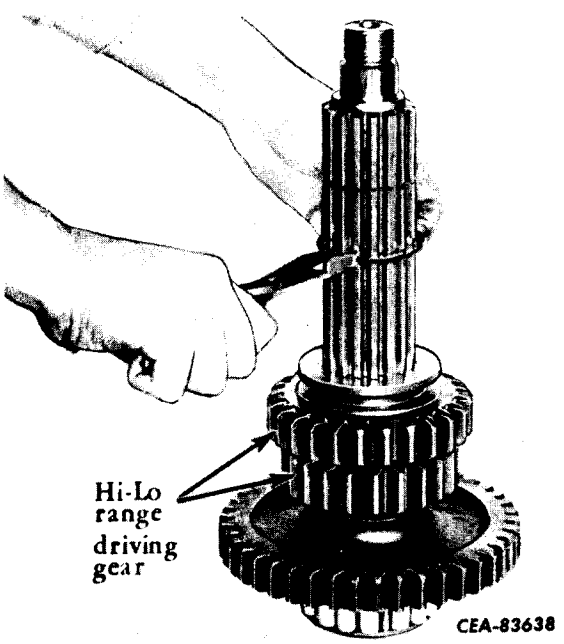
27. Support the shaft in a press under the second speed driven gear (10) and press the shaft from the gear (Illust. 25). Use a driver to protect the shaft.



Illust. 25
Removing the Second Speed Driven Gear.

28. Remove the second speed driven gear inner snap ring (9) and slide the hi-lo range driving gear (8) from the shaft (Illust. 26). Remove the first speed driven gear front snap ring (7), driven gear (6) and rear snap ring (7).

29. Install a bearing split collar puller plate behind the rear bearing inner race. Support the shaft in a press on the puller plate and press the shaft from the bearing inner race.



Illust. 26
Removing the Second Speed Driven Gear Inner Snap Ring.

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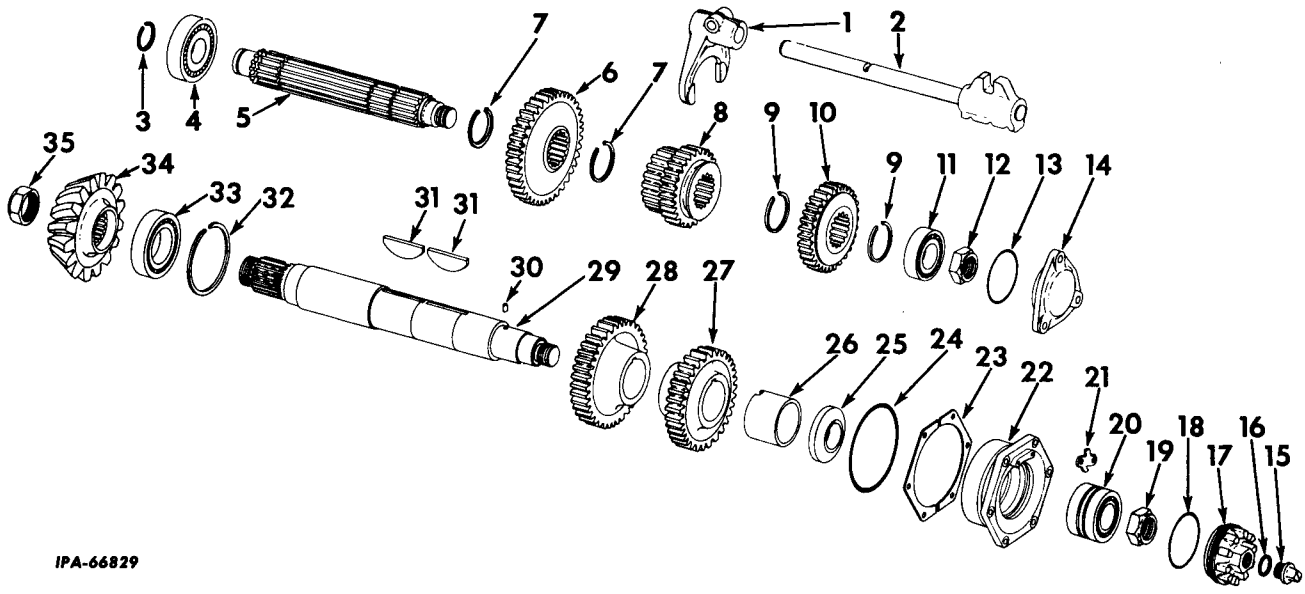


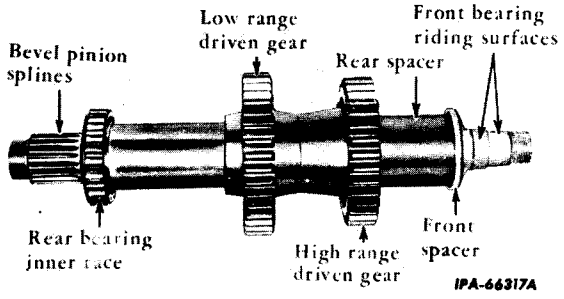
Illust. 27
Exploded View of Spline Shaft and Bevel Pinion Shaft.

1. Hi-lo shifter fork.
2. Hi-lo shifter shaft.
3. Snap ring.
4. Rear bearing.
5. Spline shaft.
6. First speed driven gear.
7. Snap ring.
8. Driving gear.
9. Snap ring.
10. Second speed driven gear.
11. Front bearing.
12. Nut.
13. Sealing ring.
14. Bearing cap.
15. Plug.
16. Gasket.
17. Front bearing retainer.
18. Sealing ring.
19. Nut.
20. Double-row taper roller bearing.
21. Lock.
22. Bearing cage.
23. Shim.
24. Sealing ring.
25. Front spacer.
26. Rear spacer.
27. High range driven gear.
28. Low range driven gear.
29. Pinion shaft.
30. Locating pin.
31. Key.
32. Snap ring.
33. Rear bearing.
34. Pinion.
35. Nut.

Pinion Shaft
(Ref. Nos. Refer to Illust. 27)

NOTE: If difficulty is encountered in removing the high or low range driven gears, use a torch on the gear hubs. Care must be taken that heat is uniform all around the hub and kept away from the gear bores or shaft. Do not heat to more than 400°F.

(Continued on next page)



Illust. 28
Bevel Pinion Shaft Assembly.

5. DISASSEMBLY - Continued

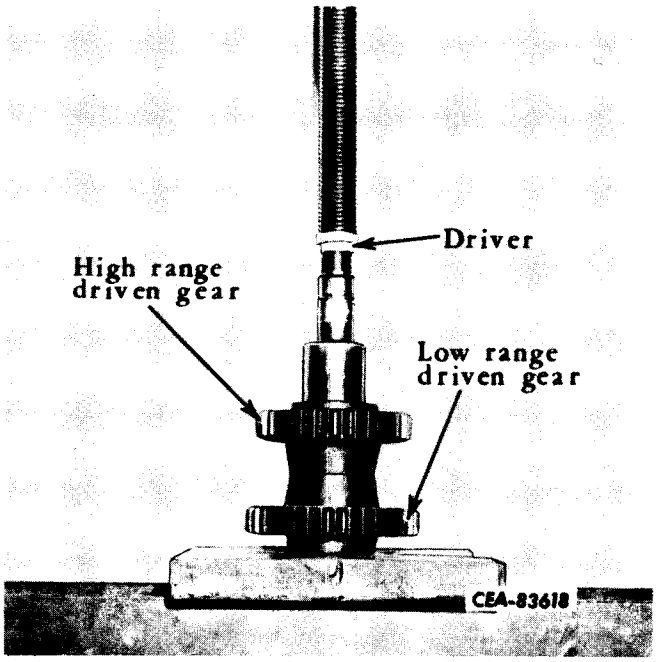
Pinion Shaft - Continued
(Ref. Nos. Refer to Illust. 27)

30. Slide the two spacers (25 and 26) from the shaft. Place the shaft in a press supported by the low range driven gear (28) and press off both gears (27 and 28) in one operation. Remove the woodruff keys (31) (Illust. 29).

31. Install a bearing split collar puller plate behind the rear bearing inner race (Illust. 28). Support the shaft in a press on the puller plate and press the shaft from the bearing race.

Forward and Reverse Clutch Shafts
(Ref. Nos. Refer to Illust. 30 and 31)

NOTE: The following procedure covers the disassembling of either a forward or reverse clutch shaft. Whenever a difference in the disassembly of one clutch shaft from the other is required, both procedures are covered. Illustrations used to show disassembly are of the reverse clutch shaft; the forward clutch shaft would be similar.



Illust. 29
Removing the High and Low Range Driven Gears.

(Continued on page 25)

Legend for Illust. 30.

1. Backing plate.
1A. Snap ring retainer. *
2. Snap ring.
3. Snap ring.
4. Hub retainer.
5. Clutch spacer.
6. Thrust washer.
7. Washer spacer.
8. Second speed gear and drum assembly.
9. Bushing (if equipped).
9A. Roller bearings (if equipped).
10. Thrust washer.
11. Snap ring.
12. Reverse drive gear.
13. Bearing.
14. "O" ring (used with metal face type oil seal only).
14A. Wear sleeve (used with lip type conversion oil seal).
15. Lip type conversion oil seal.
15A. Lip type oil seal.
16. "O" ring.
17. Housing.
17A. Housing.
18. Drive yoke.
18A. Drive yoke.
19. Clutch plate.
20. Clutch plate.
21. Dowel pin. *
21A. Cap screw.
22. Clutch hub assembly.
22A. Hub.
22B. Return spring.
22C. Spring retainer.
22D. Plate retainer.
23. Seal ring.
24. Snap ring.
25. Force piston.
26. Seal ring.
27. Snap ring.
28. Seal ring.
29. Accelerating piston.
30. Disc valve.
31. Reinforcing disc.
32. Dowel pin.
32A. Guide pin.
33. "O" ring.
34. Plug.
35. Dowel pin (used with metal face type oil seal only).
36. Key.
37. Separator plate.
37A. Dowel pin.
37B. Spring pin (if equipped).
38. Shaft.
39. Shaft tube.
40. Plug.
41. Piston housing.
42. First speed gear and drum assembly.
43. Thrust washer.
44. Bearing.
45. Snap ring.
46. Sealing ring.
47. Sealing rings.
48. "O" ring.
49. Hydraulic manifold.
50. Sealing ring.
51. Clutch pack release spring (inner).
52. Clutch pack release spring (outer).

* - Not used with splined backing plate.

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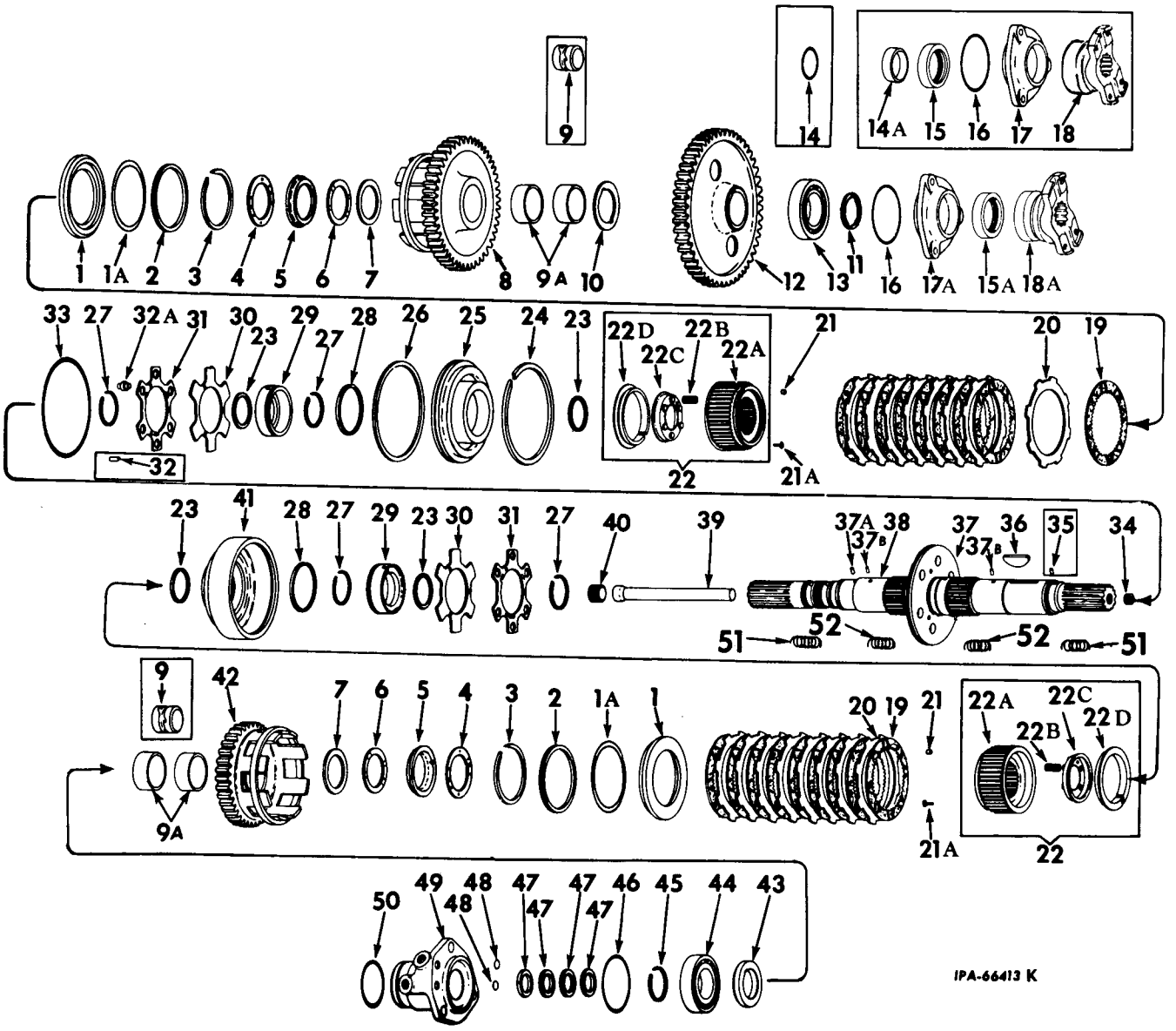
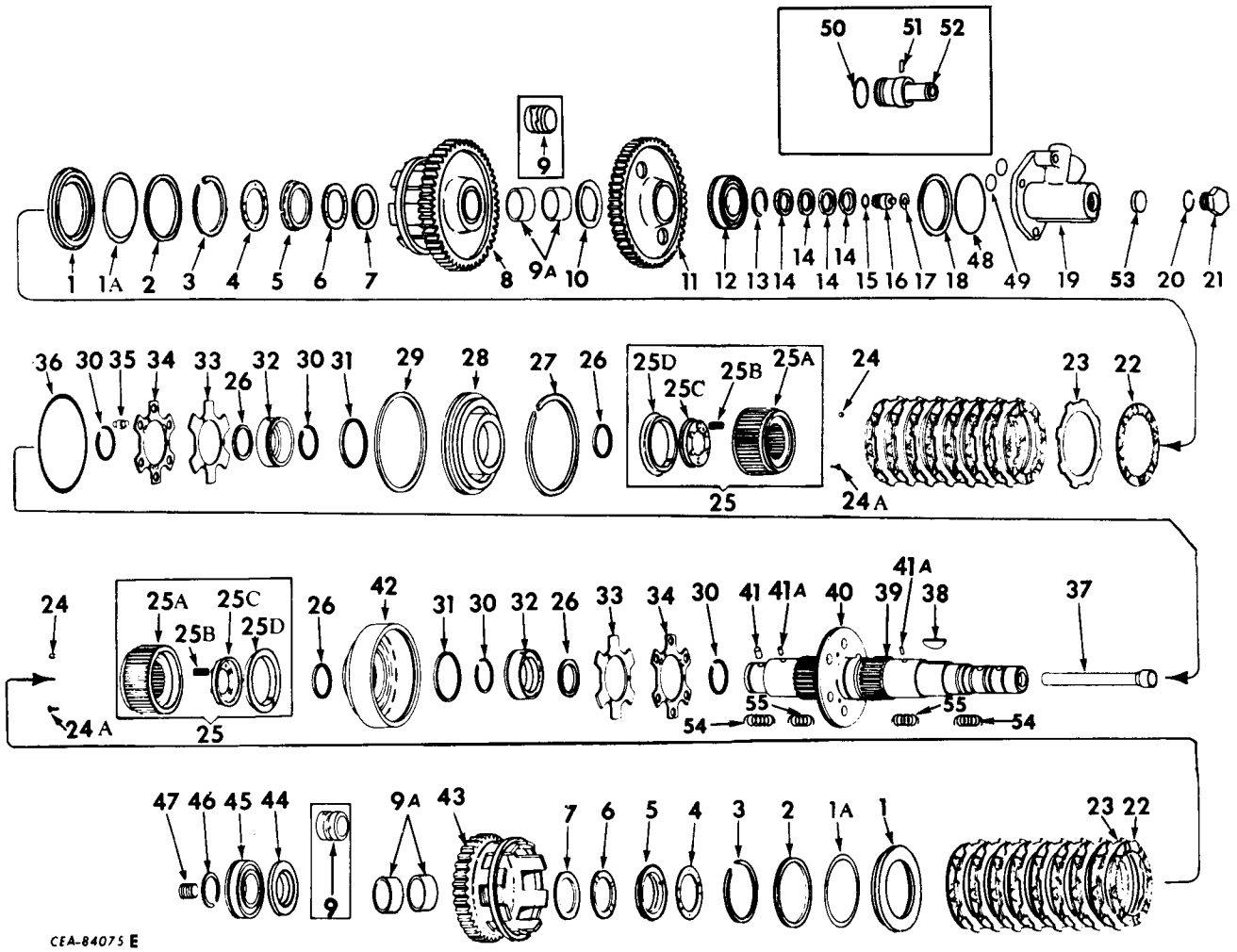


Illust. 30
Exploded View of Forward Clutch Shaft.



Illust. 31
Exploded View of Reverse Clutch Shaft.

1. Backing plate.
1A. Snap ring retainer. *
2. Snap ring.
3. Snap ring.
4. Hub retainer.
5. Clutch spacer.
6. Thrust washer.
7. Washer spacer.
8. Second speed gear and drum assembly.
9. Bushing (if equipped).
9A. Roller bearing (if equipped).
10. Thrust washer.
11. Reverse driven gear.
12. Bearing.
13. Snap ring.
14. Sealing rings.
15. "O" rings.
16. Tachometer drive plug.
17. Snap ring.
18. Shims.
19. Hydraulic manifold.
20. Gasket.
21. Plug.
22. Clutch plate.
23. Clutch plate.
24. Dowel pin.*
24A. Cap screw.
25. Clutch hub assembly.
25A. Hub.
25B. Return spring.
25C. Spring retainer.
25D. Plate retainer.
26. Seal ring.
27. Snap ring.
28. Force piston.
29. Seal ring.
30. Snap ring.
31. Seal ring.
32. Accelerating piston.
33. Disc valve.
34. Reinforcing disc.
35. Guide pin.
36. "O" ring.
37. Shaft tube.
38. Key.
39. Shaft.
40. Separator plate.
41. Dowel pin.
41A. Spring pin (if equipped).
42. Piston housing.
43. First speed gear and drum assembly.
44. Thrust washer.
45. Bearing.
46. Snap ring.
47. Plug.
48. Sealing ring.
49. "O" rings.
50. "O" ring.
51. Dowel.
52. Flexible drive.
53. Flexible drive shaft seal.
54. Clutch pack release spring (inner).
55. Clutch pack release spring (outer).

* - Not used with splined backing plate.

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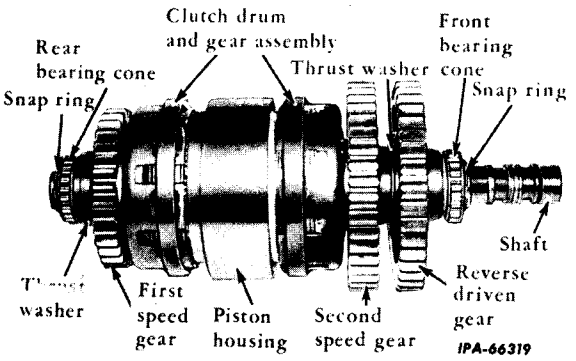
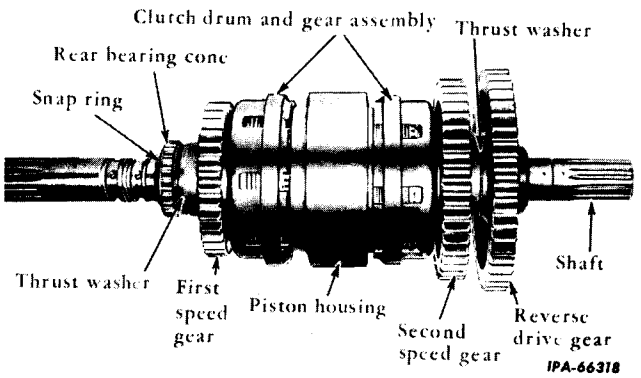
5. DISASSEMBLY - Continued

Forward and Reverse Clutch Shafts - Continued
(Ref. Nos. Refer to Illust. 30 and 31)



Illust. 32
Reverse Clutch Shaft Assembly.

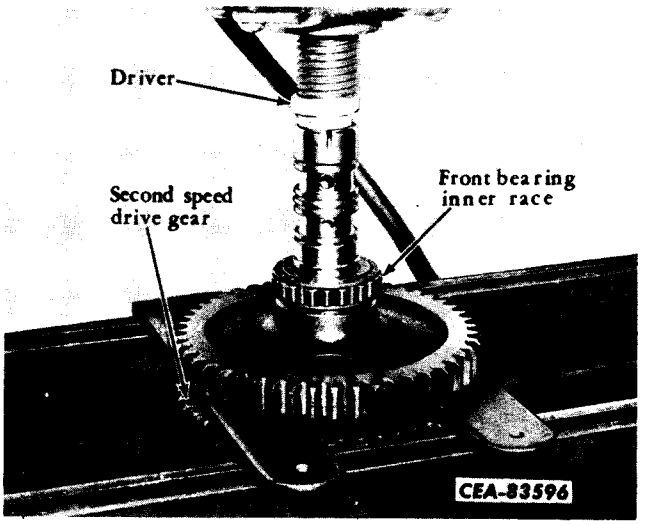


Illust. 33
Forward Clutch Shaft Assembly.

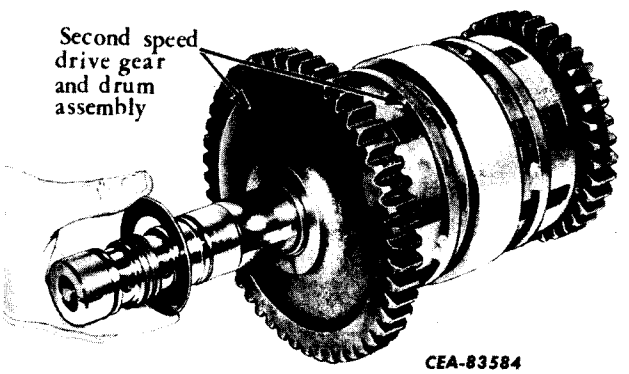
32. REVERSE CLUTCH SHAFT: Remove the rear bearing snap ring (13). Support the shaft assembly on a press under the reverse driven gear (11) and press the shaft from the gear and inner race of the front bearing (12) (Illust. 34). Remove the gear key (38) from the shaft.

FORWARD CLUTCH SHAFT: Support the shaft assembly in a press under the reverse drive gear (12) and press the shaft from the gear. Remove the gear key (36).

33. GEAR AND DRUM ASSEMBLY WITH ROLLER BEARINGS: Remove the second speed drive gear thrust washer (10) from the clutch shaft. Slip the second speed drive gear and drum assembly (8) off the shaft (Illust. 35). Remove the two caged roller bearings (9A).



Illust. 34
Removing the Reverse Driven Gear.



Illust. 35
Removing the Second Speed Drive
Gear Thrust Washer.

GEAR AND DRUM ASSEMBLY WITH BUSHING: Remove the second speed drive gear thrust washer (10) from clutch shaft. Slip the second speed drive gear and drum assembly (8) off the shaft (Illust. 35). The bushing (9) must not be removed from the gear unless replacement is necessary.

34. Remove the spacer (7), thrust washer (6) and clutch spacer (5) from the shaft.

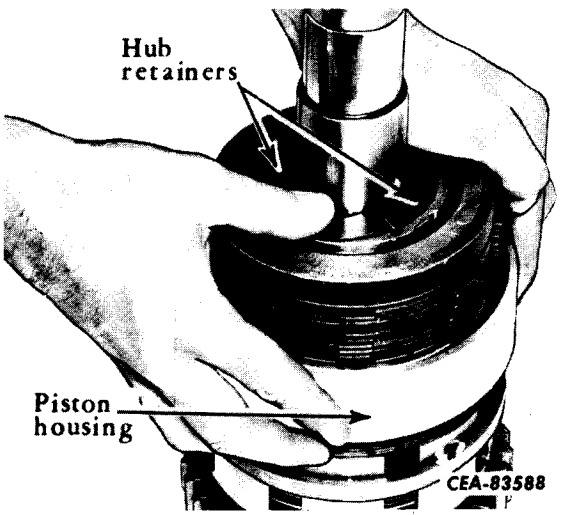
35. Remove the two cap screws (21A or 24A) securing the retainer halves (4) to the clutch hub (22A or 25A).

(Continued on next page)

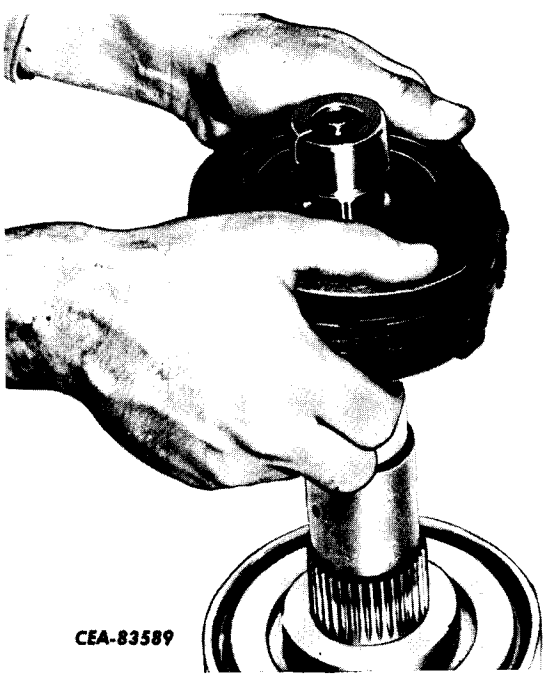
5. DISASSEMBLY - Continued

Forward and Reverse Clutch Shafts - Continued
(Ref. Nos. Refer to Illust. 30 and 31)

36. Remove the hub retainers (4). To free the retainers (4) from the shaft, grasp the end of the piston housing with the fingers and using the palms of the hands compress the hub assembly (22 or 25) (Illust. 36).



Illust. 36
Removing the Clutch Hub Retainers.



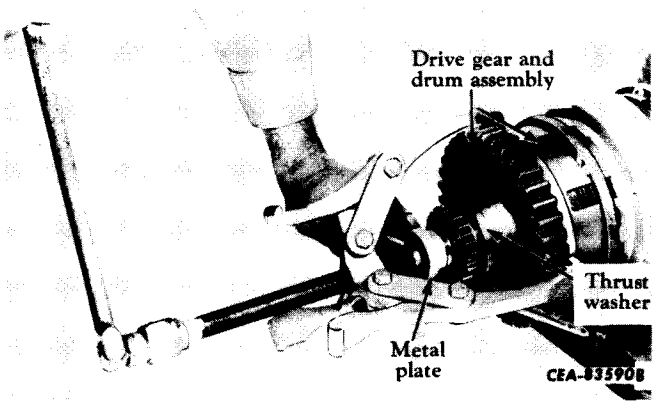
Illust. 37
Removing the Clutch Hub Assembly.

37. Grasp the outside diameter of the steel clutch plates (20 or 23) and lift off the clutch hub assembly (Illust. 37).

NOTE: The hub assembly must be lifted straight off. Be careful not to cock the hub (22A or 25A) on the shaft splines as the return springs in the hub may become twisted.

38. Remove the rear bearing snap ring (45 or 46) from the clutch shaft. Install a three jaw puller to the first speed drive gear and drum assembly as shown in Illust. 38. The gear and drum assembly and the thrust washer are not tight on the shaft and will push the bearing inner race off the shaft. Remove the thrust washer, gear and drum assembly. If the gear and drum assembly is equipped with a bushing (9), do not remove the bushing unless replacement is necessary. If the assembly is equipped with caged roller bearings (9A), lift them from the clutch shaft. Remove the spacer (7), thrust washer (6) and the clutch spacer (5).

NOTE: Do not remove the bearing inner race with a bearing split collar puller plate as the bearing will be damaged. When pulling the bearing race from the shaft, place a flat metal plate between the puller screw and the end of the shaft.



Illust. 38
Removing the Rear Bearing Inner Race.

39. Place the shaft assembly on end so the remaining clutch hub assembly is up. Repeat steps 35 through 37 for removing the clutch hub assembly.

40. Place the shaft on end so the force piston (25 or 28) is up. Remove the internal snap ring (24 or 27) from the groove in the piston housing using a screwdriver or other suitable tool (Illust. 39).

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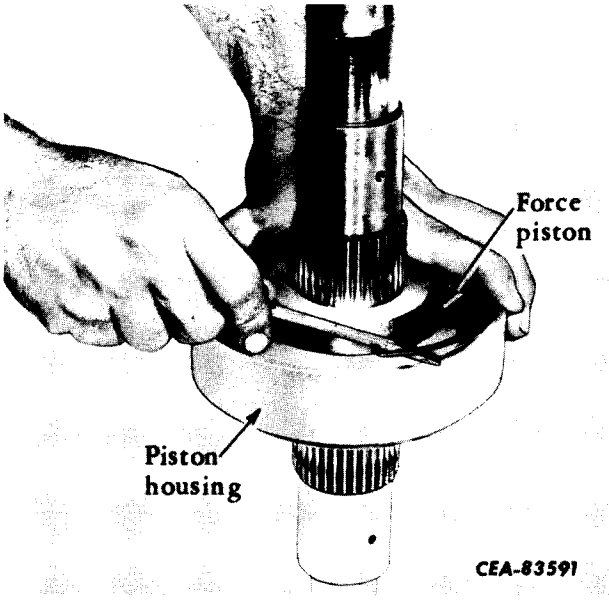
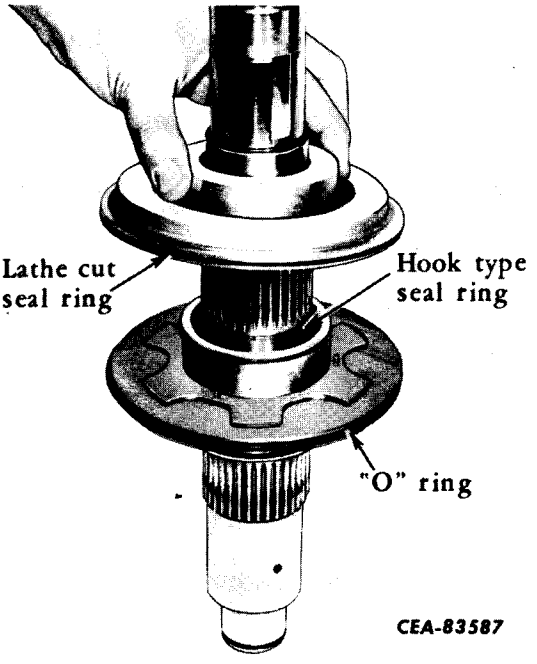


Illust. 39
Removing the Force Piston Snap Ring.



Illust. 40
Removing the Force Piston.

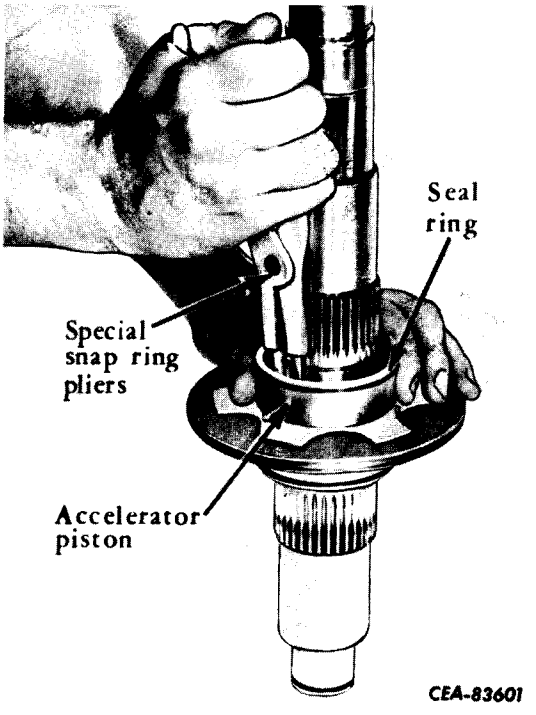
41. To prevent damaging the lathe cut seal ring (26 or 29) on the force piston and the "o" ring (33 or 36) on the separator plate when the piston housing is being removed, fill the snap ring groove in the piston housing. A piece of brazing rod can be rolled around in the groove to the approximate circumference of the force piston or an "O" ring of the exact diameter can be used to fill the snap ring groove.

Push the piston housing down off the force piston. If the housing is tight, tap around the outer diameter of the piston housing with a soft-faced hammer.

42. Lift off the force piston and remove the lathe cut seal ring. Remove the hook type seal ring from the shaft and the "O" ring from the separator plate (Illust. 40).

43. Push the accelerator piston away from the snap ring (27 or 30) and, using a pair of special snap ring pliers no. 1 020 441R1, remove the snap ring (Illust. 41). Remove the accelerator piston. Remove the seal ring (28 or 31) from the accelerator piston. Remove the hook type seal ring (23 or 26) from the clutch shaft.

(Continued on next page)



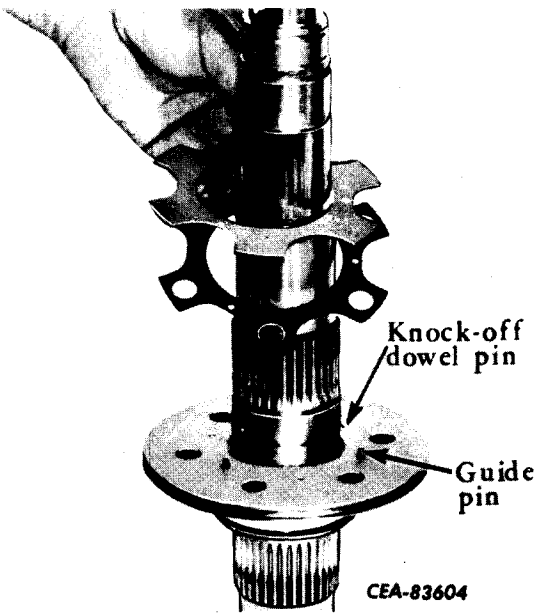
Illust. 41
Removing the Accelerator Piston Snap Ring.

5. DISASSEMBLY - Continued

Forward and Reverse Clutch Shafts - Continued
(Ref. Nos. Refer to Illust. 30 and 31)

44. SEPARATOR PLATE WITH SWAGED GUIDE PINS: Remove the disc valve and reinforcing disc from the guide pins in the separator plate. Then remove the three knock-off dowel pins from the separator plate (Illust. 42). The guide pins are swaged to the separator plate and are not serviced separately.

SEPARATOR PLATE WITH SHOULDER TYPE GUIDE PINS: Remove the disc valve and reinforcing disc from the guide pins (32A or 35) in the separator plate (Illust. 42). Remove the three guide pins.



Illust. 42
Removing the Disc Valve and Reinforcing Disc (Assembly with Swaged Guide Pins Shown).

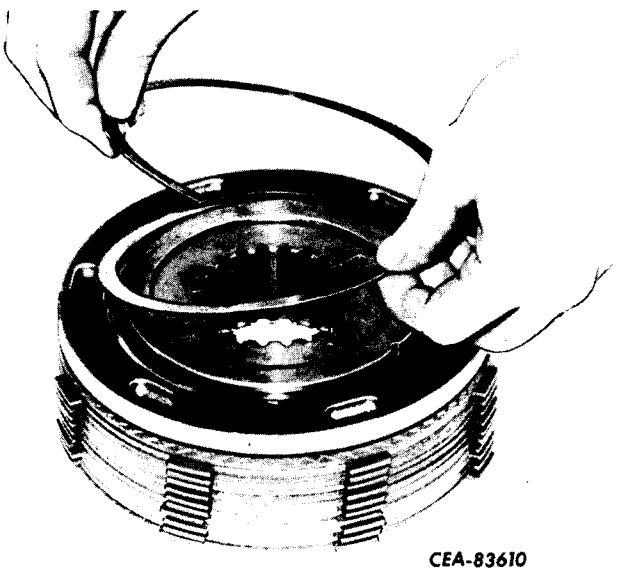
45. SEPARATOR PLATE WITH RELEASE SPRINGS: Remove the release springs (51 and 52 or 54 and 55) from the separator plate.

46. Reverse the shaft on the bench. Remove the hook type seal ring (23 or 26) from the shaft. Remove the accelerator piston, hook type seal rings and the reinforcing disc, disc valve and springs in the same manner as was done previously.

47. Disassemble the clutch hub assembly. Remove the spiral snap ring from the groove in the clutch backing plate. (Illust. 43). Remove the external snap ring (3), retainer or retainers (1A), backing plate (1) and the dowel pins (21 or 24) from the clutch hub (Illust. 44 and 45). Later backing plates (1) are splined to the clutch hubs and do not have dowel pins or retainers.

Alternately remove the internal splined clutch plates and externally tanged clutch plates from the clutch hub.

NOTE: No attempt should be made to remove the sheet metal retainers and springs contained on the inside of the clutch hub.



Illust. 43
Removing the Clutch Hub Spiral Snap Ring.

Illust. 44
Removing Clutch Hub External Snap Ring.

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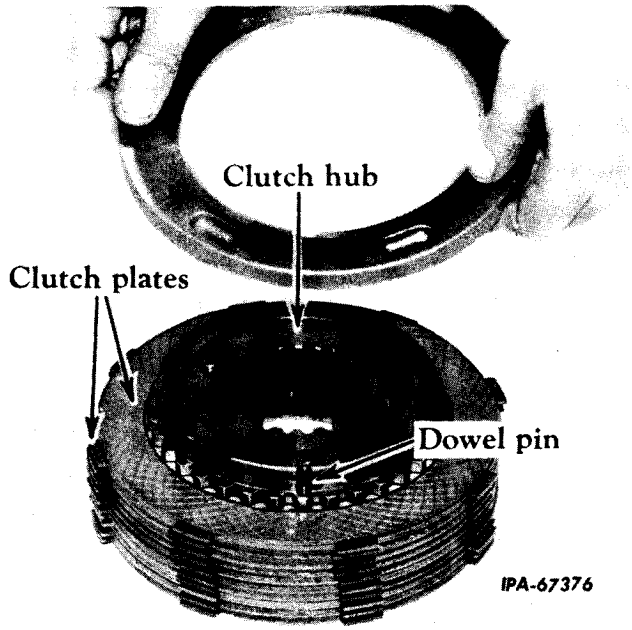


Illust. 45
Removing Clutch Hub Backing Plate.

48. Remove the four hook type seal rings (14 or 47) from the clutch shaft.

49. Do not remove the separator plate from the shaft unless it is damaged and a new plate is to be installed. The separator plate is thermally fitted on the shaft and must be removed by one of the following methods to prevent damaging the shaft.

In either of the following methods one of the snap rings next to the separator plate must first be removed.

(a) With a hack saw, saw through the separator plate from the outer diameter through one of the six holes and to within approximately 1/16 to the inside diameter of the separator plate. Caution must be used to prevent the saw blade from marring the shaft. Place a chisel in the groove formed by the saw cut on the outer diameter of the separator plate. Using a hammer, drive the chisel down into the saw cut spreading and breaking the separator plate. This should spread the separator plate enough to be easily slipped off the shaft.

(b) An alternate method of removing the separator plate is to heat the inside diameter with a torch until it expands enough to be slipped off of the shaft. The torch flame must never touch the shaft and no attempt should be made to cut the separator plate from the shaft by using the torch.

6. INSPECTION AND REPAIR

1. Inspect all bearings for cracks, scores and wear. Replace if necessary. Soak in oil, wrap and cover until ready for assembly.

2. Inspect the gears for wear or chipped or broken teeth. Replace if wear is excessive or teeth are damaged.

3. Inspect the hi-lo shifter fork fingers for misalignment or wear and the shifter fork slot in the driving gear for wear. (Refer to Par. 2, "SPECIFICATIONS.")

4. Inspect the condition of the hi-lo shifter poppet and poppet lock springs. If they are not within specification as described in Par. 2, "SPECIFICATIONS," they must be replaced.

5. Inspect the splines on the spline shaft and the power take-off and universal joint coupling spline on the forward clutch shaft for wear. Replace shaft if wear is excessive. Slight burrs can be smoothed down with a stone.

6. Remove the plugs in the ends of the clutch shafts and flush all oil passages. Install the plugs. Be sure all lube holes are clean and free of obstruction. All parts of the clutch packs should be thoroughly cleaned and reoiled before assembly.

Remove the snap ring securing the tachometer drive plug in the end of the reverse clutch shaft. Remove the drive plug and inspect the "O" ring. Reinstall the drive plug with "O" ring and secure with the snap ring.

7. Inspect the first and second speed drive gear thrust washers for excessive wear (refer to Par. 2 "SPECIFICATIONS" for minimum allowable thickness).

8. Inspect the clutch hub assembly (22, Illust. 30) and (25, Illust. 31). Lubrication holes in the hub should be checked for possible contamination by foreign particles that could interfere with lubrication. The return springs should be checked visually to see if they are properly seated and not damaged. Push the spring plate down by hand and release to check spring fatigue and binding. Spring plate must return

(Continued on next page)

6. INSPECTION AND REPAIR - Continued

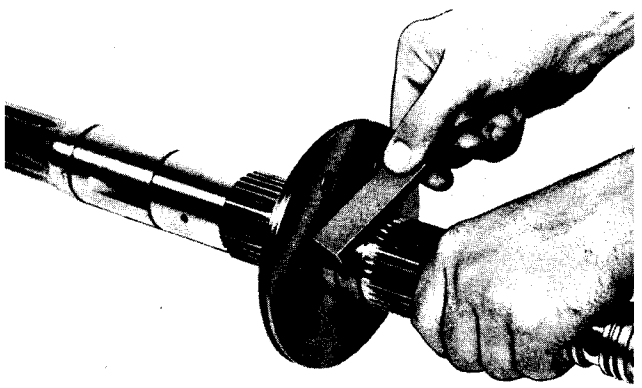
immediately upon release. If any components of the hub assembly are not functioning properly. replace the complete hub assembly.

9. Inspect the "O" rings, sealing rings, reinforcing disc and disc valve of the forward and reverse clutch packs for wear or damage and replace parts as necessary.

NOTE: Do not mistake the loose appearance of the separator plate "O" ring as being stretched or deformed. It has been manufactured with a greater circumference than the separator plate.

10. Inspect the clutch plates for excessive wear or warpage and replace if necessary. (Refer to Par. 2, "SPECIFICATIONS" for wear tolerance of bronze clutch plates.)

11. Using an oil stone, remove any burrs that might damage sealing surfaces or increase wear to close tolerance parts (Illust. 46).



Illust. 46
Removing Burrs from Clutch Shaft.

12. DRIVE GEARS EQUIPPED WITH BUSHINGS: Inspect the first and second speed drive gear bushings for scoring or excessive wear. Measure the shaft O. D. where the bushing rides and the bushing I. D. Subtract the shaft dimension from the bushing dimension to obtain the running clearance. If the running clearance exceeds that shown in Par. 2, "SPECIFICATIONS" the bushing should be replaced. If the bushing needs replacement, install a new bushing as follows:

(a) Check the drive gear bore for scoring or galling. Check that the leading chamfer of the gear is free of burrs, nicks and sharp edges.

(b) Lubricate bushing O. D. or gear bore with engine oil before pressing bushing into place.

(c) Press bushing into place until end of bushing is .030 of an inch below the edge of the gear hub thrust surface (opposite to clutch drum).

(d) Check bushing I. D. (refer to Par. 2, "SPECIFICATIONS").

13. The thermo by-pass valve is unnecessary in the hydraulic systems of the torque converter and transmission and it is suggested that it be removed. Remove and add parts as follows to operate the hydraulic system without a thermo by-pass valve (refer to Illust. 47 and legend for new parts).

(a) Disconnect the two oil cooler hoses and the regulator valve inlet hose at the by-pass valve housing.

(b) Remove the by-pass valve housing and valve assembly with plug, nipples and adapters from the nipple in the safety filter base. Remove the nipple from the filter base. Discard these parts.

(c) Install the new adapter (7) and elbow (4) into the safety filter and connect the oil cooler inlet hose (5).

(d) Place the new clamp (2) on the regulator inlet hose (1) and install the new adapter (3) to the hose. Install the new elbow (4) on the oil cooler outlet hose (6) and connect the elbow to the adapter. Secure the clamp (2) to the safety filter mounting bracket.

14. Flush and clean all oil lines and the oil coolers to assure a clean hydraulic system.

15. LIP TYPE OIL SEAL: If the oil seal used at the front of the forward clutch shaft needs replacement, refer to Par. 7, "REASSEMBLY" under "Transmission Case and Cover" for the proper method of installing a new oil seal.

METAL FACE TYPE OIL SEAL: If this oil seal (used on earlier transmissions) was found to be serviceable, the instructions on the proper method for handling this oil seal must be followed (refer to Par. 7, "REASSEMBLY" under "Transmission Case and Cover!").

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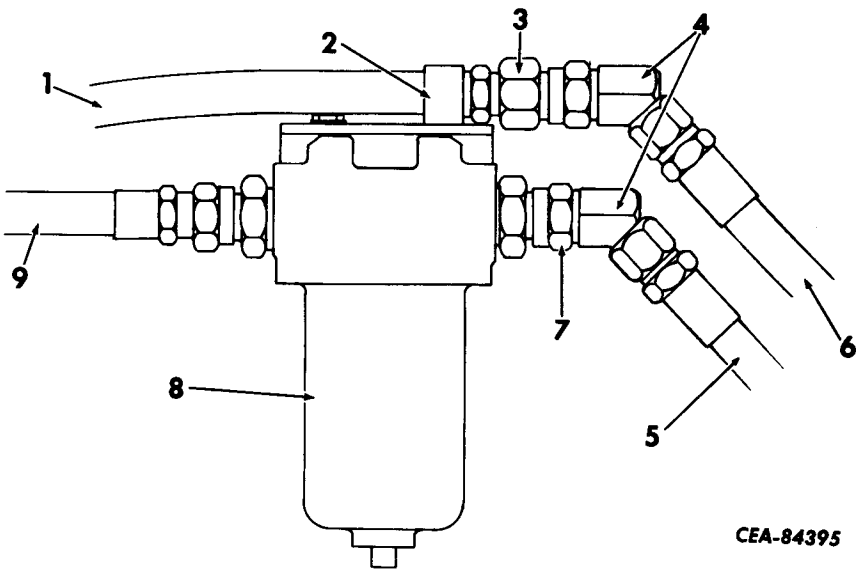


Illust. 47
Hydraulic Hose Connections without Thermo By-Pass Valve.

1. Regulator valve inlet hose.
2. Hose clamp (308 576R1).
3. Hose adapter (606 291C91).
4. Elbow (296 406R91) (2 Req'd).
5. Oil cooler inlet hose.
6. Oil cooler outlet hose.
7. Hose adapter (336 182R1).
8. Safety filter.
9. Converter-to-safety filter inlet hose.

Procedure for Servicing and Adjusting Tapered Roller Bearings (Ref. Letters Refer to Illust. 48)

The tapered roller bearings and spacer are furnished as a matched unit, so a definite procedure for adjustment of the tapered roller bearings, due to normal wear, must be followed.

1. Assemble the complete bearing assembly on a flat surface (surface plate).

2. Place a weight (20 pounds minimum) on top of bearing assembly as shown in Illust. 48. This will keep the rollers in alignment.

NOTE: Be sure to place parallels or spacers on the bearing, and then rest the weight on top of the parallels or spacers. This is done so the weight is free from touching the bearing cone or rollers and the proper thrust is given. The same must be done between the bottom surface of the bearing cup and the surface plate (Illust. 48). Bottom parallels must be of equal thickness.

3. Rotate the cones (C) to a minimum of four revolutions in each direction.

4. With the spacer (B) in place, set the dial indicator at zero. Check at three different points.

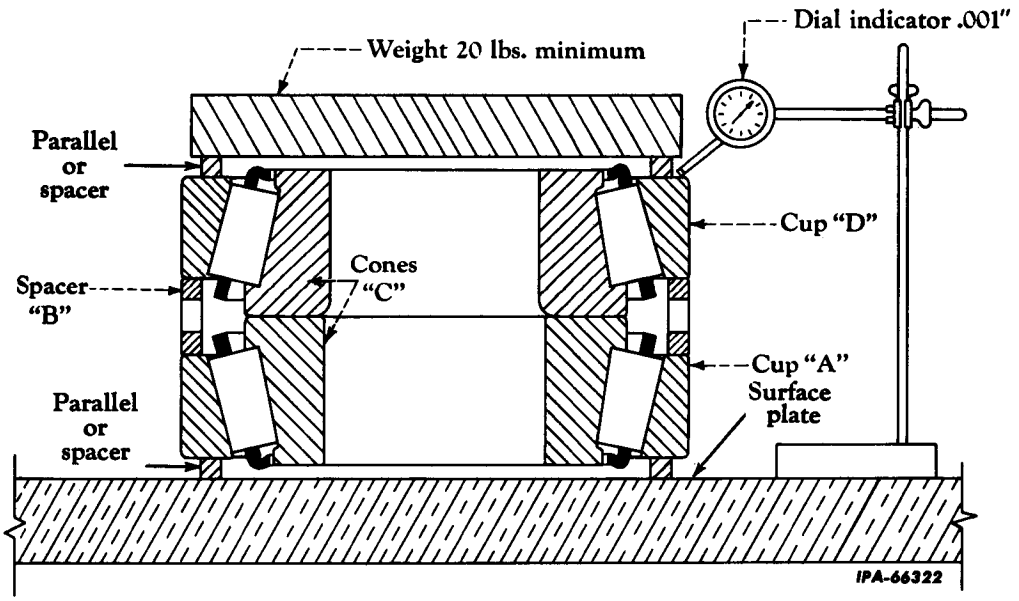
5. Slide the dial indicator off the cup (D) carefully. (Do not disturb the indicator reading.)

6. Remove the weight, parallels, cup (D) and spacer (B). Replace the cup (D), parallels and weight. (Do not replace the spacer (B).)

7. Repeat the rotation of the cones (C) and slide the dial indicator on the cup (D). Be careful to get an accurate reading from the dial indicator. Check at three different points.

8. The factory end play specification in a new bearing assembly is .008 ± .001 inch. If the reading on the dial indicator shows a greater drop than the maximum factory set end play (.008 ± .001 inch), grinding or lapping of the spacer (B) is necessary. The amount to be ground off of the spacer is the difference between the indicator reading and the factory set end play.

A bearing assembly that is heavily pitted or scored must not be salvaged.



Illust. 48
Adjustment of Tapered Roller Bearings.

7. REASSEMBLY

Forward and Reverse Clutch Shafts
(Ref. Nos. Refer to Illust. 30 and 31)

NOTE: The inner races for the reverse clutch shaft front and rear bearings or forward clutch shaft rear bearing must be heated to 275° F for approximately 45 minutes before assembling on the shaft.

1. If the separator plate (37 or 40) was removed, install the new plate as follows. On plates with the swaged type guide pins, be sure the three pins (Illust. 42) are pressed and wedged into the plate and extend an equal distance on both sides of the plate.

Be sure one of the snap rings (27 or 30) is installed on the shaft. Heat the separator plate in oil to 350° F to 400° F for approximately 15 to 20 minutes. This should allow the separator plate to drop onto the clutch shaft flush against the snap ring. Install the other plate snap ring (27 or 30) and allow the plate to cool.

NOTE: Force must not be used at any time in attempting to install the separator plate. After the plate has cooled, it must be checked for warpage.

2. Be sure the pipe plugs (34 and 40) in both ends of the forward clutch shaft and plug (47) in the rear of the reverse clutch shaft are installed below, flush with end of shaft. Be sure the tachometer drive plug (16) with "O" ring (15) has been installed and is held securely in the front of the reverse clutch shaft with an internal snap ring (17).

3. Place the shaft on end. Install an inner and outer clutch pack release spring (51 and 52 or 54 and 55) (if equipped) into each of the three spring bores in the separator plate.

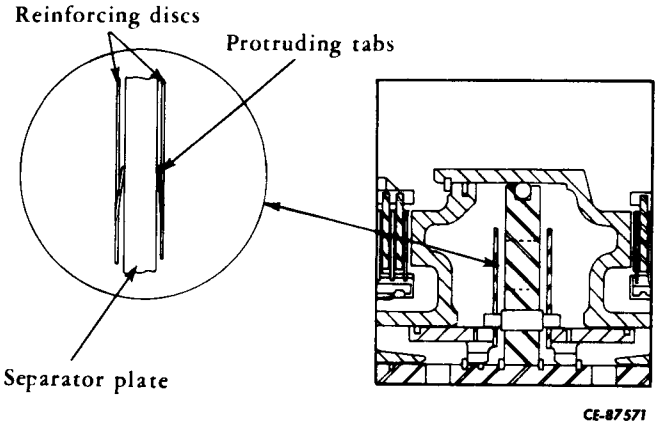
4. SEPARATOR PLATE WITH SWAGED GUIDE PINS: Install the reinforcing disc (31 or 34) and disc valve (30 or 33) over the guide pins in the separator plate. If disc (31 or 34) has protruding tabs, install discs as shown in Illust. 49.

SEPARATOR PLATE WITH SHOULDER TYPE GUIDE PINS: Install the reinforcing disc (31 or 34) so the three protruding tabs are down toward the separator plate (Illust. 49). Install the disc valve (30 or 33) on the reinforcing disc.

NOTE: If replacement of the reinforcing disc was necessary, be sure the same type disc is used on each side of the separator plate. New discs with protruding tabs will work with swaged type separator plate but must not be intermixed with earlier type disc within a final clutch pack. Reinforcing discs without protruding tabs will not work with separator plate with shoulder type guide pins.

NOTE: The reinforcing disc is of heavier gauge metal and contains six oil passage holes. The reinforcing disc must be assembled next to the separator plate (Illust. 42).

5. Install 2 hook type seal ring (23 or 26) on the shaft in the groove nearest the separator plate. Position the accelerator piston (29 or 32) over the clutch shaft until it is past the snap ring groove and install the snap ring (27 or 30). Install the hook type seal ring (28 or 31) on the accelerator piston (Illust. 41).



Illust. 49
Reinforcing Disc Installation Drawing.

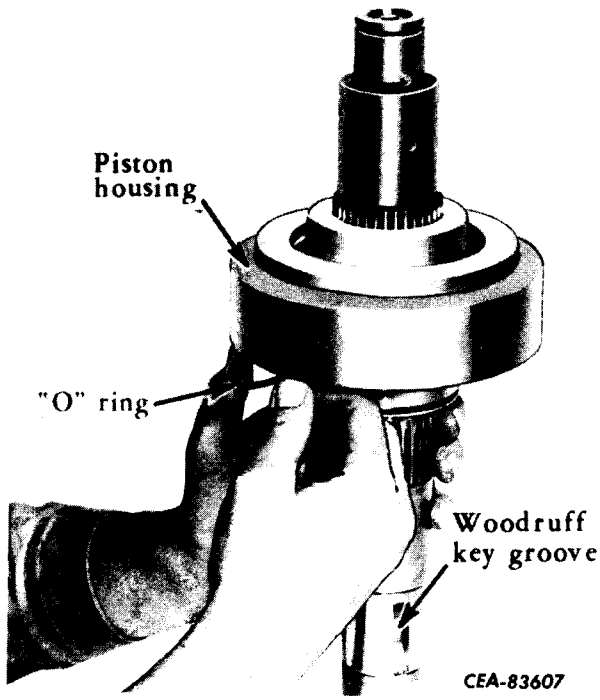
6. Place the shaft on a bench with the opposite end up. Install the dowel pins in the separator plate. On separator plate with shoulder type pins (32A or 35), position the reinforcing disc and disc valve installed previously so the pins enter the openings provided in the disc and valve. Repeat Steps 3, 4 and 5.

7. Place a hook type seal ring (23 or 26) in the clutch shaft groove near each accelerator piston (Illust. 40).

Place the "O" ring (33 or 36) into the groove on the separator plate and apply a low melting, non-fibrous grease around the "O" ring.

8. Remove the brazing rod or "O" ring (used in piston housing removal) from the snap ring groove in the piston housing. This groove does not have to be filled for installing the piston housing.

9. Place the clutch shaft on end so the woodruff key groove in the shaft is down. Position the piston housing (41 or 42) over the shaft until it contacts the separator plate "O" ring. Pull the excess of the "O" ring into a small loop in one area as shown in Illust. 50, positioning the rest of the "O" ring against the inside diameter of its groove. Allow the chamfer on the leading edge of the piston housing to cover as much of the "O" ring as possible and feed the excess loop of the "O" ring back into its groove. Push the piston housing over the "O" ring and the separator plate.



Illust. 50
Positioning "O" Ring for Piston Housing Installation.

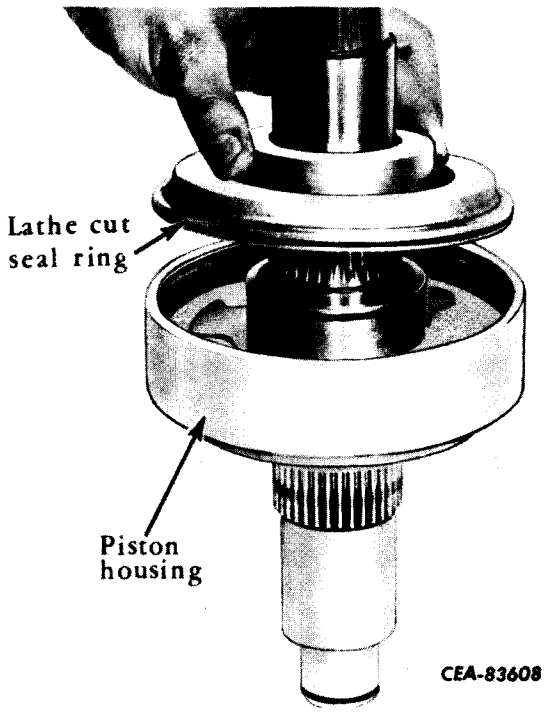
NOTE: Do not force the piston housing into position. Allow the chamfer of the housing to compress the seal rings and move the housing slowly over the separator plate "O" ring. Rough handling of the housing can result in a broken seal ring or cut "O" ring.

10. Reverse the shaft assembly on the bench. Install the lathe cut seal ring (26 or 29) into the groove in the force piston (25 or 28). Position the force piston on the clutch shaft and engage it into the piston housing. Care must be taken to prevent damage to the lathe cut seal ring (Illust. 51).

(Continued on next page)

7. REASSEMBLY - Continued

Forward and Reverse Clutch Shafts - Continued
(Ref. Nos. Refer to Illust. 30 and 31)



Illust. 51
Installing the Force Piston.

As the force piston contacts the piston hook type sealing ring on the clutch shaft and accelerator piston, rotate the piston and allow the chamfer on the force piston to compress the sealing rings. Do not force the force piston over the sealing rings.

11. After the force piston has cleared the snap ring groove in the piston housing, install the snap ring (24 or 27) (Illust. 39).

12. Alternately install one internally splined bronze clutch plate and one externally tanged steel clutch plate on the clutch hub (22A or 25A).

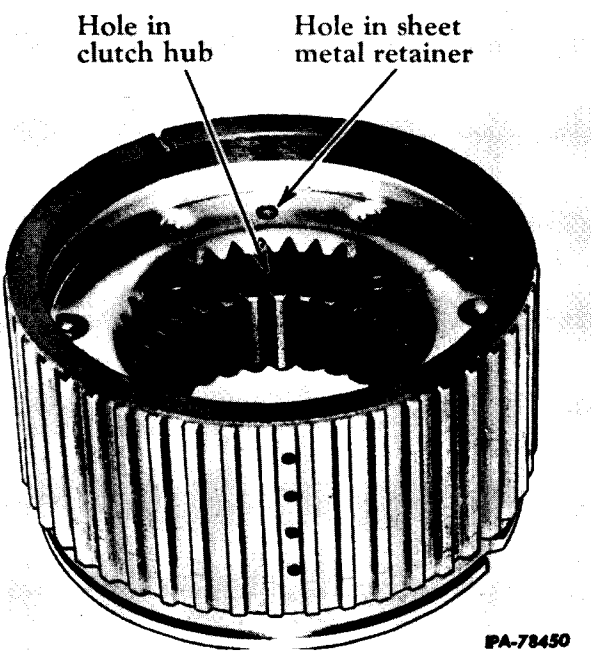
NOTE: The bronze faced clutch plates must be thoroughly oiled (with same oil as used in the transmission) prior to assembling on the clutch hub. Because the sintered bronze facing is porous and absorbs oil, a light oiling with an oil can may not be sufficient. Whenever possible, the plates must be soaked, for at least two minutes, in a container of clean transmission oil. If facilities are not available for soaking, a heavy oiling on both surfaces may be sufficient.

13. Install the splined backing plate (1) into position on the clutch hub. On earlier assemblies without the splined backing plate, position the dowel pins (21 or 24) into the hub and install the backing plate so it is properly indexed over the dowel pins (Illust. 45). Place the snap ring retainer or retainers (1A) (if equipped) on the hub. Install the snap ring (3) on the hub to secure the backing plate and install the internal spiral snap ring (2) into the groove in the backing plate (Illust. 43 and 44).

14. Be sure the small hole in the sheet metal retainer is in line with the through hole in the clutch hub (Illust. 52). On assemblies with the splined backing plate, the hole and punch mark must be aligned. Position the clutch hub assembly onto the shaft by properly aligning the sheet metal retainer and hub splines to the clutch shaft splines (Illust. 37).

NOTE: When positioning the clutch hub assembly on the shaft, the splines of the retainer will engage the shaft splines first. The splines of the hub, which can be moved separately, may move slightly out of line with the shaft splines. If this happens, and the hub will not go down on the shaft, turn the hub very slightly in either direction until the splines engage. Do not turn the hub so the two holes (refer to Illust. 52) become misaligned. To do so will cock the springs, causing them to bind and even pop off their seats.

15. Compress the hub assembly to install the two clutch hub retainers (4) onto the shaft and secure them with the two cap screws (21A or 24A).



Illust. 52
Clutch Hub Assembly.

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16. Assemble and install the remaining clutch hub assembly as described in Steps 12 through 15.

17. Place the shaft on end so the woodruff key groove in the shaft is up.

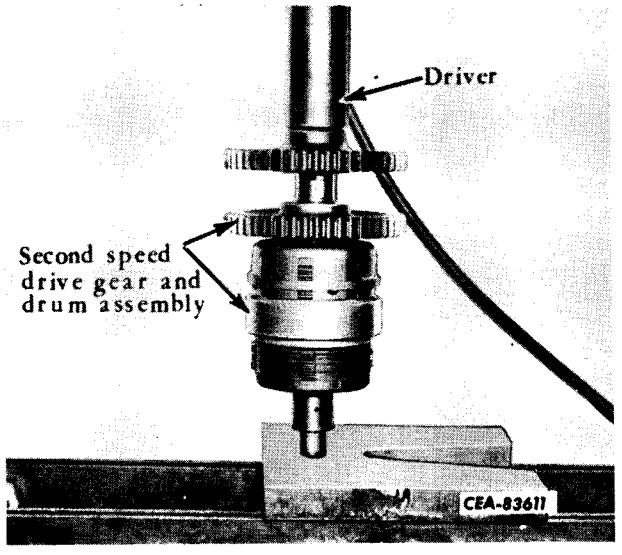
18. Place the clutch spacer (5) against the clutch hub so the slots of the spacer fit over the flats of the cap screws (21A or 24A). Install the thrust washer (6) and washer spacer (7) over the end of the shaft until they are up against the clutch spacer (5).

19. DRUM AND GEAR ASSEMBLY WITH ROLLER BEARINGS: Install the two caged roller bearings (9A) over the clutch shaft and against the washer spacer (7). Position the second speed gear and drum assembly (44 teeth) over the shaft, indexed on its outside diameter with the externally tanged clutch plates and flush with the spacer (7) on its inside diameter (Illust. 53).

DRUM AND GEAR ASSEMBLY WITH BUSHING: Position the second speed gear and drum assembly (44 teeth) with bushing over the shaft, indexed on its outside diameter with the externally tanged clutch plates and flush with the spacer (7) on its inside diameter (Illust. 53).

20. Install the second speed gear thrust washer (10), and gear key (36 or 38) on the shaft.

21. Place the clutch shaft in a press as shown in Illust. 53 and press the reverse drive gear (12) or the reverse driven gear (11) over the woodruff key.



Illust. 53
Installing the Reverse Driven Gear.

NOTE: The gear (11 or 12) must be installed with the long taper of the gear hub up.

22. REVERSE CLUTCH SHAFT: Install the heated inner race of the bearing (12) on the shaft and use the press to hold the inner race in position until it cools. Secure with the snap ring (13).

23. Place the shaft assembly on end so the reverse drive gear or reverse driven gear is down.

24. Position the clutch spacer (5) on the clutch hub so the slots of the spacer fit over the flats of the cap screws (21A or 24A). Install the thrust washer (6) and washer spacer (7) over the end of the shaft until they are up against the clutch spacer (5).

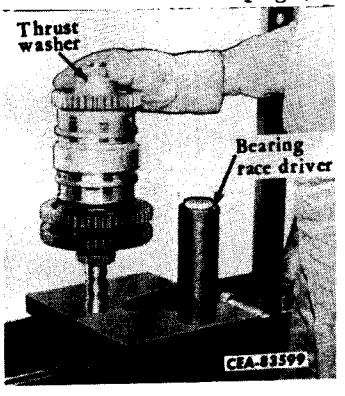
25. DRUM AND GEAR ASSEMBLY WITH ROLLER BEARINGS: Install the two caged roller bearings (9A) over the clutch shaft and against the washer spacer (7). Position the first speed gear and drum assembly (33 teeth) over the shaft, indexed on its outside diameter with the externally tanged clutch plate and flush with the spacer (7) on its inside diameter.

DRUM AND GEAR ASSEMBLY WITH BUSHING: Position the first speed clutch drum and gear assembly (33 teeth) with bushing over the shaft, indexed on its outside diameter with the externally tanged clutch plates and flush with the washer spacer on its inside diameter.

26. Install the thrust washer (43 or 44) on the shaft so the slot engages the dowel pin (37A or 41) (Illust. 54).

27. Install the heated inner race of the rear bearing (44 or 45) on the shaft and use the press to hold the inner race in position until it cools. Secure with snap ring (45 or 46) (Illust. 54).

(Continued on next page)

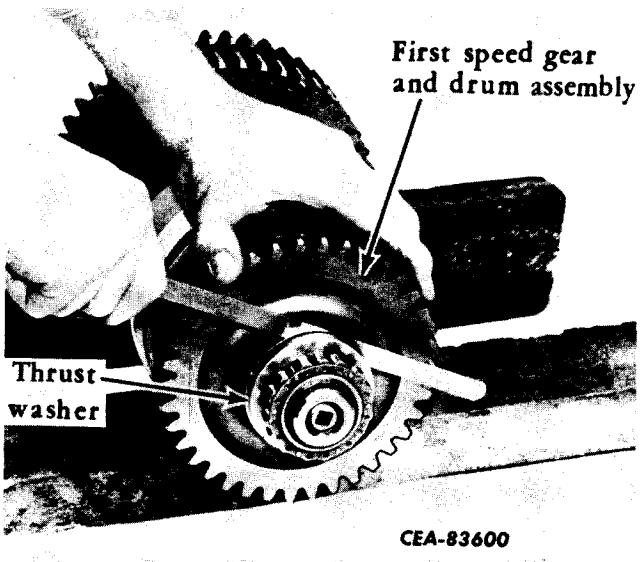


Illust. 54
Installing the Rear Bearing Inner Race.

7. REASSEMBLY - Continued

Forward and Reverse Clutch Shafts - Continued
(Ref. Nos. Refer to Illust. 30 and 31)

28. Check the gear and drum assembly end play. Move the gear and drum assembly away from the thrust washer (10, 43 or 44) as far as possible. Measure the clearance between the gear and thrust washer using a feeler gauge (Illust. 55). The clearance obtained must be within the limits shown in Par. 2, "SPECIFICATIONS." Check the gear and drum assembly end play on the opposite side of the clutch shaft in the same manner. If the clearance obtained on either of the assemblies is above or below the specified clearance, the clutch shaft must be disassembled and the thrust washer, gear and drum assembly and clutch shaft inspected. Replace the part or parts necessary to bring the end play within the limit specified.



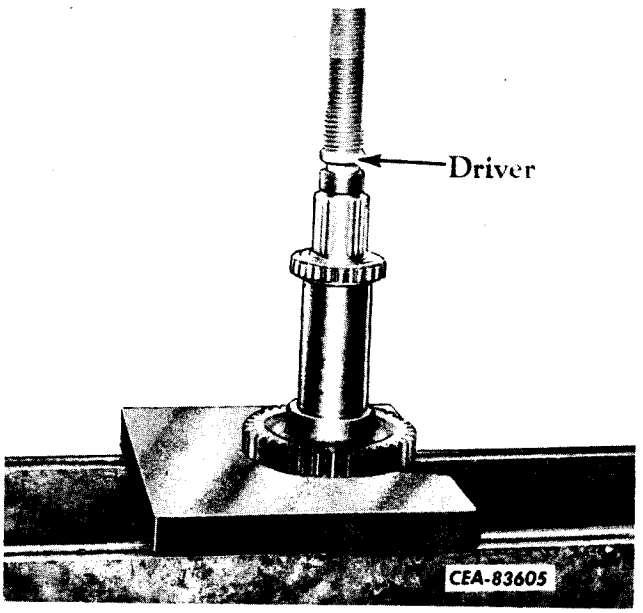
Illust. 55
Checking Gear and Drum Assembly End Play.

29. Install the hook type seal rings (14 or 47) in the grooves of the clutch shaft.

Pinion Shaft
(Ref. Nos. Refer to Illust. 27)

NOTE: Heat the inner race of the rear bearing to not more than 300° F and the driven gears to not more than 400° F before installing on the shaft.

30. Install the gear key (31) in the keyway closest to the spline. Position the low range driven gear (28) (gear with the larger outside diameter) in a press so the short taper of the gear hub is up. Place the shaft in the gear aligning the gear key with the keyway in the gear and press the shaft into the gear until the shaft shoulder bottoms on the gear (Illust. 56).

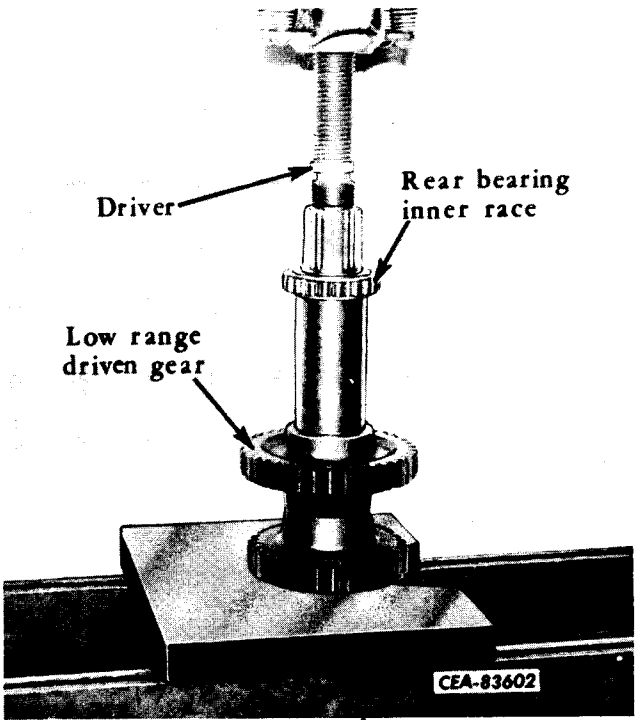


Illust. 56
Installing the Low Range Driven Gear.

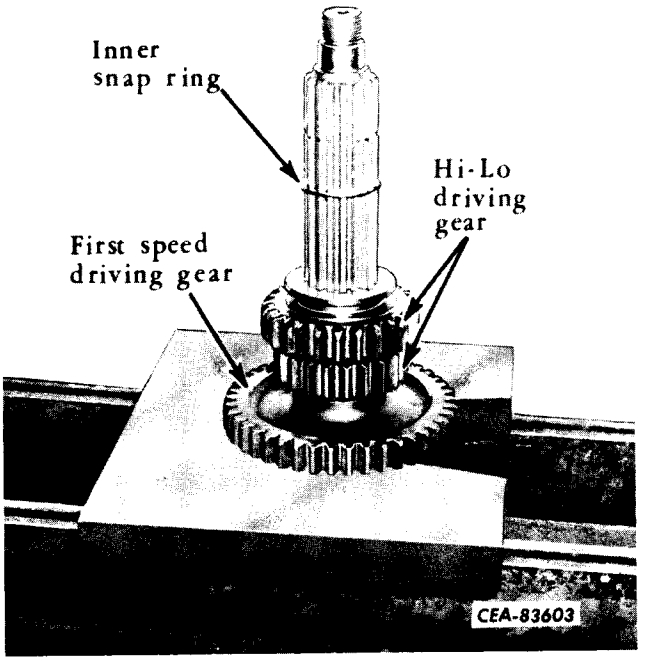
31. Position the rear bearing inner race (Illust. 57) on the shaft. Press the inner race on the shaft and hold until it cools.

32. Install the remaining gear key (31). Position the high range driven gear (27) in the press so the long taper of the gear hub is up. Place the shaft in the gear aligning the key and keyway and press the shaft into the gear until the low range gear bottoms on the high range gear (Illust. 57).

33. Install the rear spacer (26) on the shaft until the slot in the spacer engages the high range gear key. Install the front spacer (25) over the locating pin (30) in the shaft (Illust. 28).



Illust. 57
Installing the High Range Driven Gear.



Illust. 58
Hi-Lo Speed Driving Gear Installed.

Spline Shaft
(Ref. Nos. Refer to Illust. 27)

NOTE: Heat the front and rear bearing inner races to not more than 300°F. and the first and second speed driven gears to not more than 400°F. before installing on the shaft.

34. Install the front snap ring (7) in the third snap ring groove from the threaded end of shaft. Place the first speed driven gear (6) (gear with larger outside diameter) in a press. Press the shaft (threaded end up) into the gear until the snap ring bottoms on the gear (Illust. 58).

35. Install the hi-lo speed driving gear (8) so the shift collar is up. Install the second speed driven gear inner snap ring (9) (Illust. 58). Remove the shaft from the press and install the rear snap ring (7) next to the gear (6).

36. Place the second speed driven gear (10) in a press and press the shaft into the gear until the inner snap ring (Illust. 58) bottoms on the gear (Illust. 59). Install the outer snap ring (9) (Illust. 60).

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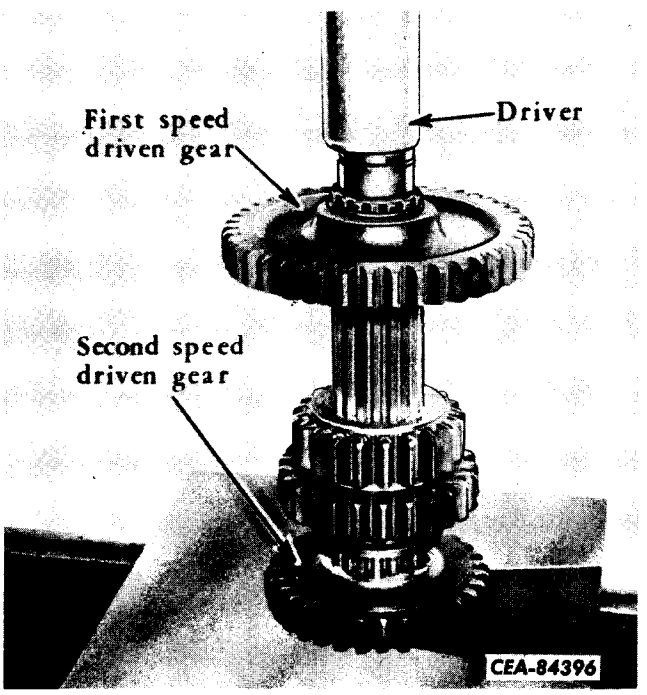
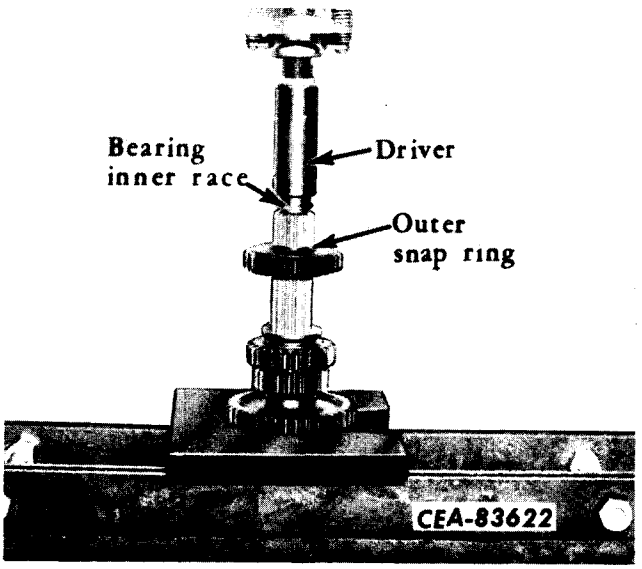


Illust. 59
Installing the Second Speed Driven Gear.

7. REASSEMBLY - Continued

Spline Shaft - Continued
(Ref. Nos. Refer to Illust. 27)

37. Position the shaft in the press supported by the first speed driven gear. Press the front bearing inner race on the shaft (lip of race down) until it bottoms and hold in place until it cools (Illust. 60).



Illust. 60
Installing Front Bearing Inner Race.

38. Reverse the shaft in the press and press on the rear bearing inner race until it bottoms on the shaft and hold in position until it cools. Secure the bearing race with the snap ring (3).

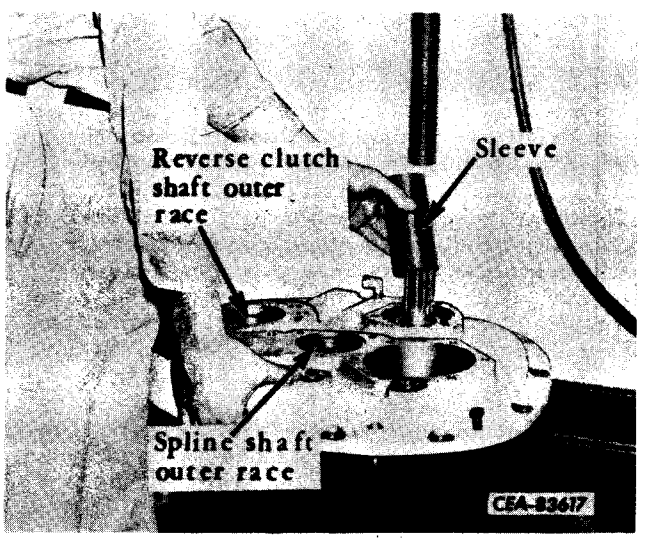
Transmission Case and Cover

39. Install the reverse clutch shaft and the spline shaft rear bearing outer races into the transmission case until the lips of the bearing races bottom on the case shoulder. Install the pinion shaft rear bearing outer race into the case until it bottoms and secure with the internal snap ring (32, Illust. 27).

Install the hydraulic manifold (Illust. 10) to the transmission case and install the forward clutch shaft rear bearing outer race until the lip of the bearing race bottoms on the flange of the manifold. Remove the hydraulic manifold.

40. Both the ball bearing for the forward clutch shaft and the straight roller bearing outer race for the spline shaft should be pressed in the transmission front cover until they bottom against a shoulder in their respective bores. If the reverse clutch shaft outer race was removed, or if a new one is to be installed, it should be installed with the lip of the outer race facing up. Press it in until the lip is not more than 1/4 inch past the start of the bore. The proper distance will be adjusted later with the shims (Illust. 61).

41. Place the forward clutch shaft in a press and let the lower end of the shaft rest on blocks. Do NOT rest the clutch shaft on the gears. Position the transmission front cover so the ball bearing is over the shaft. Then place a sleeve over the shaft that has an I. D. that will rest on the face of the inner race of the bearing. It should be deep enough to allow the bearing to be pressed all the way on the shaft before bottoming out. Support the transmission front cover by hand while the bearing is being pressed on the shaft. The bearing should bottom against the reverse drive gear. Then install the snap ring (11, Illust. 30) (Illust. 61).



Illust. 61
Installing the Forward Clutch Shaft.

42. Place the sealing ring on the bevel pinion shaft front bearing cage. Install the bearing cage with the two tapped holes for the retainer lock at the bottom (Illust. 62).

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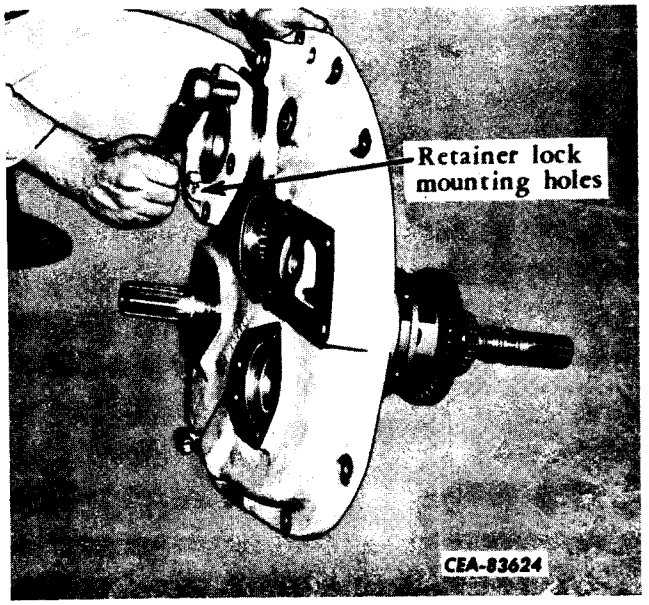
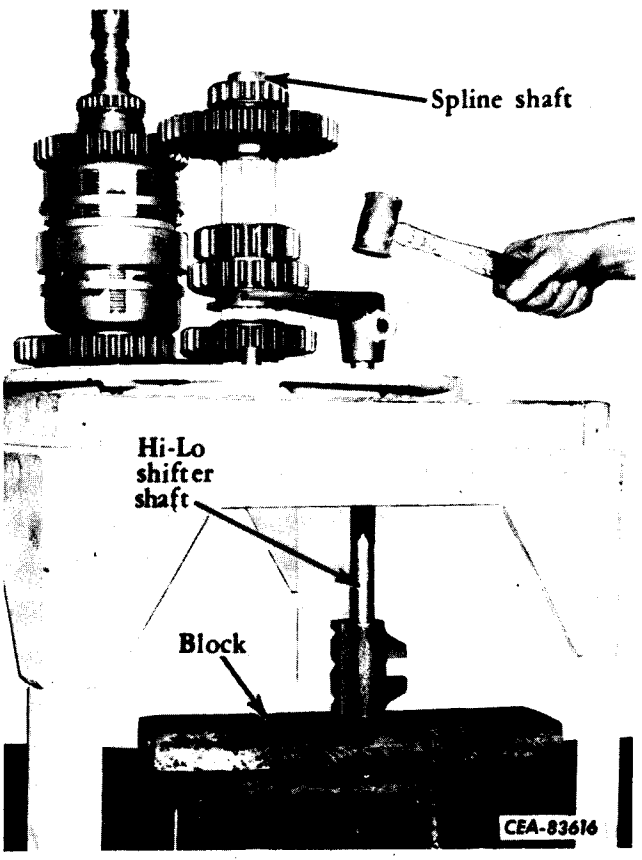


Illust. 62
Installing the Pinion Shaft Front Bearing Cage.

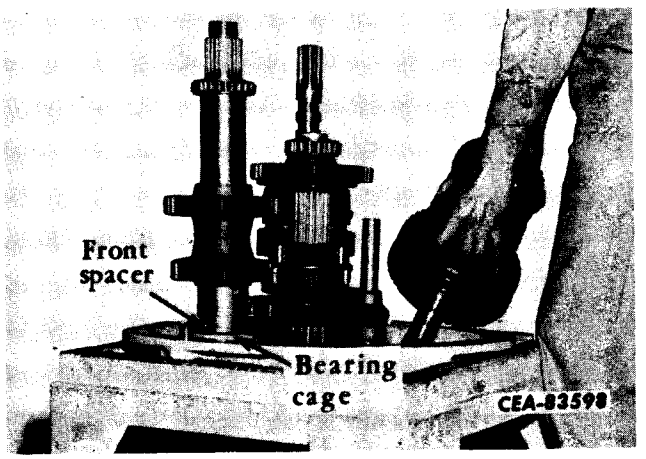


Illust. 63
Installing the Hi-Lo Shifter Shaft and Fork.

43. Place the front cover in the stand or on blocks as the forward clutch shaft is up. Set the spline shaft into the front cover (Illust. 63).

44. Install the hi-lo shifter fork on the sliding gear with the long part of the fork hub facing toward the front cover. Slide the shifter shaft through the bushing in the front cover and through the shifter fork until the slot in the chart is in the center of the fork. Secure the fork to the shaft with a cap screw, washer and nut. If the shifter shaft is tight entering the fork, block the shaft and tap the fork into place (Illust. 63).

45. Set the pinion shaft in the front cover allowing the front spacer to rest on the bearing cage. Install the reverse clutch shaft (Illust. 64).



Illust. 64
Installing the Reverse Clutch Shaft.

NOTE: Later transmission cases are equipped with two pipe plugs in the rear of the case. Remove these plugs to provide a visual means for aligning the spline shaft and reverse clutch shaft rear bearing cones with their cups as the case is lowered into position. After the case is seated and secured, install the two pipe plugs.

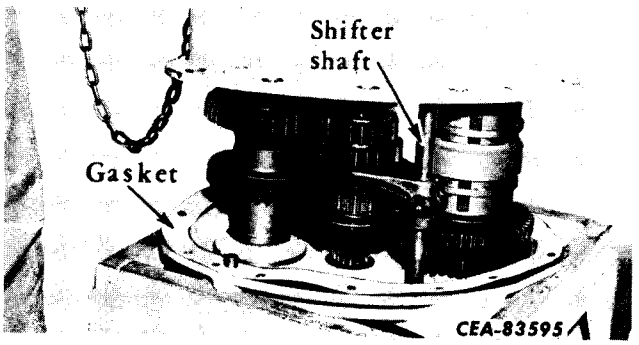
46. Place a jack or blocks under the hi-lo shifter shaft to raise the shaft to its highest position (Illust. 63 and 65). Then install a new transmission cover gasket. Begin to lower the transmission case over the four shafts. The case should be lowered so that the hi-lo shifter shaft starts into the hole provided for it in the transmission case. Then continue to

(Continued on next page)

7. REASSEMBLY - Continued

Transmission Case and Cover - Continued

lower the transmission case until it rests against the top of the shafts. Joggle the case until the rear bearings are properly seated (Illust. 65). Secure the case to the cover with cap screws, washers and nuts.



Illust. 65
Installing the Transmission Case.

47. Position the transmission in the stand or on blocks so the front cover is up.

48. FORWARD CLUTCH SHAFT WITH METAL FACE TYPE OIL SEAL: If this oil seal was inspected and found serviceable, the following method of handling this oil seal must be used:

A. Be extremely careful not to nick either seal face.

B. Clean seal faces just prior to their contacting each other.

1. It is usually easier to clean these faces when they are dry.

2. Coat the seal rotor face with Molykote to permit a few minutes running until the oil can reach the seal faces. Some of this is likely to rub off during the final cleaning.

3. Clean rags should be used to wipe the seal faces. If oil is used to wipe the seal faces, it must be clean and be kept in a closed container.

C. Install the oil seal rotor with "O" ring (14, Illust. 30) on the clutch shaft being sure to engage the slot in the rotor with the locating pin (35). Install the "O" ring (16) on the oil seal housing.

FORWARD CLUTCH SHAFT WITH LIP TYPE CONVERSION OIL SEAL (Refer to Illust. 66):

If this seal is being installed for the first time, be sure to remove and discard the dowel pin (35, Illust. 30) from the shaft. Before installing the wear sleeve, check that the shaft surface is clean and free of rust. Heat the wear sleeve from 250°F to 300°F by submerging it on hot oil. Install the wear sleeve on the shaft until it is .10 of an inch from the bearing snap ring (Illust. 66). Install the oil seal into the rear of the housing until it is positioned as shown in Illust. 66. The oil seal must be installed with the part number facing to the outside. Install the "O" ring on the housing.

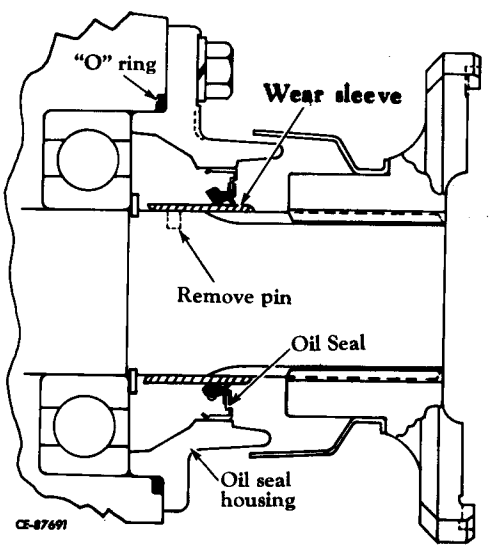
FORWARD CLUTCH SHAFT WITH LIP TYPE OIL SEAL WITHOUT WEAR SLEEVE: Install the oil seal (15A) into the rear of the housing (17A) until it is flush with the housing rear face and the seal part number is toward the inside of the housing. Install the "O" ring on the housing (Illust. 30).

49. Install the oil seal housing with the seal and "O" ring over the forward clutch shaft and secure to the front cover (Illust. 67).

50. Place a jack or some blocks under the pinion shaft and raise the shaft the full length of its travel.

51. Heat the pinion shaft front bearing cones to not more than 250°F. for approximately 15 minutes before installing.

52. Install the inner bearing cup of the pinion shaft front bearing into the bearing cage so the large diameter of the taper is up. Be sure the cup bottoms squarely in the cage (Illust. 67).



Illust. 66
Forward Clutch Shaft with Lip Type Conversion Seal.

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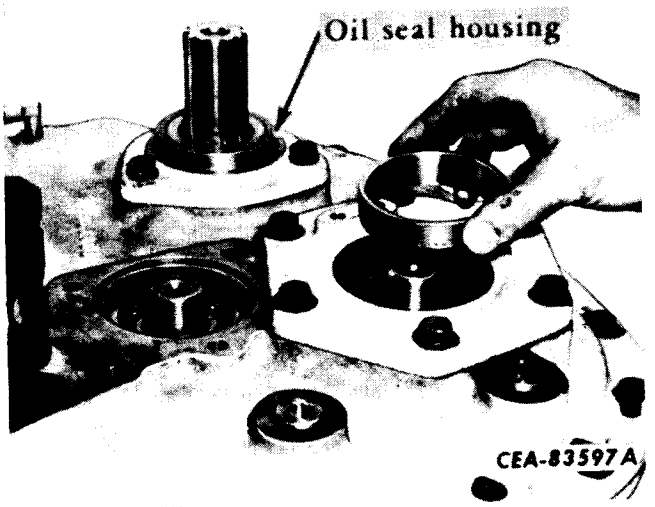
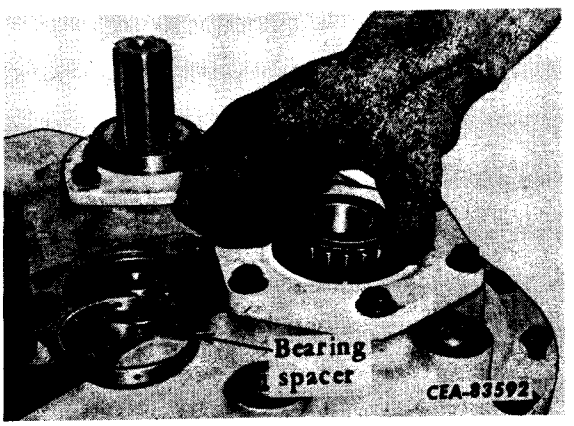


Illust. 67
Installing Pinion Shaft Front Bearing Inner Cup.

53. Install the front bearing inner cone (cone with the larger I.D.) on the pinion shaft so the large diameter of the taper is up. Place the bearing spacer on the inner cup (Illust. 68).

54. Install the outer cone on the shaft (small diameter of the taper up) until it bottoms on the inner cone. Install the outer cup until it bottoms on its cone.



Illust. 68
Installing the Pinion Shaft Front Bearing Inner Cone.

55. Install the front bearing plate (Illust. 15) and a new nut on the spline shaft. Install a new nut on the front of the bevel pinion shaft.

56. Place the transmission assembly on the bench so the shafts are horizontal with the bench.

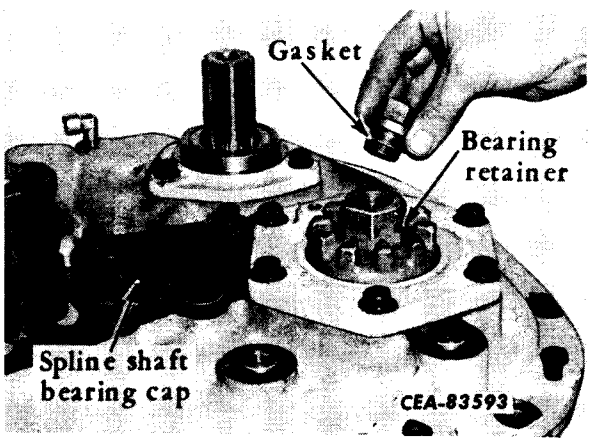
57. Install a 3/4 inch square drive breaker bar with an extension in the rear of the pinion shaft to keep the shaft from turning and tighten the front nut. Then tighten the spline shaft front nut while keeping the pinion shaft from turning (Illust. 15). Both nuts must be torqued from 500-550 ft. - lbs.

NOTE: If the spline shaft turns when tightening the front nut, the hi-lo range driving gear is in neutral and should be moved into either high or low range.

58. Place the sealing ring on the spline shaft bearing cup and secure the cap to the front cover (Illust. 69).

59. Place the sealing ring in the groove on the pinion shaft front bearing retainer. Then screw the retainer into the bearing cage until it stops. Use a socket and torque wrench and tighten the retainer from 300-350 ft. -lbs. (Illust. 69).

60. Install the retainer plug with gasket on the retainer (Illust. 69).



Illust. 69
Installing the Retainer Plug and Gasket.

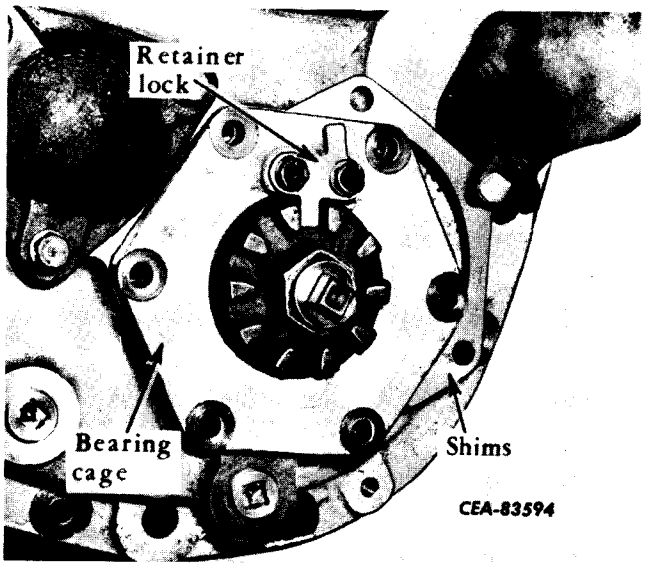
61. Install the retainer lock. Then remove the cap screws securing the bearing cage and slide the split shims into place. The original shim thickness that was removed must be re-installed (Illust. 70). Secure the cage to the transmission cover.

(Continued on next page)

7. REASSEMBLY - Continued

Transmission Case and Cover - Continued

NOTE: If the pinion shaft front bearing, pinion shaft, bevel pinion and the drive bevel gear in the steering planetary are to be reused, it will not be necessary to check the pinion shaft end clearance as long as the original shims are installed. However if a new or reworked bearing, new shaft, pinion or bevel gear is installed, adjust for end clearance and backlash after the transmission is installed. (Refer to "STEERING SYSTEM," Section 7.)



Illust. 70
Installing the Pinion Shaft Front Bearing Cage Shims.

62. If a new transmission case or cover has been installed or any reverse clutch shaft bearings or gears replaced, it will be necessary to check the end play in the reverse clutch shaft. If it was not necessary to replace any of these parts, using the original shims will result in the proper end play.

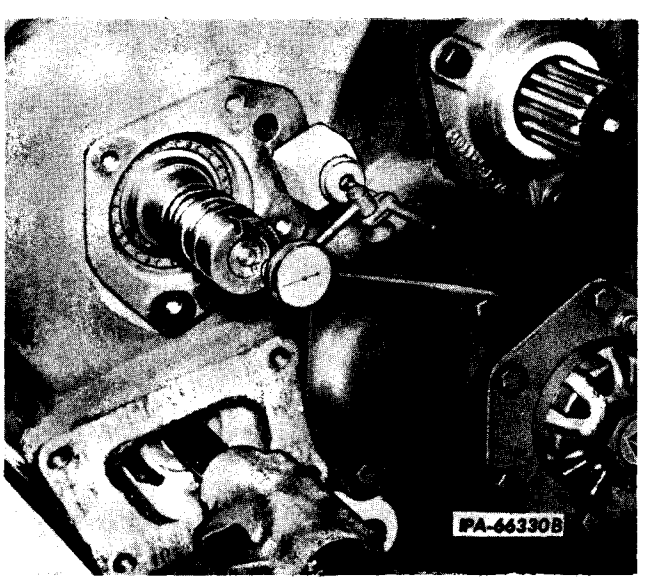
63. Check the reverse clutch shaft end play.

A. TRANSMISSIONS WITH SHIMS BETWEEN FRONT COVER AND HYDRAULIC MANIFOLD:

Push the clutch shaft in until the rear bearing cone bottoms in the bearing cup. Place shims totaling approximately .060 inch over the end of the reverse clutch shaft and secure the clutch shaft manifold (19, Illust. 31) to the front cover using standard torque. Remove the clutch shaft manifold and shims. Mount the base of a dial indicator on the front cover, place the indicator pointer on the end of the clutch shaft and set the indicator at zero (Illust. 71). Pull out on the clutch shaft and take a reading. The difference between the proper end play (refer to Par. 2, "SPECIFICATIONS") and the indicator reading is the amount of shims to be removed from the shim pack. Using the remaining shims should obtain the proper reverse clutch shaft end play.

B. TRANSMISSIONS WITH SHIMS BETWEEN FRONT BEARING CUP AND MANIFOLD FLANGE:

Push the clutch shaft in until the rear bearing cone bottoms in its cup. Secure the manifold (19, Illust. 31) to the front cover using standard torque. DO NOT install shims (18). Remove the manifold. Mount a dial indicator on the front cover, place the indicator pointer on the end of the shaft and set the indicator at zero (Illust. 71). Pull out on the shaft and take a reading. The difference between the proper end play (refer to Par. 2, "SPECIFICATIONS") and the indicator reading is the amount of shims to be used to obtain the proper end play.



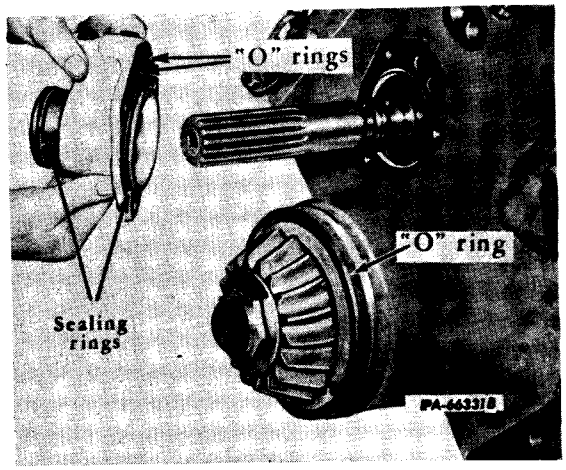
Illust. 71
Checking Reverse Clutch Shaft End Play.

64. REVERSE CLUTCH SHAFT: Install the proper amount of shims on the hydraulic manifold or against the front bearing cup (depending on transmission model). On later models be sure the "O" rings (49) and the sealing ring (48) are properly seated to the manifold (Illust. 31). Secure the manifold to the front cover. Be careful not to damage the sealing rings on the shaft as the manifold is passed over them (Illust. 13).

65. Heat the bevel pinion gear to 400° F for one hour and place it on the splines of the bevel pinion shaft. Make sure the gear is pushed back against the inner race of the rear bearing while it is cooling. Do NOT put the new retainer nut on the shaft for 15 to 20 minutes or the plastic portion of the elastic nut will melt. When the nut is installed, tighten it from 500-550 ft. -lbs. To do this, the shaft should be held by the torque wrench. Turn the nut with an open-end wrench.

66. Be sure the "O" rings and sealing rings are properly seated in the forward clutch shaft manifold and carefully guide the manifold over the clutch shaft sealing rings. Secure the manifold to the transmission case (Illust. 72).

67. Install the "O" ring on the rear of the transmission case (Illust. 72).



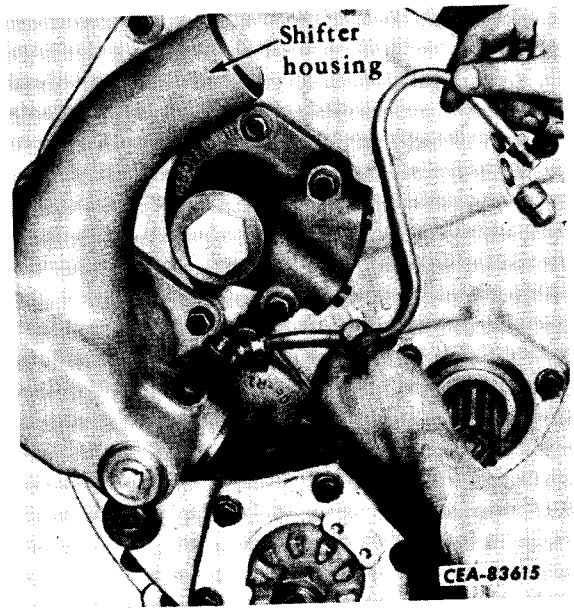
Illust. 72
Installing Forward Clutch Shaft Manifold.

Hi-Lo Shift Lever Assembly
(Ref. Nos. Refer to Illust. 9)

68. Install the shifter poppet (15) and spring (14) in the shifter housing and secure with the pipe plug (12) and gasket (13). Place the poppet lock (16) in the shifter housing so it engages the poppet. Install the spring (36) and secure with pipe plug (12) and gasket (13) (Illust. 10).

69. Install the shifter housing and gasket (24) to the front cover (27) and secure with cap screws and washers (Illust. 73).

70. MECHANICALLY CONTROLLED TRANSMISSION: Connect the shifter lock tube (17) to the hi-lo shifter housing and to the top of the transmission cover (Illust. 73).



Illust. 73
Installing the Shifter Lock Tube
(Mechanically Controlled Transmission).

71. Install the swivel cap (8), spring washer (7), spring (6) and spring stop (5) over the top of the shift lever and secure by installing a rivet through the shift lever and spring stop.

72. Insert the shift lever in the shifter housing (10) until you feel the lever (9) engage the slot of the shifter rod in the bottom of the housing. Secure the lever to the housing with the swivel shaft (26).

73. Place the shifter lever boot (3) over the top of the lever and secure with the clamps. Install the shift lever ball (1).

8. INSTALLATION

1. Remove the cover from the opening in the rear main frame. Apply a thin film of Molykote type "G" to both ends of the forward clutch shaft.

2. Install and secure the main regulating valve and range selector valve assemblies to the transmission case. On hydraulically controlled transmissions connect the inlet hose (6, Illust. 8) extending from the hydraulic manifold (1, Illust. 6) to the hi-lo shifter housing.

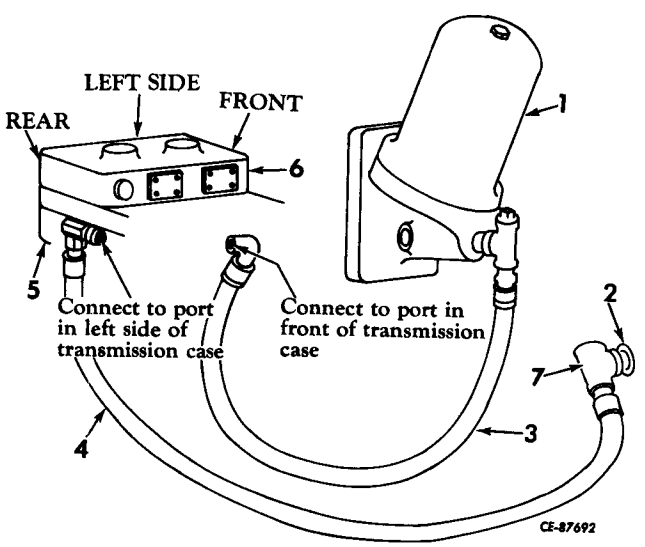
(Continued on next page)

8. INSTALLATION - Continued

3. Be sure the "O" ring (35, Illust. 9) on the rear of the transmission case and sealing ring (50, Illust. 30) on the forward clutch shaft hydraulic manifold are properly seated (Illust. 72). Attach a hoist to one of the main regulating valve mounting holes and one of the upper transmission cover-to-transmission case mounting holes. Hoist the transmission into position and secure it to the rear main frame with the locking cap screws. On earlier units, install on the rear main frame studs and secure with the nuts. Install the main regulating valve and transmission cover mounting bolts and washers.

4. Connect the steering brake pull rods (2, Illust. 6) at each of the bellcranks. Connect the operating rod to each of the steering boosters.

5. Connect the hoses and tubing to the main regulating valve (3, Illust. 6) and the transmission case that had to be removed to facilitate transmission removal.



Illust. 74
Hydraulic Hose Installation Drawing.

1. Pressure filter.
2. Pump inlet on converter housing.
3. Pressure filter outlet-to-regulator inlet hose.
4. Regulator drain hose.
5. Transmission case.
6. Transmission main regulating valve assembly.
7. Reducing tee.

◆ CAUTION: IT IS POSSIBLE TO CROSS THE CONNECTIONS OF THE HOSES (3 AND 4, ILLUST. 74) AT THE TRANSMISSION CASE AS BOTH THESE HOSES HAVE THE SAME SIZE FITTINGS. IF THESE HOSE CONNECTIONS ARE SWITCHED, AN UNRELIEVED PRESSURE BUILD-UP WILL OCCUR BETWEEN THE CONVERTER PUMP AND THE REGULATOR WHEN THE ENGINE IS STARTED. THIS PRESSURE, WHICH BUILDS UP IMMEDIATELY, MAY FORCE THE PRESSURE FILTER CASE AND HOLD-DOWN BOLT OFF THE FILTER BASE. THEREFORE, IT IS IMPERATIVE THAT WHEN THESE HOSES ARE CONNECTED THEY BE TRACED WITH THE HAND FROM ONE CONNECTION TO THE OTHER TO BE SURE THEY ARE INSTALLED TO THE PROPER PORTS AS SHOWN IN ILLUST. 74.

6. LOADERS ONLY: Connect the equipment pump outlet rear tube at the control valve. Secure the tube mounting bracket to the top of the transmission case.

7. MECHANICALLY CONTROLLED TRANSMISSION: Connect the transmission gear selector lower links to the lever on the range selector valve.

HYDRAULICALLY CONTROLLED TRANSMISSION: Install new "O" rings in the hydraulic manifold counterbores and secure the manifold (1, Illust. 6) to the bottom of the control tower.

8. Remove the covering from the flywheel housing. Connect a hoist to the converter housing as was done in removal and position the converter against the flywheel housing. Secure with the cap screws and washers and remove the hoist and eyebolts. Install the two center cap screws and washers in the input pump inspection cover (1, Illust. 7 or 8).

9. Connect the hoses and tubing between the converter, transmission and oil cooler that had to be disconnected to facilitate converter removal. Refer to the "CAUTION" following step 5 when connecting hose (4) at point (2) (Illust. 74).

10. Install the transmission drive yoke (18, Illust. 30) on the splines of the forward clutch shaft. Secure the universal to the drive yoke and to the torque converter output flange.

◆ CAUTION: REMOVE THE WIRE OR TAPE USED TO KEEP THE BEARINGS FROM FALLING FROM THE SPIDER TRUNNIONS. IF INSTALLING A NEW SPIDER AND BEARING ASSEMBLY, REMOVE THE SOFT IRON STRAP ATTACHED TO THE BEARING CAPS. THIS WILL ELIMINATE THE POSSIBILITY OF THE STRAPS OR WIRE BREAKING LOOSE FROM THE CAPS AND CAUSING PERSONAL INJURY WHEN THE ENGINE IS RUNNING.

11. LOADERS ONLY: Position the equipment pump in the converter housing transferring the hoist sling as was done in removal and secure the pump with the mounting bolts. Connect the outlet line to the bottom of the pump.

12. Install the rear cover to the underside of the front frame.

13. If equipped with a test connection header block (10, Illust. 8), connect the three connection tubes to the main regulating valve (3, Illust. 6).

14. VERTICAL PRESSURE FILTER: Secure the pressure filter base to the front frame. Install the clutch pressure gauge tube (11, Illust. 8). On earlier units the tube connects to the main regulating valve, on later units to the pressure filter base. Connect the pressure filter inlet hose (9, Illust. 7 or 8) at the filter base.

HORIZONTAL PRESSURE FILTER: Install and secure the pressure filter assembly. Connect the hydraulic lines at the filter base.

15. LOADERS ONLY: Insert the rear of the equipment pump inlet tube (4, Illust. 7) into the hose connection and secure with hose clamps. Connect the front end of the tube at the top of the equipment pump with the clamp halves.

TD-20 SERIES B TRACTOR ONLY: Install and secure the inlet tube (4, Illust. 8) between the connecting hose (5) and the equipment pump. Connect the outlet hose at the pump.

16. Position the seat support bar (with suction filter and steering levers attached) on the front frame mountings and secure with the cap screws and washers.

17. Connect the hoses at the suction filter (7, Illust. 7 or 8). On earlier units, tubing was used instead of hoses. On these units, connect the flexible couplings (3, Illust. 5) at the suction filter inlet and at the suction tee (refer to Section 1, "GENERAL" for the proper method of installing a flexible coupling).

18. Connect the steering brake pull rods (2, Illust. 6) and the booster valve operating rods at the steering levers. Connect the steering booster return springs (5, Illust. 6) at the bellcranks and seat side sheets.

19. VERTICAL PRESSURE FILTER: Position the element and spring on the pressure filter base. Be sure the "O" ring on the hold-down bolt and in the filter case are in place and in good condition and secure the filter case (8, Illust. 7 or 8) to the base using a maximum of 55 ft. -lbs. on the hex-hd type hold-down bolt or from 10-15 ft. -lbs. on the cross bar type hold-down bolt.

20. Position the platform support (2, Illust. 7 or 8) (with decelerator cylinder (if equipped) and control linkage attached) between the front frame side members and secure to the front frame with the cap screws and washers. Connect the governor control linkage that had to be disconnected to facilitate removal of the platform support. If equipped with a decelerator cylinder, secure the cylinder at the rear to the seat support bar with the cap screw and washers. Then install the cylinder lines (5, Illust. 7).

21. Install and secure the seat front support to the seat support bar and seat side sheets with the cap screws, lock washers, flat washers and nuts.

22. Install and secure the LH and RH front platforms. Connect the pick-up lever rod (10, Illust. 7) to the decelerator pedal with the end pin and cotter.

23. MECHANICALLY CONTROLLED TRANSMISSION: Check that the transmission gear selector hand lever and linkage is in proper adjustment (refer to Par. 9, "SELECTOR HAND LEVER ADJUSTMENTS AND STALL TORQUE CHECK"). Do not perform the "stall torque check" at this time.

24. Position the brake pawl operating lever so it engages the brake pedal pawl and enters the opening in the seat front support. Install the two guides and two flat washers between the seat side sheet and the operating lever and secure the guides to the seat side sheet with the nuts and lock washers. Install the equipment control valve side cover on the RH fender.

25. Install the batteries and battery support (4, Illust. 6). Connect the battery cables.

26. Install and secure the seat frame. Install the seat bottom cushion.

27. Be sure the drain plugs are installed. Fill the rear frame with the proper grade of oil as specified in the operator's manual. Fill and vent the equipment hydraulic system as described in the pertinent instruction manual.

(Continued on next page)

8. INSTALLATION - Continued

◆ CAUTION: BEFORE STARTING THE ENGINE, BE SURE ALL THE FLOOR PLATFORMS ARE IN PLACE. AS SOON AS THE ENGINE STARTS, OBSERVE THE TRANSMISSION CLUTCH OIL PRESSURE GAUGE ON THE DASH. IF THE NEEDLE MOVES RAPIDLY TO THE EXTREME SIDE OF THE "CHANGE FILTER" RANGE, IMMEDIATELY TURN OFF THE ENGINE AND WAIT FOR PRESSURE TO SUBSIDE BEFORE DISCONNECTING ANY HOSES OR MAKING ANY INSPECTIONS.

28. Start the engine and check for leaks.

29. Perform the engine idle adjustments as described in Section 4, "ENGINE."

30. MECHANICALLY CONTROLLED TRANSMISSION: Perform the "Stall Torque Check" as described in Par. 9 "SELECTOR HAND LEVER ADJUSTMENTS AND STALL TORQUE CHECK."

31. Check the oil pressures in the transmission as described in Par. 10, "CHECKING TRANSMISSION OIL PRESSURE."

32. Install the platforms.

33. Install the rear cover directly below the fuel tank at the rear of the unit.

34. After one hour of operation, disassemble and clean the suction and safety filters. Remove the pressure filter case and inspect the element. Replace the element if necessary.

9. SELECTOR HAND LEVER ADJUSTMENTS AND STALL TORQUE CHECK (MECHANICALLY CONTROLLED TRANSMISSION)

(Refer to Illust. 77)

◆ CAUTION: THE ENGINE MUST NEVER BE RUNNING WHILE THE HAND LEVER ADJUSTMENTS ARE BEING MADE.

NOTE: To arrive at the proper hand lever adjustment, the linkage must be adjusted in the following sequence.

1. Place the hand lever in neutral. Insert a 5/16 inch diameter rod (approximately nine inches long) through the holes provided in the front and rear of the selector controls housing (Illust. 75 and 77). If this can be accomplished, remove the rod and move the hand lever through all positions to feel if the detent ball (in the range selector valve) fully engages in each of the positions and that there is no pressure on the hand lever when it is in the second speed forward and reverse positions. If this can be accomplished, the hand lever linkage should be in proper adjustment and the following "Stall Torque Check" should be performed. If one of the preceding operations could not be accomplished, continue as follows.

Selector Hand Lever Adjustment

2. Remove the seat bottom cushion, seat frame, batteries and battery box. Remove the batteries and battery box on the LH fender. Remove the lower access hole cover plate from the side of the selector controls housing.

3. Place the hand lever in neutral. Be sure the selector lever, keyed to the selector valve shaft, is in the neutral position (pointer on selector lever aligned with arrow on casting). Refer to Illust. 77.

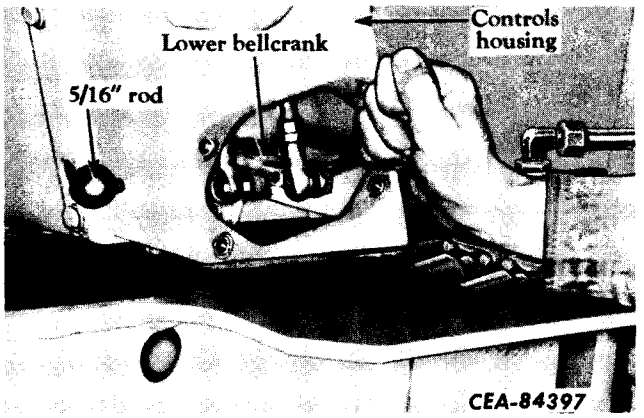
NOTE: Earlier range selector valves are equipped with an indicator bolted on the valve cover in place of the cast arrow. On these units the selector lever pointer and the bolted indicator are aligned with the valve in the "neutral" detent.

4. Disconnect the upper adjusting link ball joints at the lower bellcranks. Loosen the jam nuts at each end of the lower adjusting links.

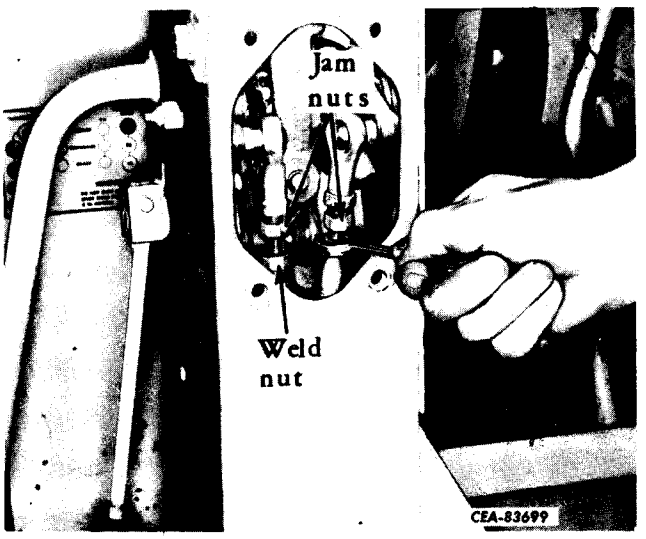
NOTE: The upper and lower adjusting links have a left hand thread on one end and a right hand thread on the other. If links were removed from the controls housing, they must be installed with the left hand threads in the position shown in Illust. 77.

5. Rotate the lower adjusting links until a 5/16 inch diameter rod (approximately nine inches long) can be inserted through the holes provided in the front and rear walls of the controls housing and the two lower rod bellcranks (Illust. 75). This rod must not be removed until all adjustments are performed. Tighten the jam nuts at each end of the lower adjusting links.

6. With the aligning rod still in position, connect the upper links to the lower bellcranks (Illust. 75). If they cannot be connected, remove the upper access hole cover plate from the rear of the controls housing and loosen the jam nuts at each end of the upper links. Use the weld nut at the top of the links and turn the links until they can be connected at the lower bellcranks (Illust. 76). Tighten the jam nuts at each end of the upper links.



Illust. 75
Securing Upper Adjusting Link to Lower Bell Crank.



Illust. 76
Turning Upper Adjusting Links to Connect at Lower Bell Cranks.

7. Remove the 5/16 inch diameter rod from the controls housing. It should come out freely without binding.

8. Move the hand lever through all the positions and feel if the detent ball (in the range selector valve) fully engages in each of the positions. If the hand lever strikes the back of the shifting gate in the second speed reverse or forward positions before the detent ball fully engages (pressure on lever) readjust as follows:

(a) Place the hand lever in the neutral position.

(b) Insert the 5/16 inch diameter rod through the controls housing and bellcranks.

(c) Disconnect the upper adjusting link (for the side hand lever touches gate) at the lower bellcrank. Loosen the jam nut and turn the clevis (one turn) to lengthen the link. Reconnect clevis to the bellcrank and tighten jam nut.

(d) Remove the 5/16 inch rod and move the hand lever through all positions to check for proper indexing of the ball poppet in the range selector valve.

Stall Torque Check

◆ CAUTION: EXTREME CAUTION MUST BE USED WHEN FOLLOWING THE STALL TORQUE CHECK PROCEDURE OUTLINED BELOW. ALL PERSONNEL EXCEPT OPERATOR SHOULD BE AWAY FROM THE TRACTOR AND ALL TOOLS AND MATERIAL AWAY FROM TRACKS.

9. Adjust brake pedal as outlined in Section 7.

10. Check transmission oil level.

11. Fully apply and lock the brake pedal.

12. Remove the rear platform (snap on type).

(Continued on next page)

9. SELECTOR HAND LEVER ADJUSTMENTS AND STALL TORQUE CHECK (MECHANICALLY CONTROLLED TRANSMISSION) - Continued

(Refer to Illust. 77)

Stall Torque Check - Continued

13. Install the batteries, battery box, seat frame and seat bottom cushion. Install the lower access hole cover plate. Install the batteries and battery box on the LH fender.

14. Start engine.

15. Place the HI-LO shift lever in HI range.

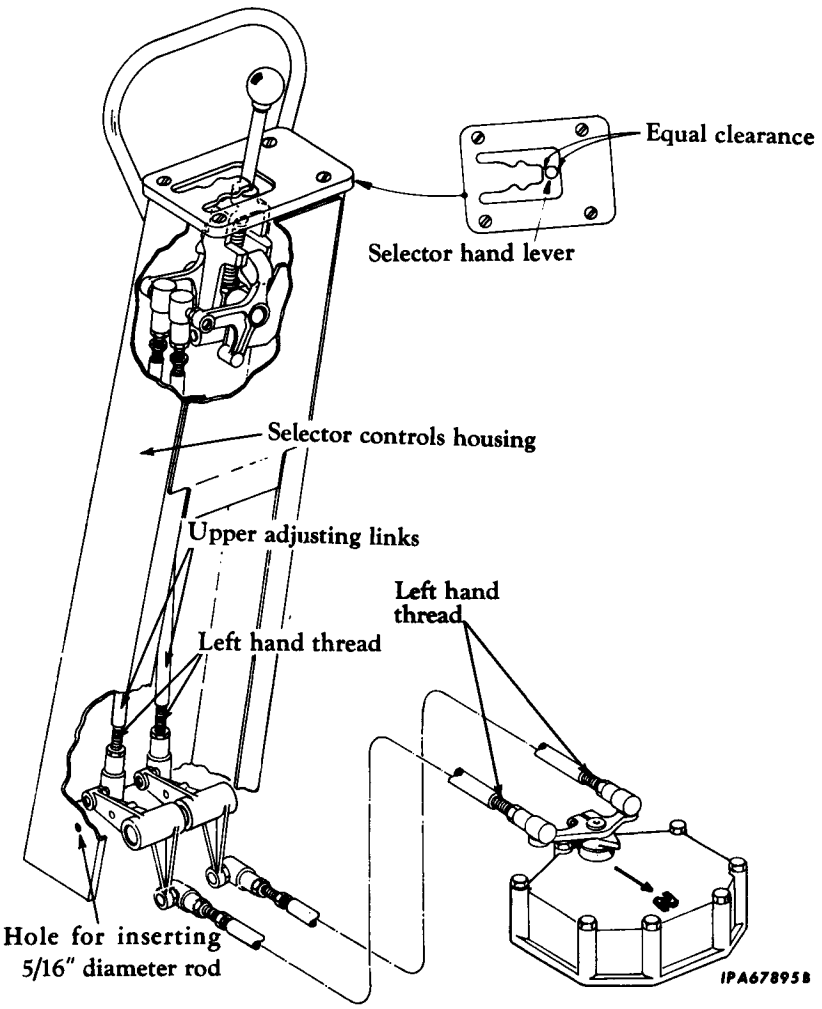
16. Place governor hand control in fully open (High Idle) position.

17. Shift transmission into each of the four speed ranges stopping momentarily in each range, while observing the universal joint. The universal joint should stop rotating in each range almost instantaneously (within one second).

18. If the universal joint continues to rotate or stops gradually, readjust the gear shift linkage and repeat step 17.

19. If after readjusting linkage step 18 still exists, the transmission is malfunctioning internally and a transmission oil pressure check should be made as outlined in Par. 10.

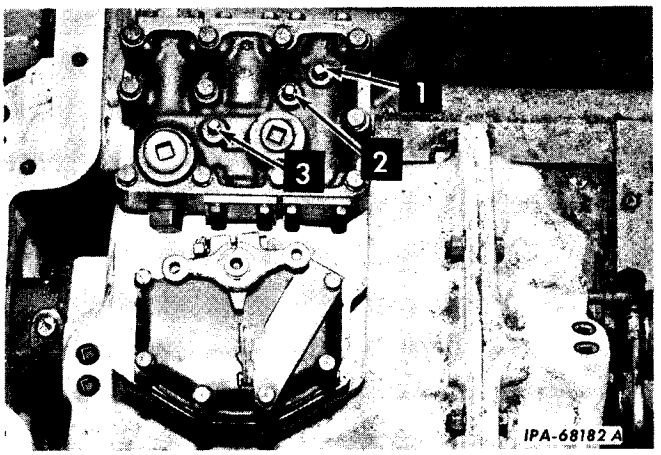
20. Secure the upper and lower access hole cover plates to the controls housing. Install the rear platform. Install the batteries and battery box on the LH fender.



Illust. 77
Selector Hand Lever Adjustment Points.

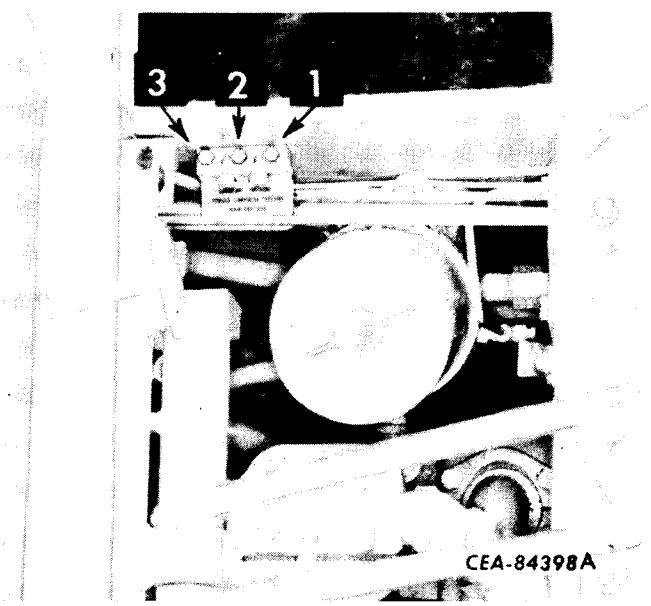
10. CHECKING TRANSMISSION OIL PRESSURE

(Ref. Nos. Refer to Illust. 78 and 79)



Illust. 78
Transmission Oil Pressure Check Points
(Transmission without Test Connection Header Block).

1. Main oil pressure.
2. Converter by-pass pressure.
3. Lubricating oil pressure.



Illust. 79
Transmission Oil Pressure Check Points
(Transmission with Test Connection Header Block) (Later Unit Shown, Earlier Units, Similar).

1. Clutch main pressure.
2. Converter by-pass.
3. Lubricating oil pressure.

◆ CAUTION: THE FOLLOWING CHECKS MUST BE MADE BY TWO MEN. ONE MAN MUST BE AT THE CONTROLS WHILE THE OTHER DOES THE CHECKING. THE BRAKE PEDAL MUST BE APPLIED AND LOCKED AND THE MANUAL HI-LO SHIFT LEVER MUST BE IN THE "NEUTRAL" POSITION UNTIL ALL PRESSURE CHECKS HAVE BEEN COMPLETED AND THE ENGINE IS SHUT OFF.

NOTE: The following pressure checks should be performed with the engine running at full throttle (governor control hand lever all the way up in the ratchet) and oil at operating temperature.

On units equipped with a test connection block (Illust. 79) only the quick disconnect platform has to be removed to connect pressure gauges. If not equipped with a test connection block, the seat frame will have to be removed and the batteries moved to connect pressure gauges at the main regulator valve (Illust. 78).

Main Pressure

Disconnect the clutch oil pressure tube at point 1, Illust. 78 or remove the pipe plug (1) (Illust. 79) and connect a 0 to 300 psi calibrated gauge in its place. Then with the engine running at full throttle, check the gauge readings with the transmission selector lever in low forward, high forward, low reverse and high reverse. On Model 250 Loader, also check gauge reading with selector lever in "fast idle" position.

The main pressure should be 200-230 psi in each position. If the main pressure does not fall within this psi range, refer to the following "DIAGNOSIS CHART." If the main pressure is still too low, add washers (18 or 19) between the valve (10) and springs (16 and 17) as required to bring the pressure up to 200-230 psi. DO NOT USE MORE THAN A TOTAL OF FOUR WASHERS (Illust. 80).

Converter Inlet Pressure

Remove the pipe plug (2) from the main regulating valve (Illust. 78) or from the test connection header block (Illust. 79) and install a 0 to 160 psi gauge. Start the engine and check pressure reading while shifting through the complete shift pattern as described previously under "Main Pressure." By-pass pressure should be from 50-80 psi in all positions except

(Continued on next page)

10. CHECKING TRANSMISSION OIL PRESSURE - Continued

Converter Inlet Pressure – Continued

"fast idle" where the pressure should be 70-110 psi. If the pressures are not within the specified range, refer to the following "DIAGNOSIS CHART."

Lubricating Oil Pressure

Disconnect the pivot brake oil line at point 3, Illust. 78 or remove the pipe plug (3) (Illust. 79) and install a 0 to 60 psi gauge. Start the engine and repeat the same checks as before. The lubrication pressure should be 10-25 psi in all positions. If the pressure is not in this range, refer to the following "DIAGNOSIS CHART."

DIAGNOSIS CHART

PROBLEM	POSSIBLE CAUSE
1. Low main pressure in all speed ranges . . .	1. a. Low oil level. b. Dirty suction filter. c. Fatigued main spring. d. Broken main spool valve spring or spring pin. e. Worn selector valve wiper.⊛ f. Worn selector valve shaft seal ring.⊛
2. Low main pressure in both forward or both reverse positions only	2. a. Damaged separator plate "O" ring. b. Warped separator plate. c. Leaking clutch shaft tube.
3. Low main pressure in one-speed position only	3. a. Worn seal rings. b. Pipe plug in clutch shaft loose.
4. Low converter inlet pressure	4. a. Low main pressure (see 1). b. Worn seal rings in the converter. c. Fatigued by-pass valve.
5. High converter inlet pressure	5. a. Stuck by-pass valve. b. Plugged safety filter.
6. Low lube pressure	6. a. Low main pressure (see 1). b. Fatigued lube spring. c. Internal clutch pack leakage.
7. High lube pressure	7. a. Stuck lube valve.

⊛ - Mechanically controlled transmission only.

MAIN REGULATING VALVE

11. REMOVAL AND DISASSEMBLY

(Ref. Nos. Refer to Illust. 81)

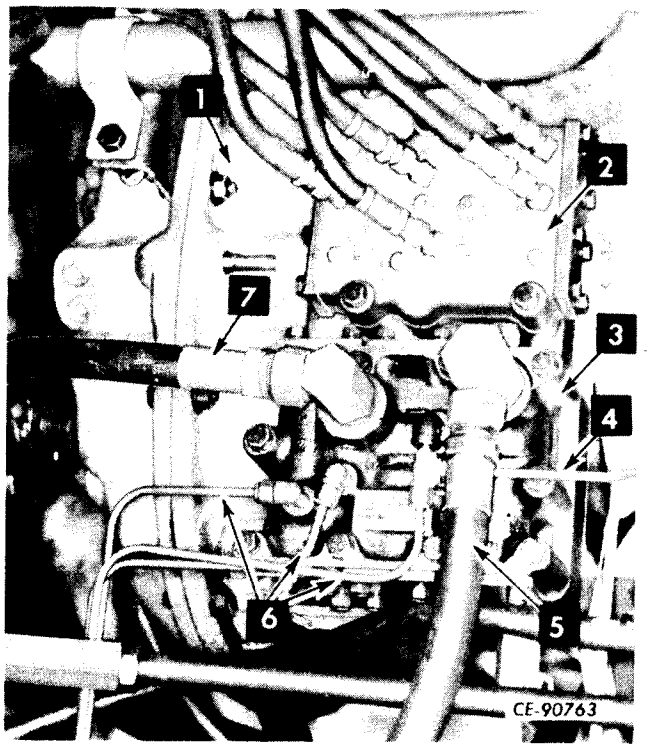
NOTE: Tag disconnected hoses and cap openings with a suitable plastic cap to prevent dust or dirt from entering. Never plug hydraulic openings with rags. If plastic caps are not available, use tape.

1. Remove the seat frame, batteries and battery support.

2. MECHANICALLY CONTROLLED TRANSMISSION: Disconnect the selector hand lever lower adjusting links at the range selector valve and move them out of the way.

3. Disconnect the converter inlet hose (7, Illust. 80) and the oil cooler outlet hose (5) at the main regulating valve. Disconnect the test connection block tubes (6) and the pivot brake tube (4) at the main regulating valve. Bend the tubes out of the way. Earlier transmissions than that shown in Illust. 80 will have different tube connections and should be disconnected accordingly.

(Continued on next page)



Illust. 80
Main Regulating Valve Disconnect Points
(Hydraulically Controlled Transmission Shown, Others Similar.)

1. Transmission case.
2. Range selector valve.
3. Main regulating valve.
4. Pivot brake oil cooling tube.
5. Oil cooler outlet hose.
6. Test connection header block-to-valve pressure tubes.
7. Torque converter inlet hose.

MAIN REGULATING VALVE

11. REMOVAL AND DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 81)

4. Remove the cap screws and washers securing the valve (3, Illust. 80) to the top of the transmission case (1) and remove the valve assembly. Discard the mounting gasket (14, Illust. 81).

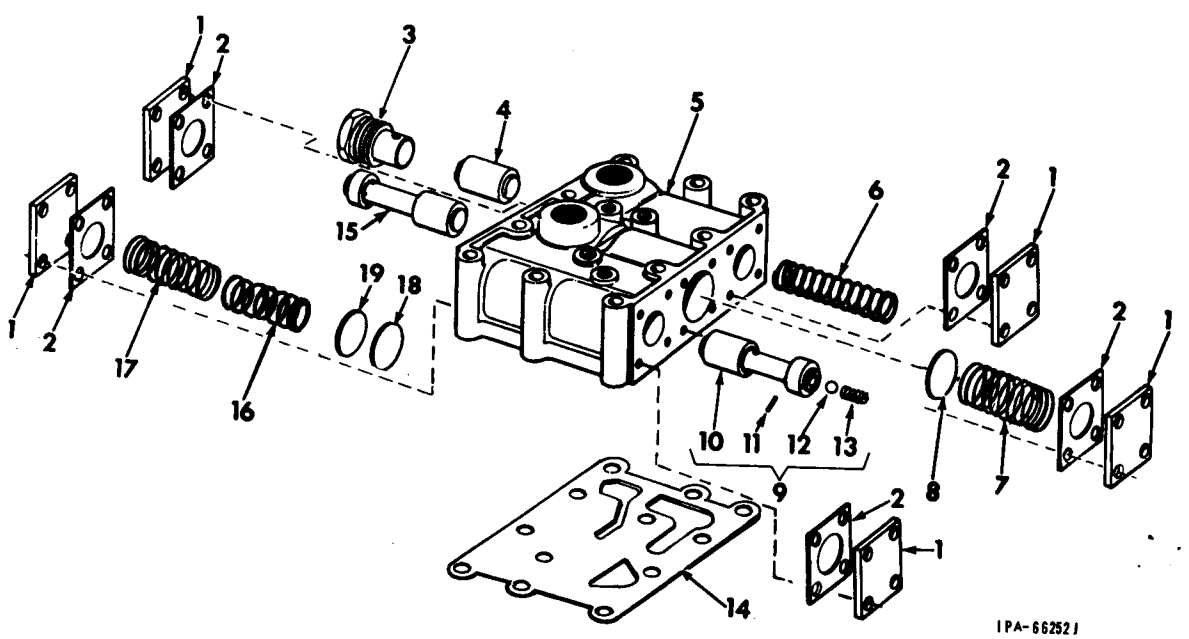
5. Remove the valve cover (1) and gasket opposite the plug (3). Tip the valve body to remove the valve (4) and spring (6).

6. Remove the valve cover and gasket next to the plug (3) and remove the by-pass valve (15) from the valve body. Remove the plug (3) from the valve body.

7. Turn the valve body around and remove the valve cover and gasket from the spring end. Tilt the body and the spring (7) and washer (8) will slide out.

8. Remove the valve cover and gasket from the valve end of the body and tip the body to remove the valve assembly (9). To disassemble the valve, drive out the pin (11) and tip the valve down to allow the spring (13) and ball (12) to fall free of the valve (10).

9. Remove the remaining valve cover and gasket and lift out the main regulating valve springs (16 and 17). Tip the valve body to remove the spring washers (18 and 19).



Illust. 81
Exploded View of Main Regulating Valve Assembly.

1. Valve cover.
2. Gasket.
3. Plug.
4. Lubricating pressure regulating valve.
5. Valve body.
6. Valve spring.
7. Valve spring.
8. Spring washer.
9. Main regulating valve assembly.
10. Valve.
11. Pin.
12. Ball.
13. Main spool valve spring.
14. Gasket.
15. By-pass valve.
16. Main pressure regulating spring (inner).
17. Main regulator valve spring.
18. Spring washer.
19. Spring washer.

MAIN REGULATING VALVE

12. INSPECTION AND REPAIR

1. Clean all parts in a suitable cleaning solution and blow dry with compressed air. Be sure that all the oil passages in the valve body are free of foreign particles and dirt. Be sure the relief passage in the by-pass valve and the oil passages in the main regulating valve are clean and free of any obstruction.

2. Inspect the parts for excessive wear and replace if necessary.

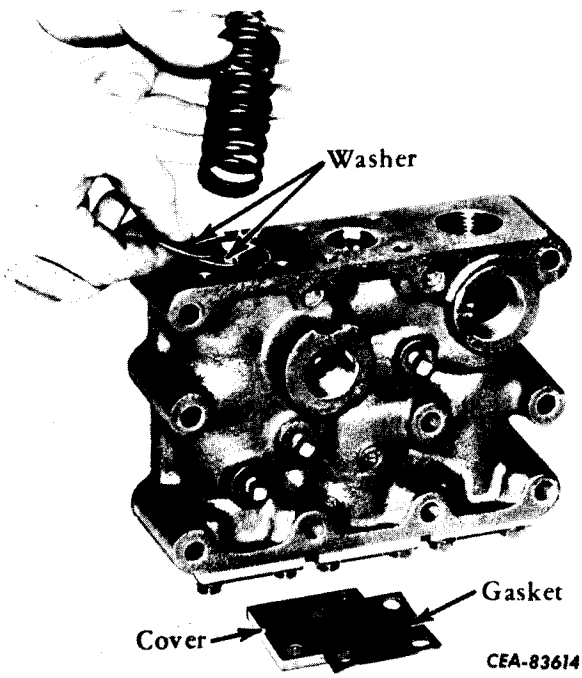
3. Inspect the condition of the valve springs. If they are not within the specifications as described in Par. 2, "SPECIFICATIONS," they must be replaced.

13. REASSEMBLY AND INSTALLATION

(Ref. Nos. Refer to Illust. 81)

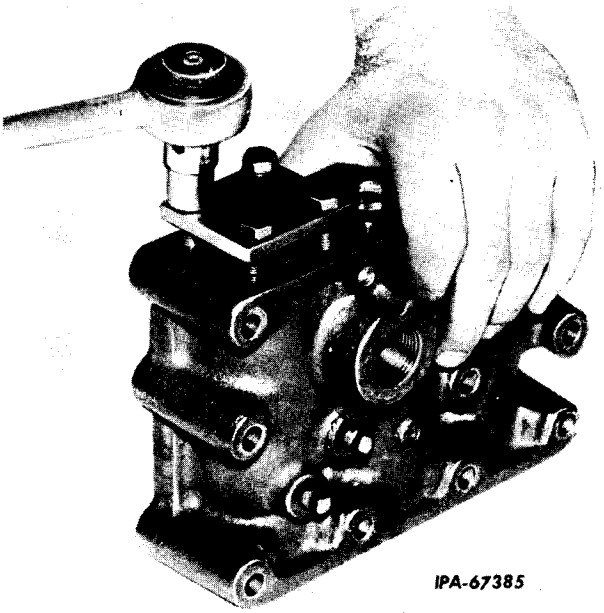
NOTE: Use new gaskets and lubricate the valves and valve bores with transmission oil upon reassembly.

1. In the end bore, place the same amount of spring washers (18 and 19) that were removed. Be sure washers are not cocked and install the inner regulating spring (16) and main regulating valve spring (17). Install and secure the valve cover and gasket (Illust. 82).



Illust. 82
Installing Main Valve Springs and Washers.

NOTE: Because of the tension exerted by the spring assemblies (16 and 17) it will be necessary to use longer cap screws to tighten the cover (1) down until the regular cap screws can be installed (Illust. 83).



Illust. 83
Installing Main Valve Spring Cover and Gasket.

NOTE: If the main regulating valve assembly (9) was disassembled, insert the ball (12) and spring (13) into the opening in the valve (10) and secure with pin (11).

2. Turn the valve body over and install the main regulating valve assembly (9) in the other end of the bore so the end of the valve with the long land is started in first. Install the valve cover and gasket.

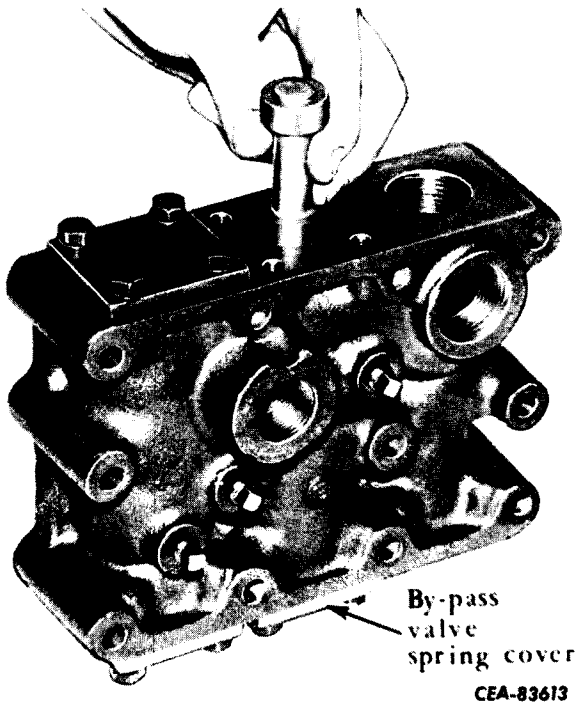
3. In the center bore, insert the washer (8) and after being sure the washer is not cocked, install the spring (7) on the washer and secure with the valve cover and gasket (Illust. 84).

4. Turn the valve body over and in the other end of the center bore install the by-pass valve (15) so the end with the long land starts in first (Illust. 84). Install the valve cover and gasket.

(Continued on next page)

13. REASSEMBLY AND INSTALLATION - Continued

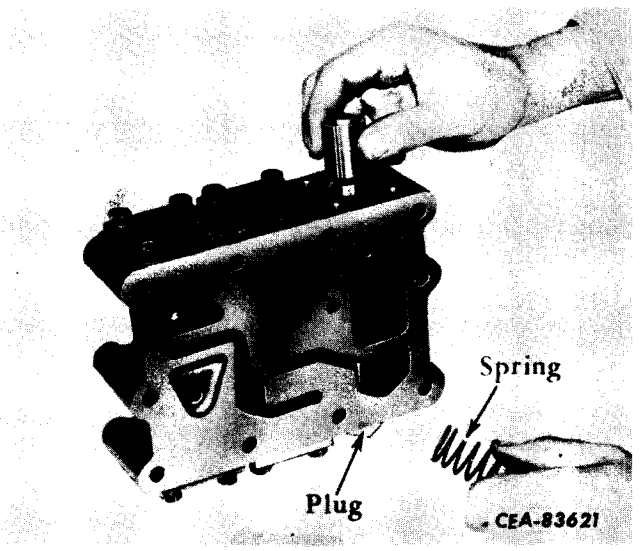
(Ref. Nos. Refer to Illust. 81)



Illust. 84
Installing the By-Pass Valve.

5. Install the plug (3) in the end bore, then turn the valve body over and insert the valve (4) and spring (6) into the valve body from the other end and secure with the valve cover and gasket (Illust. 85).

NOTE: The valve (4) can be installed with either end starting in the valve body first; but because of the design of the valve body bore, the valve must be installed from the side opposite the plug to prevent the possibility of marring the valve surface.



Illust. 85
Installing the Lubricating Pressure Regulating Valve and Spring.

6. Position the valve body gasket (14) and valve body (5) on the hydraulic valve spacer (mounted on the transmission case) and secure with the cap screws and washers.

NOTE: Always tighten the cap screws in sequence from the center of the housing to the outside.

7. Connect the tubes (4 and 6, Illust. 80) to the valve housing. Connect the oil cooler outlet hose (5) and the converter inlet hose (7) at the valve housing. On earlier transmissions than that shown in Illust. 80, connect existing hydraulic lines accordingly.

8. MECHANICALLY CONTROLLED TRANSMISSION: Connect the selector hand lever lower adjusting links to the range selector valve.

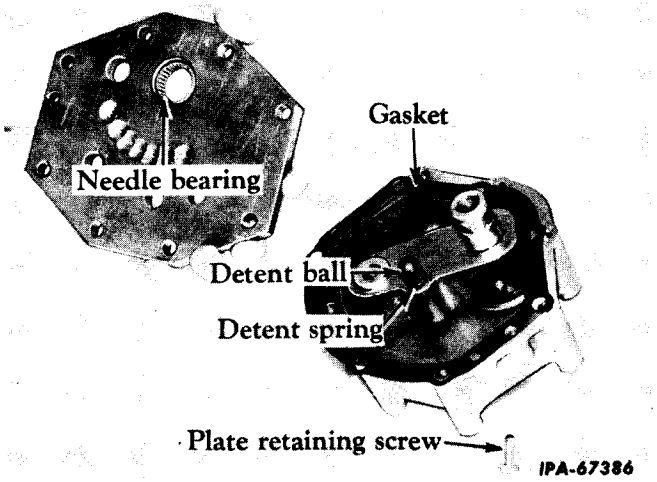
9. Install the batteries, battery support and seat frame.

RANGE SELECTOR VALVE
(MECHANICALLY CONTROLLED TRANSMISSION)

14. REMOVAL AND DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 86)

7. Separate the valve plate and cover and discard the gasket (4). If the needle bearing (22) needs replacement, it can easily be pressed from the plate (Illust. 88).



Illust. 88
Removing the Valve Plate.

8. Remove the detent ball (20), spring (19) and spring retainer (17) from the valve (9, Illust. 88).

9. Lift out or lightly tap out the shaft assembly (21) from the cover (14).

10. Remove the thrust washers (10) and bearing (11) from the shaft.

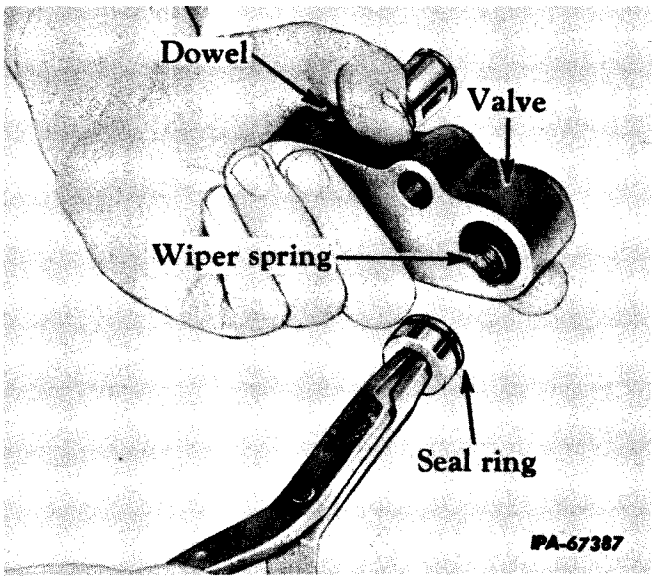
11. Remove the valve wiper (6) and wiper spring (8) from the valve and pull the seal ring (7) from the wiper (Illust. 89).

12. Use a screwdriver to remove the seal ring (13) (if equipped) from the valve cover (Illust. 90). Discard this ring.

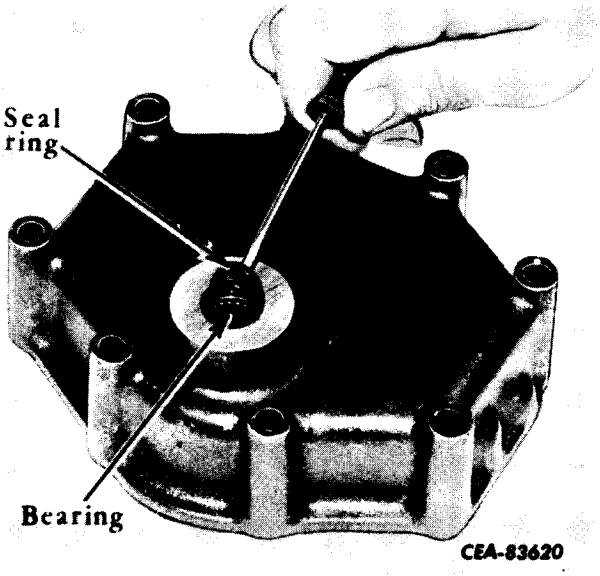
13. Use a standard type puller to remove the bearing (12) from the cover (Illust. 90).

14. Remove the seal (26) and washer (27) from the cover.

NOTE: Do not disassemble the shaft assembly (21). If either the shaft or valve (9) is damaged, a new shaft assembly (21) must be installed.



Illust. 89
Removing the Valve Wiper.



Illust. 90
Removing Valve Cover Seal Ring on Earlier Type Valve Assemblies.

15. INSPECTION AND REPAIR

1. Clean all parts in a suitable cleaning solution and blow dry with compressed air. Be sure the oil passages in the shaft and valve are clean and free of any obstruction.

2. Inspect the bearings and thrust washers for excessive wear, nicks or cracks and replace if necessary.

3. Replace all gaskets and seal rings.

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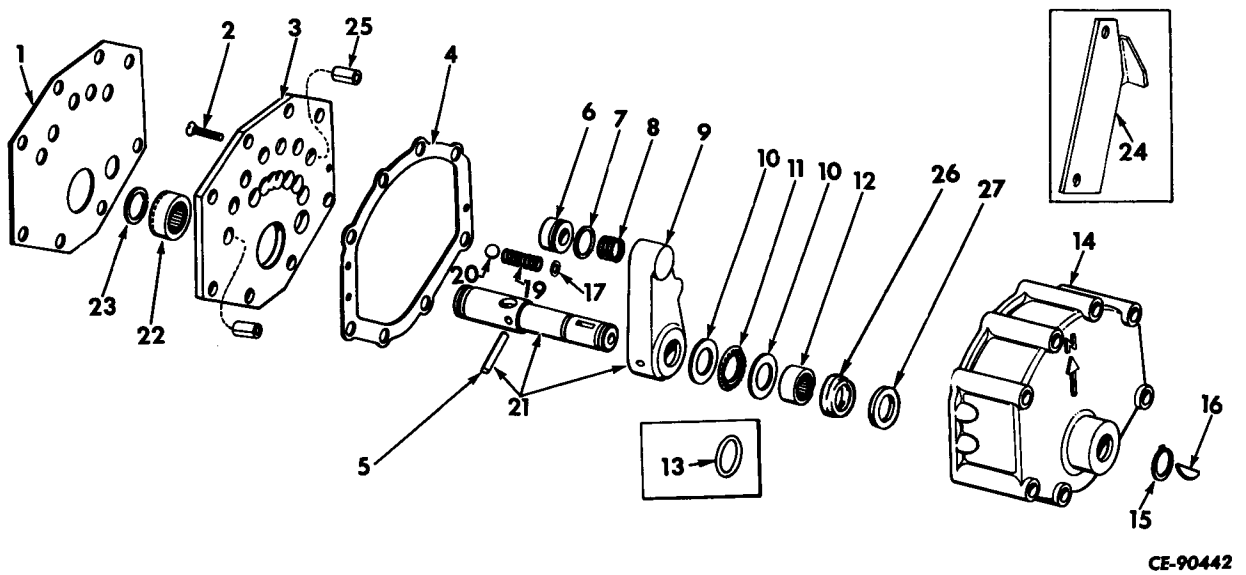
RANGE SELECTOR VALVE
(MECHANICALLY CONTROLLED TRANSMISSION)



Illust. 86
Exploded View of Range Selector Valve Assembly.

1. Plate gasket.
2. Cap screw.
3. Plate.
4. Cover gasket.
5. Dowel.
6. Wiper.
7. Seal ring.
8. Wiper spring.
9. Valve.
10. Thrust washer.
11. Thrust bearing.
12. Bearing.
13. Seal ring (earlier type valve only).
14. Valve cover.
15. Snap ring.
16. Key.
17. Spring retainer.
19. Spring.
20. Detent ball.
21. Shaft and valve assembly.
22. Bearing.
23. Seal ring.
24. Fixed indicator.
25. Roll pin.
26. Shaft seal.
27. Back-up washer.

14. REMOVAL AND DISASSEMBLY

(Ref. Nos. Refer to Illust. 86)

1. Remove the rear platform (snap on type).

2. Remove the seat frame, batteries and battery box.

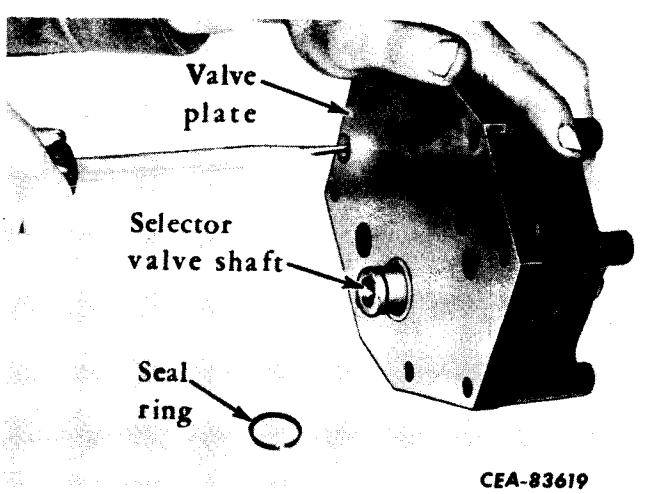
3. Disconnect the selector hand lever lower adjusting links from the selector lever on the shaft assembly (21). Remove the cap screws and washers securing the valve assembly to the transmission case and remove the assembly, fixed indicator (if equipped) and gasket (1).

4. Remove the cap screw, nut and washer from the selector lever. Remove the selector lever from the shaft (21).

5. Remove the woodruff key (16) and the lower snap ring (15) from the shaft.

6. Remove the seal ring (23) from the selector valve shaft. Then remove the screw (2) securing the plate (3) to the valve cover (Illust. 87).

(Continued on next page)



Illust. 87
Removing the Valve Plate Mounting Screw.

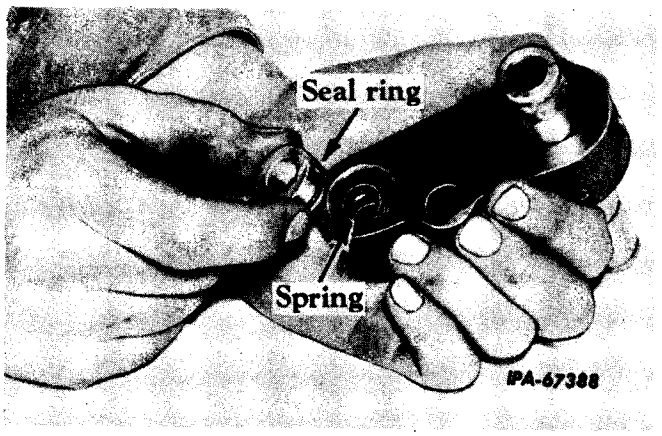
RANGE SELECTOR VALVE
(MECHANICALLY CONTROLLED TRANSMISSION)

16. REASSEMBLY AND INSTALLATION

(Ref. Nos. Refer to Illust. 86)

1. Place the washer (27) in the cover bore. Next, install the seal (26) with the grooved side up until it bottoms on the washer. Press in the bearing (12) flush with the cover bore. Press only on the flat numbered side of the bearing.

2. Place the seal ring (7) on wiper (6). Install the spring (8) into the bore of the valve (9) and place the wiper on the spring with the seal ring (7) closest to the spring (Illust. 91).



Illust. 91
Installing Valve Wiper and Spring into Selector Valve.

3. Install one thrust washer (10); then install the bearing (11) and the other thrust washer (10) on the shaft. Insert the shaft and valve assembly into the cover until the lower snap ring groove in the shaft is uncovered and install the snap ring (15).

4. Lay the spring retainer (17) in the bore of the valve (9). Place the spring (19) and the detent ball (20) on the retainer (Illust. 88).

5. If it was removed, press the bearing (22) into the valve plate (3), allowing the bearing to extend .08 inch beyond the bottom side of the plate. Install the new gasket (4) on the cover. Be sure not to install the gasket upside down covering the tapped screw hole.

6. Install the plate (3) on the cover and gasket, compressing the springs in the valve (9). Secure the plate to the cover with the cap screw (2). Install the seal ring (23) and key (16) on the shaft (Illust. 87).

7. Install the selector lever over the key (16). Install the selector lever cap screw, nut and washer.

8. Position the gasket (1) on the spacer on the top of the transmission case. Position the valve assembly on the gasket.

9. Place the fixed indicator (24, if equipped) on the valve cover (14) so that the raised flange is in line with the arrow on the cover.

10. Secure the valve assembly with the cap screws and washers.

11. Connect the selector hand lever lower adjusting links to the selector lever.

12. Install the batteries, battery box and seat frame.

13. Install the rear platform (snap on type).

RANGE SELECTOR VALVE
(HYDRAULICALLY CONTROLLED TRANSMISSION)

17. REMOVAL AND DISASSEMBLY

(Ref. Nos. Refer to Illust. 92)

NOTE: Tag disconnected hydraulic lines and cap hydraulic openings to prevent dirt or dust from entering.

1. Remove the seat frame, batteries and battery support.

2. Disconnect the hydraulic hoses at the range selector valve (2, Illust. 80).

3. Remove the cap screws and washers securing the valve assembly to the top of the transmission case. Remove the valve assembly and discard the valve mounting "O" rings.

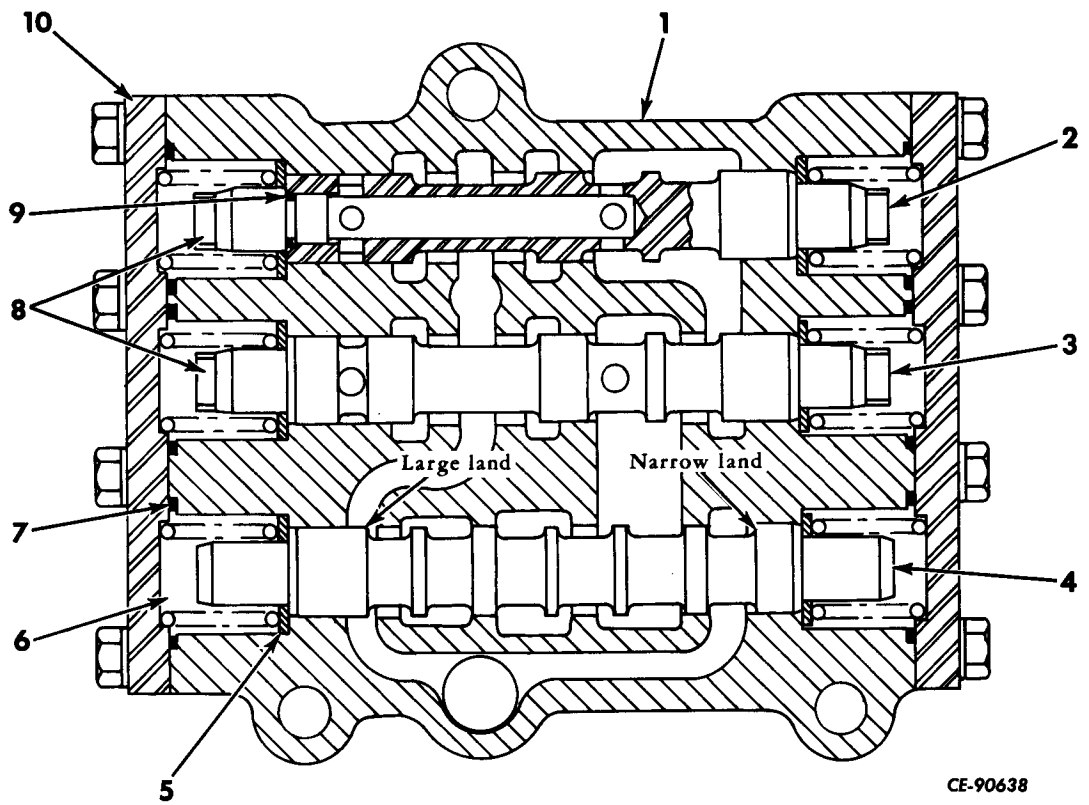
4. Remove the cap screws and lock washers securing the end cover (10) to the valve housing and remove the end cover.

5. Lift out the three spool centering springs (6) from the housing bore. Remove the three sealing rings (7) from the counterbore in the housing and discard them.

6. Tip the housing slightly to expose the valve spool ends and carefully pull each spool from the housing. Remove the spring retainer (5) from each spool.

7. Remove the end cover, sealing rings, centering springs and spring retainers from the opposite end of the housing in the same manner.

8. Unthread the spool plug (8) from the forward and the reverse valve spools. Remove the sealing ring (9) from the spool plug and discard it.



Illust. 92
Range Selector Valve Cross Section.

1. Valve housing.
2. Forward valve spool.
3. Reverse valve spool.
4. Lock-out spool.
5. Spring retainer.
6. Centering spring.
7. Sealing ring.
8. Spool plug.
9. Plug sealing ring.
10. End cover.

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RANGE SELECTOR VALVE (HYDRAULICALLY CONTROLLED TRANSMISSION)

18. INSPECTION AND REPAIR

1. It is recommended that all new sealing rings be installed upon reassembly of the valve.

2. Clean all reusable parts in a suitable solvent and blow dry with compressed air. Be sure all drilled and cored passages are clean and free of obstruction.

3. Check all threads for damage. Repair damaged threads with a thread file or stone or replace part as necessary.

4. Inspect the valve spools for excessive wear and scratches. Inspect the bores in the housing for grooving and scratches. If a defect cannot be corrected by light polishing, the part must be replaced.

5. Inspect the condition of the valve spool centering springs. If they are damaged or do not fall within the specifications shown in Par. 2, "SPECIFICATIONS" they must be replaced.

19. REASSEMBLY AND INSTALLATION

(Ref. Nos. Refer to Illust. 92)

1. Place a new sealing ring (9) on each of the plugs (8) and thread the plugs into the forward and reverse spool ends using 5 to 7 ft. -lbs. torque.

2. Place the housing (1) on end so the side with the cast letters, "R," "R1" and "F2" is up. Place a spring retainer (5) in each of the spool bores and a new sealing ring (7) in each of the counterbores.

3. Place a centering spring (6) in each bore and install the end cover (10) on the springs being sure each spring is seated properly in the end cover counterbores. Secure the end cover to the housing with the lock washers and cap screws.

4. Turn the housing over so the open bores are up. Lubricate the valve spools with the same type fluid used in the system and carefully install them into the housing until they bottom against the spring retainers (5).

The forward and reverse spools (2 and 3) are interchangeable and must be installed in the housing so the spool plug (8) is up. The lockout spool (4) must be installed so the end with the large land is up.

5. Insert a spring retainer (5) over each of the spools being sure it bottoms in the bore. Install the sealing rings (7), centering springs (6) and end cover (10) as was done previously on the opposite side of the housing.

6. Install new mounting "O" rings in the spacer plate on the transmission case (1, Illust. 80). Install and secure the valve assembly to the transmission.

7. Connect the hydraulic hoses to the valve body. Install the battery support, batteries and seat frame.

PILOT CONTROL VALVE (HYDRAULICALLY CONTROLLED TRANSMISSION)

20. REMOVAL

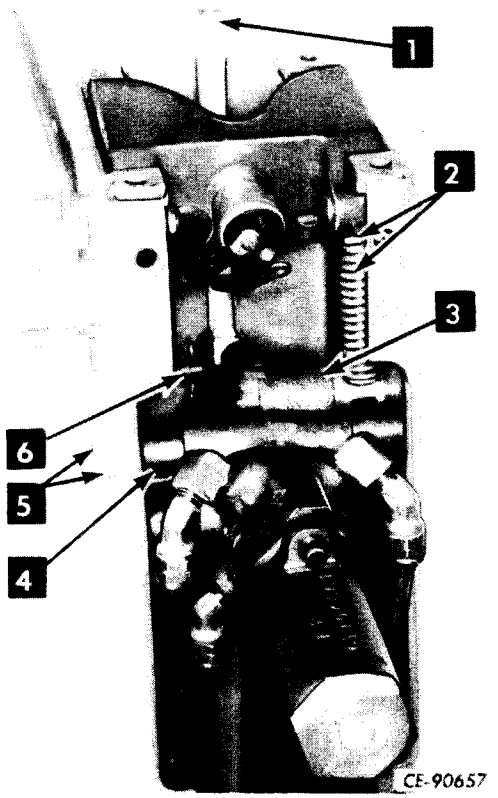
(Ref. Nos. Refer to Illust. 93)

1. Remove the seat frame, battery support and batteries.

2. Disconnect the starting switch cable harness coming from the bottom of the control tower.

3. Remove the two cap screws and lock washers securing the hydraulic manifold (1, Illust. 6) to the bottom of the control tower and allow the manifold with hoses to lay on the transmission. Discard the sealing rings in the manifold counterbores.

4. Unthread the handle from the control valve lever (1). Remove the four cap screws securing the lever gate to the housing and remove the gate. Remove the cap screws and lock washers securing the cover to the housing and remove the cover.



Illust. 93
Pilot Control Valve Disconnect Points.

1. Pilot control valve lever.
2. Safety lock mechanism.
3. Valve body.
4. Mounting spacer.
5. Mounting cap screws.
6. Valve lever end pin.

5. Remove the hardware securing the control tower housing to the seat LH side sheet and remove the housing assembly from the tractor.

6. Disconnect the hydraulic oil tubes at the bottom of the control tower housing.

7. Remove the cotter and end pin (6) securing the valve lever to the spool and remove the lever (1) from the housing.

8. Remove the four cap screws (5), washers, and spacers (4) securing the control valve body (3) to the housing. Maneuver the valve assembly to free it from the safety lock mechanism (2) and remove the valve with oil tubes attached. Remove the oil tubes from the valve body.

21. DISASSEMBLY

(Ref. Nos. Refer to Illust. 94)

1. Clamp the valve assembly in a vise with the spool (1) down. Only light pressure must be used and the valve body (6) protected from the vise jaws with a soft material to prevent damage.

2. Unscrew the cap (15) with filter (16) from the end of the housing.

3. Insert a brass rod into the housing (7) and slowly apply pressure on the indexing ball (13). When the indexing ball is free of the poppet balls (14), pull the sleeve (8) from the housing. Slowly release the pressure of the brass rod on the ball until the spring (12) is completely extended.

4. Remove the assembly from the vise. Tip the housing down to free the four poppet balls, indexing ball and spring.

5. Insert a drift in the spool eye and unthread the spool (1) from the spool extension (10) using finger pressure to hold the spool extension from turning. If necessary, place the assembly in the vise and apply pressure against the end of the spool extension to break the initial torque.

6. Remove the spool extension with pin (11) and sealing ring (9) from the housing bore. Discard the sealing ring. Slowly pull the spool (1) from the valve body (6).

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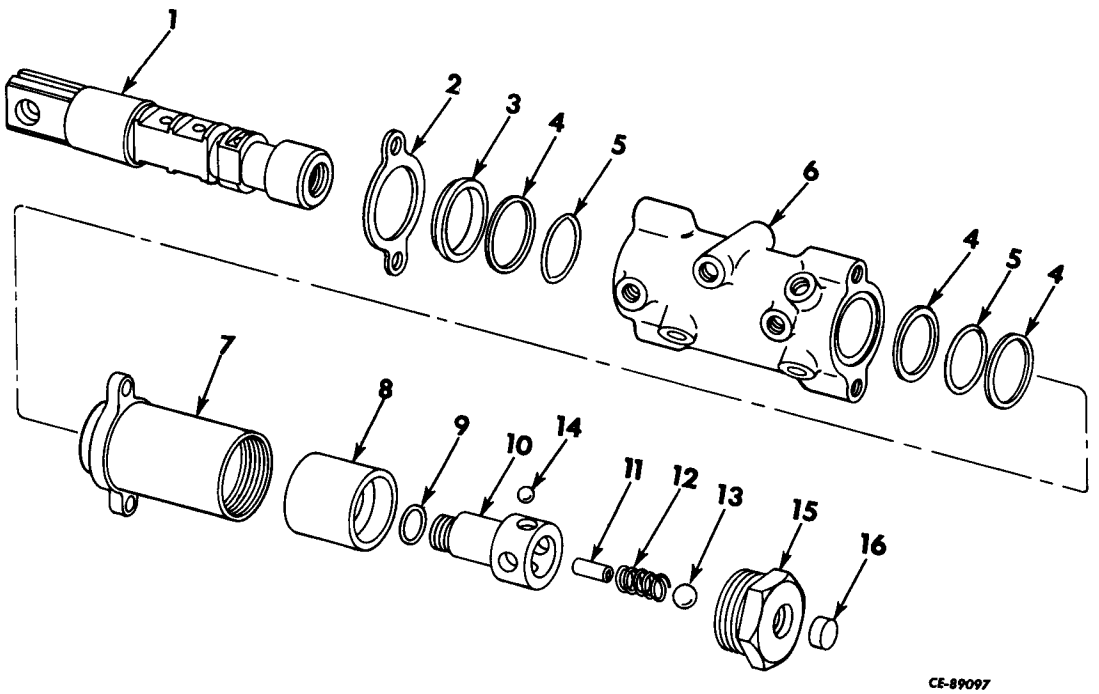
PILOT CONTROL VALVE
(HYDRAULICALLY CONTROLLED TRANSMISSION)



Illust. 94
Exploded View of Pilot Control Valve.

1. Spool.
2. Seal retainer.
3. Wiper ring.
4. Back-up ring.
5. Sealing ring.
6. Valve body.
7. Detent housing.
8. Detent sleeve.
9. Sealing ring.
10. Spool extension.
11. Stop pin.
12. Indexing spring.
13. Indexing ball.
14. Poppet ball.
15. Housing cap.
16. Bronze filter.

7. Remove the two cap screws securing the housing (7) to the valve body and separate the parts. Remove the sealing ring (5) and two back-up rings (4) from the valve body pilot bore. Discard the sealing ring and back-up rings.

8. Remove the two cap screws securing the retainer (2) to the valve body and remove the retainer.

9. Remove the wiper ring (3), back-up ring (4) and sealing ring (5) from their respective bores in the valve body. Discard the sealing ring and back-up ring.

22. INSPECTION AND REPAIR

1. It is recommended that all rubber rings be discarded and replaced with new ones.

2. Clean all parts in a suitable solvent and dry. Check all cored passages and oil ports to be sure they are clean and free of obstruction.

3. Check parts for excessive wear and damage such as cracks, deep scratches or defective threads. If an existing defect cannot be repaired, the part must be replaced.

4. Inspect the valve spool and body bore for excessive wear, scoring or scratches. If the part is excessively worn or if the defect cannot be corrected by light polishing, it must be replaced.

5. Check that the bronze filter in the bore of the detent housing cap is in good condition and is not loose. Check the condition of the indexing spring. If it is damaged or does not fall within the specifications given in Par. 2, "SPECIFICATIONS" it must be replaced.

PILOT CONTROL VALVE
(HYDRAULICALLY CONTROLLED TRANSMISSION)

23. REASSEMBLY

(Ref. Nos. Refer to Illust. 95)

NOTE: All sealing rings and the valve spool should be lightly lubricated with the same type fluid used in the system to facilitate ease of assembly.

1. Clamp the spool extension (12) in the vise with the spring bore up. If the stop pin (5) was removed, be sure to install the pin until it bottoms in the extension bore.

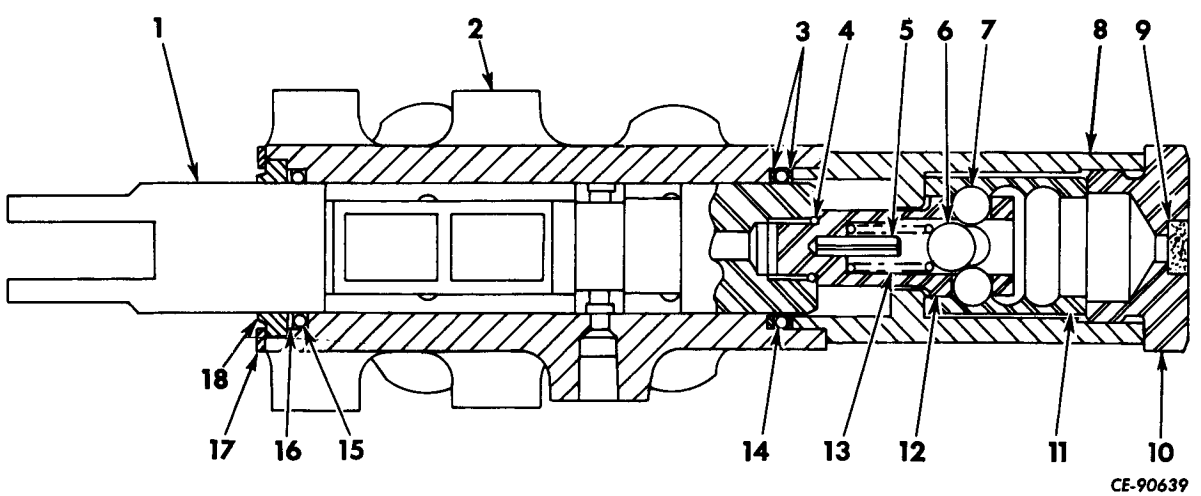
2. Place the spring (13) in the extension bore over the stop pin. Place a heavy coat of chassis lubricant on the end of the spring and in the poppet ball holes of the spool extension. Position the indexing ball (6) on the spring.

3. Place the detent sleeve (11) over a brass rod and hold both items with one hand. Push down on the indexing ball with the rod and install the four poppet balls (7) in the spool extension until they are approximately flush with the outside diameter. Keeping a constant pressure on the rod, lower the detent sleeve over the spool extension and poppet balls. Release the pressure on the rod, allowing the indexing ball to move against the four poppet balls, causing them to move outward into the sleeve to lock the assembly in place. Spin the sleeve to be sure it is locked in place.

4. Remove the assembly from the vise and install a new sealing ring (4) in the groove provided on the spool extension.

5. Place the body (2) in the vise with the double counterbore end up. Install a new sealing ring (15) and back-up ring (16) in the smaller counterbore. The back-up ring must be installed so the concave side is against the sealing ring. Install the wiper ring (18) in the large counterbore and secure in position with the retainer (17) and two cap screws.

6. Reverse the body (2) in the vise so the single counterbore end is up. Install the two back-up rings (3) and sealing ring (14) until



Illust. 95
Pilot Control Valve Cross Section.

1. Spool.
2. Body.
3. Back-up ring.
4. Sealing ring.
5. Stop pin.
6. Indexing ball.
7. Poppet ball.
8. Detent housing.
9. Bronze filter.
10. Housing cap.
11. Detent sleeve.
12. Spool extension.
13. Indexing spring.
14. Sealing ring.
15. Sealing ring.
16. Back-up ring.
17. Seal retainer.
18. Wiper ring.

PILOT CONTROL VALVE (HYDRAULICALLY CONTROLLED TRANSMISSION)

they bottom in the bore. The assembly is installed correctly when the sealing ring (3) is encircled by the concave portion of the two back-up rings.

7. Carefully pilot the detent housing (8) into the valve body. Secure the detent housing with the two mounting screws using 19 to 21 ft. -lbs. torque.

8. Insert the assembled spool extension and detent sleeve into the detent housing bore.

9. Carefully insert the spool (1) through the valve body until it contacts the spool extension. At this point, a brass rod of the proper diameter must be used to apply pressure on the end of the spool extension as the spool is threaded on the other end using 5 to 7 ft. -lbs. torque.

10. Thread the cap (10) with bronze filter (9) into the end of the detent housing. Remove the assembly from the vise.

24. INSTALLATION

(Ref. Nos. Refer to Illust. 93)

1. Connect the oil tubes to the valve body (3). Position the valve body with tubes in the housing so the pivot shaft of the safety lock mechanism (2) enters the valve body bore. Secure the valve assembly in the housing with the four spacers (4), lock washers and cap screws (5).

2. Position the valve lever (1) in the housing and secure it to the valve spool with the cotter and end pin (6).

3. Connect the hydraulic oil tubes to the bottom of the control tower housing.

4. Position the control tower housing on the LH fender and secure it to the seat LH side sheet with the mounting hardware.

5. Install and secure the lever gate to the top of the housing. Install the lever handle.

6. Install new sealing rings in the hydraulic manifold counterbores and secure the manifold (1, Illust. 6) to the bottom of the control tower housing.

7. Connect the starting switch cable harness. Secure the cover to the control lever housing.

8. Install the battery support, batteries and seat frame.

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

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CONTENTS

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TD-20 SERIES B AND MODEL 250 AND 250 SERIES B LOADERS STEERING SYSTEM SERVICE CHART

STEERING PLANETARY

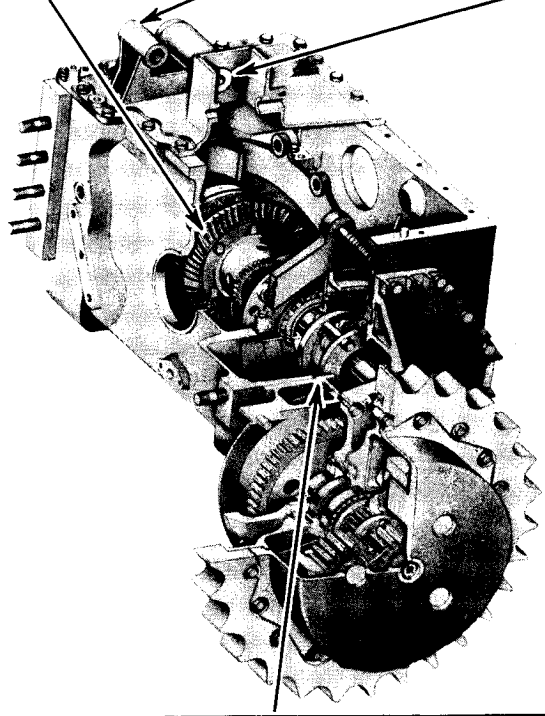
Bevel gear carrier thrust washer thickness	.091-.093
Large sun gear (42 teeth) hub OD, inches	3.186-3.184
Planet gear carrier, inches:	
Bushings ID (assembled)	5.377-5.375
Small sun gear (21 teeth) disc hub OD, inches	5.370-5.367
Disc thickness, inch	.250
Planet gear cluster (small gear, 15 teeth, large gear, 36 teeth), inches:	
Bore diameter	1.3135-1.3129
Thrust washer thickness	.0747
Planet gear cluster shaft diameter, inches	1.000-.9996
Backlash, bevel gear with transmission pinion, inch	approx. .010-.013

PIVOT BRAKE ACTUATING BELLCRANK

Shaft OD (Inches)	1.248-1.246
Bushing ID (Assembled) (Inches)	1.254-1.250

BELLCRANK PUSH ROD OUTER LEVER

Shaft OD (Inches)	1.000-.999
Bushing ID (Assembled) (Inches)	1.0004-1.0024



PIVOT BRAKES

Type	Multiple-disc, mechanical
How applied	Steering levers or foot pedal
Mounting	On sprocket drive pinion shaft

EARLIER TYPE BRAKE

Disc and lining thickness, inch	.135-.131
Steel disc thickness, inch	.095-.091
Actuating disc balls diameter, inch	⅞
Brake stud overall length, inches	7.20—7.39
Number of lined discs, each side of actuator discs	5 — 6
Number of steel discs, each side of actuator discs	4 — 5
Number of friction surfaces, each side of actuator discs	10 —12

LATER TYPE BRAKE

Separator plate thickness, inch	.121-.125
Friction plate thickness (including lining), inch	.110-.114
Actuator assembly ball diameter, inch	1
Number of lined plates	9
Number of steel plates	10

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GENERAL

1. DESCRIPTION

The steering system on this tractor combines a planetary gear type drive, steering planetary brakes and pivot brakes for making short turns. These are all located in the rear main frame (Illust. 1). The steering is manually operated by hand levers. A brake pedal applies both pivot brakes at the same time for stopping or holding the tractor. Hydraulic boosters are used as an assist for steering.

Steering Planetary (Illust. 1)

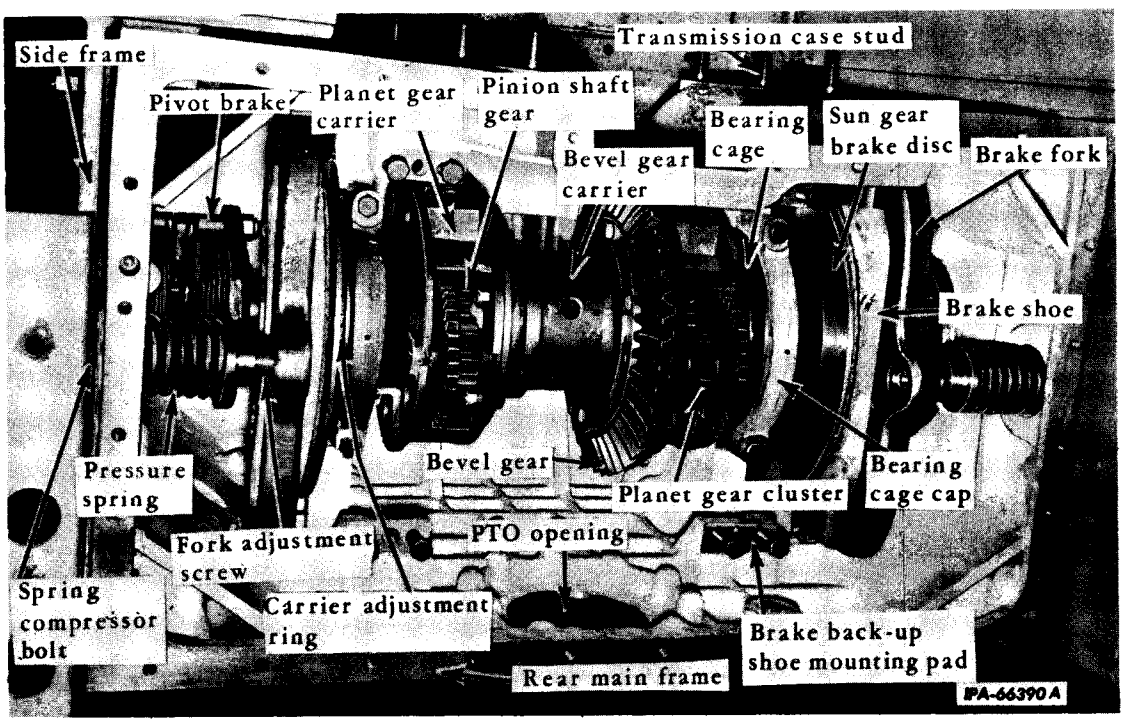
This steering-planetary unit functions as an intermediate drive crosswise between the transmission and the sprocket final planetary drives. It provides a gear reduction and permits a power disconnect on each side for turning the tractor. Power to the tracks is transmitted through the drive bevel gear bolted to the bevel gear carrier, the planetary gear carries located at both ends of the bevel gear carrier, and the sprocket drive pinion shafts out to the sprocket planetary gear drives.

The hubs of the planet gear carriers, located at the ends of the bevel gear carrier, are supported by tapered roller bearings mounted in a cage installed in the brake partitions of the main frame. The tapered bearings are preloaded by an adjustment nut in the threaded section of the bearing cages. These adjusting nuts are also used to adjust the backlash between the bevel gear and pinion. The hub of a 42 tooth gear is installed in each end of the bevel gear carrier. A bushing and the hub of a 21 tooth gear are installed in the hub of both planet gear carriers. This arrangement provides two adjacent sun gears within each planetary carrier around which the planet gear clusters rotate. Three planet gear clusters, each consisting of a 15 and 36 tooth gear, shaft and roller bearings, mesh with the large (42 tooth) and small (21 tooth) sun gears. The steering brake disc is bolted to the flanged end of the smaller sun gear hub which extends through and beyond the outer edge of the planetary carrier hubs. The sprocket drive pinion shafts extend into the steering planetary with the inner ends splined to the large sun gear installed in the bevel gear carrier hub.

Steering Planetary Brakes (Illust. 1)

Two mechanical steering planetary brakes are installed in the rear main frame; one on each

(Continued on next page)



Illust. 1
Steering Planetary and Brakes (Stationary Back-up Shoe Removed).
(Unit with Earlier Type Pivot Brake Shown.)

GENERAL

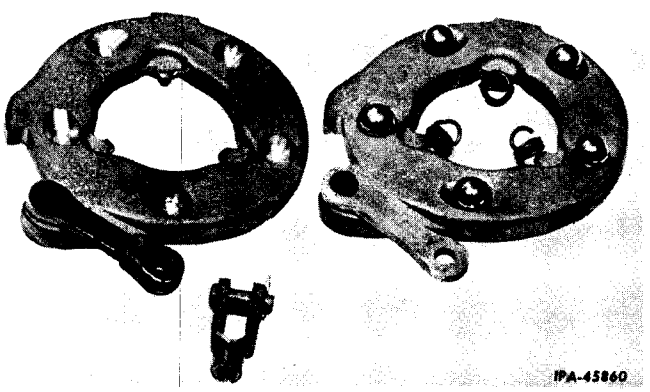
1. DESCRIPTION - Continued

Steering Planetary Brakes - Continued (Illust. 1)

side of the planetary drive unit (Illust. 1). Each steering brake assembly consists of a brake disc, an outer brake shoe installed in a movable fork (Illust. 1) and an inner stationary back-up brake shoe (not shown). The stationary, or inner brake shoe, spans the distance between both brake discs and is secured to the mounting pads shown. Crescent shaped brake linings, bonded to both ends of the stationary shoe and to the inner side of both movable shoes, make contact with the upper section of the brake discs. Springs installed inside the main frame apply pressure against the top of each fork, forcing the movable brake shoes against the brake discs. The brake shoes are released with the steering hand levers which operate the levers, bellcranks and fork push rods. When a steering lever is pulled back part way, the bellcrank moves the push rod to force the fork away from the brake disc, causing the outer brake shoe to release the sun gear disc (brake disc).

Pivot Brakes (Earlier Type) (Illust. 1 and 2).

The pivot brakes are multiple-disc type and are oil cooled by the oil in the rear main frame. Refer to the hydraulic oil flow diagram in Section 6, "TRANSMISSION (POWER SHIFT)." They are separately housed outside of the steering-planetary compartment in each side of the rear main frame. Each brake consists of ten steel intermediate discs held by the brake studs and twelve lined brake middle discs splined to the sprocket drive pinion shaft with an actuating disc assembly between them. Earlier pivot brake assemblies consisted of eight steel discs and ten middle discs.



Illust. 2
Earlier Type Pivot Brake Actuating Disc Assembly. (Later Type Similar.)

Each actuating disc assembly contains two actuator discs connected by three springs and held slightly apart by five balls trapped in matching inclined pockets or ramps. Each actuator disc is linked to the brake actuating cable.

When the brake actuating cable is pulled, it causes the two actuator discs to rotate slightly in opposite directions. This forces the five balls to roll toward the shallow end of the ramps, spreading the actuator discs apart, squeezing the lined brake discs against the stationary intermediate discs. On contact, the rotating lined brake discs cause one of the actuator discs to rotate a little further; thus, applying the brake tighter and providing a self-energizing action. The same action occurs in either forward or reverse travel. Pick-up blocks, installed at the ends of the brake pull rods, provide delayed brake action which permits the steering levers to be pulled back part way (disengaging sun gear brake disc) without applying the pivot brakes. Further travel of the steering lever applies the pivot brake.

Pivot Brakes (Later Type) (Illust. 2A)

The pivot brakes are multiple-disc type and are oil cooled by the oil in the rear main frame. They are separately housed outside of the steering-planetary compartment in each side of the rear main frame. Each brake consists of ten steel separator plates held by a retainer (6) and nine lined brake friction plates splined to a hub (3) which is splined to the sprocket drive pinion shaft.

Each brake has an actuator assembly which consists of a pressure plate (1) and a brake actuator (4) connected by three springs (2) and held slightly apart by five balls trapped in matching inclined pockets or ramps.

When the brake actuating cable is pulled, it causes an actuating lever to rotate slightly on its pivot shaft. The actuating lever finger (cast part of the lever) is indexed with a slot in the brake actuator causing the actuator to rotate. As this rotation occurs, the five steel balls located between the plate retainer and actuator roll toward the shallow end of the ramps forcing the actuator against the stationary separator plates and rotating friction plates. The same action occurs in either forward or reverse travel. Pick-up blocks, installed at the ends of the brake pull rods, provide delayed brake action which permits the steering levers to be pulled back part way (disengaging sun gear brake disc) without applying the pivot brakes. Further travel of the steering lever applies the pivot brake. (Refer to Illust. 40A.)

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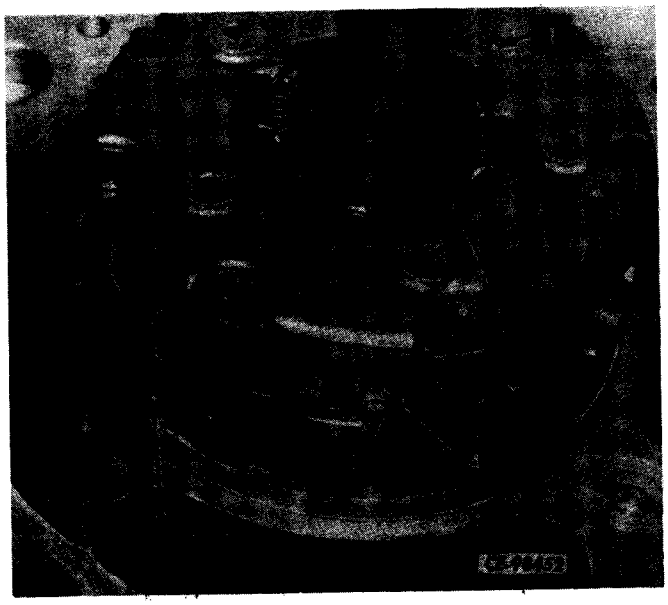
GENERAL



Illust. 2A
Pivot Brake Assembly Installed.

1. Actuator pressure plate.
2. Actuator return spring.
3. Brake hub.
4. Brake actuator.
5. Separator and friction plates.
6. Separator plate retainer.

Steering Boosters

The hydraulic steering boosters eliminate the effort to disengage the steering brake discs. The boosters are mounted on the rear main frame cover (Illust. 43). They are controlled independently by the steering hand levers and actuated by the oil in the rear main frame. Refer to the hydraulic oil flow diagram in Section 6, "TRANSMISSION (POWER SHIFT)."

Operation

With the steering lever in the forward (applied) position, the steering brake shoes hold the brake disc and attached sun gear stationary. Rotation of the bevel gear by the transmission pinion carries with it the bevel gear carrier and planetary carriers. This forces the planet gear clusters to orbit around the stationary sun gear to which the larger planet gears are meshed. The smaller planet gears, in orbit, rotate the sprocket drive pinion shaft gear which is splined to the shaft, resulting in a power output to the final drive.

As the steering lever for one side of the tractor is pulled to the rear (released) position, the steering brake releases the brake disc and small sun gear. Rotation of the bevel gear, carrier and planet gear carrier continues; but, the planet gear carrier on that side induces its rotary motion to the three planet gear clusters which now freewheel on their axis causing the sun gear and disc to rotate in the opposite direction. In a wide gradual turn, the planet gears also freewheel around the larger sun gear, allowing the sprocket drive pinion shaft to idle. There is no power output to the pinion shaft. The only reason the sprocket drive pinion shaft turns is that it is being dragged around by the opposite track.

In a pivot turn, however, the steering lever is pulled further to the rear, applying the pivot brake to the sprocket drive pinion shaft. This holds the larger sun gear stationary and allows that end of the planetary drive to freewheel around the sun gears and brake disc. The amount of pressure applied to the pivot brake determines the degree of the turn and the action of the gears in the steering planetary.

One brake pedal, equipped with a pawl and ratchet lock, applies both pivot brakes at the same time without moving the steering levers. Two pulleys (right movable, left stationary), a cable assembly connected to two brake actuating bellcranks, and a pull rod connected to the brake pedal provide the brake operating linkage. When the foot brake is depressed, the pull rod pivots the movable pulley forward, causing the cable to pull the actuating bellcranks upward to apply the brakes.

GENERAL

2. SPECIFICATIONS

Steering Planetary

Bevel gear carrier thrust washer thickness (inches)	.093 - .091
Large sun gear (42 teeth) hub OD, inches	3.186 - 3.184
Planet gear carrier, inches:	
Bushing ID (assembled)	5.377 - 5.375
Small sun gear (21 teeth) disc hub OD, inches	5.370 - 5.367
Disc thickness, inch	.250
Planet gear cluster (small gear, 15 teeth, large gear, 36 teeth), inches:	
Bore diameter	1.3135 - 1.3129
Thrust washer thickness	.070 - .076
Planet gear cluster shaft diameter, inches	1.000 - .9996
Backlash, bevel gear with transmission pinion, inch	Approx. .010 - .013

Steering Planetary Brakes

Number of linings used (each brake)	2
Lining thickness to depth of grooves, inch	Approx. 5/64
Bellcrank push rod outer lever:	
Shaft OD inches	1.000 - .999
Bushing ID (assembled), inches	1.0024 - 1.0004
Brake fork push rod bellcrank bushing ID (assembled), inches	1.0055 - 1.0015
Brake fork push rod bellcrank shaft diameter, inches	1.000 - .998
Brake fork push rod bellcrank thrust washer thickness, inch (early machines only)	.0383 - .0423
Brake fork push rod length, inches	10.795
Bellcrank push rod length, inches	2.840
Bellcrank push rod lever washer thickness, inch (early machines only)	.0383 - .0423
Steering brake bellcrank return spring:	
Free length, inches	7.25
Test length, inches	5.65
Test load, lbs	20
Steering brake pressure spring:	
Free length, inches	6-11/16
Test length, inches	5-1/8
Test load, lbs	1540
Total number of coils	8-3/4
Steering hand levers return spring:	
Free length, inches	4.06
Test length, inches	4.30
Test load, lbs	50
Free length, inches	3.89
Test length, inches	4.30
Test load, lbs	35

Pivot Brakes

Type	Multiple-disc, mechanical
How applied	Steering levers or foot pedal
Brake stud overall length (inches) (earlier type brake)	7.20
Number of lined discs, each side of actuator discs	5
Number of steel discs, each side of actuator discs	4
Number of friction surfaces, each side of actuator disc	10
Brake stud overall length inches (earlier type brake)	7.39
Number of lined discs, each side of actuator discs	6
Number of steel discs, each side of actuator discs	5
Number of friction surfaces, each side of actuator discs	12

(Continued on next page)

GENERAL

2. SPECIFICATIONS - Continued

Pivot Brakes - Continued

Actuating disc balls diameter, inch (earlier type brake)	7/8
Intermediate disc thickness, inch (earlier type brake)	.095 - .091
Middle disc thickness (including lining), inch (earlier type brake)	.135 - .131
Separator plate thickness, inch (later type brake)	.121 - .125
Friction plate thickness (including lining), inch (later type brake)	.110 - .114
Actuator assembly ball diameter, inch (later type brake)	1
Number of lined plates (later type brake)	9
Number of steel plates (later type brake)	10
Pivot brake actuating bellcrank:	
Shaft OD, inches	1.248 - 1.246
Bushing ID (assembled), inches	1.254 - 1.250
Foot brake pedal return spring:	
Free length, inches	9.61
Test length, inches	13-1/16
Test load, lbs	40
Brake actuating cable return springs (earlier type brake):	
Free length, inches	3.76
Test length, inches	1.93
Test load, lbs	20
Free length, inches	3.10
Test length, inches	1.93
Test load, lbs	40
Actuating disc extension springs (earlier type brake):*	
Free length, inch	15/16
Test length, inches	1-1/16
Test load, lbs	20 - 28
Working range, inches	1-1/16 to 1-3/8
Actuator lever return spring (later type brake):*	
Free length, inches	2-3/4
Test length, inches	2-7/8
Test load, lbs	72
Actuator return springs (later type brake):*	
Free length, inches	1-3/8
Test length, inches	1-5/8
Test load, lbs	28-1/2

Hydraulic Steering Boosters

Housing inside diameter, inches	2.253 - 2.250
Booster piston, inches:	
Outside diameter	2.249 - 2.247
Inside diameter	1.000 - .9990
Rod diameter	1.000 - .998
Piston support inside diameter, inches	1.004 - 1.001
Piston valve return spring (13 coils):	
Free length, inches	3.30
Test length, inches	2.50
Test load, lbs	5.6
Piston valve return spring (12 coils):	
Free length, inches	3.57
Test length, inches	2.5
Test load, lbs.	5.0
Booster piston return spring:	
Free length, inches	10.33
Test length, inches	12.10
Test load, lbs	50
Piston sealing ring gap (assembled in housing), inch	.006 - .001

*Spring lengths measured from inside to inside of end loops.

GENERAL

Special Nut and Bolt Torque Data (Foot-Pounds)
(Torques given are for bolts and nuts lubricated with SAE-30 engine oil).

Bevel gear dowel bolts	90 - 80
Bevel gear carrier bolts	90 - 80
Planet carrier dowel bolts	90 - 80
Sprocket drive carrier stud nuts and cap screws	470 - 420
Pivot brake studs	110 - 125
Pivot brake stud nuts	70 - 80
Steering brake disc dowel bolts	37 - 33
Pivot shaft cap-to-sprocket carrier bolts ("Loctite" applied)	2328 - 2616
Pivot shaft cap-to-rear frame bolts ("Loctite" applied)	1440 - 1620
Foot brake idler pulley stud shaft	290 - 320
Foot brake moveable pulley support stud	290 - 320

NOTE: Except for the special torques shown, all bolts and nuts are to be given a standard torque. Refer to the "STANDARD TORQUE DATA CHART" in Section 1, "GENERAL."

3. CHECKING MECHANICAL PROBLEMS

PROBABLE CAUSE	REMEDY
Tractor Does Not Move	
1. Brake pedal locked	Release brake pedal latching pawl.
2. Transmission faulty	Refer to "TRANSMISSION" Section.
3. Steering planetary brakes slip, levers have no free play due to improperly adjusted brake shoes or worn linings	Adjust brake shoes or replace linings.
4. Steering planetary brakes slip due to weak, broken or improperly tensioned brake pressure spring	Adjust or replace spring.
Tractor Moves with Pivot Brakes Locked (Brakes Do Not Hold)	
1. Brakes out of adjustment	Adjust pivot brakes.
2. Brake discs worn or steel balls damaged	Remove and inspect pivot brakes.
3. Foot brake linkage disconnected or broken	Repair or replace linkage parts.
Tractor Does Not Turn (Steering Planetary Brake Does Not Disengage)	
1. Excessive steering lever free play	Adjust brake forks and linkage.
2. Worn, disconnected or improperly adjusted linkage	Repair or adjust.
3. Bent or warped sun gear disc	Replace.
Tractor Will Not Make Pivot Turn	
1. Steering planetary brake does not disengage	Refer to "Tractor Does Not Turn" problem above.
2. Pivot brake does not hold	Refer to "Tractor Moves with Pivot Brakes Locked" problem above.
Tractor Creeps to One Side	
1. Track chain loose on one side	Adjust track chain tension. (Refer to "TRACKS AND TRACK FRAME" Section.)
2. Track frame bent or misaligned	Correct or replace parts as necessary.
3. Steering planetary brake on one side slips	Adjust brake forks and linkage.

(Continued on next page)

GENERAL

3. CHECKING MECHANICAL PROBLEMS - Continued

PROBABLE CAUSE	REMEDY
Tractor Loses Pulling Power	
1. Pivot brakes drag	Adjust steering planetary brakes and brake linkage. Remove and inspect pivot brakes.
2. Steering planetary brakes slip	Adjust for correct steering lever free play.
Steering Planetary Brakes Overheat	
1. Improper use of brake pedal	Pivot brake pedal should never be applied unless steering planetary brakes are disengaged.
2. Steering planetary brakes slip:	
(a) Brake shoes out of adjustment or linings worn	Adjust or reline shoes.
(b) Brake pressure spring damaged, weak or improperly tensioned	Replace or adjust spring as necessary.
3. Bent or warped sun gear disc	Replace.
Pivot Brakes Overheat	
1. Pivot brakes drag	Adjust brakes.
2. Steering planetary brake does not disengage	Refer to "Tractor Does Not Turn" problem.
3. Binding in brake controls	Free controls and lubricate with light oil.

STEERING PLANETARY

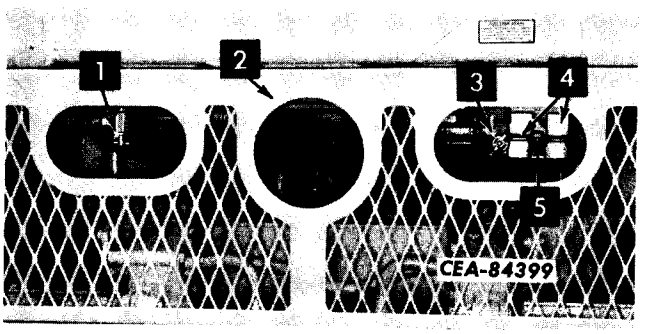
4. REMOVAL

NOTE: Disconnected hydraulic lines must be properly capped with the correct size plastic cap. If caps are not available, use tape or rubber stoppers. Openings must never be plugged with rags. This practice could introduce dirt or lint into critical hydraulic components. Remove all dirt accumulation from the main frame cover. Excessive dirt pack-up could cause binding of external brake linkage and result in premature brake failure. Tag disconnected lines to facilitate faster and correct installation.

1. Remove the sprocket rock shield (if equipped). Disconnect the track chain and clear it from the sprocket. It is not necessary to remove the track chain from under the track frame (refer to Section 9, "TRACKS AND TRACK FRAME" for removal).

2. Drain the rear main frame by removing the plug in the underside of the frame.

3. Drain the equipment hydraulic system. It is not necessary to drain the fuel tank, closing the fuel shut-off valve (1, Illust. 3) is sufficient.



Illust. 3
Disconnect Points at Rear of Unit.

1. Diesel fuel shut-off valve.
2. Rear cover.
3. Diesel fuel drain valve.
4. Scarifier front tubing (if equipped).
5. Tubing clamp.

4. UNITS EQUIPPED WITH SCARIFIER: Disconnect the hydraulic hoses from the front tubing (4) at the apron type cover (2) at the rear of the tractor. Remove the clamp (5) securing the tubing (Illust. 3).

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5. Remove the apron type cover (2, Illust. 3) at the rear of the tractor. Remove the rear frame oil level dipstick.

6. Remove the seat, batteries and battery support.

7. Disconnect the rear light wiring. Disconnect all the lines necessary at the hydraulic oil tank (Illust. 4) to facilitate removal of the tank.

8. Disconnect the fuel lines at the fuel tank. Disconnect the vent tubes running down the front of the fuel tank at the rear frame cover. Disengage and remove the vent tubes from the fuel tank. Disconnect the seat side sheets at the fuel tank.

9. Remove the cap screws, nuts and washers securing the tank support platform to the front frame. Attach a hoist as shown in Illust. 4 and remove the tanks.

Illust. 4
Removing the Fuel Tank and Hydraulic Oil Tank as an Assembly.

10. UNITS EQUIPPED WITH SCARIFIER: Disconnect the scarifier front oil tubes (4, Illust. 3) at the control valve.

11. If the lift cylinder crossover tubes look like they may interfere with removal of the rear main frame cover, they can be disconnected at the control valve, RH cylinder hose connection and the cylinder hose connection on the left hand fender. To reach the connection on the left hand fender, the battery box and batteries must be removed.

12. Disconnect the torque converter vent tube at the rear frame cover and at the converter and remove the vent tube. Disconnect and remove the sprocket drive vent tubes on units with external piping.

13. Remove the booster piston return springs (1). Disconnect the steering booster pressure hose (11) at the booster tee connection. Remove the clamp securing the hose to the rear frame cover and move the hose out of the way (Illust. 6).

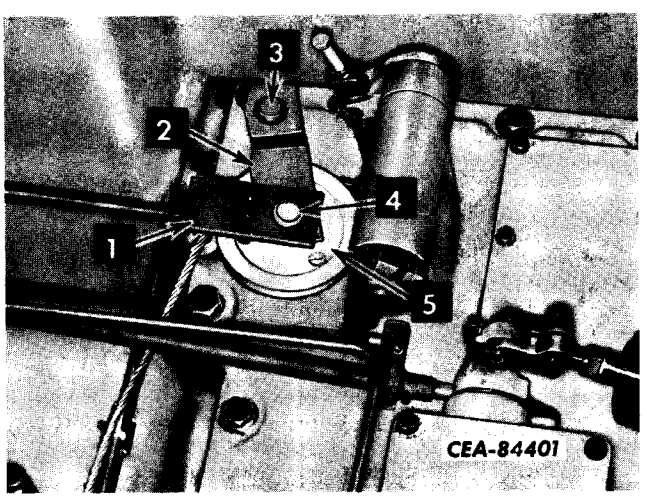
14. Disconnect the steering booster valve operating rod (10, Illust. 6) at the steering lever and booster on each side of the unit and remove the rods.

15. Disconnect and remove the brake pull rods (4 and 5, Illust. 6) on each side of the unit.

16. Remove the snap ring and spacer securing the brake cable idler pulley to the stud on the left hand side of the rear main frame cover. Remove the idler pulley.

Remove the snap ring securing the brake pedal pull rod (1) and pulley support (2) to the pulley shaft (4). Remove the snap ring securing the

(Continued on next page)



Illust. 5
Brake Disconnect Points.

1. Brake pedal pull rod.
2. Pulley support.
3. Support stud.
4. Pulley shaft.
5. Movable pulley.

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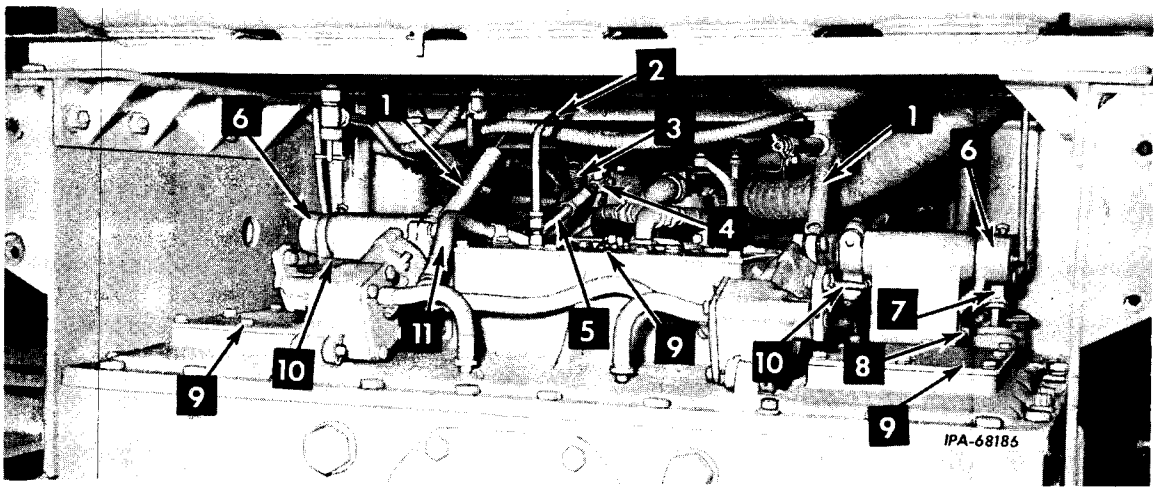
4. REMOVAL - Continued



Illust. 6
Rear Frame Cover.

1. Booster piston return spring.
2. Vent tube.
3. Hand lever return spring.
4. Pull rod (short).
5. Pull rod (long).
6. Brake actuating bell crank.
7. Brake actuating cable.
8. Actuating cable yoke.
9. Inspection covers.
10. Booster valve operating rod.
11. Booster pressure hose.

pulley support to the support stud (3). Lift the brake pedal pull rod as far as possible and tap the pulley shaft (4) with lower snap ring down and out from the pull rod. Remove the moveable pulley (5) and pulley support from the pull rod (Illust. 5).

17. Remove the three inspection covers (9, Illust. 6) from the rear frame cover.

18. Remove the cotter end pin securing the brake actuating cable (7, Illust. 6) to the actuating bell crank (6). Turn the bell crank up as far as possible and, using pliers or other suitable tool, pull the rubber boot from the cable. Push the cable down into the rear frame by prying under the bell crank (6) with a large screwdriver or other suitable tool. Disconnect the brake pedal actuating cable yoke (8) from the bell crank by removing the coller and end pin. Repeat this operation for the cables on the other side of the rear frame cover.

19. Remove the cap screws securing the rear power take-off cover to the rear main frame. Remove the power take-off cover and cover gasket.

20. Relieve the brake pressure spring pressure as follows: Remove the 1-1/2 inch square socket pipe plug from each side of the rear frame. Access holes to these plugs are provided in the front frame below the fenders (Illust. 29). Use two cap screws (1-14UNF, approximately 5 inches in length) and two round flat washers as spring compressors. If suitable flat washers cannot be found, they can easily be made out of bar stock (2-1/4" OD x 1-1/32" ID x 3/16"). Insert a cap screw, with washer, through each hole to engage the thread in the spring retainer. Alternately tighten the cap screw and reach in through the rear power take-off cover opening to push the brake fork (23, Illust. 11) to the outside of the unit against the spring retainer. Continue in this manner until the brake fork and adjusting screw (22, Illust. 11) are clear of the push rod (21). Compress the spring on the other side of the unit in the same manner.

21. Reach in through the center inspection cover opening and disengage the bell crank push rods (12, Illust. 11) from the bell cranks (13).

22. Remove the rear frame cover mounting cap screws. Free the cover from the dowels

STEERING PLANETARY

by turning in the four set screws provided in the cover. Remove three of the set screws and insert eyebolts for attaching a hoist. Lift the cover off the rear frame. Discard the cover gasket.

NOTE: The cover should be removed slowly, checking that linkage above and below the cover does not bind with the cover.

23. LATER TYPE BRAKE: Remove the mounting bolts (17, Illust. 40A) securing the lever support (1) to the pivot brake. Lift the lever support and adjusting cable (18) with the lever (2) and spring (16) attached from the machine.

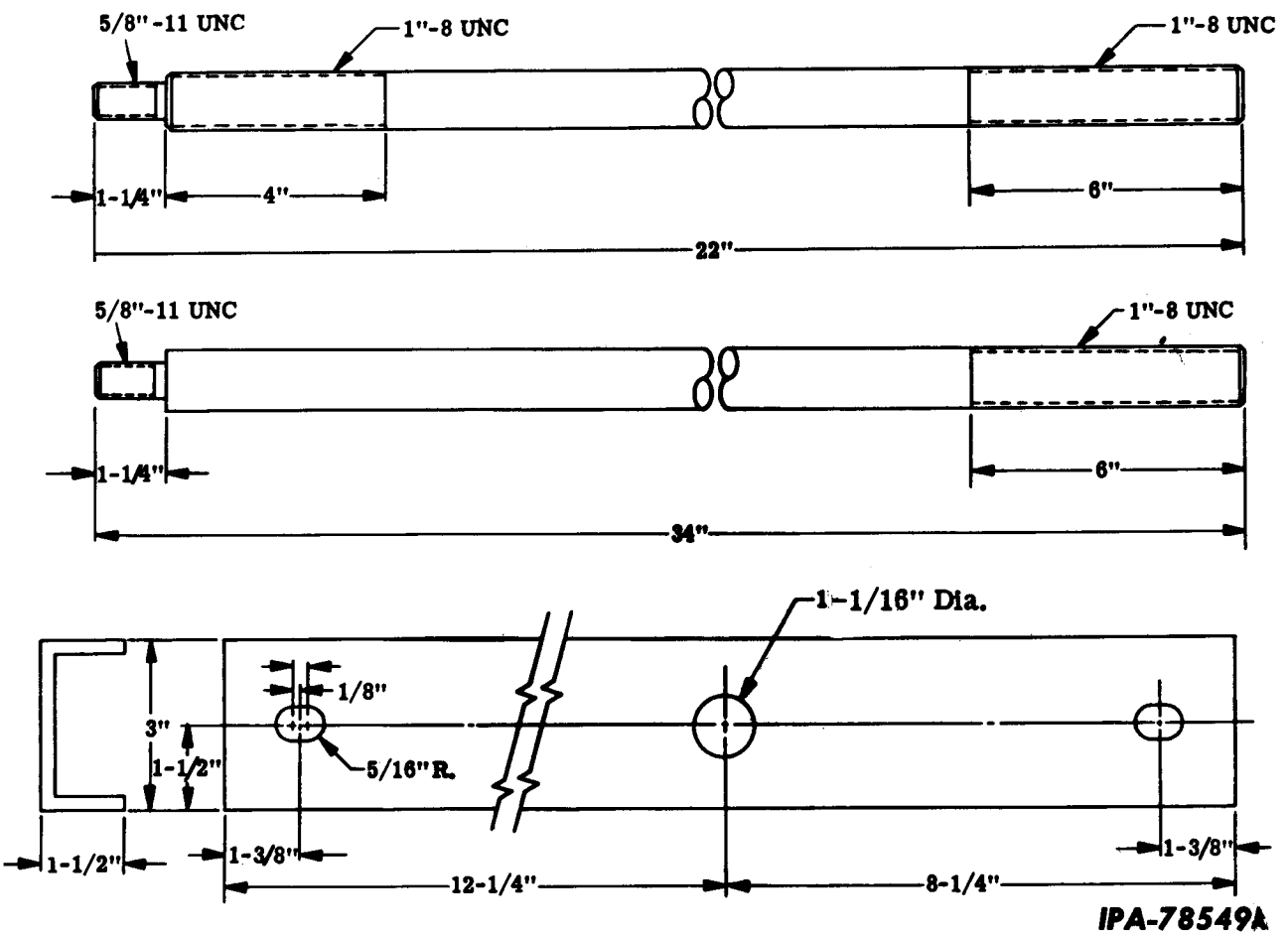
24. LOADERS ONLY: Remove the pivot brakes and the sprocket drive pinion shaft from both sides of the unit (refer to "PIVOT BRAKES" in this section).

TD-20 (SERIES B) ONLY: Remove the pivot brakes and the sprocket drive pinion shaft from both sides of the unit as described under "PIVOT BRAKES" in this section. Due to the time involved in removing and installing the pivot shaft caps secured to the sprocket drive carrier, it is suggested that (on machines with earlier type brakes) only the pinion shaft be removed as described under "SPROCKET DRIVE PINION" in Section 8, "SPROCKET AND SPROCKET DRIVE."

25. Remove the bellcrank return spring (15) and spring stiffener (33) from between the bellcranks (13). Remove the snap ring (19) from each of the bellcranks (13) and remove the fork push rods (21). (Refer to Illust. 11.) Remove the cap screws securing the back-up brake shoe (31, Illust. 11) to the rear frame and remove the shoe from the dowels in the rear frame.

26. Remove the compressor bolt from the brake pressure spring (25, Illust. 11) on each side of the main frame and pry the spring with retainer (24) from between the seat in the rear frame and the brake fork.

(Continued on next page)



Illust. 7
Detailed Parts for Removing and Installing Brake Fork Pins.

STEERING PLANETARY

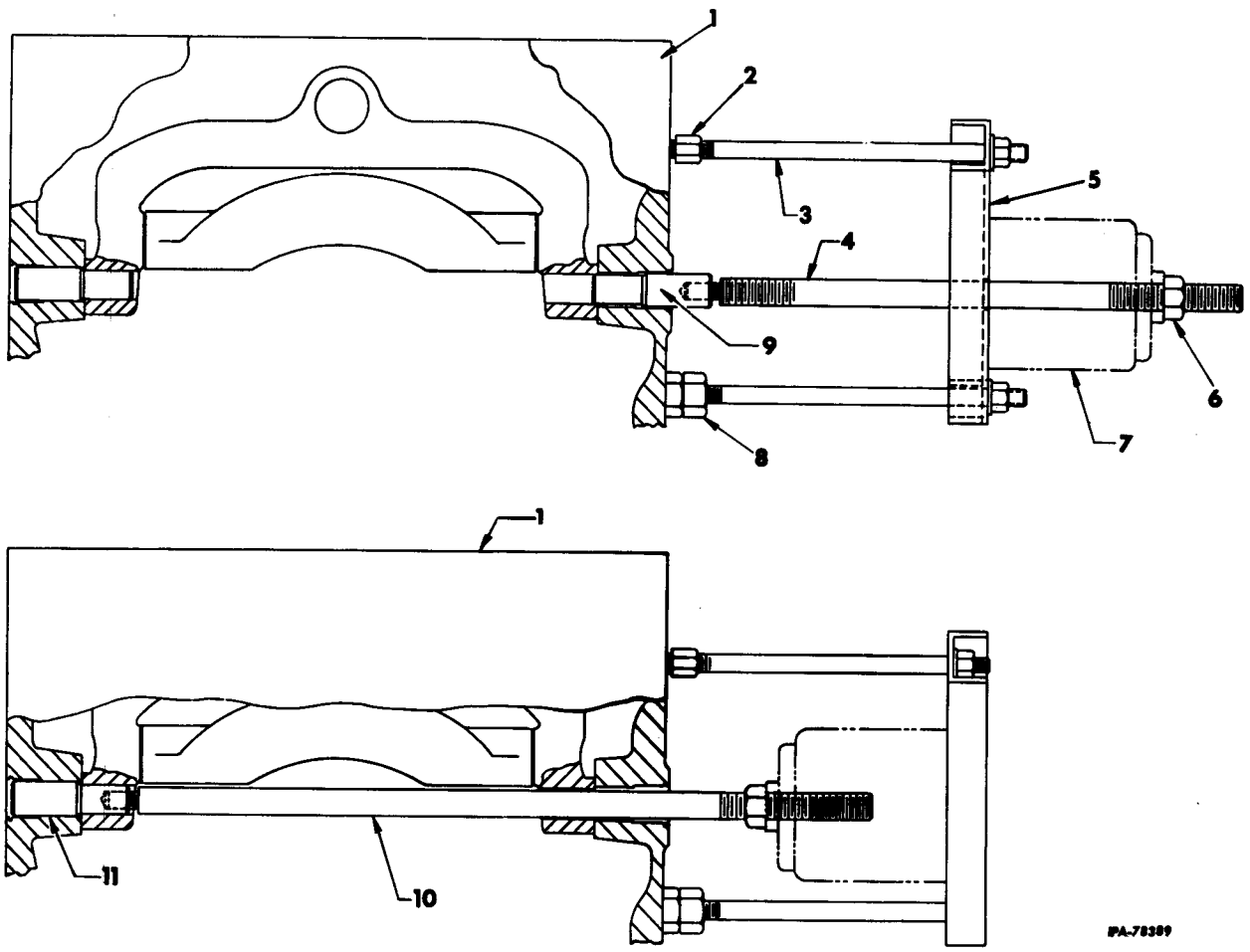
4. REMOVAL - Continued

NOTE: These springs must be removed to allow the brake forks to be moved far enough to the side to provide clearance for the removal of the sun gear (24, Illust. 10) and disc (22) with the steering planetary.

27. Remove the cap screws from the bearing cap at each end of the planet gear carriers (Illust. 1). Lift the bearing cap straight up, with the three dowel pins, one at each end and one at the center of the bearing cap.

NOTE: If shims are used under the caps, they must be attached to the caps to facilitate proper installation. The caps are stamped "LH" and "RH". If these markings have become obliterated, they must be marked to assure installation in the same location.

28. Remove the adjusting nut lock (21, Illust. 10) on the right hand side and, using a special spanner wrench 1020 454R91, turn out the adjusting nut (20) to allow the planetary assembly to be moved over to the right. This will prevent the drive bevel gear from binding on the transmission pinion gear as the planetary assembly is lifted from the frame. Attach a sling to the center of the bevel gear carrier so that it can be rotated. Turn one cluster gear to the top. Roll the brake discs



Illust. 8
Brake Fork Pin Removing Tools Assembled.

1. Main frame.
2. Adapter (OTCM-20).
3. Leg (OTC-930D).
4. Puller screw.
5. Support bar.
6. Nut.
7. Hydraulic ram.
8. Adapter (OTC-940).
9. Rear fork pin.
10. Puller screw.
11. Front fork pin.

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to the inside and secure "C" clamps or vise grip pliers to the discs. Attach a coil or rope to the "C" clamps or pliers to hold the discs inward.

Tip the brake forks to the outside and wire the shoes to the forks to keep the shoes in a vertical position for clearing the brake discs as the planetary is lifted out. Remove the steering planetary from the rear frame (Illust. 9).

29. After the assembly is out of the frame, remove the brake disc and the bearing cage (19) with adjusting nut (20) and bearing cup (18) from each end of the planetary (Illust. 10). Keep these parts located or marked for right and left sides to assure the same parts will operate together as before. Do not remove the adjusting nut from the bearing cage.

30. Place the planetary assembly on a bench and remove the hoist. The assembly should be placed on end so it is resting on the planet gear carrier attached to the bevel gear.

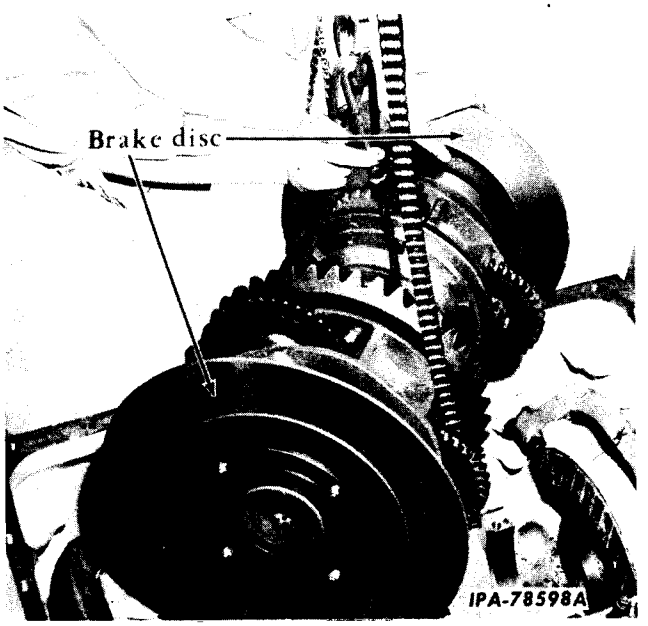
31. If it is necessary to remove the brake forks, the fork support pivot pins (26, Illust. 11), installed through the front and rear walls of the rear main frame, must be removed. Refer to Illust. 7 for constructing puller screws and a support bar for removing the fork pins. Remove the pivot pin retaining snap rings from the rear frame bores. Thoroughly clean and oil the threads in the tapped hole of each rear pin to provide a free turning fit for the puller screw.

Remove the rear pins with a hydraulic ram as shown in Illust. 8. With the rear pins removed, insert the front pin puller screw through the rear frame and into the threads of the front pin until it bottoms in the pin. Using a hydraulic ram as shown in Illust. 8, press the pin out the front of the rear frame.

NOTE: Support each brake fork before completely removing the pivot pins.

NOTE: Some machines have front fork pins that are not threaded to receive a puller screw for this type of removal. Whenever these pins are removed, they should be replaced with a pin that is threaded at each end. On these machines, it may be necessary to remove the transmission to facilitate removal of the front pins.

32. Remove the brake shoe from the fork by removing the pivot pins with a slide hammer and adapter.



Illust. 9
Removing the Steering Planetary from the Rear Main Frame.

5. DISASSEMBLY

(Ref. Nos. Refer to Illust. 10)

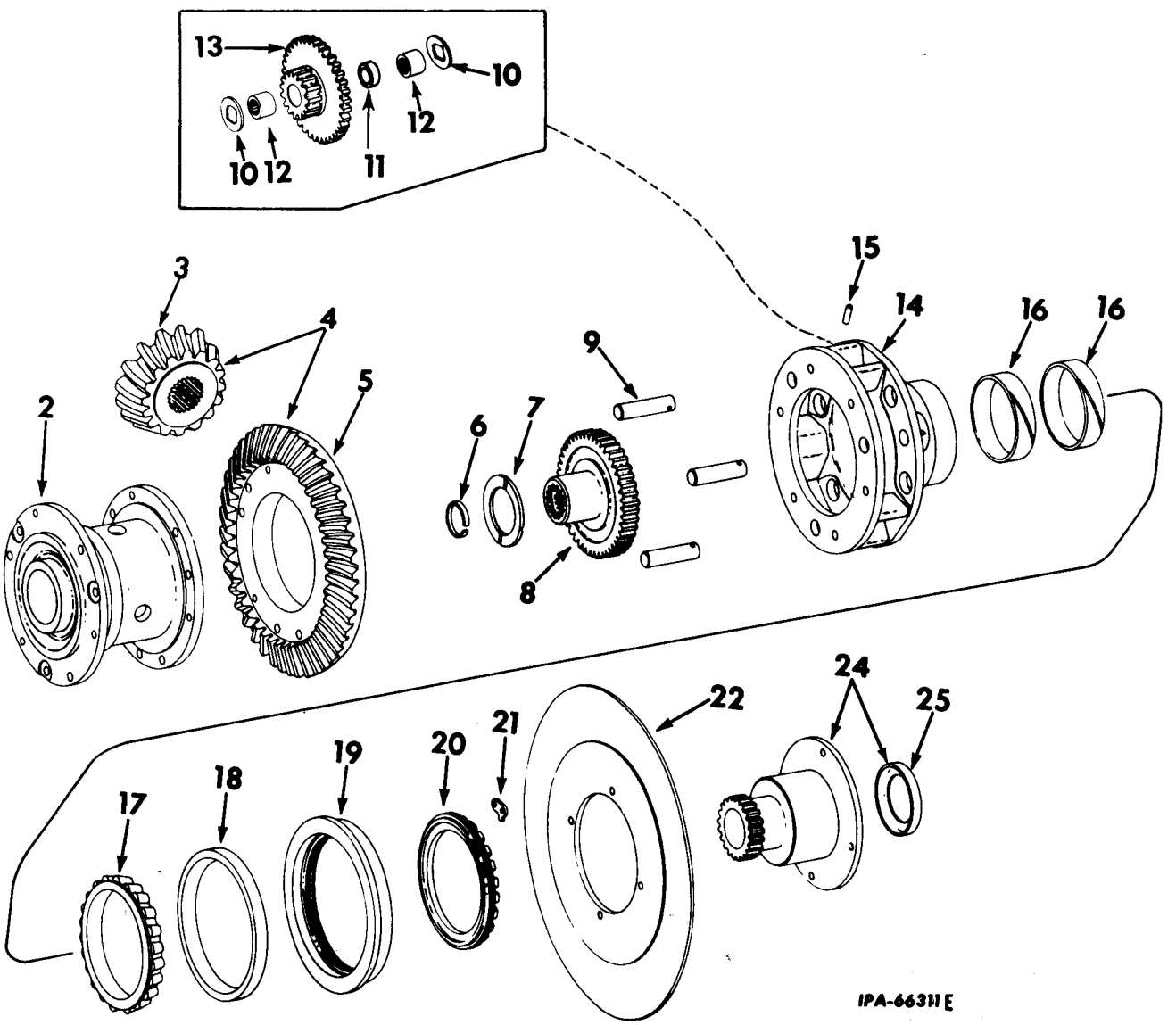
The instructions which follow are for the disassembly of the left side of the steering planetary. The procedure for both sides is the same except for the drive bevel gear.

(Continued on page 14.)

STEERING PLANETARY

5. DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 10)



Illust. 10
Steering Planetary (Exploded).

2. Bevel gear carrier.
3. Transmission pinion.
4. Matched set, pinion and bevel gear.
5. Bevel gear.
6. Snap ring (pinion shaft stop).
7. Thrust washer.
8. Sprocket drive pinion shaft gear.
9. Planet gear shaft.
10. Steel thrust washers.
11. Bearing spacer.
12. Planet gear needle bearings.
13. Planet gear cluster.
14. Planet gear carrier.
15. Planet gear shaft pin.
16. Bushings.
17. Taper roller bearing cone.
18. Taper roller bearing cup.
19. Bearing cage.
20. Bevel gear carrier adjusting nut.
21. Adjusting nut lock.
22. Brake disc.
24. Sun gear and ring assembly.
25. Oil collector ring.

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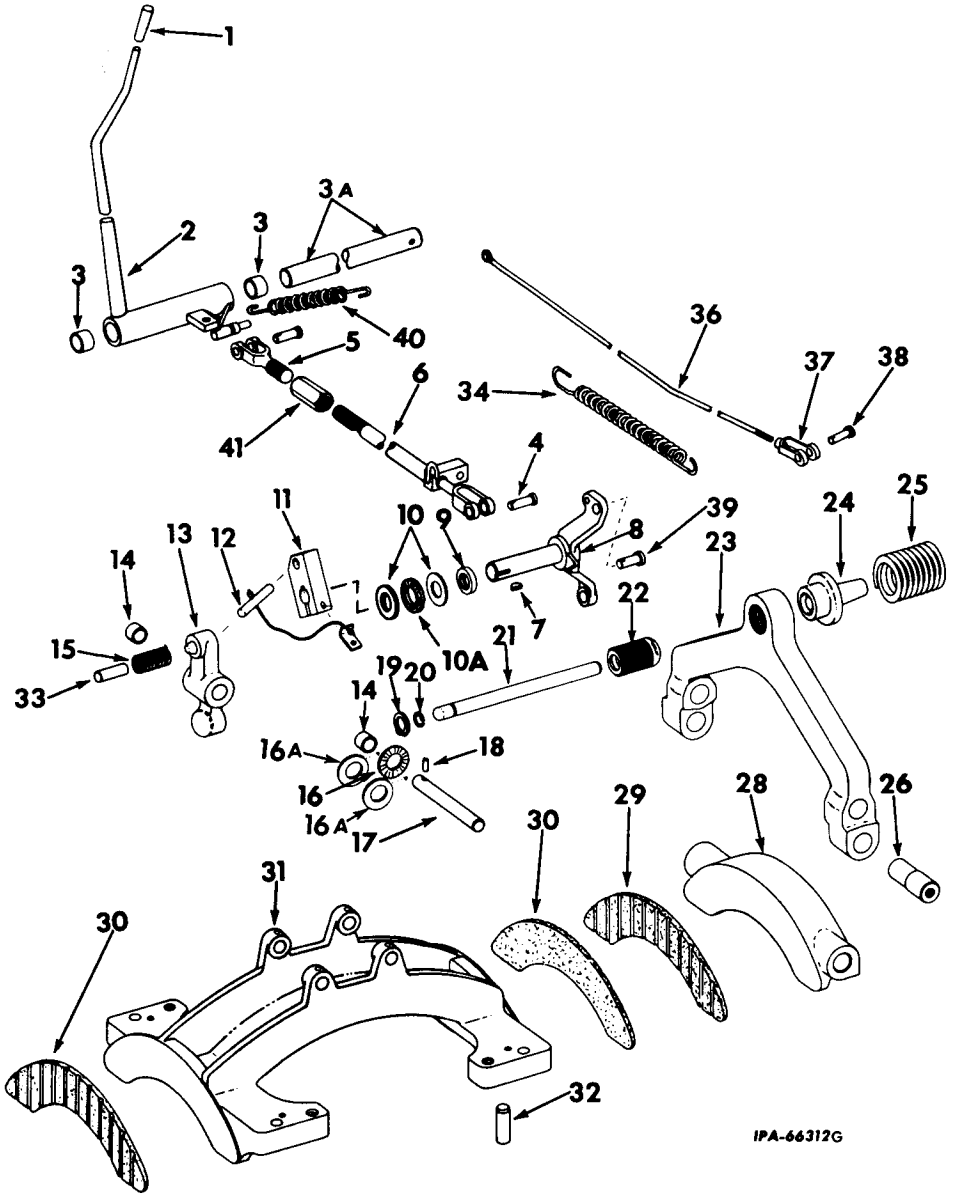

Illust. 11
Steering Planetary Brake and Linkage (Exploded).

1. Steering lever handle.
2. Steering hand lever.
3. Lever shaft bushings.
3A. Hand lever shaft.
4. Rod end pin.
5. Brake pull rod (short).
6. Brake pull rod (long).
7. Key.
8. Outer lever.
9. Oil seal.
10. Needle bearing race.
10A. Needle bearing.
11. Push rod lever.
12. Bell crank push rod.
13. Bell crank.
14. Bell crank bushings.
15. Bell crank return spring.
16. Bell crank needle bearing.
16A. Needle bearing race.
17. Bell crank shaft.
18. Shaft retainer pin.
19. Bell crank snap ring.
20. Push rod snap ring.
21. Fork push rod.
22. Brake adjusting screw.
23. Brake fork.
24. Pressure spring retainer.
25. Brake pressure spring.
26. Brake fork and shoe pivot pins.
28. Movable brake shoe.
29. Movable brake shoe lining.
30. Back-up shoe lining.
31. Stationary or back-up shoe.
32. Dowel pin (back-up shoe).
33. Return spring stiffener.
34. Booster piston return spring.
36. Steering booster valve operating rod.
37. Rod clevis.
38. Clevis pin.
39. Booster front mounting pin.
40. Hand lever return spring.
41. Pull rod turnbuckle.

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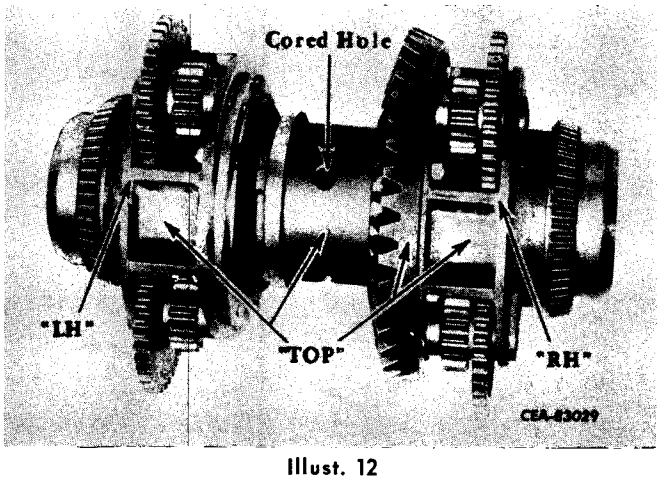
5. DISASSEMBLY - Continued
(Ref. Nos. Refer to Illust. 10)

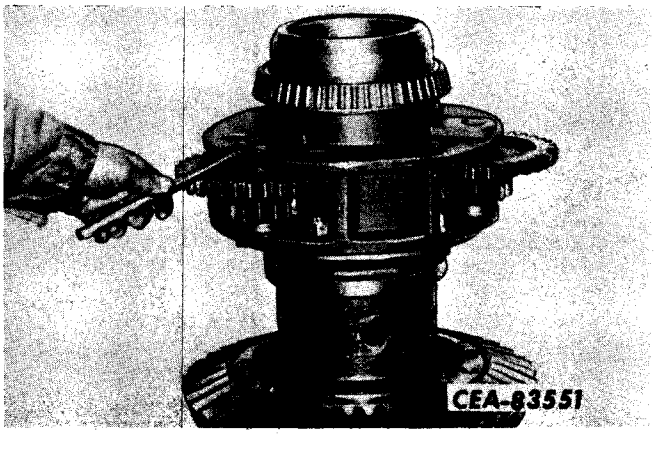
1. The word "TOP" is cast (raised letters) into the center of the bevel gear carrier. This marking should be aligned with the word "TOP" stamped on the planet gear carrier and the bevel gear and must be used for aligning parts in reassembly (Illust. 12).

NOTE: If a component is found to have this mark obliterated, it must be marked "TOP" in line with its mating parts before disassembly.



Illust. 12
Location of Carrier and Bevel Gear Aligning Marks.

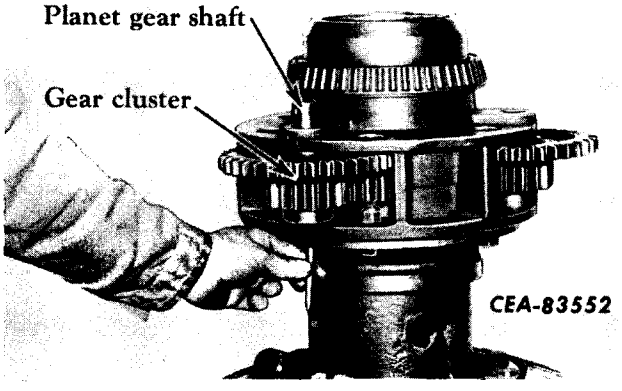
2. To remove the planet gear cluster (13), drive the roll pin (15) securing the shaft (9) to the planet gear carrier into the shaft (9) until it is clear of the carrier (Illust. 13). The roll pin should be removed from the shaft after disassembly and discarded. Always use a new roll pin.



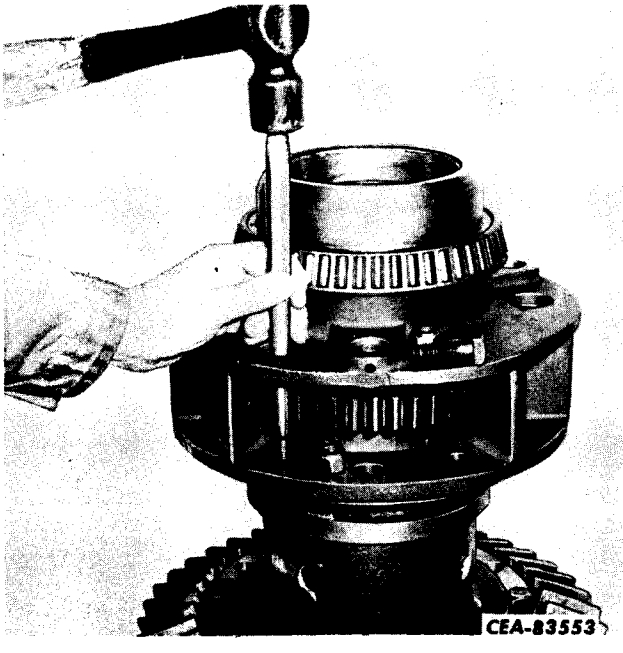
Illust. 13
Removing the Planet Gear Shaft Roll Pin.

3. Using a short punch and hammer, drive the shaft (9) from the gear cluster and carrier. Slide the gear cluster to the outside. Then place one hand under the gear as it is removed from the carrier as the thrust washers (10), the bearings (12) and bearing spacer (11) are free to drop out (Illust. 14). On earlier units, there is a bronze thrust washer used next to each of the steel washers (10).

4. Remove the two remaining gear clusters from the carrier in the same manner described in steps 2 and 3.



Illust. 14
Removing the Planet Gear Shaft.



Illust. 15
Driving Out the Planet Gear Carrier Dowel Bolt.

5. The planet gear carrier (LH) is secured to the bevel gear carrier (2) with three regular

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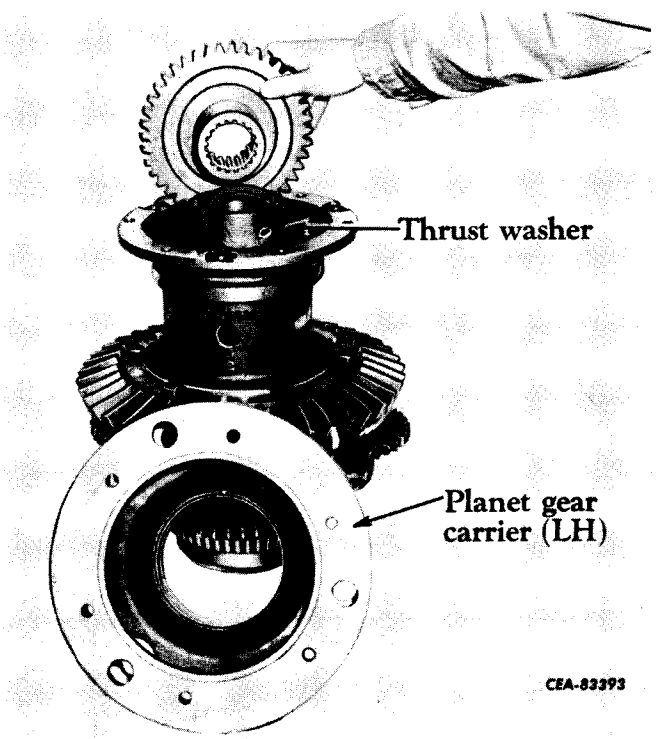
cap screws and nuts and three dowel bolts and nuts. Remove the mounting hardware and lift the planet gear carrier from the bevel gear carrier. Drive the dowel bolts out the bottom of the planet gear carrier (Illust. 15).

NOTE: The planet gear carrier (RH) is secured to the bevel gear and bevel gear carrier with six dowel bolts and nuts.

6. Lift the sprocket drive pinion shaft gear (sun gear) (8) from the bevel gear carrier. Remove the thrust washer (7) (Illust. 16).



Illust. 16
Removing the Sprocket Drive Pinion Shaft Gear.

7. If bushing (16) or bearing (17 and 18) replacement is necessary, refer to Par. 6, "INSPECTIONS AND REPAIR" for servicing.

6. INSPECTION AND REPAIR

Clean all parts in solvent and dry thoroughly. Inspect for excessive wear or damage as outlined. Refer to Par. 2, "SPECIFICATIONS," for the sizes of the new parts. After inspection, if parts are serviceable, lubricate them with clean oil of the type specified for normal lubrication.

1. Inspect the bevel gear, large and small sun gears and all planet gear clusters for excessive wear and chipped or broken teeth. Examine the transmission pinion gear for the same defects. If the small sun gear (24) or the brake disc (22) need replacing, the new part must be line reamed with its mating part before installation. The sun gear (24) and brake disc (22) used for service have four bolt holes drilled to proper size (11/32 inch), but not reamed. Secure the disc and sun gear with two of the matching holes and line ream the remaining two 11/32 inch holes to .3730-.3740 inch using the matching reamed holes in the old mating part as pilot holes for the reamer. Line ream the other two holes in the same manner. Secure the parts together with the four cap screws and nuts inserting the cap screws from the sun gear side. (Illust. 10.)

Check the condition of the oil collector ring (25, Illust. 10). If replacement is necessary, press the new ring into the sun gear (hollow end first) until it bottoms.

2. Inspect the planet gear cluster shafts, roller bearings and thrust washers for excessive wear. Replace parts as necessary. If either the bronze or steel planet gear cluster thrust washer used on earlier units is found unserviceable, they must both be discarded and replaced by one new thicker thrust washer (10, Illust. 10). Refer to Par. 2, "SPECIFICATIONS" for dimension of new thrust washer.

3. Inspect the bevel gear carrier (2) and both planet gear carriers (14) for cracks or other damage. If replacement of a planet gear carrier or bevel gear carrier is necessary, refer to the following pre-assembly procedure (Illust. 10).

Replacement parts for the carriers are furnished for service with the three dowel bolt holes drilled to the proper size (.437 inch), but not reamed. New planet gear carriers are not marked "LH" or "RH" as they are interchangeable. Before final assembly, the three dowel bolt holes must be line reamed to .4985 - .5000 inch diameter in assembly with the mating part and, in the case of a new planet carrier, marked "LH" or "RH" as required. The remaining .531 inch bolt holes do not require reaming.

LEFT SIDE PROCEDURE: Position the planet carrier against the left end of the bevel gear carrier with the word "TOP" on both in alignment. Insert the three short standard bolts

(Continued on next page)

6. INSPECTION AND REPAIR - Continued

through the alternate three matching .531 inch bolt holes and secure both carriers with standard hex nuts. Line ream the three .437 inch drilled dowel bolt holes to .4985 - .5000 inch. Use the matching reamed dowel bolt holes in the old mating part as pilot holes for the reamer. Mark the planet carrier "LH" if it was the replacement, and separate both carriers after the reaming operation is completed.

RIGHT SIDE PROCEDURE: Assemble the bevel gear to the bevel gear carrier, or to the planet carrier depending on which is the replacement part, with the word "TOP" on both in alignment. Insert three short bolts, as used for the left side, through three of the bevel gear .502 - .500 inch holes that match at alternate intervals with three of the .531 inch holes in the replacement part. Secure both mating parts with standard hex nuts. Line ream the three drilled .437 inch dowel bolt holes to .4985 - .5000 inch. Use the three remaining .502 - .500 inch opposing holes in the bevel gear as pilot holes for the reamer. Mark the planet carrier "RH" if it was the replacement. Remove the bevel gear after the reaming operation is completed.

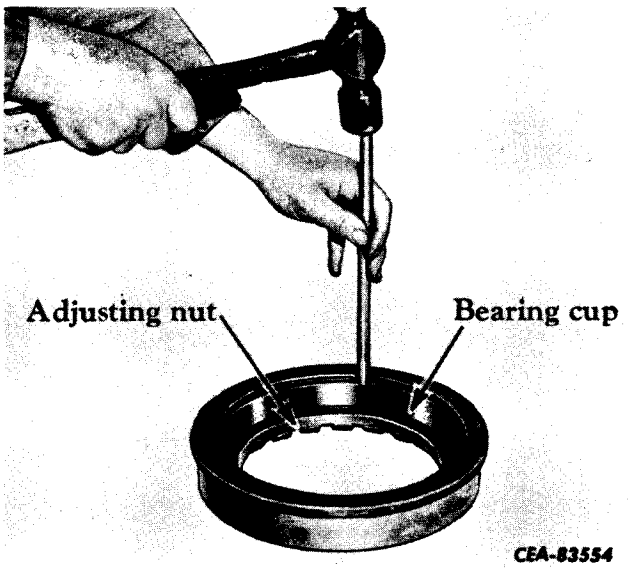
NOTE: The dowel bolt holes in the planet and bevel gear carriers on the right hand side of the tractor are located at alternate intervals to provide a staggered snug and loose fit for the six dowel bolts when installed through the planet and bevel gear carriers in assembly.

4. Inspect the thrust washer (7) used between the bevel gear carrier hub and the large sun gear (Illust. 10).

5. Inspect the large sun gear splined bore and the snap ring near the end of the bore. The sun gear spline and sprocket drive pinion shaft splined end should make a sliding fit. Remove any roughness with a fine stone or emery cloth. Replace the snap ring if cracked or broken.

6. Inspect the two bushings in the bore of the planet gear carrier hub and the tapered roller bearing on the hub. If necessary to replace the bushings, press out the old bushings. Apply "LOCTITE" (Grade C) to the new bushing OD and install the new bushings flush with the chamfer edge at both ends of the bore to allow a space between the bushings so as not to obstruct the oil passage in the sun gear hub.

7. If necessary to replace the tapered roller bearing cone on the outside of the planet carrier hub, press off the old cone. Press on a new bearing cone to butt against the shoulder so the bearing tapers toward the end of the hub.



Illust. 17
Installing a New Planetary Bearing Cup.

Before removing the old bearing cup and the adjusting nut from the cage, mark the position of the nut in the cage. Remove the nut and tap the bearing cup from the cage. Then install the nut in the cage in its original position. Tap the new bearing cup into the cage (small diameter of the taper down) until it bottoms on the adjusting nut (Illust. 17). Installing the bearing cup in this manner is necessary to provide clearance for planetary installation and seating of the bearing cage in the main frame bore.

8. Inspect the brake linings on the stationary back-up and movable fork shoes. If the linings are excessively worn down to the depth of the radial grooves, they should be replaced. To reline the movable shoes, it will be necessary to remove the brake fork from the rear main frame. (Refer to "REMOVAL," Par. 4, in this section.)

New linings are to be riveted to the movable brake shoes and back-up shoes. Follow the instructions that are included in the brake lining field service package.

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Steering Planetary Brake Linkage
(Ref. Nos. Refer to Illust. 11)

9. When assembling the brake shoe (28) to the fork (23), be sure the mounting holes in the shoe and fork are aligned and secure with the two pivot pins (26).

NOTE: Before installing the pivot pins, inspect the pins for burrs, otherwise pin may broach hole in shoe. The brake shoe should pivot freely on the pins (.004 to .007 inch loose fit.)

10. Inspect the brake operating linkage, installed in the back-up shoe and in the rear frame cover, for excessive wear or sloppy fits and for oil leakage at the brake outer levers (8). Remove the parts from the cover or shoe and replace, when required, as follows:

(a) BRAKE FORK PUSH ROD BELL CRANKS (13): Pull the roll pins (18) holding the bell crank shafts (17) in the back-up shoe (31). Drive out each bell crank shaft (17), remove the needle bearings (16), bearing races (16A) and bell cranks (13). Earlier machines use a thrust washer instead of the needle bearing and bearing races at each end of the bell cranks.

Inspect the bushing (14), shafts (17) and bearings (16) or thrust washers for excessive wear or damage. Check the tension of the spring (15). Examine the ends of the rods (21) and the rod sockets in the bell cranks (13) and adjusting screw (22). These should be round and smooth. Refer to Par. 2,"SPECIFICATIONS," for the dimensions of new parts.

NOTE: If the bell crank thrust washers used on earlier machines need to be replaced, install a new needle bearing (16) and two bearing races (16A) at each end of the bell crank (13). When installing bearings on these machines, the later type bell crank must be installed or the old bell crank (if reuseable) can be reworked by removing .100 inch of material from each end of the bell crank hub at the thrust washer face.

Reassemble the parts as follows: If the bushings (14) needed replacement, the new bushings must be pressed into the bell cranks (13) from each end until they are flush with the ends of the bell crank bore. Position the bell crank with a thrust washer or bearing (16) with two bearing races (16A) at each end between the bosses of the back-up shoe and drive in the shaft (17) until the hole in the shaft lines up with the hole in the shoe. Install the pin (18). Assemble the other bell crank in the same manner.

(b) OUTER LEVER (8) AND OIL SEAL (9): Disconnect the steering boosters on the outer lever arms. Remove the cap screw on the inner lever (11) and remove the push rod assembly (12). The inner lever is keyed to the outer lever shaft and should be carefully pryed off. Remove the key (7), needle bearing (10A) and bearing races (10); then, pull the outer lever (8) from the housing. Earlier machines have a thrust washer instead of the needle bearing on the shaft assembly (8).

Inspect the outer lever shaft, bearing or thrust washer, oil seal (9) and shaft bushings in the rear frame cover for excessive wear or damage. Examine the ends of the push rods (12) and the rod socket in the rod levers (11). These should be round and smooth. Refer to Par. 2, "SPECIFICATIONS," for the dimensions of new parts.

To replace the bushing, remove the oil seal in the outer end of cover bore and press out the old bushing. Press the new bushing in from the outer end until it is flush with the bore inner edge. Install the oil seal, part number to the outside, using a new seal if the old seal leaked or was damaged.

Reassemble parts as follows: Install the outer lever (8). Place the thrust washer or the bearing (10A) with bearing races (10) on the outer lever. Key the lever (11) to the shaft so the ends of key (7) are flush with both sides of the lever. Secure the clip of the push rod assembly (12) to the lever (11) with the cap screw. Push the outer lever inward and tighten the cap screw to clamp the lever to the outer lever shaft, allowing a slight end play. Connect the steering boosters to the outer lever arms.

(c) Check the hand lever return spring (40). (Refer to Par. 2, "SPECIFICATIONS.")

(d) Check the brake pressure spring (25). (Refer to Par. 2, "SPECIFICATIONS.")

7. REASSEMBLY

(Ref. Nos. Refer to Illust. 30)

NOTE: If both planet gear carriers (14) were removed from the bevel gear carrier (2), reassemble and install the left hand planet gear carrier first, as it makes dowel bolt installation easier without bevel gear interference.

(Continued on next page)

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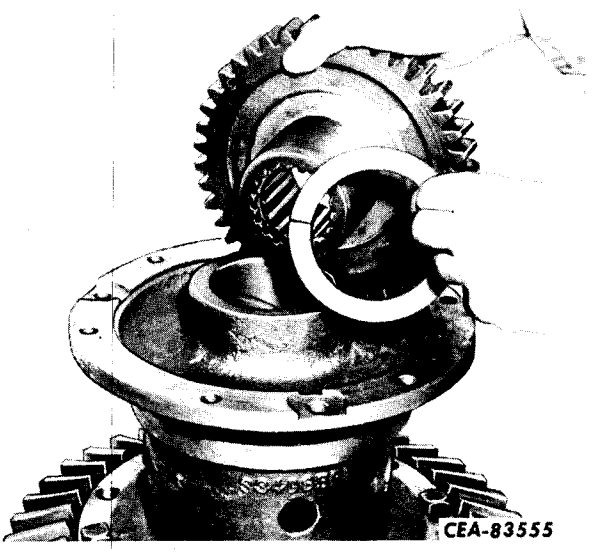
7. REASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 10)

1. Coat both sides of the thrust washer (7) with MPG (MIL-G-10924B). Be sure the snap ring (6) is installed in the groove around the interior spline of the gear (8). Place the thrust washer on the bevel gear carrier and insert the pinion shaft gear into the carrier (Illust. 18).

NOTE: To assure proper assembly when installing the bevel gear and planet gear carriers to the bevel gear carrier, the word "TOP" on all parts must be in alignment. In addition, the planet gear carriers are stamped "RH" and "LH" to avoid interchanging them. These parts are dowel bolted to each other and the dowel bolt holes were line reamed during assembly at the factory. They must be reassembled in the same position or the dowel bolts will not fit properly.

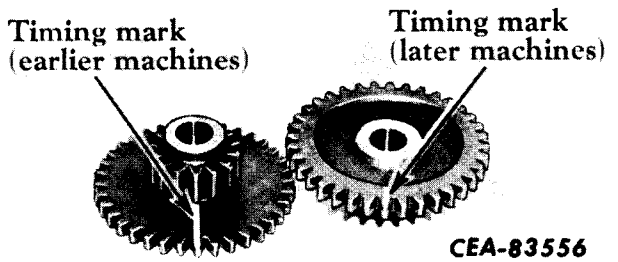


Illust. 18
Installing the Sprocket Drive Pinion Shaft Gear and Thrust Washer.

2. Place the "LH" planet gear carrier on the bevel gear carrier (side away from bevel gear) and secure with the three regular cap screws three dowel bolts and six nuts using 80-90 ft. - lbs. torque. All bolt heads are to face the bevel gear.

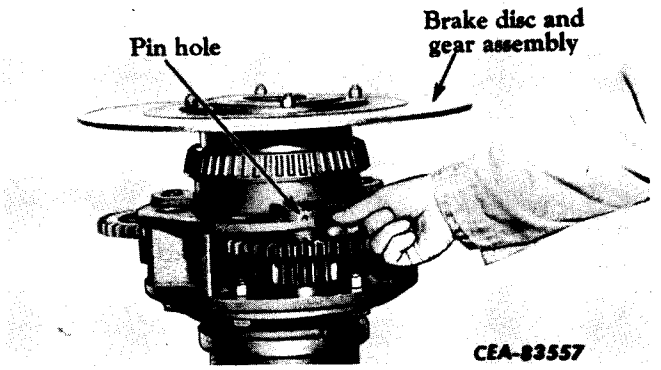
NOTE: The "RH" planet gear carrier and bevel gear are secured to the other end of the carrier (2) with six dowel bolts. Install the six long dowel bolts through the assembly from the tooth side of the bevel gear. Torque these bolts from 80-90 ft. -lbs. The dowel bolts, while alternately making a snug and a free fit in the bolt holes around the bevel gear carrier, are arranged to provide a free and a snug fit in the opposite bolt holes of the planet carrier.

3. The planet gear clusters (13) have a timing mark on one tooth of the large gear (small gear of the clusters on earlier machines) to facilitate proper installation in the carrier. Locate this mark on the large gear and mark the same tooth on the opposite side. On earlier machines, mark a line out to the tooth in the large gear that is in line with the mark on the small gear first (Illust. 19). This is necessary as this is the side that will be visible during assembly.



Illust. 19
Planet Gear Cluster Timing Marks.

4. Position the gear cluster with bearings (12) and bearing spacer (11) installed, on the outer diameter of the planet gear carrier so that the small gear is nearest the bevel gear carrier (2) and the timing mark is aligned with the planet gear shaft pin hole in the carrier (Illust. 20). Place one thrust washer (10) between the gear cluster hub and the carrier on each end of the gear cluster. If the bronze and thin steel thrust washers used on earlier machines are being reinstalled, place one of each between the gear cluster hub and the carrier on each end of the gear cluster with the steel washer next to the gear hubs. Position the complete assembly in the carrier.



Illust. 20
Positioning the Planet Gear Shaft Roll Pin.

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5. Use a round tool to center the gear and thrust washers with the shaft bore in the carrier before installing the planet gear shaft (9). Tap the shaft into the carrier and gear cluster, aligning the pin holes in the shaft and carrier. If necessary, the slot in the end of the shaft can be used to align the pin holes. Do not install the roll pin (15) at this time.

6. Install the other two planet gear clusters in the same manner described in steps 3, 4 and 5.

NOTE: All the planet gear clusters are installed with the smaller gear toward the bevel gear carrier (2) and the timing mark aligned with planet gear shaft pin hole in the carrier (14).

7. Place the brake disc and gear assembly (Illust. 20) in position. The gear should mesh with the three planet gear clusters without binding. If a bind occurs, recheck the timing procedure by removing and reinstalling the three planet gear clusters.

8. After the correct installation of the planet gear clusters has been obtained, secure each of the planet gear shafts with a new roll pin (15) (Illust. 20). Drive the roll pin into the carrier and shaft until it is flush with the carrier. Remove the brake disc and gear assembly from the carrier.

9. Coat the bushings (16) in the planet gear carrier bore with MPG (MIL-G-10924B).

8. INSTALLATION

1. Attach a sling to the center of the bevel gear carrier (so it can be rotated) and hoist the assembly up. Place the bearing cage (19) (with bearing cup (18) and adjusting nut (20) installed) in position on the bearing cone (17) (installed on the planet carrier hub) at each end of the assembly (Illust. 10).

2. Install the brake disc (22) and gear (24) (with the oil collector ring (25) installed) through the planet carrier hub on each end of the assembly meshing the sun gear with the large gear on each of the three planet gear clusters (13) (Illust. 10).

NOTE: Use "C" clamps or vise grip pliers as was done in removal to hold the brake discs inward.

3. Lower the steering planetary unit into the rear main frame with the bevel gear located on the right hand side. Turn the bearing cages to position the dowel pin hole at the top. While lowering the unit, tilt the left end down and forward to engage the bevel gear and pinion teeth. Lower the high end while turning the bevel gear forward to bring both gears into mesh. When the gears are meshed, relieve the hoist strain on the carrier unit to set the lower section of the bearing cages onto the shoulder of the bearing cradles. Do not remove the hoist sling until after the bearing caps are bolted into position. Remove the vise grip pliers or "C" clamps.

4. If bearing cap shims are used, the same thickness of shims that were removed must be installed on the cap surface of the main frame. If a new bearing cap is being installed, perform the following steps:

(a) With the bearing cage in place, put lead pellets on the cap surface of the main frame. Assemble the cap and torque the cap retaining bolts until the cap and top of bearing cage contact each other. Remove the cap and measure the thickness of the lead. Add the thickness of the rear and front lead pellets; then divide by two. The result is the shim pack thickness for each side of the cap.

NOTE: Since the smallest shim is .003 inch, select the right number of shims so the resulting fit between the cage and cap will be .001 inch tight to .004 inch loose.

(b) Press the dowel pin in the middle of the cap so that .20 inch of the dowel pin is protruding out of the cap. Press the dowel pins in the ends of the cap so that .30 inch of the dowel pin is protruding out of the cap. Peen casting at top of dowel holes for securing the end dowel pins only.

(c) Stamp "LH" or "RH" as required on the cap for future identification.

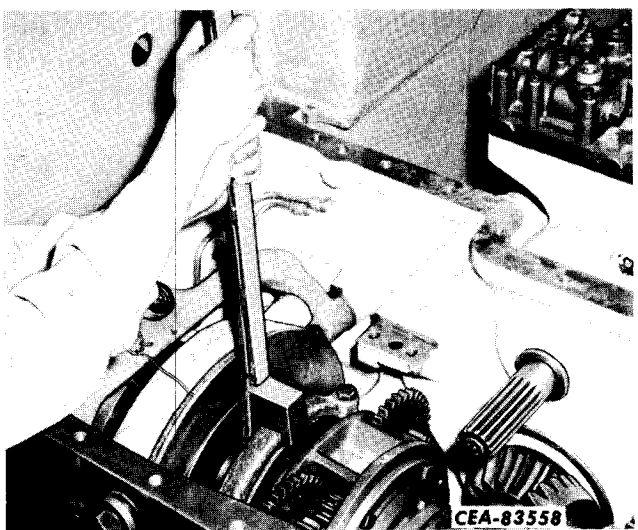
5. Install the bearing cap over the bearing cage assembly at both planet gear carrier ends aligning the middle dowel pin in the cap with the hole in the cage as the bearing cap recess butts against the bearing cage shoulder. The carrier unit can be shifted left or right if necessary, with a slight strain on the hoist, to line up the other dowel pins in the bearing cap with the dowel holes in the ends of the bearing cradle. When the dowel pins match the three holes, tap the bearing cap down, torque the cap bolts from 5 to 10 ft-lbs. and rap the bearing caps while rotating the assembly to be sure the caps seat squarely. Do not apply full torque to the cap bolts at this time. Remove the hoist sling.

(Continued on next page)

STEERING PLANETARY

8. INSTALLATION - Continued

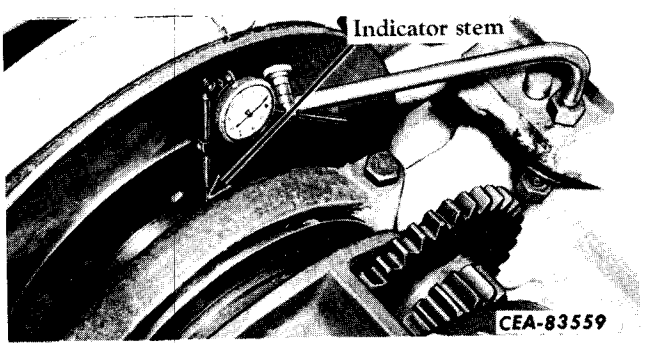
6. The steering planetary assembly must be located in the rear frame so there is excessive backlash between the bevel gear and pinion. This is accomplished by loosening the right hand adjusting nut (20, Illust. 10) and tightening the left hand adjusting nut on an equal amount using the special spanner wrench (Illust. 21). Rotate the assembly regularly while setting this excessive backlash (approximately three times specified backlash).



Illust. 21
Tightening the Left Hand Adjusting Nut.

7. Next, tighten the adjusting nut in each bearing cage to a heavy bearing pre-load. Rotate assembly and rap bearing caps to assure that the shoulder on the bearing cage is seated against the bearing cap.

8. Torque the retaining bolts in the cap on the side adjacent to the bevel gear to 160-180 ft-lbs.



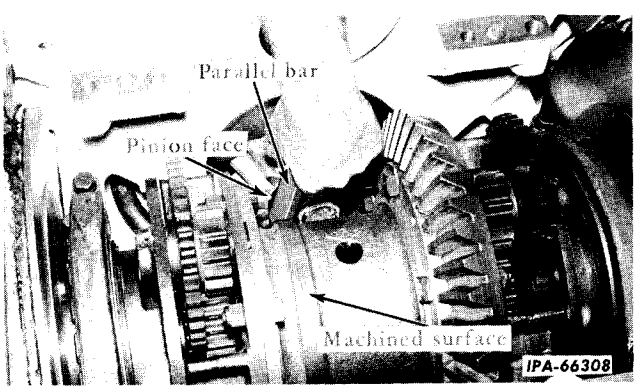
Illust. 22
Dial Indicator Set-up for Obtaining Bearing Pre-load.

9. Back off on the adjusting nut on the side opposite the bevel gear and pry the assembly to the left side with a pry bar until the bearings rotate freely. Place a dial indicator on any surface of the rear main frame so its stem is against the outer machined face at the top of the bearing cage adjacent to the bevel gear. Set the indicator at zero (Illust. 22).

10. Tighten the adjusting nut opposite the bevel gear until the indicator reads .002-.003 inch which is the outward deflection of the top of the bearing cage adjacent to the bevel gear. It is important that the assembly is rotated while the nut is tightened to obtain this deflection reading.

11. Tighten the retaining bolts in the bearing cage cap opposite the bevel gears to 160-180 ft-lbs.

12. Position the dial indicator on any machined surface of the rear main frame so its pointer will rest against the machined surface of the bevel gear carrier (Illust. 23). Rotate the assembly one complete revolution and note the total deflection of the indicator hand from high to low. Maximum permissible run-out is not to exceed .010 inch total indicator reading. Rotate the assembly further and watch the indicator. When the pointer shows one-half of total deflection, cease rotating and paint-mark this point. It will be the mark used to set up the pinion end clearance.



Illust. 23
Measuring Pinion End Clearance.

13. Check the transmission bevel pinion end clearance as follows: Using adjustable parallels or a gauge bar, measure the distance between the machined boss on the end of the pinion and the machined surface of the bevel gear carrier at the paint mark (Illust. 23). This measurement should agree with the end gap figure marked on the end of the pinion.

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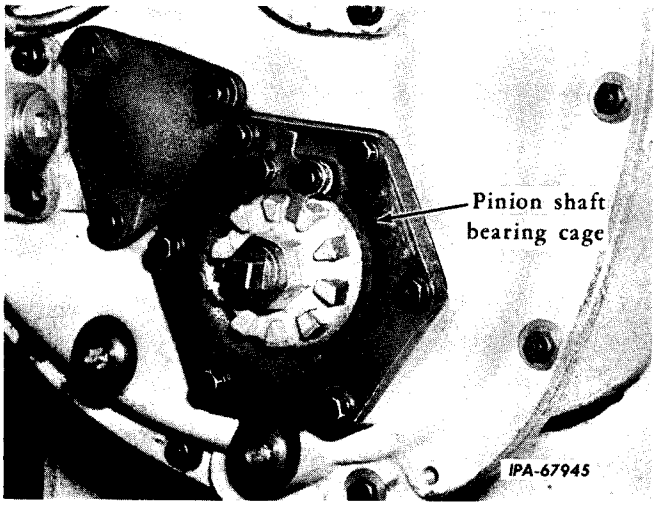
If the setting does not agree, the pinion must be moved in or out as required. To adjust the pinion, remove the cap screws and washers securing the pinion shaft bearing cage to the transmission front cover (Illust. 24). Add shims between the bearing cage flange and transmission cover to move the pinion away from the bevel gear carrier or remove shims from the bearing cage to move the pinion toward the carrier. When the correct end clearance is reached, secure the bearing cage to the front cover. Be sure the bearing cage is tight when making the final check.

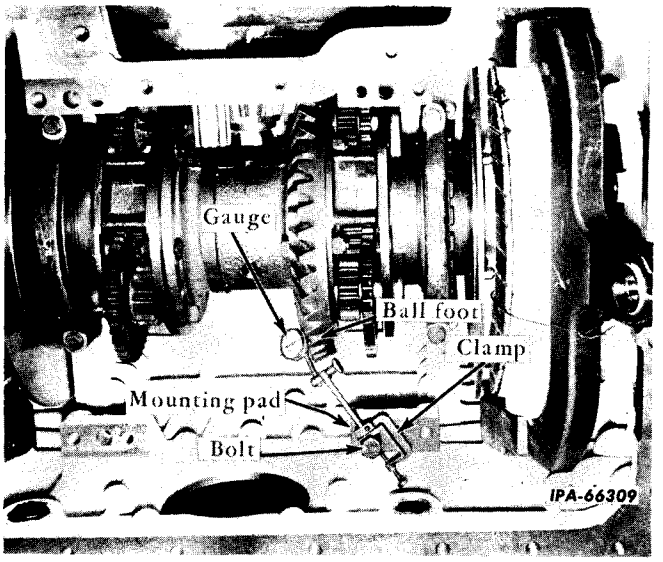


Illust. 24
Transmission Front Cover.

14. Check the backlash between the bevel gear and pinion with the dial indicator (Illust. 25) as follows: Position the dial indicator on the right rear mounting pad and adjust the arm so the indicator pointer will rest on one of the bevel gear teeth. Turn the bevel gear toward the rear to the limit of its movement. Set the indicator pointer to touch the top surface of the tooth and set the indicator at zero.

Insert a pry bar behind the transmission pinion to hold the pinion positively locked and move the bevel gear forward within the limits of its free play. Note the indicator reading. Repeat this check at four equidistant points on the bevel gear and adjust for the minimum backlash at the tightest point. The dial indicator deflection average should agree with the backlash figure marked on the bevel gear rim. (A .002 inch plus or minus tolerance of the required backlash dimension marked on the rim of the bevel gear is acceptable as a final backlash setting.)

Adjust the bevel gear for the proper backlash by loosening the bearing cap retaining bolts and moving the planetary assembly left to decrease



Illust. 25
Checking Bevel Gear Backlash.

and right to increase the backlash. Loosen one adjusting nut (20, Illust. 10) and tighten the opposite adjusting nut, one notch at a time, to move the bevel gear in the direction required. Both nuts must be moved equal amounts to maintain the .002 - .003 inch bearing setting obtained previously. Rotate the assembly and rap the bearing caps while tightening the adjusting nut. With each adjustment, rotate the bevel gear several times; then check the backlash obtained by moving the bevel within its free limit as described previously. When the proper backlash is obtained, torque the bearing cage cap bolts to 160-180 ft-lbs and install and secure the nut locks (21, Illust. 10).

NOTE: Should the holes for the nut locks fail to coincide, always tighten the adjusting nuts to fit the nut locks, never loosen them.

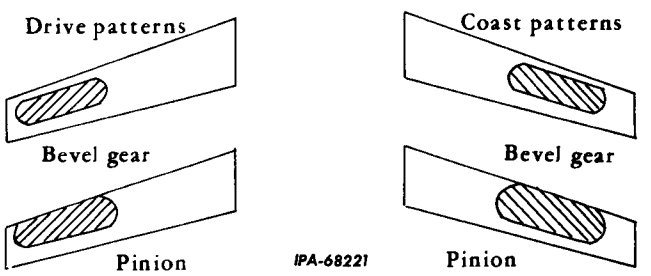
15. The proper backlash, pinion end clearance and bearing settings should now be correctly set. To check this, coat both sides of the transmission pinion teeth with red lead or prussian blue. Turn the pinion by hand in the normal direction or rotation. Compare the tooth contact with the drive patterns shown in Illust. 26.

Next, rotate the steering planetary by hand so the pinion and bevel gear rotate in the same direction as when checking the drive pattern. Compare the tooth contact on the reverse sides of the teeth with the coast patterns shown in Illust. 26.

(Continued on next page)

STEERING PLANETARY

8. INSTALLATION - Continued



Illust. 26
Preferred No Load Tooth Bearing.

16. If the tooth patterns obtained are not similar to those shown in Illust. 26, recheck the settings. When satisfactory adjustments are obtained, check to be sure the adjusting nut locks (21, Illust. 10) are installed and secure.

17. Apply Molykote type "G" to the threads of the retainer (24) and install the pressure spring (25) and retainer (24) to both sides of the rear frame as follows (Illust. 11):

NOTE: Before installing the brake pressure springs (25) in the frame check that they both have the same number of coils. Later type springs have 8-3/4 coils (one more than previously used) and must not be intermixed with an earlier type spring.

(a) BRAKE FORKS REMOVED: Position the spring and retainer in the rear frame and compress the spring with the compressor bolt and washer to provide space for brake fork and fork push rod (21) installation.

(b) BRAKE FORKS INSTALLED: Position the spring and retainer at an angle in the rear frame so the compressor bolt (with flat washer installed) can be inserted through the rear frame and threaded into the spring retainer. Turn in on the bolt to compress the spring until the spring can be seated in the frame and compressed far enough to provide space for the installation of the fork push rod (21). If the retainer (24) binds on the brake fork, hit the retainer with a brass hammer as the compressor bolt is turned in.

18. If removed, install the brake forks into the rear main frame with the brake shoes, linings and adjusting screws facing inward (Illust. 1). Before installing the fork front and rear pins they should be inspected for burrs, otherwise the pins may broach the mounting holes. Support the brake fork to align the mounting holes with the openings in the rear frame until the fork pins are installed. Position the front fork pin in the rear frame counterbore. Insert the puller screw through the rear pin opening in the frame and thread it into the front pin until it bottoms. Using a hydraulic ram as shown in Illust. 27, pull the front pin into the frame until the snap ring groove appears and install the snap ring. Install and secure the opposite pin in the same manner. Install the rear pins in the frame as shown in Illust. 27 until the snap ring groove appears and install the snap rings. The brake fork should pivot freely on the front and rear fork pins (.004 to .007 inch loose fit).

NOTE: On machines where it may have been necessary to remove the transmission, install the front fork pins until the snap rings can be installed in their grooves in the rear main frame. Install the transmission.

19. Install the pivot brakes and sprocket drive pinion shaft through both sides of the tractor. Refer to "INSTALLATION" under "PIVOT BRAKES" in this section.

TD-20 (SERIES B) WITH EARLIER TYPE BRAKE ONLY: If only the sprocket drive pinion shaft was removed and the pivot brakes and sprocket drive carrier remained attached to the rear frame, refer to Section 8, "SPROCKET AND SPROCKET DRIVE" under "SPROCKET DRIVE PINION" for installing the sprocket drive components. Install the pinion shaft using a back and forth motion, keeping some inward pressure to allow the pivot brake discs to pick up the shaft splines.

20. LATER TYPE BRAKE: Position the actuating cable (18, Illust. 40A) and lever support (1) with lever (2) and spring (16) attached on the pivot brake assembly. Install this assembly as the finger of the lever (2) engages the slot in the brake actuator (12) and secure the support with the mounting bolts (17).

21. Remove the wire securing the brake shoes (28, Illust. 11) to the brake fork (23). Position the brake back-up shoe (31, Illust. 11) over the dowels in the mounting pads of the rear frame. Use the mounting cap screws to draw the shoe down evenly onto the mounting pads and tighten the cap screws to their full torque.

22. Tilt the brake forks to the side and position the push rods (21, Illust. 11) between the fork adjusting screws and bellcranks (13). Secure the push rods to the bellcranks with the snap rings (19). Insert the stiffener (33) in the return spring (15) and install the return spring between the bellcranks (13).

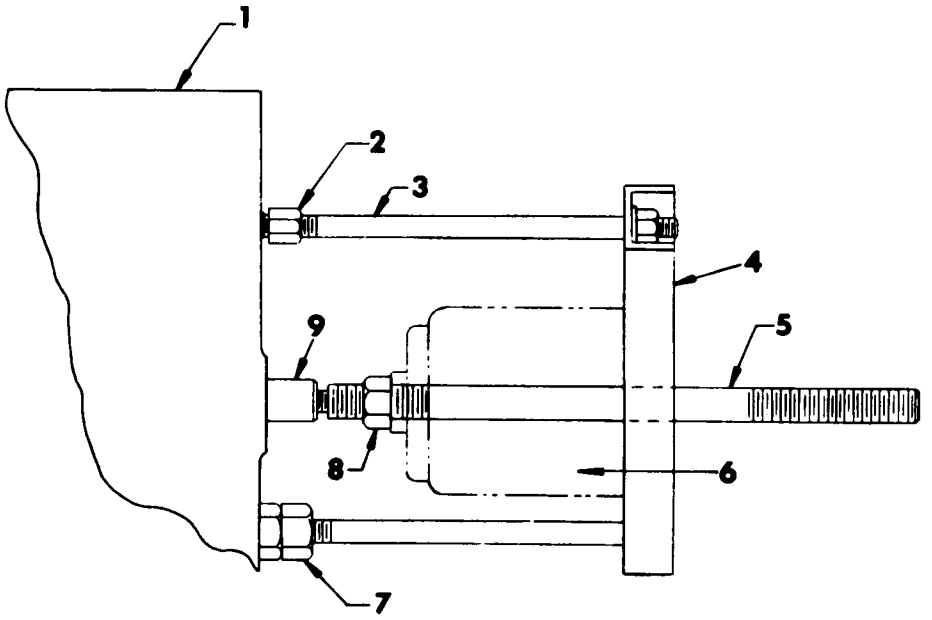
23. Thoroughly clean the mating surfaces of the rear main frame and cover. If surfaces are

STEERING PLANETARY

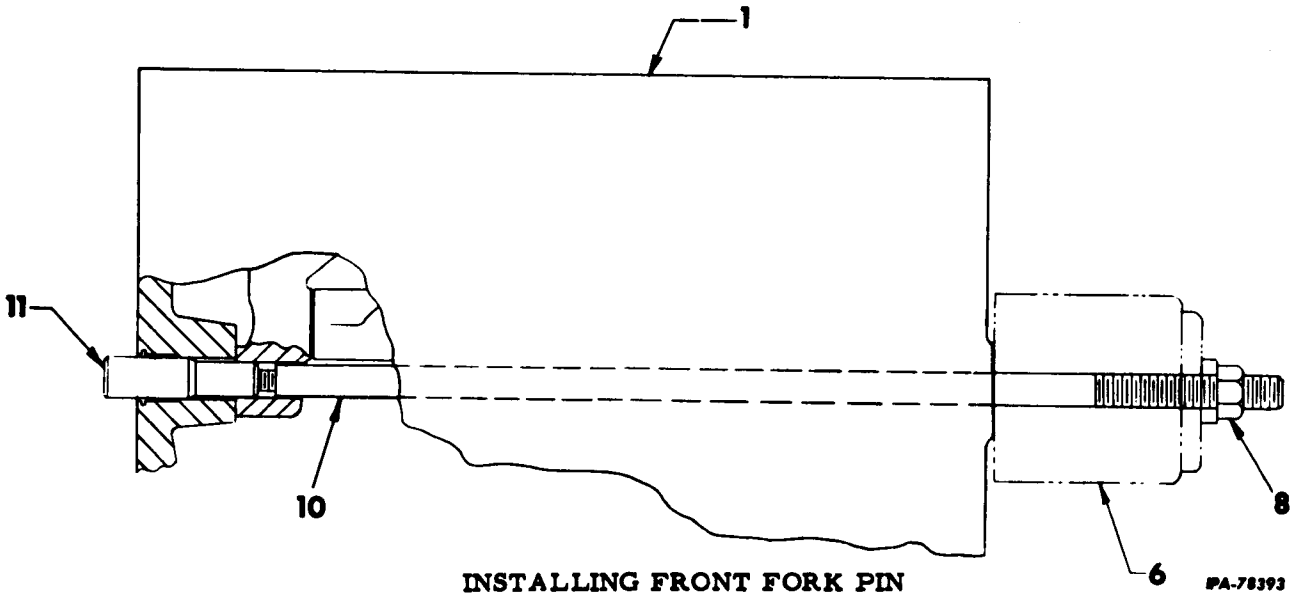
coated with grease or oil, remove with drying degreasing solvent. Dry with clean dry compressed air or lint free wiper. Spread an even coat of "LOCTITE" plastic gasket on one of the mating surfaces.

24. Hook a wire around each of the pivot brake cable yokes and when the rear frame cover is in position, thread the wire through the cable opening in the cover (Illust. 28).

(Continued on next page)



INSTALLING REAR FORK PIN

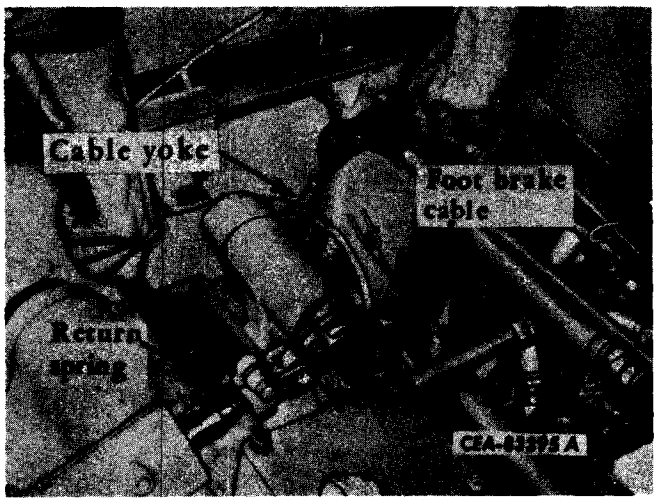


INSTALLING FRONT FORK PIN

Illust. 27
Installing Brake Fork Pins.

1. Main frame.
2. Adapter (OTC M-20).
3. Leg (OTC 930 D).
4. Support bar.
5. Puller screw.
6. Hydraulic ram.
7. Adapter (OTC-932).
8. Nut.
9. Rear fork pin.
10. Puller screw.
11. Front fork pin.

8. INSTALLATION - Continued



Illust. 28
Installing the Pivot Brake Actuating Cable on Earlier Type Brake Assemblies.

25. Attach a hoist to the eyebolts in the main frame cover that were used for removal. Be sure the set screw that remained in the cover is backed out sufficiently to prevent interference.

Lower the cover into position over the cover dowels in the rear frame. Use a soft hammer to start the cover on the dowels, then seat the cover by tightening the mounting cap screws on each side of the dowels evenly. Secure the cover to the frame with all the mounting cap screws. Be sure to coat the cap screws with oil to prevent seizing with "LOCTITE" plastic gasket which may have run into the mounting holes. Remove the hoist and eyebolts. Install the three set screws in the cover.

26. Reach in through the center inspection cover opening and engage the push rods (12, Illust. 11) with the bellcranks (13).

27. Remove the compression bolt and washer holding the brake spring compressed on each side of the cover. As the compression bolt is removed, reach in through the rear power take-off opening in the rear of the rear main frame and check that the push rod (21, Illust. 11) enters the adjusting screw (22) or the brake spring moves the fork in that direction. Also move the push rod back and forth as the adjusting screw contacts the rod. With the compression bolt removed, there should be some movement of rod.

28. EARLIER TYPE BRAKE: Install the pivot brake actuating cable to bolt sides of the rear main frame cover. Insert a heel bar through the inspection cover opening under the brake return spring retainer to align the spring with the cable opening in the cover. Grab the wire (secured to the cable yoke previously) with a pair of pliers and in one motion, pry up with the heel bar and pull on the wire to seat the cable in the cover (Illust. 28). Remove the wire from the cable yoke. Do not secure yoke to bellcrank.

LATER TYPE BRAKE: Install the pivot brake actuating cable to both sides of the rear main frame cover. Grab the wire secured to the cable yoke previously and, with a pair of pliers, pull on the wire to seat the cable in the cover. Remove the wire from the cable yoke. Do not secure the yoke to the bellcrank.

29. Install the brake cable rubber boot using a pair of pliers. First maneuver the boot down over the cable yoke until the top of the boot can be inserted in the groove around the bottom of the yoke. Then pull the boot all around the flange protruding from the rear main frame cover.

30. Install and secure the foot brake cable (Illust. 28) and pulleys.

A. MOVABLE PULLEY SIDE (Illust. 5): Position the support (2) on the stud (3). Wrap the cable around the pulley (5) and place the pulley, support and cable assembly inside the yoke of the pull rod (1). Move the complete assembly to the front of the tractor until clearance is obtained to insert the pulley shaft (4) from the underside of the yoke. Be sure the snap ring is installed in the groove in the bottom of the pulley shaft and push the shaft up through the complete assembly. Install the upper snap ring in the pulley shaft (4) to its stud with the snap ring. Secure the cable to the bellcrank with the end pin and cotter so the head of the pin is toward the outside of the tractor.

B. IDLER PULLEY SIDE: Place the pulley on the stud protruding from the cover and secure the pulley to the stud with the spacer and snap ring. Wrap the cable around the pulley and secure the cable to the bellcrank with the end pin and cotter. The head of the pin must face the outside of the tractor.

31. Secure the pivot brake cable to the bellcrank on each side with the end pin and cotter.

32. Install a new power take-off cover gasket and the power take-off cover to the rear of the rear main frame. Apply Permatex No. 3 to the inspection cover side of the cover gaskets and install the three inspection covers on the rear main frame cover.

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33. Connect the brake pull rods (4 and 5, Illust. 6) on each side of the unit.

34. Connect the steering booster valve operating rod (10, Illust. 6) at the steering lever and booster on each side of the rear frame cover. Connect the steering booster pressure hose (11) at the booster connection and secure the hose to the cover with the clamp.

35. On units with external piping, install and connect the sprocket drive vent tubes. Connect the converter vent tube at the rear frame cover and at the converter.

36. If the left cylinder hose crossover tubes were removed, they should be connected at the control valve and at the cylinder hose connectors. Install the batteries and battery box on the left hand fender.

37. Connect the booster piston return springs (1, Illust. 6) to the hooks on the seat support bar. Do not connect the other end of the springs to the outer levers at this time. Connection of the springs will be performed when adjusting the brakes.

38. UNITS EQUIPPED WITH SCARIFIER: Connect the scarifier front oil tubes (4, Illust. 3) at the control valve.

39. Attach a hoist to the fuel and hydraulic oil tanks and position the tanks on the fenders of the front frame (Illust. 4). Secure the tank support platform to the frame with the cap screws, nuts and washers.

40. Connect the seat side sheets at the fuel tank. Position the vent tubes in the clips at the front of the fuel tank and connect the tubes at the rear frame cover. Connect the fuel lines at the fuel tank.

41. Connect all the lines at the hydraulic oil tank that were removed to facilitate removal of the tank. Connect the rear light wiring.

42. UNITS EQUIPPED WITH SCARIFIER: Connect the hydraulic hoses at the scarifier to the front tubing (4) and secure with the clamp (5, Illust. 3).

43. Installation of the seat, batteries and battery support and the apron type cover (2, Illust. 3) at the rear of the tractor will be performed when adjusting the brakes and in the sequence outlined.

44. Open the diesel fuel shut-off valve (1, Illust. 3). Check line connections up to the fuel filters for leakage.

45. Be sure the drain plug in the underside of the rear main frame is installed and tight. Fill the rear main frame with the lubricant and to the level described in the operator's manual. Install the oil level dip stick.

46. Fill the hydraulic oil tank to the oil level mark with the lubricant described in the pertinent operator's or instruction manual.

47. Perform the major adjustment as described in Par. 9, "STEERING PLANETARY BRAKE AND PIVOT BRAKE ADJUSTMENTS." Be sure to follow the caution described at the beginning of Par. 9.

48. Install the track chain (refer to Section 9, "TRACKS AND TRACK FRAME" for installation). Install the sprocket cock shield (if equipped).

49. Operate the unit and vent the equipment hydraulic system as described in the pertinent operator's or instruction manual. Refill system as necessary. Recheck the level in the rear main frame and add lubricant as necessary. Check for proper functioning of the brakes in actual operation.

9. STEERING PLANETARY BRAKE AND PIVOT BRAKE ADJUSTMENTS

(Ref. Nos. Refer to Illust. 30)

◆ CAUTION: THE FOLLOWING ADJUSTMENTS MUST BE PERFORMED WITH THE ENGINE STOPPED UNLESS OTHERWISE STATED. WHENEVER IT IS NECESSARY TO HAVE THE ENGINE RUNNING, BE SURE THE TRANSMISSION GEAR SELECTOR LEVER IS LOCKED IN THE NEUTRAL POSITION WITH THE SAFETY LEVER AND THAT THE HI-LO SHIFT LEVER IS IN NEUTRAL.

NOTE: Before performing adjustments, remove all dirt accumulation from the main frame cover. Excessive dirt pack-up could cause binding of external brake linkage.

Adjust the pivot brakes when the steering levers can be pulled against the seat with the engine

(Continued on next page)

9. STEERING PLANETARY BRAKE AND PIVOT BRAKE ADJUSTMENTS - Continued

(Ref. Nos. Refer to Illust. 30)

running or when the brake pedal bottoms. Refer to "Pivot Brake Adjustment."

Adjust the steering planetary brakes when they slip or the tractor creeps to one side. Refer to "Steering Planetary Brake Adjustment."

Adjust the steering lever linkage when the levers are hard to pull or they stick in the disengaged position. Refer to "Steering Lever Linkage Adjustment."

The preceding adjustments compensate for normal wear only. If brake linkage has been disconnected or removed, the procedure under "Planetary Brake and Pivot Brake Major Adjustment" must be followed.

After adjustment has been performed, the unit must be checked out in actual operation for proper functioning.

Pivot Brake Adjustment

1. Loosen the lock nut (8) and turn the adjusting screw (9) until the hand lever can be pulled to dimension "E" (following table) (measured from the top edge of the front seat support) without bowing the lever. Tighten the lock nut (8).

See Illust. 30	L-250P, TD-20BP and TD-20BPS Below 5324	L-250BP, L-250P, TD-20BP and TD-20BPS 5324 and Up
E	1-3/4 Inches	2-1/4 Inches
F	1-1/4 to 1-1/2 Inches	1-3/4 to 2 Inches

2. Start and run the engine at low idle.

3. Pull back on the steering levers. The adjusted lever travel "E" (obtained in Step 1) should reduce to dimension shown as "F" in table following Step 1. If necessary, adjust screw (9) until dimension "F" is obtained with the engine running. Tighten lock nut (8). Stop the engine.

4. Depress the foot pedal and check for free travel (8-3/4 to 9-1/4 inches). If the proper free travel is not obtained, it may be due to binding of linkage or the adjustment procedure was not performed correctly.

NOTE: If the proper foot pedal free travel was not obtained, recheck adjustments performed in Steps 1 through 3. Then check the pedal linkage only if the free travel is still incorrect.

5. Checking pedal linkage. With the foot pedal back against its stop, check that the bell crank (C) is against the stop (D)(machined surface on main frame cover) or can be pushed against the stop. If the bell crank will not rest against the stop, proceed as follows:

(a) Remove the quick disconnect platform and the right hand platform.

(b) Remove the cotter and rod end pin (12). Push the bell crank against the stop (D).

(c) Loosen the lock nut (14) and turn the clevis (13) as required to reconnect it to the foot pedal without disturbing the position of the pedal or bell crank (C).

(d) Secure the clevis to the pedal with the end pin and cotter.

(e) Install the platforms.

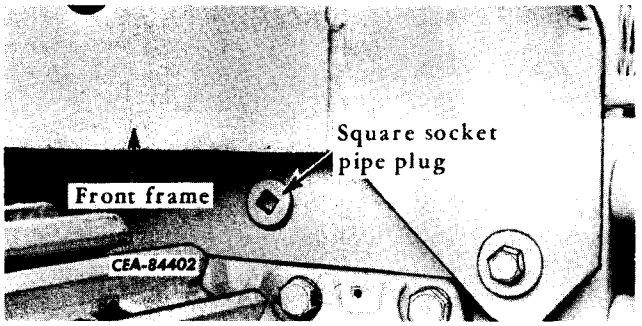
Steering Planetary Brake Adjustment (Units Without Rear Mounted Equipment)

1. Insert a bar through one of the openings in the apron type cover located below the fuel tank at the rear of the main frame and pry against the booster clevis (25) to assure that the booster piston is fully extended. This must be done with the planetary brakes engaged (hand levers in forward position).

2. Remove the P.T.O. cover from the rear of the main frame. Remove the 1-1/2 inch square socket pipe plug from the main frame to gain access to the brake adjusting screw. Access to this plug is provided in the front frame below the fender (Illust. 29).

3. Reach in through the P.T.O. cover opening and check for movement of the brake fork push rod (21, Illust. 11). If movement exists, insert a 1/2 inch drive extension through the access hole in the side of the main frame and turn the adjusting screw (21) clockwise until the push rod becomes snug. Then turn the adjusting screw counterclockwise 1/2 turn. This should provide approximately a 1/32 inch end play on

the push rod. If the brake fork push rod was tight, turn the adjusting screw (21) counterclockwise until the rod is loose. Then turn the adjusting screw clockwise until the rod becomes snug; back off 1/2 turn to obtain the 1/32 inch end play.



Illust. 29
Steering Planetary Brake Adjusting Screw Plug.
(Model 250 Loaders Shown,
TD-20 SERIES B Similar).

4. Repeat adjustment procedure on the other side of the unit.

5. Install the pipe plugs (Illust. 29). Install the P.T.O. cover using a new gasket.

Steering Planetary Brake Adjustment (Units With Rear Mounted Equipment)

NOTE: If the rear power take-off cover can be removed, follow the preceding adjustment procedure under "Units Without Rear Mounted Equipment." It is the preferred method of adjustment and must be used whenever practical.

NOTE: Before this adjustment procedure can be performed, it is very important that the engine speeds be checked to be sure it is in proper adjustment. (Refer to "ENGINE IDLE ADJUSTMENTS" in Section 4, "ENGINE.")

1. Insert a bar through one of the openings in the apron type cover located below the fuel tank at the rear of the main frame and pry against the booster clevis (25) to assure that the booster piston is fully extended. This must be done with the planetary brakes engaged (hand levers in forward position.)

2. Apply the foot brake pedal and lock.

3. Remove the quick disconnect platform so the "U" joint can be seen.

4. Remove the 1-1/2 inch square socket pipe plug (Illust. 29) from the main frame to gain access to the brake adjusting screw (21) on the side of the unit to be adjusted.

5. Start the engine. Pull back the steering lever (on the side not being adjusted) to full pivot position. Leave the hand lever on the side being adjusted in the engaged position (forward).

6. Move the engine speed control up to the third notch above low idle (approximately 1050 rpm). Place the transmission gear selector lever in "FORWARD 2" and the "HI-LO" lever in "HI."

◆ CAUTION: USE AN EXTENSION LONG ENOUGH TO AVOID ANY CONTACT WITH THE TRACK WHEN MAKING THE FOLLOWING ADJUSTMENTS.

7. Insert a 1/2 inch drive extension into the adjusting screw (21) and turn clockwise until the "U" joint starts to rotate. Then slowly turn the adjusting screw counterclockwise until the "U" joint stops; continue to turn counterclockwise for an additional 1-1/2 turns.

8. Remove the drive extension and install the pipe plug (Illust. 29).

9. Lock gear selector lever in "NEUTRAL" and place "HI-LO" lever in neutral (N). Stop engine.

10. Repeat adjustment on the other side of the tractor.

11. Install the quick disconnect platform.

Steering Lever Linkage Adjustment

◆ CAUTION: LOCK THE GEAR SELECTOR LEVER IN "NEUTRAL" AND PLACE THE "HI-LO" LEVER IN NEUTRAL (N) BEFORE PERFORMING THE FOLLOWING STEPS.

1. Start the engine and operate at low idle.

2. Pull back on the steering hand levers. If the hand lever pull is hard or a short catch is felt, disconnect the operating rod (4) at the booster and shorten the rod by turning the clevis (22) one turn at a time until lever travel is smooth. If the hand lever hangs up when released, lengthen the rod (4) until it returns freely. When the adjustment is completed and the rod (4) is connected and secured, the booster timing marks (Insert B, Illust. 30) will not necessarily be aligned.

3. Stop the engine.

(Continued on next page)

9. STEERING PLANETARY BRAKE AND PIVOT BRAKE ADJUSTMENTS - Continued

(Ref. Nos. Refer to Illust. 30)

Planetary Brake and Pivot Brake Major Adjustment

NOTE: The following adjustment is for the right side of the unit. Adjustment is the same for the left side.

1. Remove the bottom seat cushion. Remove the cap screws and washers securing the seat frame to the seat side sheets. Remove the seat frame.

2. Disconnect battery cables. Remove the battery support top bracket. Mark batteries to assure installation in the same location and remove the batteries. Remove the battery bottom bracket.

3. Remove the quick disconnect platform and the right hand platform.

4. Remove the rear cover (2, Illust. 3). If equipped with a scarifier, the tube clamp (5, Illust. 3) must first be disconnected and then the rear cover positioned over the hydraulic hoses.

5. Remove the cotter and end pin (11) but leave the release rod (19) connected to the bell crank (7). Remove the cotter and end pin (6) securing the booster to the bell crank. Temporarily disconnect booster spring (10) from bell crank and attach it to the hook on the release rod (19).

6. Remove the 1-1/2 inch square socket pipe plug from the right hand side of the main frame to gain access to the brake shoe adjusting screw (21). Access to the plug is provided in the front frame below the fender (Illust. 29).

7. Insert a 1/2 inch drive extension in the end of the adjusting screw (21) and turn the screw until the pointer (5) on the bell crank (7) is aligned with the pin on the rear frame cover (refer to Insert A, Illust. 30). Be sure release rod (19) is free to move and not binding at the front end as this adjustment is being performed. Install the 1-1/2 inch pipe plug.

8. Pull the booster piston (23) out until it is fully extended. Measure the distance from the center of the booster mounting pin (26) to the center of the mounting pin opening in the clevis (25). This distance must be 13-1/2 inches. If adjustment is necessary, loosen the clevis lock screw (24) and turn the clevis (25) until this distance is obtained with the piston fully extended. Tighten the lock screw (24). Secure the booster to the bell crank (7) with the end pin (6) and cotter.

9. Position the front of the release rod (19) so it will not bind and reconnect the spring (10) to the upper end of the bell crank (7). The pointer (5) will now move up from the pin on the rear frame cover (refer to Insert "A," Illust. 30).

10. Loosen the lock nuts (18) and turn the turnbuckle (17) until the pin (11) enters the rod and hand lever hub freely. Secure the pin (11) with the cotter. Continue adjusting the turnbuckle until 1-1/2 inches of free travel is measured at the top of the hand lever as shown in Illust. 30. Tighten the lock nuts (18).

11. Check to be sure that the alignment mark on the lever (1) is aligned with the alignment mark on the booster housing (refer to Insert "B," Illust. 30). If the marks are not aligned, disconnect the clevis (22) at the lever. Move the lever (1) until the alignment marks coincide and hold the lever in this position. Loosen the lock nut on the clevis (22) and turn the clevis as required to line up the mounting holes in the lever and clevis. Secure with the end pin (2) and cotter. Tighten the lock nut (3).

12. Loosen the lock nut (8) and turn the adjusting screw (9) until the hand lever can be pulled to dimension "E" (measured from the top edge of the front seat support) without bowing the lever. Tighten the lock nut (8). (Refer to the table under "Pivot Brake Adjustment" for dimension "E.")

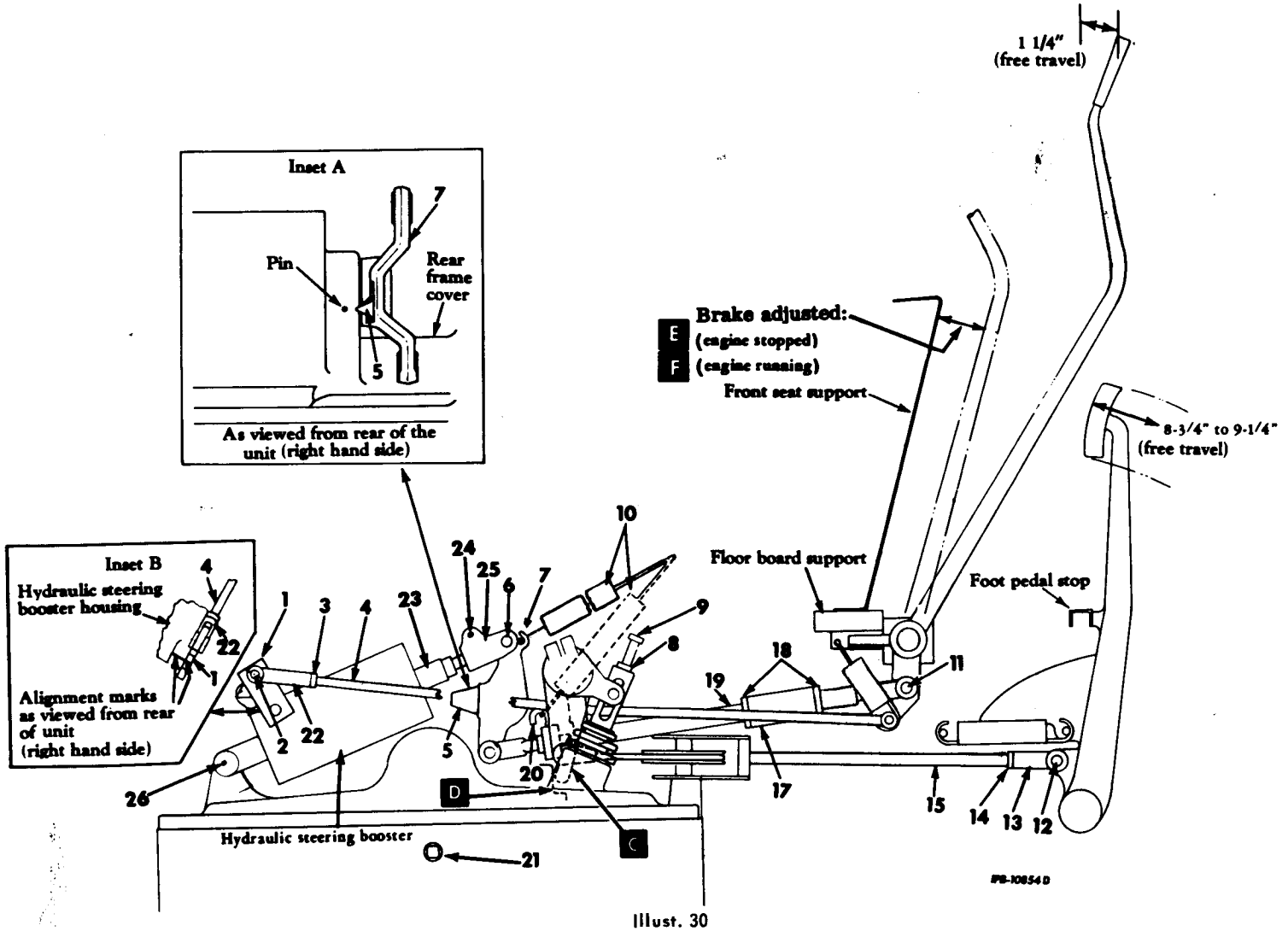
13. Repeat Step 5 through 12 for adjustment on the left side of unit.

14. Secure the battery bottom bracket to the seat support bar. Secure the rear of the bracket to the seat side sheets.

15. Install the batteries in their original location using the markings made in removal. Install and secure the battery support top bracket. Connect the battery cables.

16. Secure the seat frame to the seat side sheets with the four cap screws and lock washers. Install the seat bottom cushion.

(Continued on page 30.)



Illust. 30
Steering Planetary Brake and Pivot Brake Adjustments.

1. Hydraulic steering booster valve operating lever.
2. Rod end pin.
3. Lock nut.
4. Steering booster valve operating rod.
5. Pointer.
6. Hydraulic booster clevis pin.
7. Bell crank.
8. Lock nut.
9. Adjusting screw.
10. Spring.
11. Release rod end pin.
12. Rod end pin.
13. Brake pulley pull rod yoke clevis.
14. Lock nut.
15. Brake pulley pull rod yoke.
17. Turnbuckle.
18. Lock nut.
19. Release rod.
20. Hook.
21. Steering planetary brake adjusting screw.
22. Clevis.
23. Booster piston.
24. Lock screw.
25. Booster clevis.
26. Booster mounting pin.

STEERING PLANETARY

9. STEERING PLANETARY BRAKE AND PIVOT BRAKE ADJUSTMENTS - Continued
(Ref. Nos. Refer to Illust. 30)

Planetary Brake and Pivot Brake Major Adjustment - Continued

17. Start and run the engine at low idle. Pull back on the steering levers. The adjusted lever travel "E" (obtained in Step 12) should reduce to dimension shown as "F" in the table under "Pivot Brake Adjustment." If necessary adjust screw (9) until dimension "F" is obtained with the engine running. Tighten lock nut (8). Stop the engine.

18. With the foot pedal back against its stop, check that the bell crank (C) is against the stop (D) (machined surface on main frame cover) or can be pushed against the stop. If the bell crank will not rest against the stop, proceed as follows:

(a) Remove the cotter and rod end pin (12). Push the bell crank against the stop (D).

(b) Loosen the lock nut (14) and turn the clevis (13) as required to reconnect it to the foot pedal without disturbing the position of the pedal or bell crank (C).

(c) Secure the clevis to the pedal with the end pin and cotter.

19. Depress the foot pedal and check for free travel (8-3/4 to 9-1/4 inches). If the proper free travel is not obtained, it may be due to binding of linkage or the adjustment procedure was not performed correctly and should be rechecked.

20. Check the movement of the steering levers as described under "Steering Lever Linkage Adjustment."

21. Secure the rear cover (2, Illust. 3) to the rear frame and fuel tank support with the cap screws, lock washers and nuts. If equipped with a scarifier, secure the hydraulic oil tube clamp (5, Illust. 3).

22. Install the quick disconnect platform and the right hand platform.

PIVOT BRAKES

10. REMOVAL

> NOTE: Remove all dirt accumulation from the rear main frame cover. Excessive dirt pack-up could cause binding of external brake linkage and result in premature brake failure.

The pivot brake assemblies on each side of the tractor are the same; therefore, all parts are interchangeable. The removal, disassembly, inspection, repair, reassembly and installation procedures are also the same for each side.

1. Remove the sprocket rock shield (if equipped). Disconnect the track chain and clear it from the sprocket. It is not necessary to remove the track chain from under the track frame.

2. Drain the rear main frame by removing the plug in the underside of the frame.

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PIVOT BRAKES

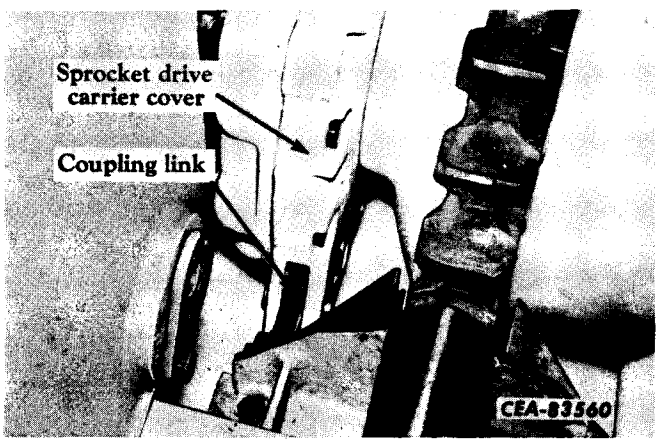
3. EARLIER TYPE BRAKE: To facilitate removal and installation of the pivot brake actuating cable (7, Illust. 6), the seat frame, batteries and battery support must be removed. When disconnecting the pivot brake cable on the right hand side of the unit, the brake pawl operating lever and lever guides must be removed and the seat side sheet moved out of the way.

4. EARLIER TYPE BRAKE: Remove the cotter and end pin securing the pivot brake actuating cable (7) to the bellcrank (6). Using a pair of pliers or other suitable tool, pull the rubber boot from the cable. Push the cable (7) down into the rear frame cover (Illust. 6).

5. LATER TYPE BRAKE: Remove the inspection cover located behind the brake actuating cable. Work through this opening to free the actuating lever assembly from the pivot brake by removing the bolts (17, Illust. 40A) securing the support (1) to the brake. Swing the support, with spring (16) and lever (2) attached, out of the way and secure this assembly near the top of the rear frame so it will be in position for installation.

EARLIER TYPE BRAKE: Remove the inspection cover located behind the pivot brake actuating cable. It will be necessary to work through this opening to feed the cable into the rear frame cover upon installation.

NOTE: EARLIER TYPE BRAKE: A pry bar or large screwdriver can also be used through this opening to aid in pushing the cable into the rear frame.



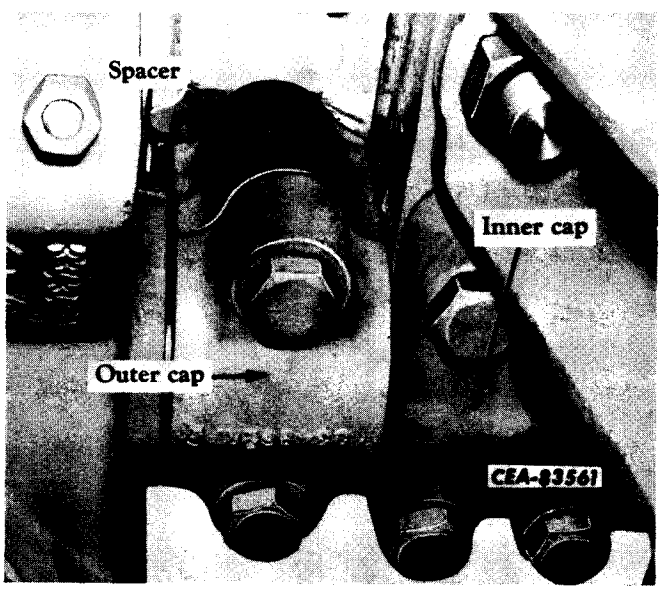
Illust. 31
Track Frame Coupling Link
(Model 250 Loaders Only).

6. LOADERS ONLY: Remove the track frame coupling link. Remove the cap screws, washers and link pin locks securing the link pins to the coupling at the track frame and at the bottom of the sprocket drive carrier cover. Tap out the link pins to remove the coupling link (Illust. 31).

NOTE: On the earlier MODEL 250 Loaders, it may be necessary to partially remove the track frame to permit track frame coupling link removal. On these units, the boss on the sprocket drive carrier cover must be filed down so the link can be lifted from position in the cover boss without partially removing the track frame in the future.

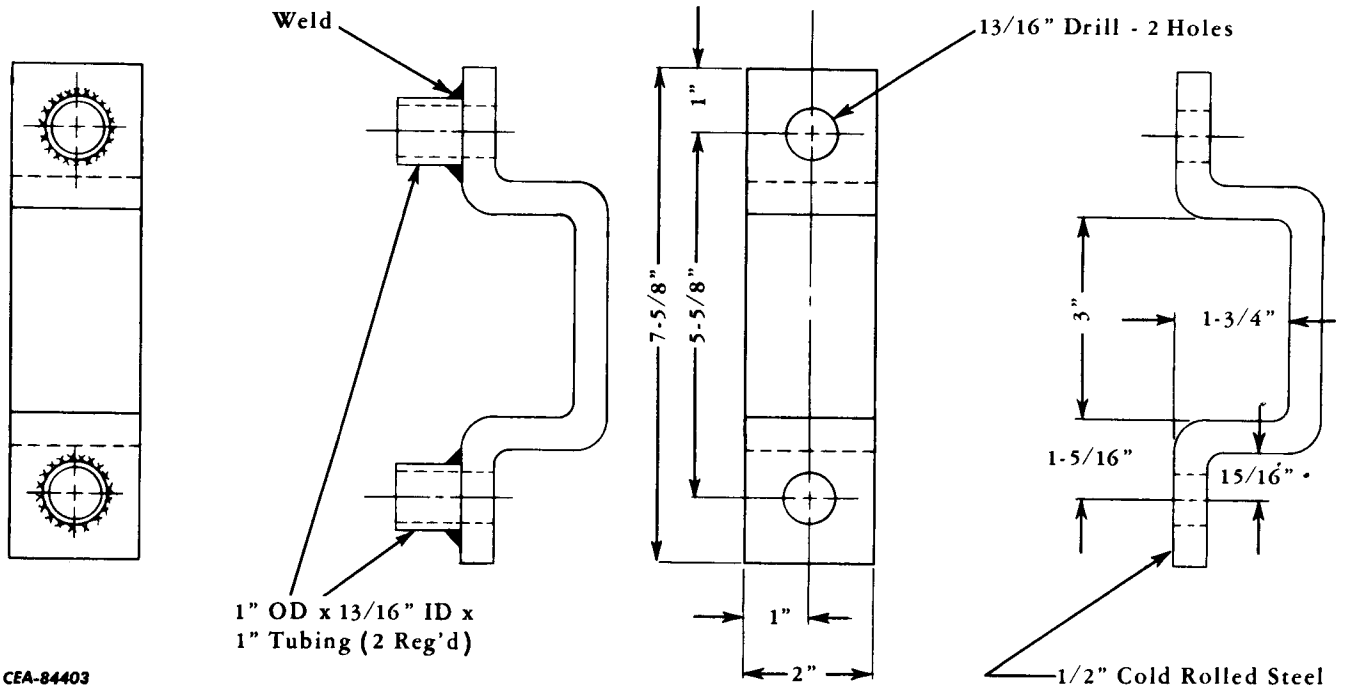
TD-20 (SERIES B) ONLY: Remove the outer cap securing the track frame pivot shaft to the sprocket drive carrier. Loosen the mounting bolts on the inner cap on each side of the tractor. Pry forward slightly on the pivot shaft to remove the shims between the spacer and sprocket drive carrier (Illust. 32). The spacer should be worked free of the carrier when the sprocket drive assembly is removed from the unit. Keep the shims together with the spacer and outer cap to facilitate reassembly.

(Continued on next page)



Illust. 32
Pivot Shaft Mounting Caps (Earlier Units Shown)
(TD-20 SERIES B Only).

10. REMOVAL - Continued



Illust. 33
Detailed Parts for Sprocket Drive Lifting Hook Adapter Shown in Illust. 35.

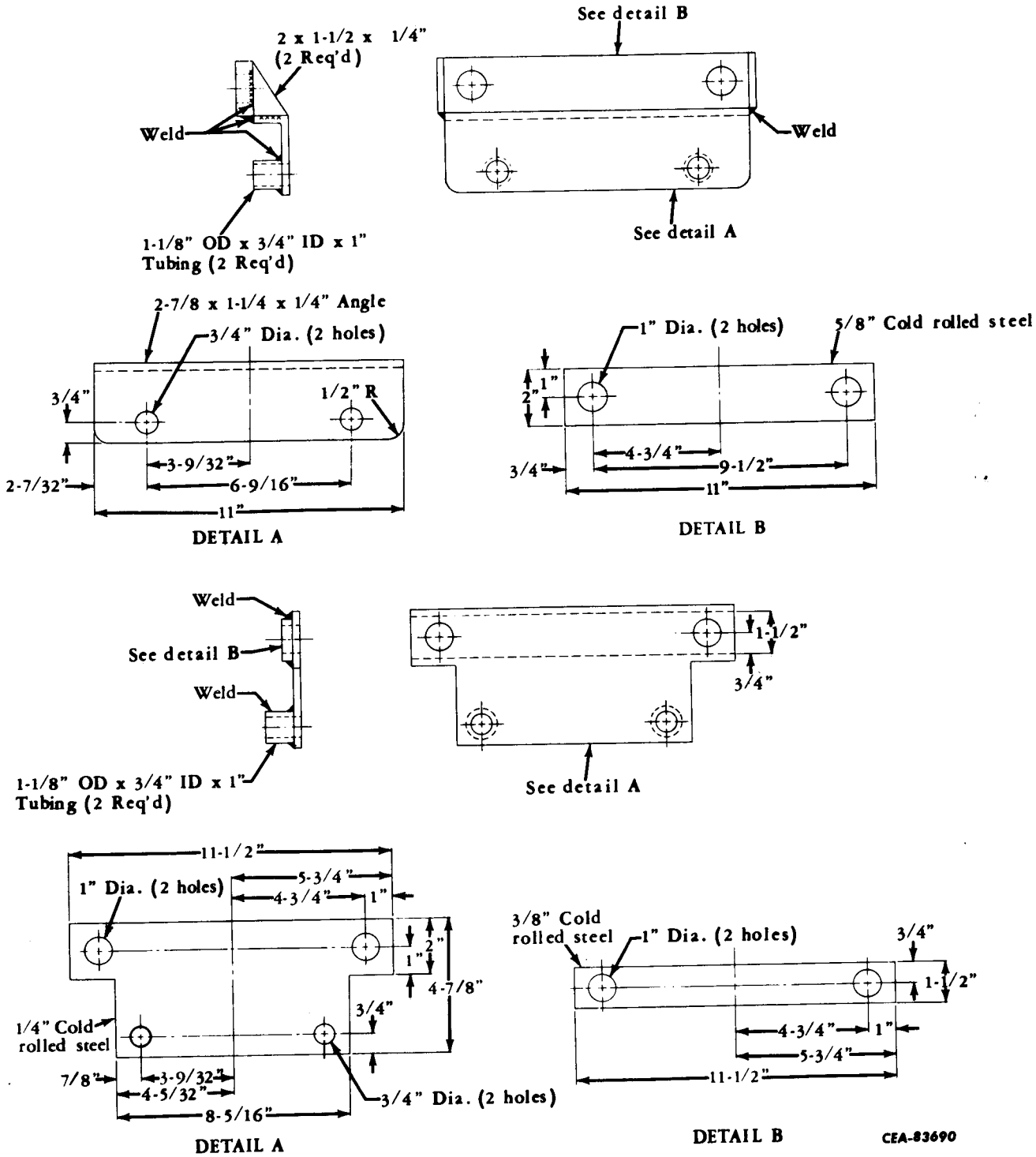
9. Remove the cap screws and nuts securing the sprocket drive carrier to the rear main frame. Remove two of the sprocket drive carrier cover mounting bolts and use two bolts (three inches in length) to secure the adapter (Illust. 33) to the cover. Secure the lifting hook (Illust. 34) and hoist to the adapter (Illust. 35).

Turn in the three hexagon-socket set screws provided in the sprocket drive carrier until pry bars can be inserted to pry the assembly from the studs and dowel. Pull the assembly straight away from the frame until the pinion shaft clears the frame. On the TD-20 (SERIES B), the pivot shaft spacer (Illust. 32) should be worked free of the carrier as the assembly is being removed.

7. Jack up the rear of the unit until the sprocket clears the track chain. Block under the rear frame.

8. To remove the sprocket drive assembly as a unit, a lifting hook and adapter should be made as shown in Illust. 33 and 34.

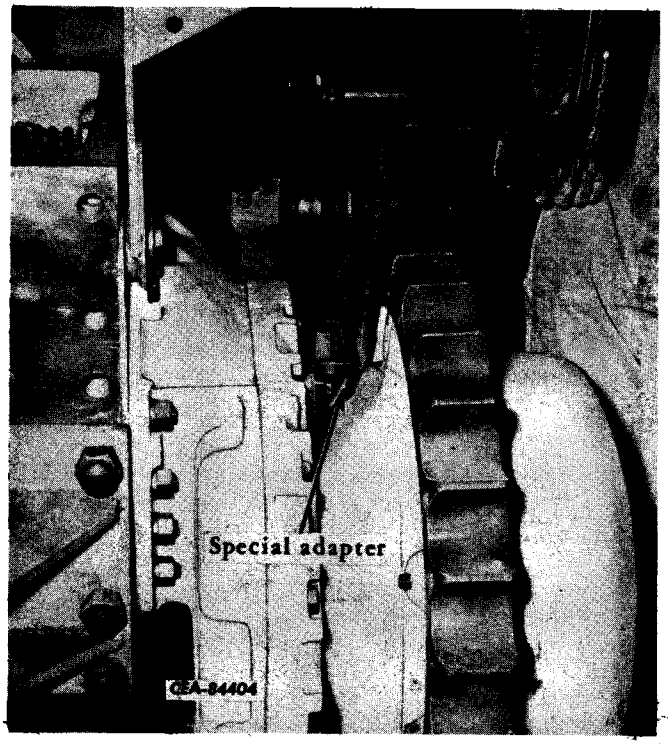
PIVOT BRAKES



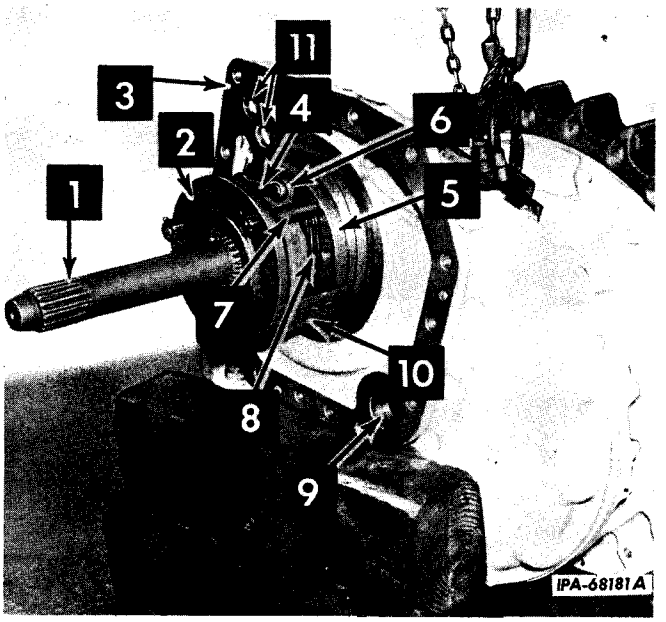
Illust. 34
Detailed Parts for Lifting Hook Shown in Illust. 35.

PIVOT BRAKES

10. REMOVAL - Continued



Illust. 35
Installing Sprocket Drive Special Lifting Hook and Adapter.
(TD-20 SERIES B Shown, Loaders Similar).



Illust. 36
Pivot Brake Assembly.

1. Sprocket drive pinion shaft.
2. Retaining ring.
3. Sprocket drive carrier.
4. Actuating link.
5. Back-up ring.
6. Actuating disc assembly.
7. Stud.
8. Brake discs.
9. Dowel hole.
10. Pivot brake sump.
11. Sealing rings.

11. DISASSEMBLY

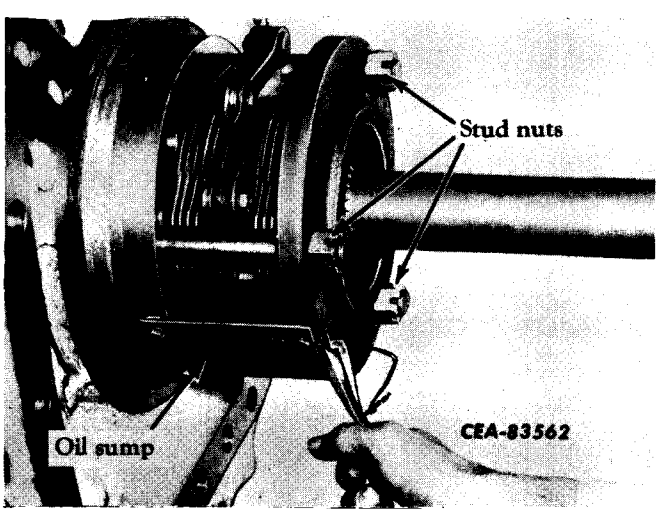
(Earlier Type Brake)

1. Support the sprocket drive assembly (as shown in Illust. 36).

2. Disconnect the pivot brake actuating cable from the links of the brake actuating assembly.

3. Remove the lock wire, cap screws and washers securing the oil sump and gaskets to the bottom of the brake retaining and back-up rings and remove the sump and gaskets (Illust. 37).

4. Remove the cotter pins and nuts from the three brake studs (Illust. 37).

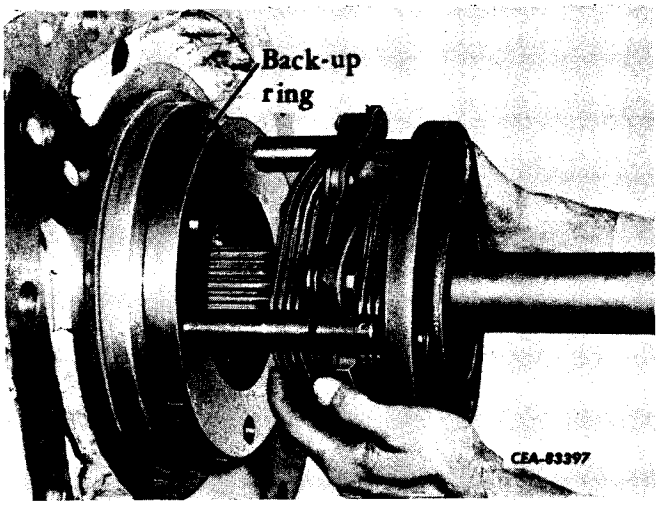


Illust. 37
Removing the Lock Wire from the Oil Sump Mounting Cap Screws.

PIVOT BRAKES

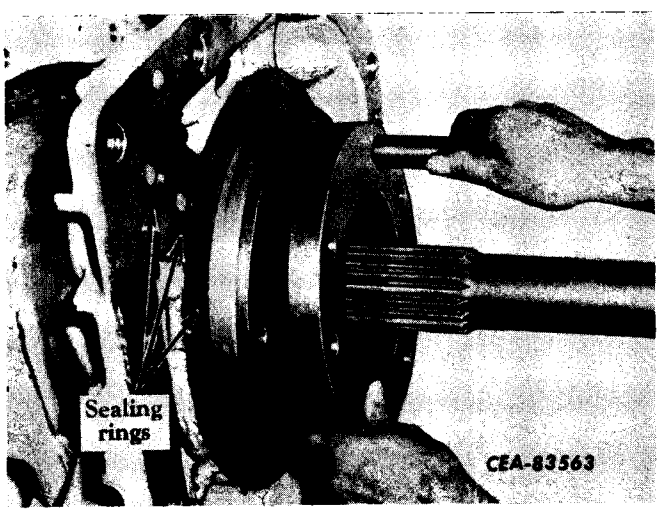
5. Remove the brake retaining ring, discs and actuating assembly from the studs and off the end of the pinion shaft (Illust. 38).

NOTE: Some brake assemblies are equipped with stud spacers. If so equipped, discard the spacers.



Illust. 38
Removing the Brake Disc Assembly from the Pinion Shaft.

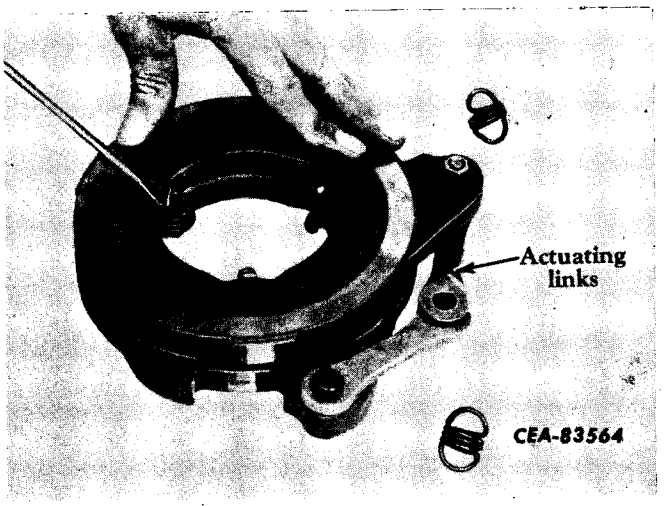
6. If necessary, the brake back-up ring can be removed from the carrier by loosening the three studs with a stud puller. Remove the studs and back-up ring (Illust. 39).



Illust. 39
Removing the Back-up Ring.

7. Pry the three extension springs from the ear lugs of the actuating discs using a screwdriver (Illust. 40). Separate the discs and remove the five steel balls.

8. If it is necessary to remove the actuating link (Illust. 40) from the disc, unstake and remove the nut and stud.



Illust. 40
Removing the Brake Extension Springs.

(Later Type Brake)
(Ref. Nos. Refer to Illust. 40A)

1. Position the sprocket drive assembly so the pinion shaft is up.

2. Remove the cap screws securing the pressure plate (13) to the sprocket drive carrier. Remove the pressure plate and actuator assembly from the sprocket drive pinion shaft. To separate this assembly, pry the three return springs (15) from the ear lugs of the actuator (12) using a screwdriver. Remove the actuator and the five steel balls (14) from the pressure plate. (Refer to Illust. 2A.)

3. Remove the cap screws securing the retainer (4) to the sprocket drive carrier and remove the retainer. Lift the separator plates (5) and friction plates (6) from the brake hub (7). Remove the spacer(s) (19) from the sprocket drive carrier.

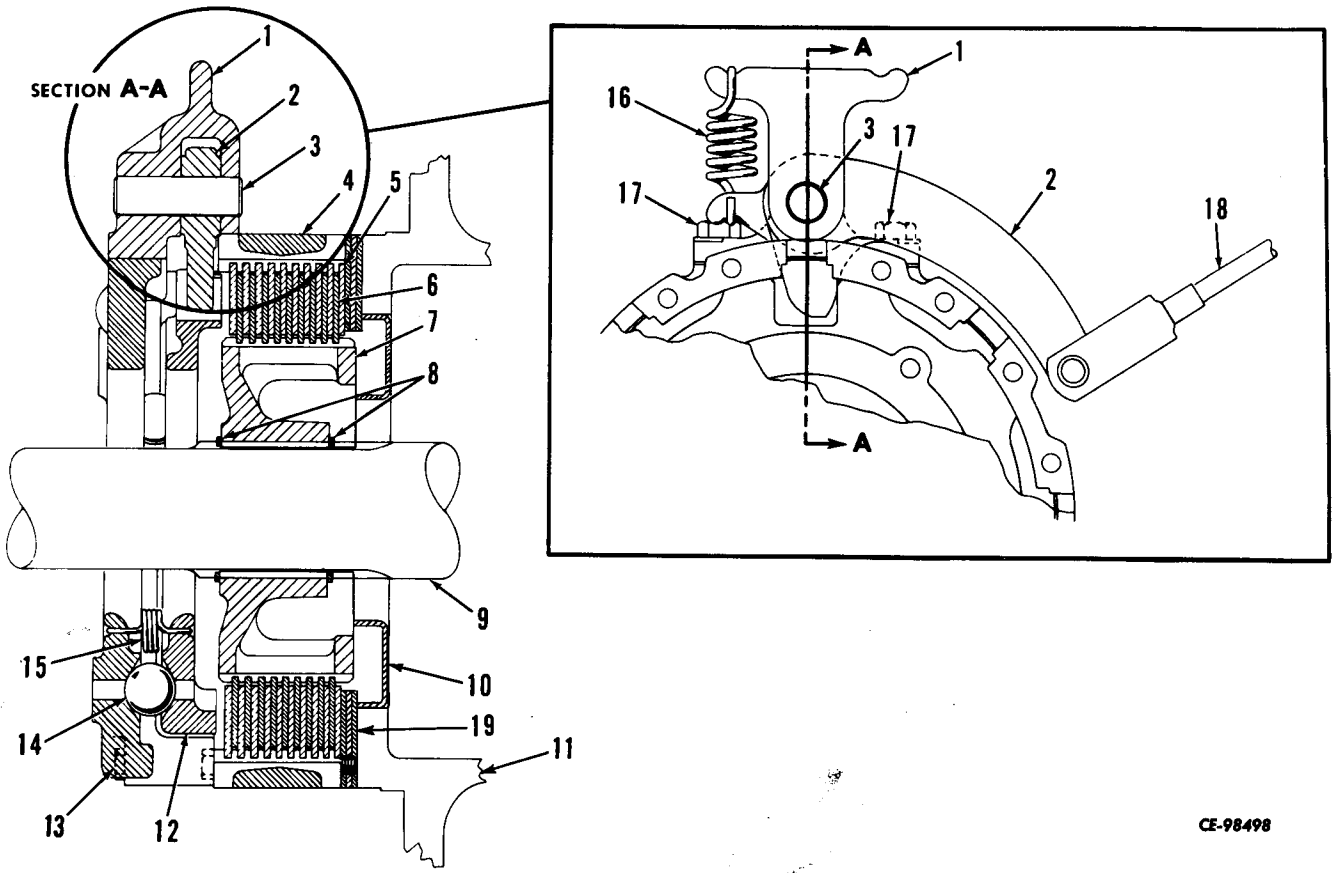
(Continued on next page)

PIVOT BRAKES

11. DISASSEMBLY - Continued

(Later Type Brake) - Continued
(Ref. Nos. Refer to Illust. 40A)

4. Remove the outer retaining ring (8) from the sprocket drive pinion shaft. Slide the brake hub (7) from the shaft.



Illust. 40A
Pivot Brake Assembly Cross Section.

1. Actuating lever support.
2. Actuating lever.
3. Actuating lever pivot shaft.
4. Separator plate retainer.
5. Separator plates.
6. Friction plates.
7. Pivot brake hub.
8. Hub retaining rings.
9. Sprocket drive pinion shaft.
10. Oil dam.
11. Sprocket drive carrier.
12. Pivot brake actuator.
13. Actuator pressure plate.
14. Steel ball.
15. Actuator return spring.
16. Actuating lever return spring.
17. Lever support mounting bolts.
18. Pivot brake actuating cable.
19. Brake mounting spacer (3 used on loaders, 2 used on dozers).

PIVOT BRAKES

12. INSPECTION AND REPAIR

1. Check the brake pedal action. New bushings are required if excessive looseness causes pedal wobble. If a binding movement exists, it may be possible to eliminate it by lubricating at the grease fitting in the pedal hub.

Remove the brake pedal to install the new bushings as follows:

(a) Remove the center and right front floor plates.

(b) Disconnect the brake rod yoke from the bottom of the pedal and unhook the pedal return spring. Check spring tension. Refer to Par. 2, "SPECIFICATIONS."

(c) Drive out the pedal shaft retaining pin installed through the side of pedal bracket arm and remove the shaft.

(d) Press out both bushings installed in the pedal bore.

(e) Press in new bushings until each is flush with the outer edges to allow space between the bushings for lubrication.

(f) Reinstall the brake pedal, linkage and floor plates.

(Later Type Brake)

2. Inspect the separator and friction plates for distortion and excessive wear at the braking surface. Refer to Par. 2, "SPECIFICATIONS" for dimension of new parts.

The braking surface on both sides of the friction plates are grooved to allow oil to squeeze out when the brakes are applied. All these groovings should be cleaned thoroughly.

3. Inspect the friction plate and the pivot brake hub splines for excessive wear and damage. Replace parts as necessary.

4. Check the pressure plate and actuator ramps for wear that may prevent the ball from rolling smoothly up the ramp. If any corrosion is found, polish the ramp with emery cloth. Inspect the steel balls and, if they are out-of-round or too rough to be polished with emery cloth, replace them with new balls.

5. Inspect the extension springs for excessive wear at the attaching loops or loss of tension needed to hold the actuator firmly against the balls. Refer to Par. 2, "SPECIFICATIONS."

6. Check the actuating lever return spring (16, Illust. 40A) for damage and tension (refer to Par. 2, "SPECIFICATIONS").

(Earlier Type Brake)

7. Inspect the middle and intermediate discs for distortion and excessive wear at the braking surface. If a wear pattern is established on either or both sides of an intermediate disc and the original disc thickness is reduced below the minimum dimension shown in Par. 2, "SPECIFICATIONS," the disc should be replaced with a new one.

The braking surface on both sides of the middle discs are grooved to allow oil to squeeze out when the brakes are applied. All these groovings should be cleaned thoroughly. If the discs or disc hub splines are excessively worn, replace the disc with a new one.

NOTE: The pressure required to obtain a given braking action will increase as braking surface wear progresses. This is due to the changing leverage of the actuating links as their angular relationship to each other decreases.

8. The outer face of the brake back-up ring and the inner surface of the brake retainer ring serve as stationary braking surfaces and must be inspected for excessive scratches or pitting. If these cannot be cleared up with emery cloth, replace the grooved or pitted parts.

9. Perform the same inspection and servicing operations, as in Step 8 preceding, on the brake surfaces of the actuator disc assembly.

10. Check each actuator disc ramp for wear that may prevent the ball from rolling smoothly up the ramp. If any corrosion is found, polish the ramp with emery cloth. Inspect the steel balls and, if they are out-of-round or too rough to be polished with emery cloth, replace them with new balls.

11. Inspect the extension springs for excessive wear at the attaching loops or loss of tension needed to hold the actuating disc firmly against the balls. Refer to Par. 2, "SPECIFICATIONS."

12. Check the actuating links, studs, brake rod yoke and yoke pin for wear, and replace worn parts with new.

(Continued on next page)

PIVOT BRAKES

12. INSPECTION AND REPAIR - Continued

(Earlier Type Brake) - Continued

13. Inspect the brake actuating cable assembly removed from the rear main frame cover.

(a) Remove the snap ring installed below the spring retainer and disassemble the spring guide. Check the brake cable return spring. Refer to Par. 2, "SPECIFICATIONS."

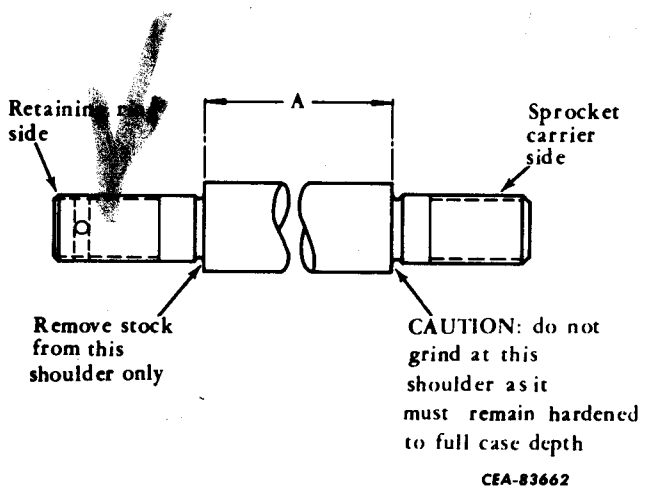
PAGE 3 SECTION 7

(b) Remove the "O" rings, from the grooves in the cable guide, and the dirt seal installed in the cover upper recess.

(c) Thoroughly clean all parts including the interior of the cover opening. Install a new dirt seal and new "O" rings, reassemble the spring and install the snap ring.

14. Check length (A, Illust. 41) of the pivot brake studs. If the dimension obtained is 3.589 to 3.594 inches, the studs must be removed and this length reduced to 3.539 to 3.544 inches to provide the proper brake disc clearance. Be sure to remove stock from the retaining ring end of the stud (Illust. 41). Install the studs so they are shouldered against the back-up ring using 110-125 ft. -lbs. torque.

[redacted] Instead of grinding the stud, an alternate method is to add an additional intermediate (steel) disc between the brake retaining ring (2, Illust. 36) and the outer lined disc upon reassembly of the pivot brake discs.



Illust. 41
Pivot Brake Stud Modification.

13. REASSEMBLY

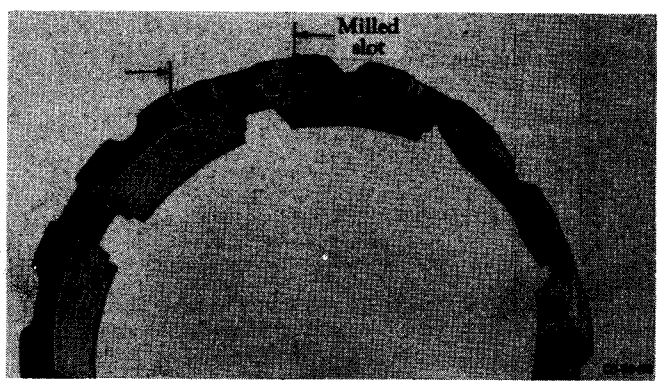
(Later Type Brake)
(Ref. Nos. Refer to Illust. 40A)

1. Position the pivot brake hub (7) on the sprocket drive pinion shaft splines until it bottoms on the inner retaining ring (8). Secure with the outer ring (8).

NOTE: To prevent damaging the oil dam (10) located in the carrier (11), be sure to install the hub with the open end toward the oil dam.

2. Install and secure the retainer (4) and spacer(s) (19) to the sprocket drive carrier.

NOTE: The retainer (4) must be installed so the milled slot (Illust. 41A) is facing away from the sprocket drive carrier (11) to prevent interference with the actuating lever (2) when the assembly is installed in the machine.



Illust. 41A
Separator Plate Retainer.

3. Alternately install ten separator plates (5) and nine friction plates (6) between the brake hub and plate retainer. These plates are installed correctly when the first and last plates to be installed are the externally tanged separator plates (5).

4. If the actuator assembly was disassembled, reassemble as follows. Place the five steel balls (14) in the ramp of the pressure plate (13). Position the actuator (12) over the pressure plate aligning the actuator ramp with the steel balls and secure the assembly with the three return springs (15). These return springs must be installed so the radii of the bends are toward the center of the actuator assembly (Illust. 41B).

PIVOT BRAKES

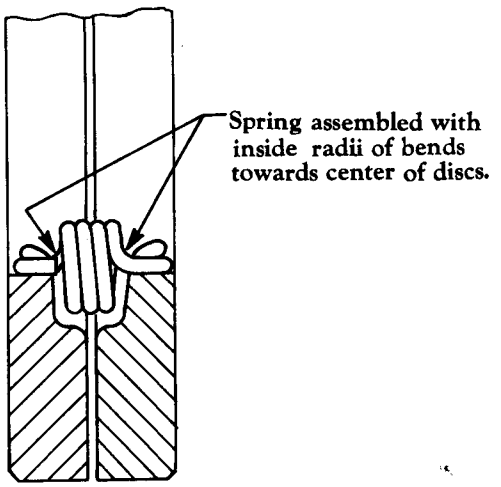
5. Position the actuator assembly over the sprocket drive pinion shaft and secure the pressure plate (13) to the sprocket drive carrier.

6. Apply pressure to the plates (5) and (6) to be sure they are bottomed on the carrier (11) and, with a feeler gauge, measure the gap between the plates and the actuator (12). If the brake assembly was installed properly and the parts used were thoroughly cleaned and within specification, a gap of .045 to .090 inch should be obtained.

(Earlier Type Brake)

1. If the actuating links (Illust. 40) were removed, assemble the two actuating links on the ramp side of the actuating discs with the link stud nuts on the friction side. Tighten and stake the nuts in place.

2. Place the five steel balls in the ramps of one actuating disc, place the other actuating disc over it and secure them together with the three extension springs (Illust. 40). These extension springs must be installed so the radii of the bends are toward the center of the actuating disc assembly (Illust. 41B).

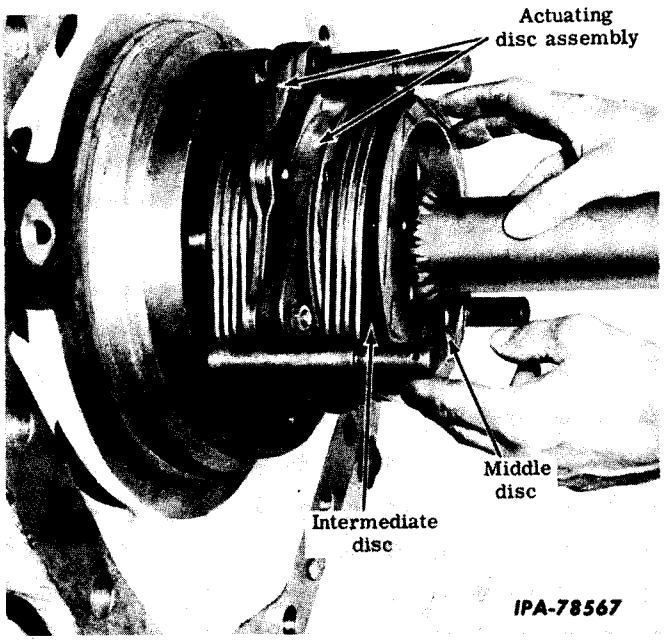


Illust. 41B
Extension Spring Properly Installed in Actuating Disc Assembly. (Later Type Brake Assembly Similar.)

3. If the brake back-up ring was removed, secure it into position against the sprocket drive carrier with the three studs using 110-125 ft. - lbs. torque. Be sure the studs are shouldered against the back-up ring.

4. Install nine of the brake discs on each side of the actuating disc assembly as follows (Illust. 42). **On brake assemblies using studs with length (A, Illust. 41) measuring 4.009-4.014 inches, install eleven brake discs on each side of the actuating disc assembly.**

NOTE: Before installing the retaining ring (Step (d)) be sure to assemble the additional steel (intermediate) disc to the studs (if necessary) (refer to Par. 12, "INSPECTION AND REPAIR").



Illust. 42
Installing the Brake Discs.

(a) Start with an internally splined middle disc next to the back-up ring. The next disc is a non-splined intermediate disc to fit the studs. Alternately install discs (five middle and four intermediate) or (six middle and five intermediate) on assemblies with stud length (A, Illust. 41) measuring 4.009-4.014 inches.

(b) Position the actuating disc assembly on the studs with the links toward the top as shown in Illust. 42.

(c) Install the remaining nine or eleven brake discs in the same manner as the first nine (Step (a)).

(Continued on next page)

PIVOT BRAKES

13. REASSEMBLY - Continued

(Earlier Type Brake) - Continued

NOTE: When installing the brake discs, be sure they are positioned so the holes are staggered. After the discs are in position, the holes should not line up.

(d) Install the brake disc retaining ring and lock nuts to the studs (stud threads oiled) and tighten the stud nuts from 70-80 ft. -lbs. Advance the nuts to the nearest cotter pin hole and install the cotter pin.

5. BRAKE ASSEMBLY WITH 18 BRAKE DISCS: Insert a feeler gauge between the retaining ring and the outer splined disc (steel disc, if additional disc was used) to determine the clearance of the brake disc between the retaining ring and the back-up ring. This clearance must be .050 to .145 of an inch. If the instructions under "INSPECTION AND REPAIR" were followed, this clearance should be obtained. If the addition of a steel disc did not bring the clearance within the specified limit, either grind the brake studs (refer to "INSPECTION AND REPAIR") or install new brake studs to obtain studs with the correct shoulder length. If this does not bring the clearance within the limit specified, install different brake discs (due to manufacturing tolerances) to obtain the proper clearance.

BRAKE ASSEMBLY WITH 22 BRAKE DISCS: Insert a feeler gauge between the retaining ring and the outer splined disc to determine the clearance of the brake discs between the retaining ring and the back-up ring. This clearance must be .050 to .145 of an inch. If the instructions under "INSPECTION AND REPAIR" were followed, this clearance should be obtained. If the clearance obtained is not within the limit specified it can be due to the variation of manufacturing tolerances. Install different brake discs to obtain the proper clearance.

6. Install the sealing ring around the shoulder of the sprocket drive carrier (Illust. 39).

7. Install new gaskets and the brake oil sump to the bottom of the back-up and retaining rings with the cap screws and washers. Secure with new lock wire (Illust. 37).

NOTE: If the brake studs were changed or modified, the slotted holes in the oil sump will have to be slightly widened for mounting.

8. Connect the pivot brake actuating cable to the links on the actuating discs.

NOTE: If it was necessary to modify the brake assembly to obtain the correct brake disc clearance, the brake assembly on the opposite side of the unit must be removed and the clearance checked.

14. INSTALLATION

NOTE: Be sure the three hexagon-socket set screws in the sprocket drive carrier have been turned back into place.

1. Apply Permatex No. 3 on the sprocket drive vent and the pivot brake cooling port sealing rings and install the sealing rings in the rear of the carrier (Illust. 39).

2. EARLIER TYPE BRAKE: Attach a wire to the end of the pivot brake actuating cable to be used for guiding the cable into position during sprocket drive assembly and for final installation of the cable in the rear frame cover.

3. Sling the assembly with the special lifting hook and adapter as was done in removal and move the assembly toward the rear main frame until two long guide bolts can be started in the frame. Install the guide bolts into the bolt openings at the top of the carrier. Use a pry bar between the track chain and sprocket planet carrier to align the assembly with the studs. Tighten the guide bolts until the carrier is on the studs and then pry the carrier against the frame. If the spline on the inner end of the pinion shaft does not enter the sun gear in the steering planetary, turn the sprocket while prying the assembly into position.

NOTE: On the TD-20 (SERIES B) tractor, the pivot shaft spacer (Illust. 32) must be positioned between the pivot shaft and sprocket carrier as the sprocket drive assembly is positioned against the frame. On machines with earlier type brake, guide the pivot brake actuating cable into the opening in the side of the frame until the wire installed on the end of the cable can be reached through the inspection cover opening in the rear frame cover.

4. Install the nuts on the studs. Remove the two guide bolts and install the regular bolts. Torque the nuts and bolts from 420-470 ft. -lbs.

5. Remove the jack from under the tractor.

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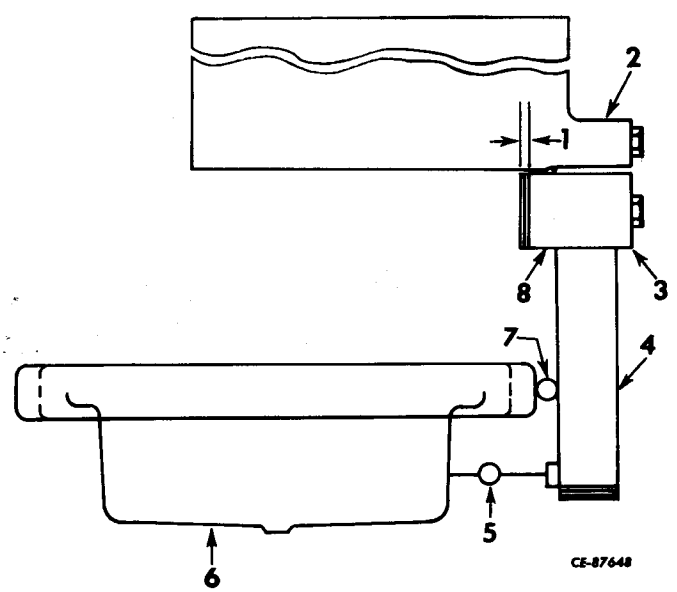
PIVOT BRAKES

6. LOADERS ONLY: Install the track frame coupling link (Illust. 31). Place the link in position and secure to the track frame coupling and sprocket drive carrier cover with the link pins. Install the link pin locks and secure with cap screws and washers.

TD-20 (SERIES B) ONLY: Install the same amount of shims that were removed between the sprocket carrier and spacer. To provide clearance for installing shims, the bolts securing the pivot shaft inner cap on each side of the tractor must be loosened (Illust. 32). Pry the pivot shaft spacer forward until the gap between the carrier and spacer is great enough to install the original shim pack. Install the outer pivot shaft cap and bolts. Apply "Loctite" to the bolt threads and secure the two inner caps using 1440-1620 ft. -lbs. torque and the outer cap using 2328-2616 ft. -lbs. torque.

NOTE: If a new sprocket drive carrier outer pivot shaft cap or pivot shaft spacer is installed, or if the number of shims (1, Illust. 43) previously used is unknown and must be determined, proceed as follows (refer to Illust. 43): Be sure the pivot shaft inner cap (2) on each side of the main frame is fully torqued from 1440-1620 ft. -lbs. Install a dial indicator (5) with a magnetic base on the rear of the pivot shaft and place the indicator pointer against the planet gear carrier (6). Set the indicator at zero. Using a prybar (7) between the pivot shaft (4) and sprocket teeth, deflect the shaft until the indicator reads approx. minus .015 inch (pointer rotation counterclockwise) at this time, measure the distance between the spacer (8) and the sprocket drive carrier with a feeler gauge (both at the top and bottom of spacer). This is the amount of shims (1) to be used. Install the shims and remove the prybar (do not disturb the dial indicator). Secure the outer cap (3) using 2328-2616 ft. -lbs. torque (Loctite applied) and note the indicator reading. Reading obtained must be zero to minus .006 inch. If necessary, remove the outer cap and add or remove shims as needed to obtain this reading with the outer cap fully torqued.



Illust. 43
Pivot Shaft Shimming Drawing.

1. Shim pack.
2. Inner cap.
3. Outer cap.
4. Pivot shaft.
5. Dial indicator.
6. Planet gear carrier.
7. Prybar.
8. Spacer.

7. EARLIER TYPE BRAKE: Working through the inspection cover opening in the rear main frame cover, thread the wire on the end of the pivot brake actuating cable through the cable opening in the cover. Insert a heel bar through the inspection cover opening and under the brake return spring retainer to align the spring with the cable opening in the cover. Grab the wire on the end of the cable with a pair of pliers and in one motion, pry up with the heel bar and pull on the wire to seat the cable in the cover (Illust. 28). Remove the wire from the cable yoke. Secure the cable to the bellcrank with the end pin and cotter.

Install the actuating cable rubber boot using a pair of pliers. First maneuver the boot down over the cable yoke until the top of the boot can be inserted in the groove around the bottom of the yoke. Then pull the boot all around the flange protruding from the rear main frame cover.

LATER TYPE BRAKE: Working through the inspection cover opening in the rear main frame cover, position the actuating lever assembly on the pivot brake assembly so the finger of the lever (2, Illust. 40A) engages the slot in the brake actuator (12). Secure the support (1) with the bolts (17).

8. EARLIER TYPE BRAKE: Install the batteries, battery support and the seat frame. If the pivot brake on the right hand side of the unit was removed, the seat side sheet, brake pawl operating lever and lever guides must also be installed.

(Continued on next page)

PIVOT BRAKES

14. INSTALLATION - Continued

9. Install the inspection cover using a new gasket. Apply Permatex No. 3 to the inspection cover side of the cover gasket.

10. Be sure the drain plug in the underside of the rear main frame is installed and tight. Fill the rear main frame with the lubricant and to the level described in the operator's manual.

11. Install the track chain (refer to Section 9, "TRACKS AND TRACK FRAME").

12. Install the sprocket rock shield (if equipped).

13. Start the engine and check for leakage. Operate the unit and check brake operation. If the brakes do not function properly, they must be adjusted. (Refer to Par. 9, "STEERING PLANETARY BRAKE AND PIVOT BRAKE ADJUSTMENTS.")

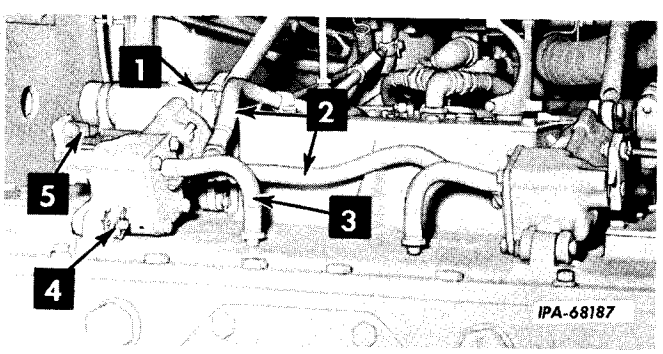
14. After the engine is up to operating temperature, recheck the oil level in the rear main frame and add if necessary. Check the level in the sprocket drive as described in the operator's manual.

STEERING BOOSTERS

15. REMOVAL
(Ref. Nos. Refer to Illust. 44)

NOTE: Disconnected hydraulic lines should be properly capped with the correct size plastic cap. If caps are not available, tape or clean rubber corks may be used. Hydraulic openings must NEVER be plugged with rags. This practice could easily introduce dirt or lint into critical hydraulic components.

1. Remove the apron type cover (2) (Illust. 3) at the rear of the unit directly below the fuel tank for access to the steering boosters.



Illust. 44
Hydraulic Steering Booster Assembly.

1. Booster piston clevis.
2. Booster pressure hoses.
3. Booster drain hose.
4. Mounting pin.
5. Booster valve operating rod clevis.

2. Disconnect the pressure lines (2) at the booster housing. Loosen the hose clamp and pull the drain hose (3) from the booster housing cover.

3. Disconnect the booster valve operating rod clevis (5) at the booster valve fork lever.

4. Unhook the booster piston return spring from the bellcrank push rod lever and attach it to the hook on the pull rod connected at the lower end of the lever. This must be done before removing the booster mounting pins to keep the bellcrank push rod (12) (Illust. 11) located below the rear frame cover from slipping free of its assembled position.

5. Remove the cotter and the pin (4) from the rear of the booster. Disconnect the booster piston clevis (1) at the front from the bellcrank push rod lever. Remove the booster assembly from the main frame cover.

16. DISASSEMBLY
(Ref. Nos. Refer to Illust. 45)

1. Remove the clevis (14) from the piston (17).

2. Using a suitable tool, remove the snap ring (12) from its groove in the housing (4).

3. Hold the rear of the housing and slowly pull the piston (17) and support (10) from the housing. Use care that the valve (19) does not fall free of the piston and become damaged. Carefully slide the support from the piston rod.

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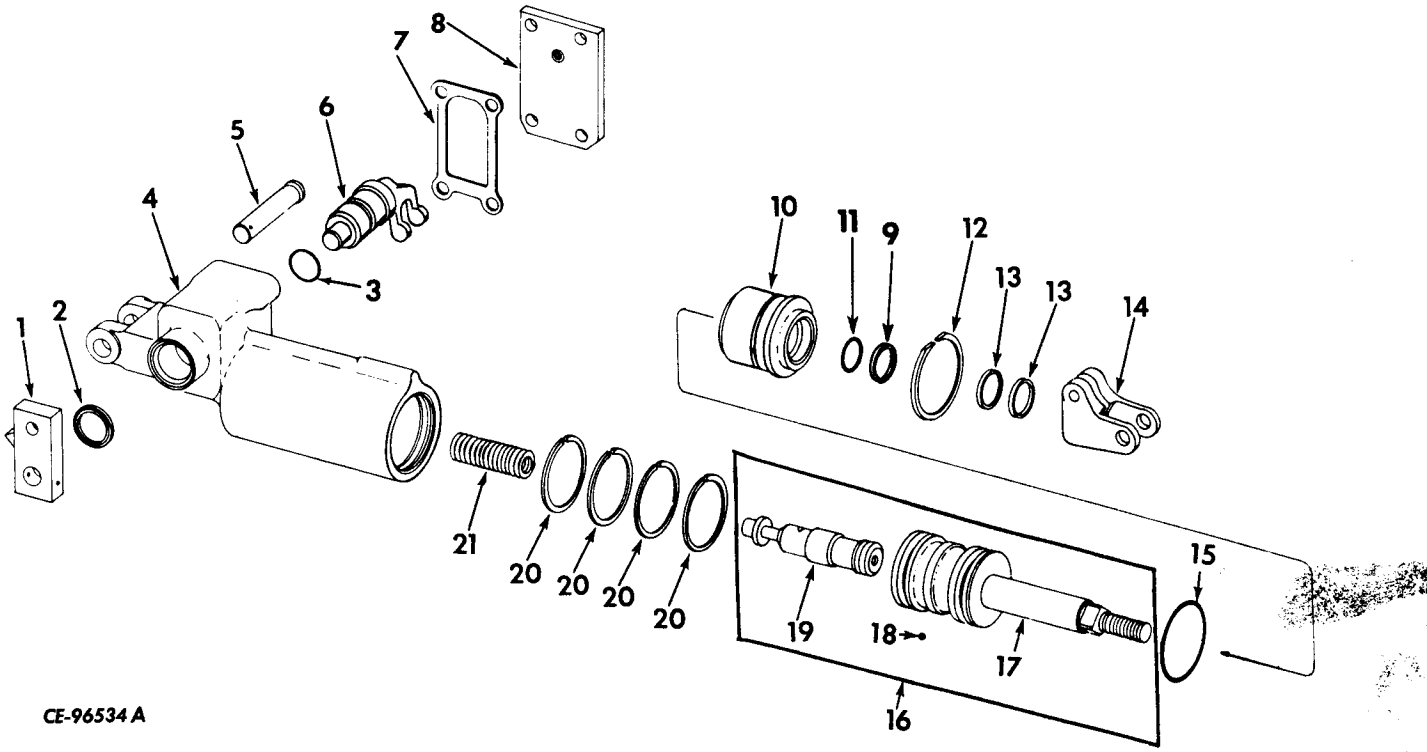
STEERING BOOSTERS



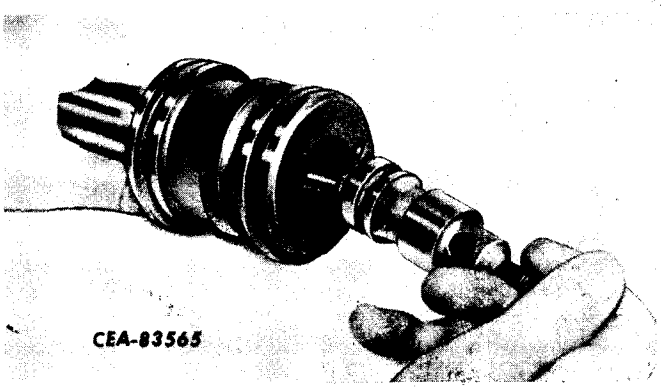
Illust. 45
Exploded View of Hydraulic Steering Booster.

1. Fork lever.
2. Fork seal and wiper.
3. Fork "O" ring.
4. Housing.
5. Mounting pin.
6. Operating fork.
7. Cover gasket.
8. Housing cover.
9. Back-up ring.
10. Support.
11. Piston rod "O" ring.
12. Snap ring.
13. Piston rod seal and wiper.
14. Clevis.
15. Support "O" ring.
16. Piston and valve assembly.
17. Piston.
18. Piston ball.
19. Valve.
20. Sealing rings.
21. Valve return spring.

4. Remove the valve (19) which usually comes out with the piston (Illust. 46). If the valve remained in the housing, move the lever (1) to the rear and remove the valve. Remove the return spring (21) from the housing.

5. Remove the roll pin securing the lever (1) to the operating fork (6) and tap the lever from the fork shaft (Illust. 47).

6. Remove the housing cover (8) and discard the cover gasket (7). Tap the operating fork from the housing.



Illust. 46
Removing the Spool Valve from the Piston.

STEERING BOOSTERS

17. INSPECTION AND REPAIR

1. Wash all parts in cleaning solvent and dry with compressed air.

2. Flush out the oil passages in the valve and in the piston. Be sure the two balls (18, Illust. 45) are in place in the piston.

3. Replace all "O" rings with new. It is also recommended that the seal and wiper in the booster housing and in the piston support be replaced whenever the booster assembly is disassembled.

4. Inspect parts for burrs or signs of excessive wear. The spool valve must slide freely in the piston bore. Temporarily install the piston sealing rings (20, Illust. 45) in the piston housing and check their gap (refer to Par. 2, "SPECIFICATIONS" for dimensions of new parts).

5. Inspect the valve return spring for damage. Test the spring for proper tension. Refer to Par. 2, "SPECIFICATIONS."

18. REASSEMBLY

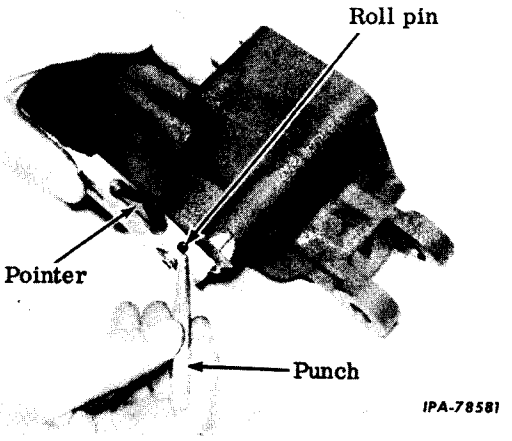
(Ref. Nos. Refer to Illust. 45)

NOTE: Coat all "O" rings with Dow Corning No. 55 pneumatic grease or its equivalent. Coat piston sealing rings with the same hydraulic oil as used in the hydraulic systems.

1. Install the new seal and wiper (2) until the side with the number stamped on it bottoms in the housing counterbore.

2. Place a new "O" ring (3) on the operating fork (6) and install into the housing until it bottoms. Tap the lever (1) on the operating fork (pointer to the rear) and secure with the roll pin (Illust. 47).

3. Install a new "O" ring (11) in the groove provided in the support (10). Install the back-up ring (9) in the same groove with the "O" ring (11). These parts are installed correctly when the grooved side of the back-up ring encircles the "O" ring and the back-up ring is closest to the counterbored end of the support (10). Install the two seal and wiper assemblies (13) in the front of the support. Install the first one (end with number stamped on it facing out) until it bottoms in the support counterbore. Then install the second one (end with number down) until it bottoms. Install a new "O" ring (15) in the groove provided on the outside diameter of the support.



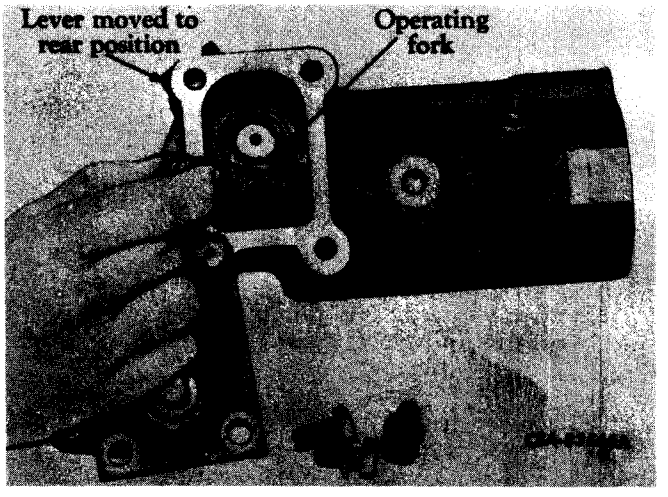
Illust. 47
Fork Lever Roll Pin Installed.

4. Position the support on the booster piston rod so that the seal and wiper assemblies are toward the threaded end of the rod.

5. Install the four sealing rings (20) on the piston so the ring end gaps are staggered. Insert the valve (19) in the bore of the piston (Illust. 46).

6. Move the lever (1) to the rear to position the operating fork up in the housing for clearing the valve stem when the piston assembly is installed. Working through the side opening, install the return spring (21) in the counterbore in the rear of the housing (Illust. 48).

(Continued on next page)



Illust. 48
Installing the Spool Valve Return Spring.

STEERING BOOSTERS

18. REASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 45)

7. Install the piston and valve assembly (16) into the housing using light taps on the rod end of the piston. Their is a tapered edge on the housing to feed the piston sealing rings into the bore. Be careful not to damage the sealing rings or support "O" ring (15) as they enter the housing.

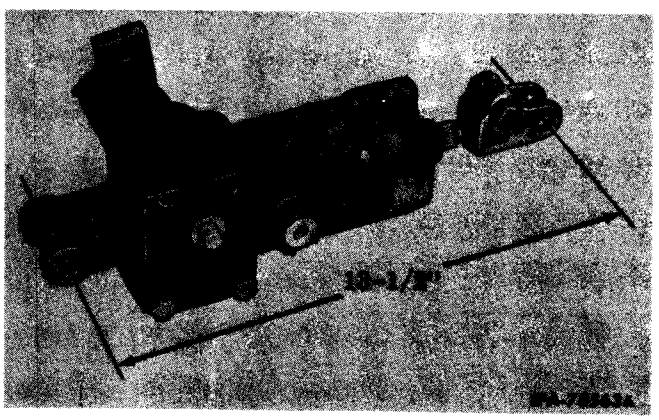
As the piston is bottomed in the housing, check to see that the valve enters the return spring (21) and that the pins on the operating fork (6) are in front of the valve shoulder (piston side of the valve stem flange). Later type operating forks do not have pins tack welded to them but the fork arms must be in front of the valve shoulder. In order for the valve to operate, the fork must move the valve to the rear.

8. Secure the support in the housing with the snap ring (12).

9. Move the lever (1) in each direction several times to be sure that no binding exists and that the valve and return spring are working properly. Install a new cover gasket and secure the cover (8) to the housing.

10. Install the clevis (14) on the piston rod but do not tighten the mounting screw.

11. Pull the piston out as far as possible and measure the distance between the center of the mounting hole in the rear of the booster housing to the center of the pin hole in the forward end of the clevis (14). Adjust clevis (14) until this measurement is 13-1/2 inches (Illust. 50). Tighten the clevis cap screw.



Illust. 49
Steering Booster Assembly Properly Adjusted.

19. INSTALLATION

(Ref. Nos. Refer to Illust. 44)

1. Position the booster assembly on the main frame cover and secure the rear of the booster housing to the cover with the mounting pin (4) and cotter.

2. Secure the front of the booster to the outer lever.

3. After the booster assembly is securely fastened to the rear main frame cover and push rod lever, unhook the booster piston return spring from the brake pull rod and connect it to the push rod lever.

4. Connect the operating rod clevis (5) to the fork lever on the booster housing.

5. Be sure the marks on the booster housing and on the valve fork lever are aligned (Inset B, Illust. 30). If they are not, disconnect clevis (5) from the lever. Loosen the jam nut on the rod and turn clevis (5) to the left or right as necessary so that the marks will align when the clevis (5) is connected. Connect the clevis and secure.

6. Connect the pressure hoses (2). Connect the drain hose (3) and secure to the booster housing cover with the clamp.

7. Install the apron type cover at the rear of the tractor.

8. Start the engine and operate the steering levers. If levers are hard to work or tractor creeps to the left or right, follow the pertinent adjustment of the steering planetary brakes as described in Par. 9, "STEERING PLANETARY BRAKE AND PIVOT BRAKE ADJUSTMENTS."

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SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

CONTENTS

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1. DESCRIPTION

(Refer to Illust. 2)

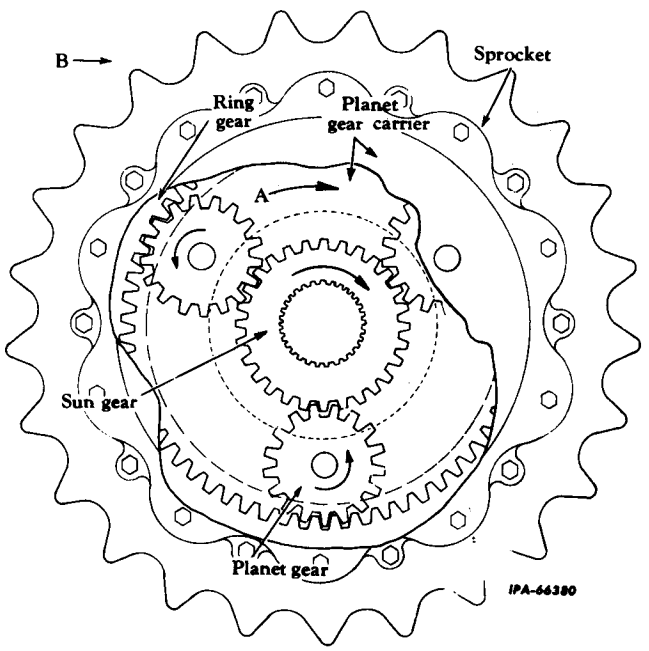
The sprocket and sprocket drive assembly consists of a set of spur gears and a planetary assembly on each side at the rear of the tractor. Engine power is transmitted from the bevel gear, through the steering planetary to the sprocket drive pinion, which is an integral part of the sprocket drive pinion shaft. The sprocket drive pinion shaft is splined to the sprocket drive pinion shaft gear in the steering planetary at the inner end and is supported at the outer end by two straight roller bearings. The sprocket drive pinion is meshed with the sprocket drive gear, which provides the first gear reduction.

The sprocket drive gear is attached to the sprocket drive gear carrier, which is supported on the sprocket drive carrier cover by a double-row spherical roller bearing. Three planet gears are meshed with the sun gear, which is splined to the sprocket drive gear carrier, and are also meshed with the sprocket drive ring gear.

The sprocket drive ring gear hub is splined to the sprocket drive carrier cover and is in mesh with the sprocket drive ring gear, keeping the ring gear stationary during operation. The planet gears provide the second gear reduction. Two tapered roller bearings support each planet gear on its shaft. The shafts are housed in the planet gear carrier. The planet gear carrier and the sprocket are both attached to the sprocket carrier which is supported on the carrier cover by two tapered roller bearings.

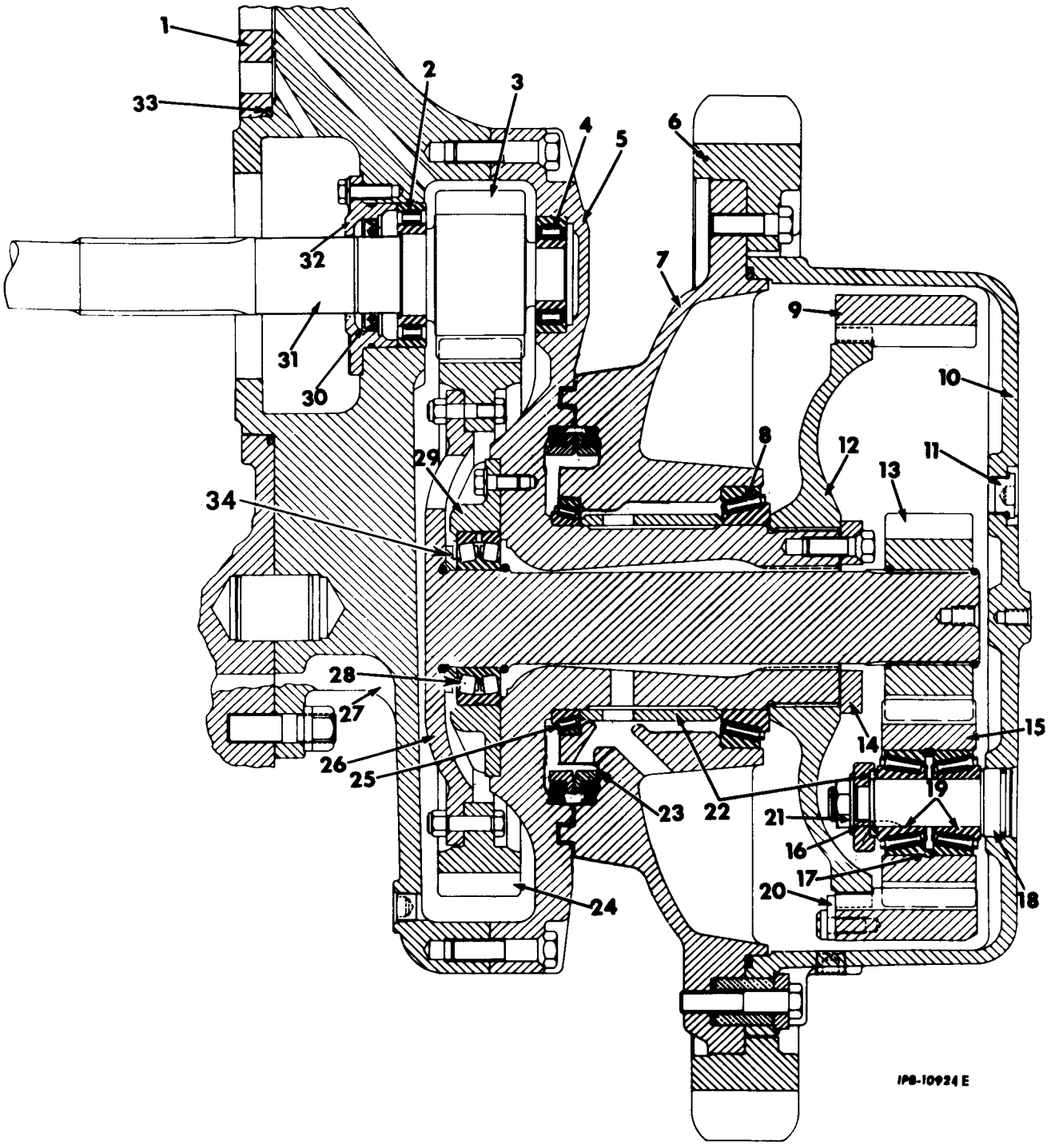
As the sprocket drive gear carrier and sun gear revolves, it causes the planet gear to rotate on their shafts. The planet gears, being meshed with the stationary ring gear, cause the planet gear carrier, sprocket carrier and sprocket to rotate in direction "A" driving the tractor in direction "B" (Illust. 1).

The sprocket drive assembly has its own supply of lubrication and is sealed against leakage and dirt by "O" rings, sealing rings and oil seals.



Illust. 1
Planetary Drive.

1. **DESCRIPTION** - Continued
(Refer to Illust. 2)



Illust. 2
Cross Section of Sprocket Drive.

Legend for Illust. 2

1. Rear main frame.
2. Pinion inner bearing.
3. Pinion.
4. Pinion outer bearing.
5. Sprocket drive carrier cover.
6. Sprocket.
7. Sprocket carrier.
8. Sprocket carrier outer bearing.
9. Ring gear.
10. Planet gear carrier.
11. Oil level plug.
12. Ring gear hub.
13. Sun gear.
14. Bearing retainer plate.
15. Planet gear.
16. Dowel.
17. Snap ring.
18. Planet gear shaft.
19. Planet gear bearings.
20. Ring gear plate.
21. Planet gear shaft nut.
22. Spacer.
23. Carrier seal.
24. Sprocket drive gear.
25. Sprocket carrier inner bearing.
26. Gear carrier.
27. Sprocket drive carrier.
28. Gear carrier bearing.
29. Bearing retainer.
30. Oil seal.
31. Pinion shaft.
32. Oil seal retainer.
33. Sealing ring.
34. Bearing spacer (if equipped).

2. SPECIFICATIONS

Sprocket drive carrier cover outer bearing surface diameter, inches	6.249 - 6.250
Sprocket drive carrier cover outer bearing inside diameter, inches	6.250 - 6.251

Sprocket Drive Pinion

Number of bearings (each side)	2
Type of bearings	Straight roller
Number of teeth	14
Backlash, inch	.014 - .020

Sprocket Drive Gear

Number of teeth	55
Backlash, inch	.014 - .020

Sprocket Drive Gear Carrier

Number of bearings (each side)	1
Type of bearing	Double-row, spherical roller

Sprocket Carrier

Number of bearings (each side)	2
Type of bearings	Tapered roller

Sprocket Drive Ring Gear Hub

Number of teeth	54
Backlash, inch	.008 - .016

Sprocket Drive Ring Gear

Number of teeth	54
Backlash, inch	.014 - .020

(Continued on next page)

2. SPECIFICATIONS - Continued

Sprocket Drive Sun Gear

Number of teeth	18
Backlash, inch	.014 - .020

Planet Gears

Number of gears (each side)	3
Number of bearings (each side)	6
Type of bearings	Tapered roller
Number of teeth	18
Backlash, inch	.014 - .020

Special Bolt and Nut Torque Data (Foot-Pounds)
(Torques given are for bolts and nuts lubricated with SAE-30 engine oil).

Sprocket carrier bearing retainer plate bolts	160 - 180
Sprocket drive carrier cover bolts:	
(Grade 8) with hardened washers	360 - 405
(Grade 5) without hardened washers	290 - 320
Sprocket drive gear dowel bolts	80 - 90
Sprocket drive carrier bolts and nuts	420 - 470
Planet gear shaft nut (Esna):	
(lubricated with engine oil)	190 - 210
(lubricated with Molykote)	140 - 160

NOTE: Except for the special torques shown, all bolts and nuts are to be given a standard torque. Refer to the "STANDARD TORQUE DATA CHART" in Section 1, "GENERAL."

3. CHECKING MECHANICAL PROBLEMS

PROBABLE CAUSE	REMEDY
Sprocket Drive Overheating	
1. Improper or insufficient lubrication	Use proper grade and amount of lubricant. Check for leaks.
2. Bearing seizure	Remove sprocket drive and inspect for damaged bearings.
Noise	
1. Improper, dirty or insufficient lubricant	Use proper grade and amount of clean lubricant.
2. Bearings scored or damaged	Replace bearings.
3. Worn or damaged gears	Inspect all the gears and replace as necessary.
Lubricant Leakage	
1. Lubricant leaks at drain plugs, level plug or planet gear shaft	Tighten plug or replace sealing ring as necessary.
2. Lubricant leaks between sprocket drive carrier and rear main frame or between planetary gear carrier and sprocket carrier	Replace sealing rings.
3. Lubricant leaks between the sprocket carrier and sprocket carrier cover	Replace carrier oil seal.
4. Lubricant leaks into sprocket drive carrier	Replace pinion gear oil seal. This leakage will not be noticeable from the outside but would result in a low oil level in the sprocket drive lubrication system.
5. Lubricant leaks between the sprocket carrier cover and sprocket drive carrier	Clean sealing surfaces and apply liquid gasket.

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PROBABLE CAUSE	REMEDY
Excessive Wear on Sprockets	
1. Tracks run too loosely	Adjust the tracks.
2. Tracks worn excessively	Install new tracks.
3. Track frame out of alignment or damaged .	Repair or install new track frame.

SPROCKET

4. REMOVAL AND INSTALLATION

1. Remove the sprocket rock shield (if equipped).

2. Remove the track chain (refer to "TRACKS AND TRACK FRAME," Section 9. It is not necessary to remove the chain from under the tractor.

3. Jack the rear of the tractor enough to allow the sprocket to clear the track chain.

4. Remove the cap screws, dowel bolts and dowel washers (44, Illust. 6) securing the sprocket to the sprocket carrier (24, Illust. 6).

5. Turn in the three hexagon-socket set screws provided in the sprocket to pull the sprocket off the dowels.

6. Check for excessive wear on the sprocket. Refer to Par. 3, "CHECKING MECHANICAL PROBLEMS," for causes of excessive wear and how they can be corrected.

7. To install the sprocket, reverse the removal procedure. Be sure the three hexagon-socket set screws in the sprocket are turned back into place before positioning the sprocket on the sprocket carrier. Apply "LOCTITE" Grade "B" to the cap screws and dowel bolts securing the sprocket to the sprocket carrier.

SPROCKET DRIVE PLANETARY

5. REMOVAL

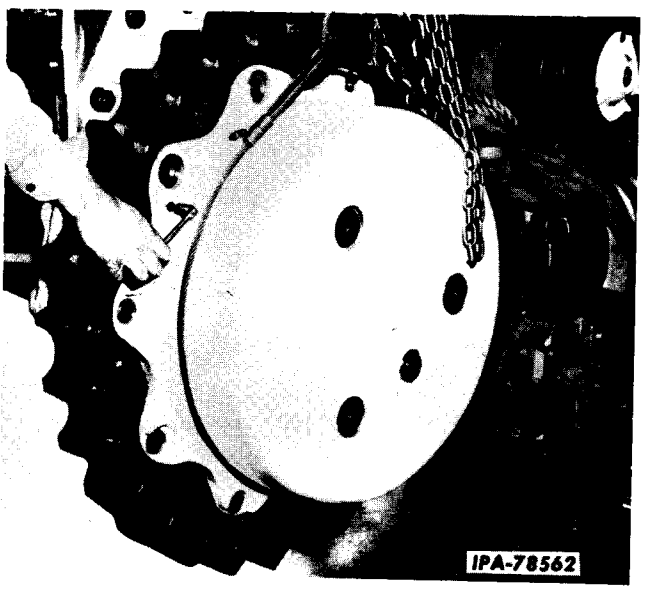
(Ref. Nos. Refer to Illust. 6)

1. Remove the sprocket rock shield (if equipped).

2. Move the tractor until the drain plug in the carrier (42) is at the bottom. Drain the oil from the sprocket drive by removing the plug in the bottom of the planet gear carrier and the lower plug in the rear of the sprocket drive carrier (6).

3. Remove the cap screws, dowel bolts and dowel washers (44) securing the carrier (42) to the sprocket carrier (24). Wrap a cable around the planet gear carrier and attach it to a hoist. Tighten the three hexagon-socket set screws provided in the planet gear carrier to pull it from the dowels (43). Remove the carrier with planet gears and sealing ring (25). Remove the sealing ring. (Refer to Illust. 3).

4. SHINK FIT SUN GEAR: Remove the sun gear outer snap ring (48) and, using a hydraulic ram and gear puller (Illust. 4), remove the sun gear (49) from the sprocket drive gear carrier splines. Remove the inner snap ring (50) using a ring expander.



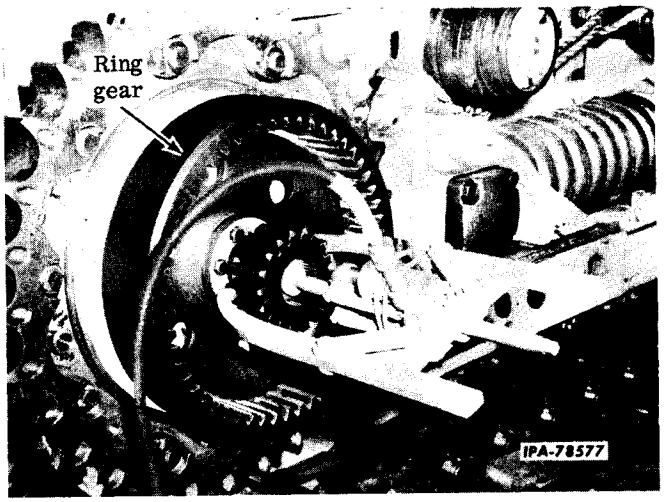
Illust. 3
Tightening the Planet Gear Carrier Set Screw.

(Continued on next page)

SPROCKET DRIVE PLANETARY

5. REMOVAL - Continued
(Ref. Nos. Refer to Illust. 6)

SLIDE FIT SUN GEAR: Remove the sun gear outer snap ring (48) and pry the sun gear (49) from the sprocket drive gear carrier splines. If it becomes necessary, a gear puller can be used to remove the sun gear. Remove the inner snap ring (50) using a ring expander.

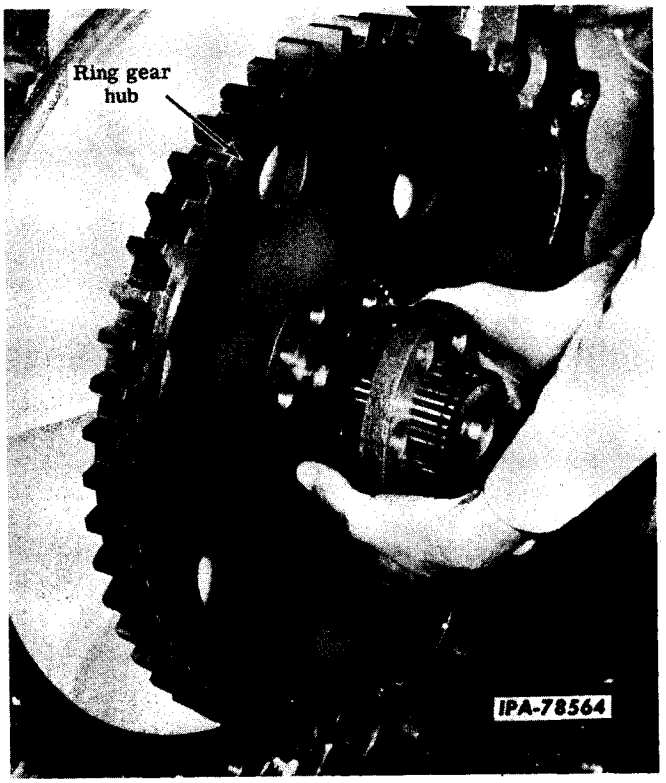


Illust. 4
Removing the Sprocket Drive Planetary Sun Gear (Shrink Fit Type).

5. Bend back the tabs of the lock plates (32) and remove the capscrews securing the three lock plates and clamp plates (33) to the ring gear (34). Remove the ring gear from the splines of the ring gear hub (28).

6. Remove the retainer plate bolts (31), bearing retainer plate (30) and shims (29) from the end of the sprocket drive carrier cover (17). Keep the shims together to facilitate installation. (Refer to Illust. 5.)

7. With a torch, heat the inner diameter of the ring gear hub (28) to a temperature of not more than 300° F. Insert the legs of a puller into the openings provided in the hub and pull the hub from the sprocket drive carrier cover splines.



Illust. 5
Removing the Bearing Retainer Plate and Shims.

Legend for Illust. 6

1. Carrier sealing ring.
1A. Oil dam (if equipped).
2. Oil seal retainer.
3. Retainer "O" ring.
4. Pinion lip type oil seal.
5. Pinion "O" ring (used with metal face type seal).
5A. Wear sleeve (used with lip type conversion seal).
6. Sprocket drive carrier.
7. Dowel.
8. Pinion inner bearing.
9. Pinion.
10. Oil seal driving dowel (used with metal face type seal).
11. Pinion outer bearing.
12. Drive gear carrier.
13. Sprocket drive gear.
14. Bearing retainer.
15. Drive gear carrier bearing.
16. Bearing snap ring.
17. Sprocket drive carrier cover.
18. Carrier cover link bushing. (MODEL 250 Loaders Only.)
19. Sprocket carrier inner bearing.
19A. Oil seal assembly (metal face type).
20. Seal wear plate. *
21. Drive pin "O" ring. *
21A. Wear plate back-up gasket. *
22. Seal rotor assembly. *
22A. Seal rotor back-up gasket. *
22B. Seal pin "O" ring. *
23. Bearing spacer.
24. Sprocket carrier.
25. Planet carrier sealing ring.
26. Sprocket.

* - Spring loaded rubber face type oil seal components.

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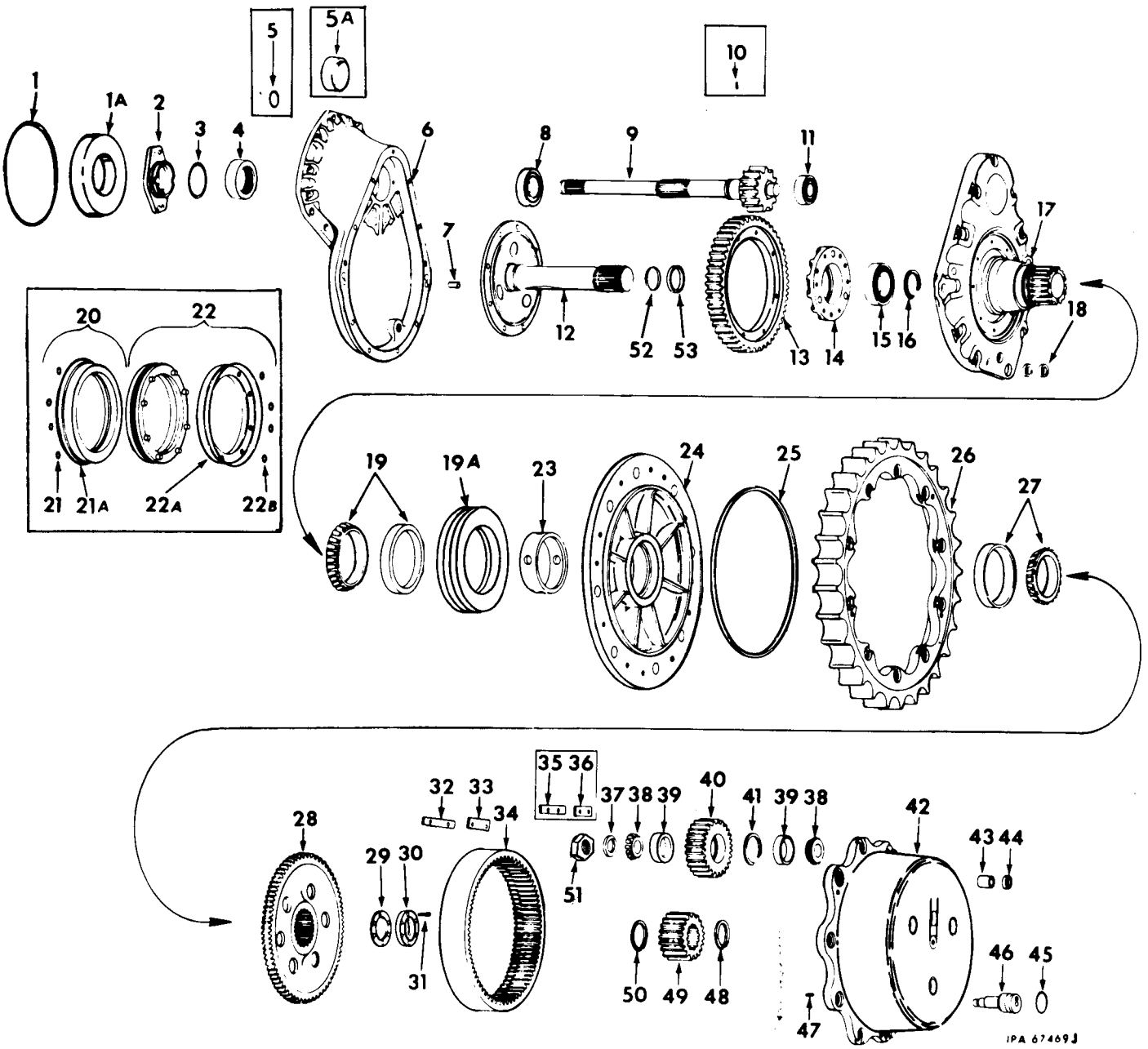
SPROCKET DRIVE PLANETARY



Illust. 6
Exploded View of Sprocket Drive (Loaders Shown, TD-20 SERIES B Similar).

Legend for Illust. 6 - Continued

27. Sprocket carrier outer bearing.
28. Ring gear hub.
29. Retainer plate shims.
30. Bearing retainer plate.
31. Retainer plate bolt.
32. Lock plate.
33. Ring gear clamp plate.
34. Ring gear.
35. Lock plate (if equipped).
36. Planet gear shaft clamp plate (if equipped).
37. Bearing spacer.
38. Planet gear bearing cone.
39. Planet gear bearing cup.
40. Planet gear.
41. Bearing snap ring.
42. Planet gear carrier.
43. Dowel.
44. Dowel washer.
45. Shaft "O" ring.
46. Planet gear shaft.
47. Planet gear shaft dowel.
48. Sun gear snap ring.
49. Sun gear.
50. Sun gear snap ring.
51. Planet gear shaft nut (if equipped).
52. "O" ring (if equipped).
53. Spacer (if equipped).

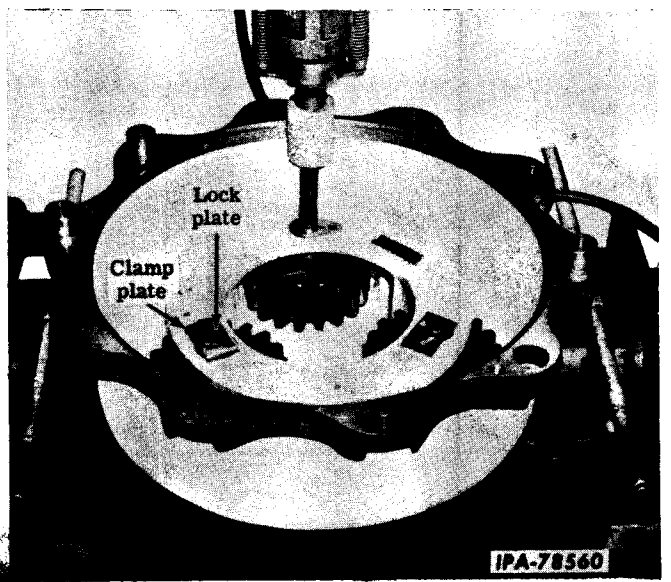
SPROCKET DRIVE PLANETARY

6. DISASSEMBLY

(Ref. Nos. Refer to Illust. 6)

1. Remove the lock nut (51) securing the planet gear shaft to the carrier. On earlier units using clamp plates remove the two cap screws securing the two plates (35 and 36) to the planet gear shaft and carrier. Remove the plates (Illust. 7).

2. Position the carrier in a press as shown in Illust. 7 and push the shaft with "O" ring (45) out the front of the carrier.



Illust. 7
Removing the Planet Gear Shaft Using Clamp Plates.

3. Remove the planet gear (40) with bearings from the carrier. Remove the two bearing cones (38) from the gear. If replacement of the planet gear bearings is necessary, the bearing cups (39) can be pulled from the gear. A snap ring (41), located between the bearing cups, positions the bearing cups during reassembly.

4. Remove the spacer (37) from the planet gear shaft dowel (47) in the carrier

5. Disassemble the remaining two planet gear and shaft assemblies in the same manner.

7. INSPECTION AND REPAIR

1. Make a preliminary inspection of all parts before cleaning to detect discrepancies which may not show up once the parts are cleaned. Examine the oil for metal particles, dirt and other foreign material. Check for foreign material in the bearings which will cause excessive wear. Wash all parts thoroughly in a dry-cleaning solvent and dry with compressed air. After cleaning, make a final inspection of all parts. Do not spin bearings during cleaning or when drying with compressed air. All new parts must remain wrapped until ready for installation.

2. Inspect the bearings for scores, cracks and wear and replace if necessary. Oil the bearings that are in a serviceable condition and wrap until ready for reassembly.

3. Check the sealing rings for damage and replace if necessary.

4. Inspect the ring gear, ring gear hub, sun gear and planet gear teeth for damage or wear excessive enough to cause excessive backlash. Inspect the ring gear hub and sun gear splines for excessive wear or damage. Slight burrs can be smoothed down with a stone.

5. Inspect the planet gear shafts and the carrier for damage. Replace parts as necessary. If a planet gear shaft using lock plates needs replacement, inspect the shaft bore in the carrier. If the bore is worn it is recommended that the carrier be replaced or oversized shafts be installed.

8. REASSEMBLY

(Ref. Nos. Refer to Illust. 6)

1. Place the carrier (42) on a bench so the fill and level plug is up. Install the three bearing spacers (37) on the dowels (47) located in the carrier (42).

2. Be sure the snap ring (41) is seated fully in its groove in the planet gear (40). If removed, press new bearing cups (39) into the planet gear (the small diameter of the taper to the inside) until they bottom on the snap ring. To prevent the snap ring from dishing, support the assembly on the bearing cup when pressing in the second bearing cup. Assemble the two remaining planet gears in the same manner.

3. Insert the bearing cones (38) in their cups in the planet gears. Place the gears into the carrier (42) and move them as far to the outside as possible. Let the assemblies rest on the spacers (37).

NOTE: Due to gear clearances, it is necessary to place all three planet gears into the carrier

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as described and then re-position on their respective centerlines. Line up and center the bearings with the shaft supporting holes in the carrier using an aligning plug.

4. SHAFT WITH LOCK PLATES: Apply "LOCTITE" grade "B" to the two surfaces of each of the planet gear shafts that rest in the planet carrier. With the "O" ring (45) in place on each of the planet gear shafts, install the shafts through the carrier and two bearings, being sure to align the slot in the shaft with the dowels (47) in the carrier.

SHAFT WITH LOCK NUT: Position the carrier in a press. Place an "O" ring (45) in the groove on each of the planet gear shafts and press the shafts through the carrier and two bearings. Before installing the shafts be sure to align the slot in the shafts with the dowels (47) in the carrier.

5. SHAFT WITH LOCK PLATES: Turn the carrier over. Apply "LOCTITE" grade "B" to the planet gear shaft cap screws and secure the shafts in the carrier with the clamp plates (36), lock plates (35) and cap screws. Bend the end of the lock plate against the cap screw. (Refer to Illust. 7.)

SHAFT WITH LOCK NUT: Turn the carrier over. Install the lock nut (51) and torque to 190-210 ft. -lbs. if the threads are lubricated with oil or to 140-160 ft. -lbs. if lubricated with Molykote.

6. Hit the exposed face of the planet gears with sufficient force to be assured that the outer cone is against the shaft shoulder. This force must be applied to the gear at 180 degrees apart at the same time using a fixture that will span the carrier web.

7. Check the planet gear end play with a dial indicator. Proper end play will be between .000 and .013 inch. However it is satisfactory if the bearings are slightly preloaded as long as they can be turned by hand.

9. INSTALLATION

(Ref. Nos. Refer to Illust. 6)

1. Heat the ring gear hub (28) to not more than 300° F and place the hub on the sprocket drive carrier cover splines until it is up against the cone of the bearing (27). Hold the hub in position until it has reasonably cooled using an old retainer plate (30). While tightening the retainer bolts, rotate the sprocket carrier (24) to be sure the carrier bearings are properly seated.

NOTE: Do not use the retainer plate to be installed for service to hold the hub in position as dishing of the plate will occur. If an old retainer plate is not available either bar stock or a double "T" bar puller with two cap screws can be used.

2. Install the same thickness of shims (29) which were removed, in position on the end of the sprocket drive carrier cover (17). Position the retainer plate (30) and secure both the shims and plate to the cover (17) with the retainer plate bolts (31) using 160-180 ft. -lbs. torque.

NOTE: If a new ring gear hub (28), sprocket drive carrier cover (17), sprocket carrier inner or outer bearing (19 or 27) or bearing spacer (23) was installed, the end clearance of the bearing retainer plate (30) must be checked before applying the final torque to the retainer plate bolts (31).

(a) Install a short coil of solder approximately 1/16 inch thick on the end of the carrier cover (17). Use grease to keep it in position. Do not install shims (29).

(b) Install the bearing retainer plate and torque the bolts (31) to 75 ft-lbs.

(c) Remove the retainer plate and compressed solder from the end of the cover (17). With a micrometer, carefully measure the thickness of the compressed solder. This measurement, less .003 inch is the amount of shims to be installed on the end of the carrier cover (17).

NOTE: The shim pack should never be the same or greater than the thickness of the gap measurement.

(d) Install the shims, retainer plate and retainer plate bolts. Torque the bolts to 160-180 ft. -lbs.

3. SHRINK FIT SUN GEAR: Install the sun gear inner snap ring (50) in the inner groove on the gear carrier splines. Heat the sun gear (49) to a maximum of 300°F and tap the gear on the splines of the gear carrier (12) until the outer snap ring groove appears. Install the sun gear outer snap ring (48) in the groove in the gear carrier splines.

(Continued on next page.)

SPROCKET DRIVE PLANETARY

9. INSTALLATION - Continued

(Ref. Nos. Refer to Illust. 6)

SLIDE FIT SUN GEAR: Install the sun gear inner snap ring (50) in the inner groove in the gear carrier splines. Tap the sun gear (49) onto the gear carrier splines with a soft faced hammer and secure the gear with the outer snap ring (48).

4. Install the ring gear (34) on the ring gear hub (28) and secure with the three ring gear clamp plates (33), lock plates (32) and six cap screws. Bend up the tabs of the lock plates to prevent the cap screws from loosening.

5. Lubricate and install the sealing ring (25) in the counterbore around the flange of the planet gear carrier (42). Check to be sure the three hexagon-socket set screws in the carrier have been turned back into place.

6. Wrap a cable around the carrier drum and attach it to a hoist (Illust. 3). Position the carrier over the dowels (43) in the sprocket carrier (24). The planet gears must mesh with the sun gear (49) and ring gear (34). Drive the planet gear carrier onto the sprocket carrier dowels.

7. Secure the planet gear carrier to the sprocket carrier with cap screws, dowel washers (44) and dowel bolts.

8. Be sure the drain plug in the planet gear carrier and the drain plug in the rear of the sprocket drive carrier (6) are installed and tight. Fill the sprocket drive with the proper amount and grade of lubricant as described in the operator's manual.

9. Install the sprocket rock shield (if equipped).

SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

10. REMOVAL

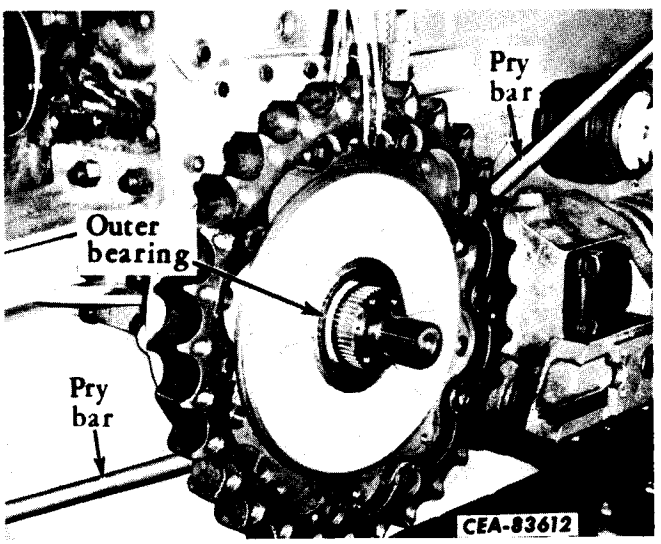
(Ref. Nos. Refer to Illust. 6)

1. Remove the track chain (refer to "TRACKS AND TRACK FRAME," Section 9). It is not necessary to remove the chain from under the tractor.

2. Jack the rear of the tractor enough to allow the sprocket to clear the track chain. Block under the rear main frame.

3. Remove the sprocket drive planetary as described in Par. 5, "REMOVAL." Be sure the drain plug in the planet gear carrier (42) is at the bottom after removing the track chain.

4. Attach a hoist to the sprocket carrier (24) and pry or tap the carrier from the cover (17) (Illust. 8). The carrier must be removed evenly to prevent possible damage to the pins of the seal rotor (22). As the carrier starts over the end of the cover, remove the cone of the outer bearing (27) to prevent it from falling and being damaged. The cups of the sprocket carrier inner and outer bearings will come off with the carrier and should not be removed unless replacement is necessary.



Illust. 8
Removing the Sprocket and Sprocket Carrier.

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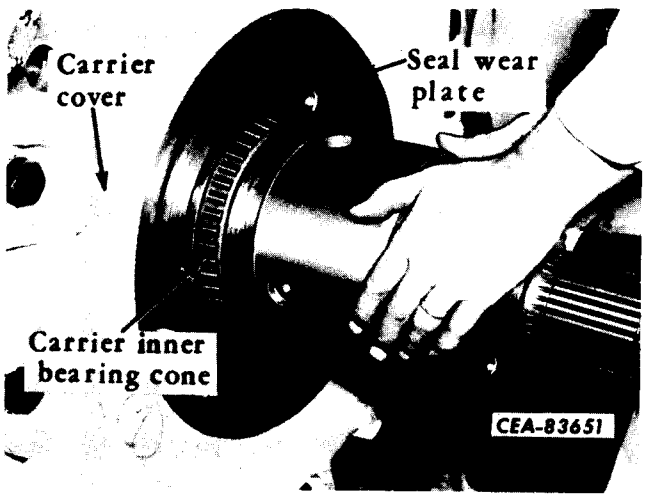
SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

5. Remove the spring loaded rubber face type oil seal (Illust. 9); the metal face type oil seal or the quad ring oil seal (as equipped). Remove the bearing spacer (Illust. 10).

6. LOADERS ONLY: Remove the track frame coupling link. Remove the cap screws, washers and link pin locks securing the link pins to the coupling at the track frame and at the bottom of the sprocket drive carrier cover (17). Tap out the link pins to remove the coupling link.

NOTE: On the earlier MODEL 250 Loaders, it may be necessary to partially remove the track frame to permit track frame coupling link removal. On these units, the boss on the sprocket drive carrier cover must be filed down so the link can be lifted from position in the cover boss without partially removing the track frame in the future.

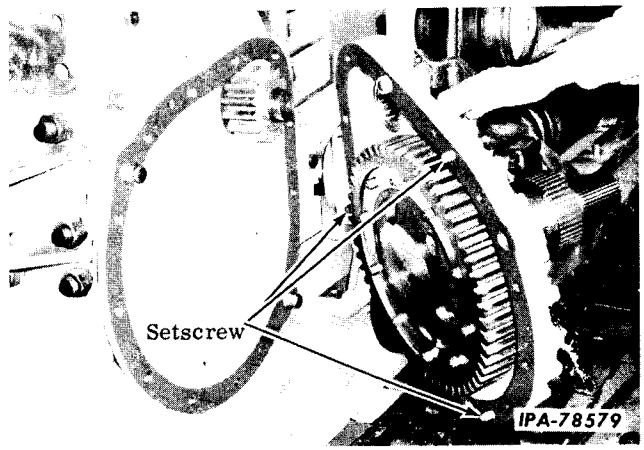
Illust. 9
Removing the Seal Rotor from the Sprocket Carrier (Spring Loaded Rubber Face-Type Oil Seal).



Illust. 10
Removing the Carrier Bearing Spacer.

7. Remove the cap screws securing the cover (17) to the sprocket drive carrier (6). Attach a hoist to the cover and take the slack out of the chain. Use the three hexagon-socket set screws provided in the cover to pull the cover free of the dowels (7) in the sprocket drive carrier. Refer to Illust. 11.

NOTE: The cup of the pinion outer bearing (11) will remain in the cover and should not be removed unless bearing replacement is necessary.



Illust. 11
Removing the Sprocket Drive Carrier Cover.

11. DISASSEMBLY

(Ref. Nos. Refer to Illust. 6)

1. The cone of the sprocket carrier inner bearing (19) should not be removed from the cover (17) unless bearing replacement is necessary. The cone should be removed (when necessary) with a bearing puller.

2. The assembly should be placed on a bench with the cover (17) blocked and resting on its splines (Illust. 12).

3. Insert a socket through the openings in the flange of the gear carrier (12) and remove the six cap screws and washers securing the retainer (14) to the cover (17) (Illust. 12). The gear carrier can be turned to reach all the cap screws.

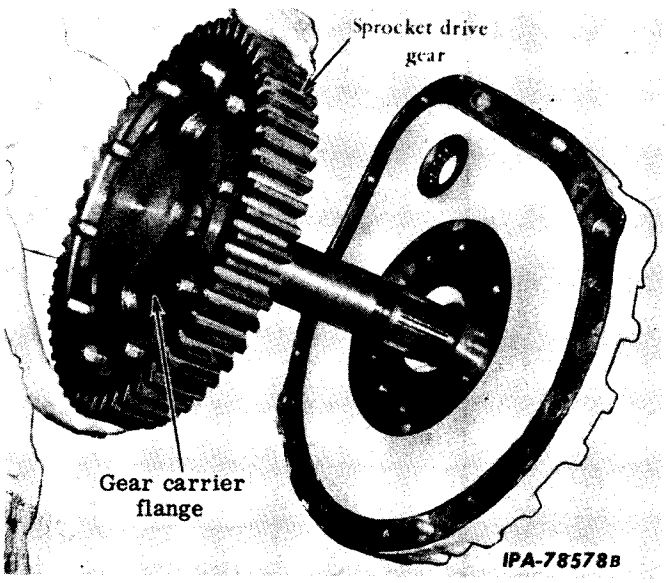
(Continued on next page)

SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

11. DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 6)

4. Pull the sprocket drive gear (13) and gear carrier from the cover (Illust. 12).



Illust. 12
Removing the Sprocket Drive Gear and Carrier from the Carrier Cover.

5. Do not remove the bearing (15) and retainer (14) unless replacement is necessary. To remove these parts it will first be necessary to remove the snap ring (16) from the groove in the gear carrier. Some gear carriers have three puller holes at 9-1/2 inch centers. On these assemblies, insert three 1/2-13 inch puller screws into the threaded holes in the carrier to push the retainer and bearing (15) from the gear carrier shaft. Press the bearing (15) out the front of the retainer. Remove the spacer (53) and "O" ring (52) (if equipped) from the carrier.

12. INSPECTION AND REPAIR

(Ref. Nos. Refer to Illust. 6)

1. Wash all parts thoroughly in a dry-cleaning solvent and dry with compressed air. Thoroughly scrape the sprocket drive carrier (6) and cover (17) mating surfaces clean. Be careful not to scratch these finished surfaces or the sealing may become ineffective.

2. Inspect the bearings for scores, cracks and excessive wear and replace if necessary. Reusable bearings should be wrapped until ready for assembly. Inspect the carrier cover outer bearing surface for wear. Refer to Par. 2, "SPECIFICATIONS."

3. LOADERS ONLY: Inspect the bushings (18) in the bottom of the carrier cover for damage. If necessary, Install new bushings. Refer to Par. 13, "REASSEMBLY."

4. If the gear teeth on the pinion (9) or sprocket drive gear (13) are damaged or are worn enough to cause excessive backlash, the gear or pinion or both must be replaced. Slight burrs can be smoothed down with a stone.

5. The sprocket drive gear and the sprocket drive gear carrier are individual service parts. After separating the old parts, install the new gear or carrier as follows:

(a) Place the sprocket drive gear over the carrier shaft and position it on the carrier pilot with the dowel bolt hole and the cap screw holes in the gear and carrier in line. (Refer to Illust. 13).

(b) Line ream the five dowel holes through both parts to .4970 - .4975 inch, diameter and install the dowel bolts with nuts using 80-90 ft. -lbs. torque. Install all five cap screws and nuts.

NOTE: If the holes in either the sprocket drive gear or the gear carrier have become elongated, relocate and drill new holes of 15/32 and 17/32 inch diameter, midway between the old elongated holes (Illust. 13). The surfaces of both the gear and carrier must be smooth to provide a good contact between the gear and carrier. Remove any burrs or irregularities that may have resulted when the holes became elongated or when drilling the new holes. The 15/32 inch holes must then be line reamed as specified previously.

Spring Loaded Rubber Face Type Oil Seal

6. Inspect the oil seal rotor (22) and wear plate (20) for excessive wear or damage. If either part is excessively worn, it is recommended that a new oil seal assembly be installed. If the wear plate back-up gasket (21A) is loose or defective, cement on a new gasket

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SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

with EC-1022 (Minnesota Mining and Manufacturing Co.) or equivalent after preparing the mating surfaces. Remove all traces of the old gasket and be sure the gasket surface of the wear plate is clean and smooth. Coat the gasket surfaces to be cemented with a generous amount of household bleach. Air dry for 5 to 10 minutes and rinse in clear water before applying the cement. Use only fresh bleach. Bleach that has been exposed to the air for more than 20 minutes must be discarded.

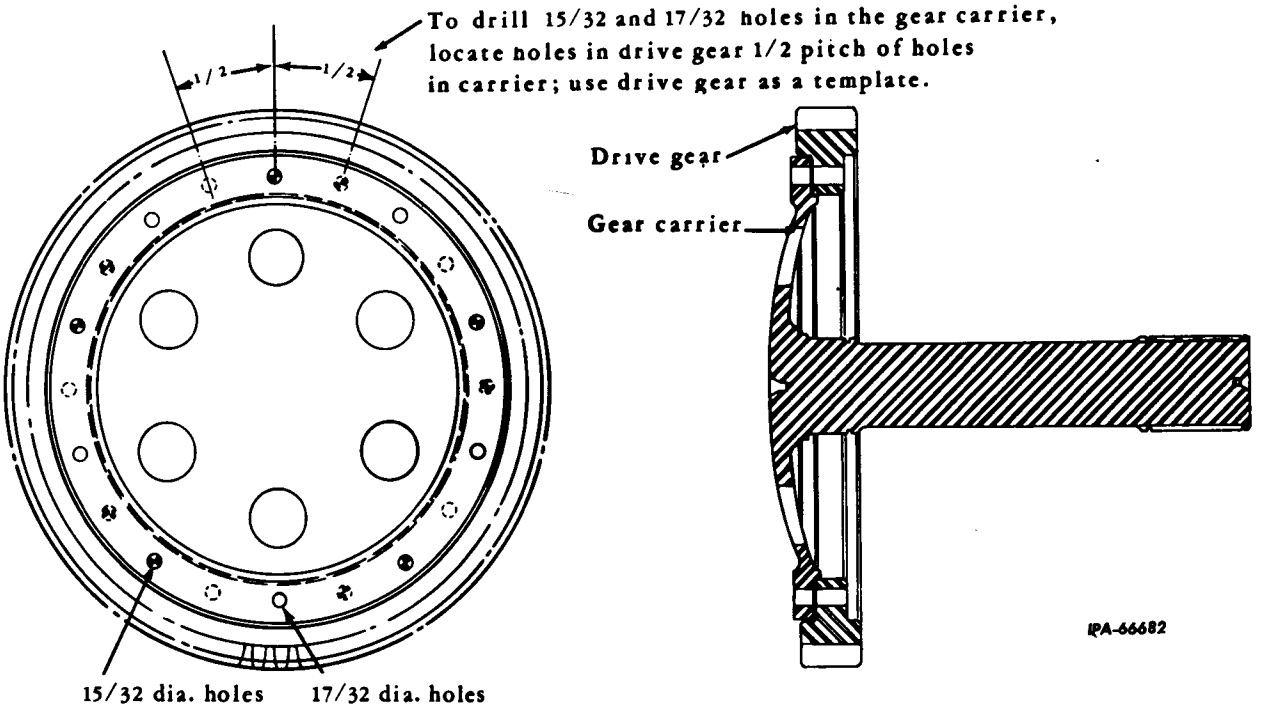
Whenever this oil seal assembly is removed, it is recommended that a new gasket (22A) be installed. Snap the new gasket into place on the seal pins. Do not apply any sealer or adhesive to the gasket. Be sure the four drive pin "O" rings (21) and the four "O" rings (22B) are in place on each of the alternate drive pins of the wear plate and seal rotor. If the "O" rings (21 or 22B) are damaged, replace with new.

NOTE: Do not discard the "O" rings (21 or 22B) because they are notched. The notches are for relieving compression when the seal pins are inserted into the mounting holes.

Metal Face and Quad Ring Type Oil Seals

7. Whenever the sprocket drive is disassembled, it is suggested that the carrier seal rubber rings be replaced. A kit containing two rubber rings and two lint free wipers is available for this purpose. Inspect the condition of the seal metal rings as described in the following steps to determine if only new rubber rings are required or if a completely new oil seal is needed.

(Continued on next page)



Illust. 13
Drilling Diagram for Drilling New Holes in Either the Sprocket Drive Gear or Sprocket Drive Gear Carrier (When Drilling Holes in the Sprocket Drive Gear, Use Carrier as a Template).

SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

12. INSPECTION AND REPAIR - Continued

Metal Face and Quad Ring Type Oil Seals - Continued

NOTE: Do not intermix metal rings; keep original mated rings as a set. Do not drop, bump or roughly handle these rings.

(1) The highly polished surfaces of the rings must be free of chips, pocks and deep scratches.

(2) The narrow, highly polished sealing band must be within the outer half of the sealing face (Illust. 14 and 15).

(3) The narrow band must be uniform and concentric with the ID and OD (Illust. 14 and 16).

NOTE: If the metal rings do not conform to these specifications, discard the metal rings and use a completely new oil seal. If the rings do conform, they must be cleaned and checked as follows.

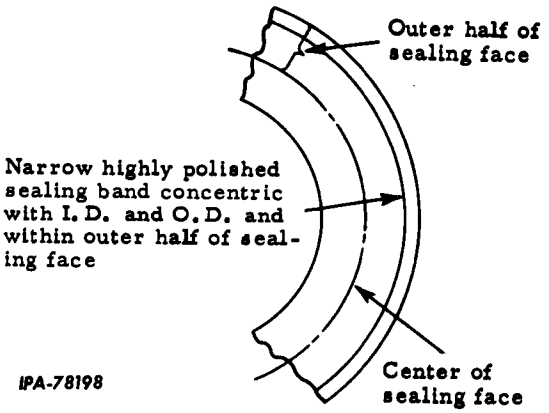
(4) Remove any corrosion or hardened material that may exist on surfaces (A) (Illust. 17 or 18). Use a scraper and/or any stiff bristled fiber brush to remove this material from the entire surface.

(5) Wash the metal rings with a non-flammable solvent to remove all oil and wipe dry. Use a lint free wiper to remove all traces of oil or grease from all surfaces.

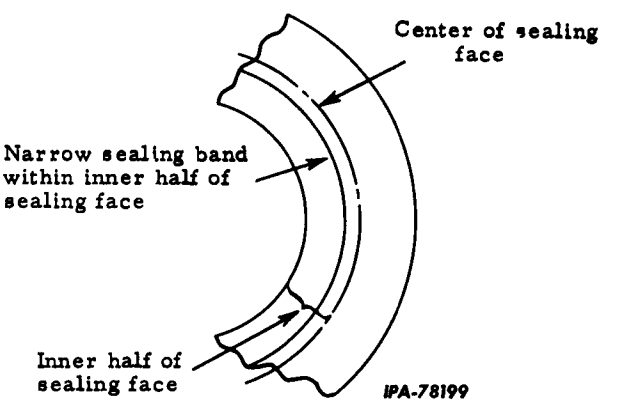
(6) Apply a thin film of clean grade-30 oil on the sealing face only of the metal rings (Illust. 17 or 18). DO NOT ALLOW THE OIL TO WET OTHER SURFACES. Slide the sealing surfaces of the two metal rings together.

(7) If the rings have been properly cleaned and oiled, the bottom ring should cling to the top ring for a minimum of two seconds when the two attached rings (lifted by the top ring) are an inch above a table surface. Failure to meet this requirement indicates that the metal rings are unusable or dirty. Repeat steps (4) thru (7) to verify this condition. If separation condition persists, discard the metal rings and install a new seal.

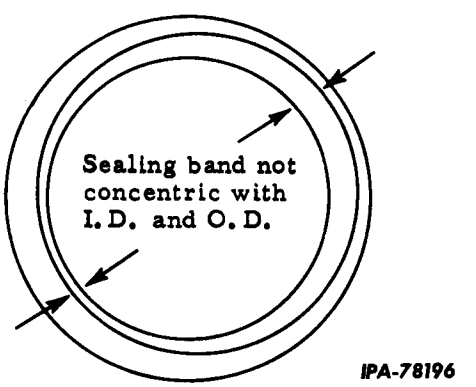
(8) Cover usable metal rings in a lint free wrapping until ready for installation. Refer to Par. 14, "INSTALLATION," for the proper handling and installation of new seal rubber rings or a new seal assembly.



Illust. 14
Metal Ring Acceptable for Rebuild.

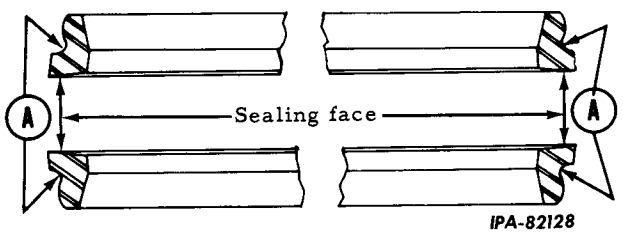


Illust. 15
Metal Ring Not Acceptable for Rebuild.

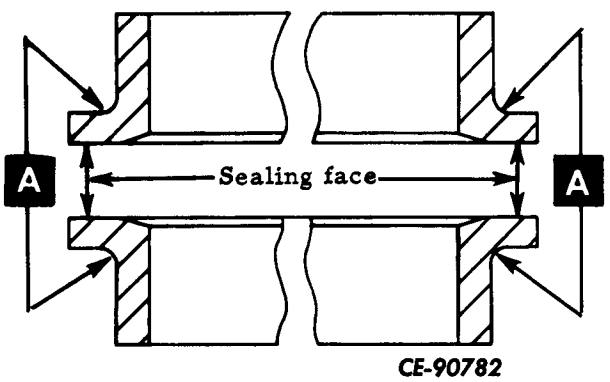


Illust. 16
Metal Ring Not Acceptable for Rebuild.

SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR



Illust. 17
Rubber Ring and Sealing Surfaces
of Quad Ring Type Oil Seal.



Illust. 18
Rubber Ring and Sealing Surfaces
of Metal Face Type Oil Seal.

13. REASSEMBLY

(Ref. Nos. Refer to Illust. 6)

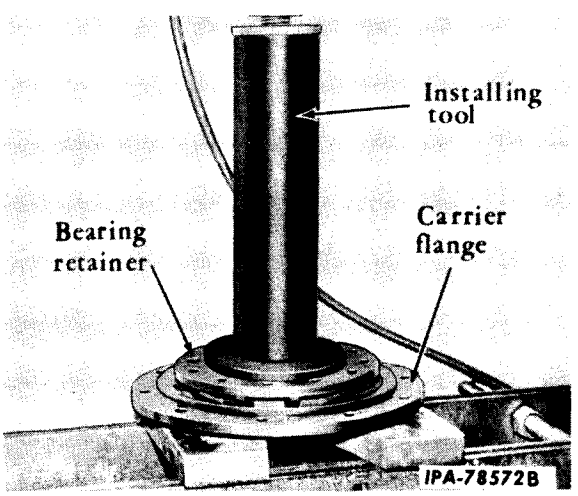
1. LOADERS ONLY: If the bushings (18) needed replacement, new ones must be pressed into the carrier cover from each end until flush with the bushing bore.

2. If the pinion outer bearing (11) needed replacement, press a new bearing cup into the carrier cover until it bottoms. The bearing cone must be installed on the end of the pinion (9) until the lip of the cone is bottomed against the pinion shoulder.

NOTE: The pinion outer bearing (11) must be thoroughly soaked with sprocket drive lubricant to insure initial lubrication.

3. If the sprocket carrier bearings (19 and 27) needed replacement, press new bearing cups into the sprocket carrier (24) (the large diameter of the taper up) until they bottom. Heat the inner bearing cone (Illust. 10) to 275 degrees for approximately 45 minutes and assemble on the cover until it is solid against the shoulder with the small diameter of the taper up. To assure cone is against the shoulder, make a final press after it has reasonably cooled down. The outer bearing cone will be installed later.

(Continued on next page)



Illust. 19
Installing the Carrier Bearing and Retainer
on the Drive Gear Carrier.

SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

13. REASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 6)

4. If the retainer (14) and bearing (15) needed replacement, press a new bearing (using the outer race) into the retainer (14) until it bottoms. To press the inner race of the bearing on the carrier an installing tool as shown in Illust. 20 must be used to keep the outer race and bearing retainer from cocking as the inner race is pressed on. Cocking of the outer race can cause the outer race to hang-up on a roller and result in scuffing the roller or race causing premature bearing failure. Place the sprocket drive gear and carrier assembly in a press with the splines of the carrier (12) up. If equipped with an "O" ring (52) and spacer (53), install the "O" ring on the carrier shaft until it bottoms against the flange and position the spacer so the open end fits over the "O" ring. Position the retainer (14) with bearing on the hub of the carrier (the small diameter of the retainer down) and, using the installing tool, press the bearing and retainer onto the carrier until the snap ring groove appears (Illust. 19). Install the snap ring (16).

NOTE: After the bearing and retainer are installed on the carrier shaft, check for free movement. If free movement is not obtained, change the bearing.

5. Block the carrier cover (17) so the splines of the cover are down. The cover must be blocked so the end of the sprocket drive gear carrier (12) will clear the bench when it is installed.

6. Insert the sprocket drive gear and carrier assembly through the hub of the cover (Illust. 12). Before seating the flange of the retainer (14) in the cover bore, align the larger three cored holes in the retainer with those in the cover and also the smaller holes with the tapped holes in the cover.

Through the openings in the gear carrier flange (Illust. 12), insert and tighten the six cap screws and washers to secure the retainer to the carrier cover (17).

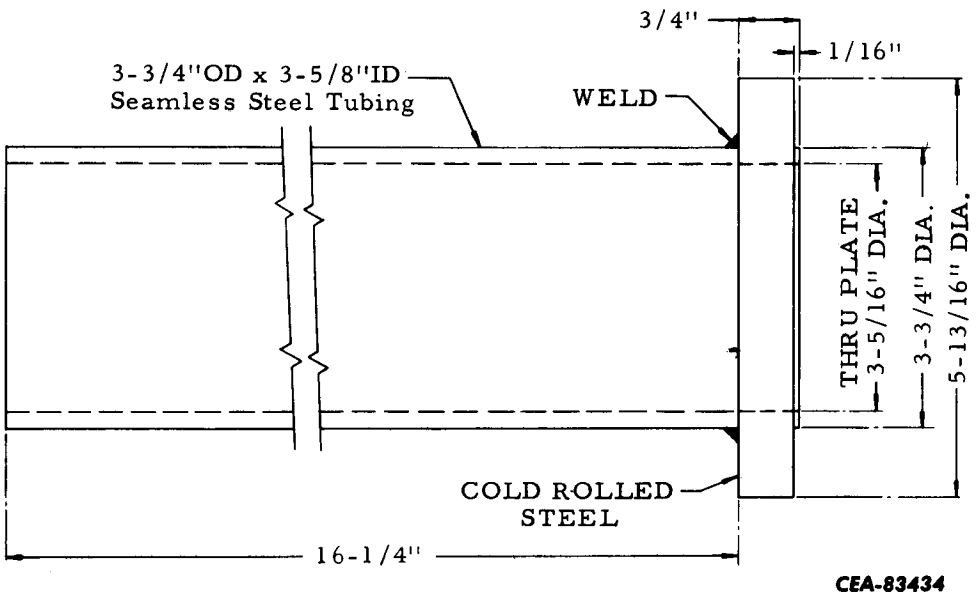
14. INSTALLATION

(Ref. Nos. Refer to Illust. 6)

1. Be sure the sealing surfaces of the carrier cover (17) and sprocket drive carrier (6) are clean of the old gasket and apply International Harvester liquid gasket to both mating surfaces.

2. Attach a hoist to the carrier cover (17) and position the cover over the carrier dowels (7). Be sure the three hexagon-socket set screws in the carrier cover have been turned back into place (Illust. 11). Using the flats on each side of the carrier cover, drive the cover onto the dowels (7). Secure the cover to the carrier with the cap screws. Assemblies using grade 8 cap screws and hardened washers must be torqued from 360-405 ft. -lbs. and assemblies using grade 5 cap screws without hardened washers from 290-320 ft. -lbs. Remove the hoist.

NOTE: The cover (17) must be started square on the dowels to prevent possible damage to the rollers of the pinion outer bearing cup.



Illust. 20
Drive Gear Carrier Bearing Installing Tool.

SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

3. SPRING LOADED RUBBER FACE TYPE SEAL: Install the oil seal wear plate assembly (20) on the cover, engaging the pins of the wear plate with the holes provided in the cover (Illust. 23). Be sure the wear plate is up against its mating face on the cover. Install the oil seal rotor assembly (22) to the sprocket carrier (24), engaging the pins of the rotor with the holes provided in the rear of the sprocket carrier. Be sure the rotor is up against its mating face on the carrier.

NOTE: SPRING LOADED RUBBER FACE TYPE SEAL: Do not use Lubriplate or grease on the back-up gasket of the seal wear plate (20) or the gasket (22A) of the seal rotor to hold them in place during assembly as this could cause the seal to leak. The "O" rings (21 and 22B) hold the seal members in place. Only the leather seal face of the wear plate and the "O" rings must be lubricated with oil to permit easier installation.

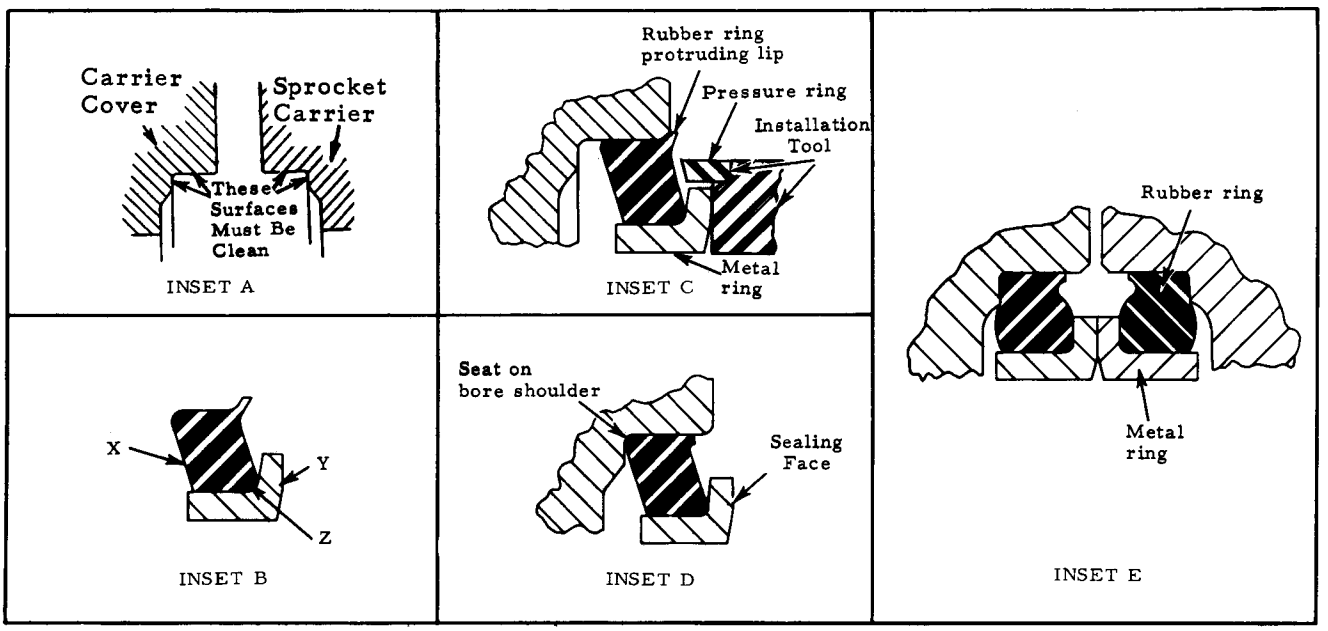
NOTE: METAL FACE TYPE AND QUAD RING TYPE SEALS: CLEANLINESS IS CRITICAL WHEN HANDLING THESE SEALS. NEVER HANDLE SEAL WITH GREASY, OILY OR DIRTY HANDS. DO NOT INTERMIX THE SEAL METAL RINGS; KEEP ORIGINAL MATED METAL RINGS AS A SET. DO NOT DROP, BUMP OR ROUGHLY HANDLE THESE RINGS.

NOTE: METAL FACE TYPE SEAL ONLY: A new seal or rebuilding kit is shipped in a molded plastic container. Because this container is also an installation tool, carefully open it following the instructions in the pamphlet furnished with the kit or seal.

METAL FACE TYPE SEAL: Install the seal as follows (refer to Illust. 21):

(a) Refer to INSET A: Remove corrosion or hardened material that may exist on the surfaces that will contact the rubber ring. Use a scraper and/or stiff bristled fiber brush to clean the surfaces with a non-flammable solvent. Wipe dry with a lint

(Continued on next page)



Illust. 21
Metal Face Type Oil Seal Installing Instructions.

SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

14. INSTALLATION - Continued

(Ref. Nos. Refer to Illust. 6)

free wiper to remove all traces of oil or grease.

(b) Refer to INSET B: Check that the rubber ring is seated against the shoulder (2) of the metal ring by pressing with the fingers at (X) and (Y) while rotating 360 degrees.

(c) Refer to INSET C: Install the rubber and metal ring assembly in the carrier cover so the protruding lip just contacts the seal bore as shown in the INSET. Rubber ring must be free of oil. Position the installation tool on the metal ring as shown (be sure pressure ring is installed with the chamfer up). Press with both hands (180 degrees apart) against the tool until the rubber ring is evenly seated (360 degrees) against the bore shoulder as shown in INSET D. Be sure seal is not cocked in the bore. Complete seating is assured by pressing at several locations 180 degrees apart.

(d) Refer to INSET D. Repeat steps (a) through (d) to install the other seal half in the sprocket carrier. Wipe both metal ring sealing faces clean with one of the lint free wipers furnished.

(e) Final installation assembly will energize the seal as shown in INSET E, so that the rubber rings load, seal and drive the mating metal rings.

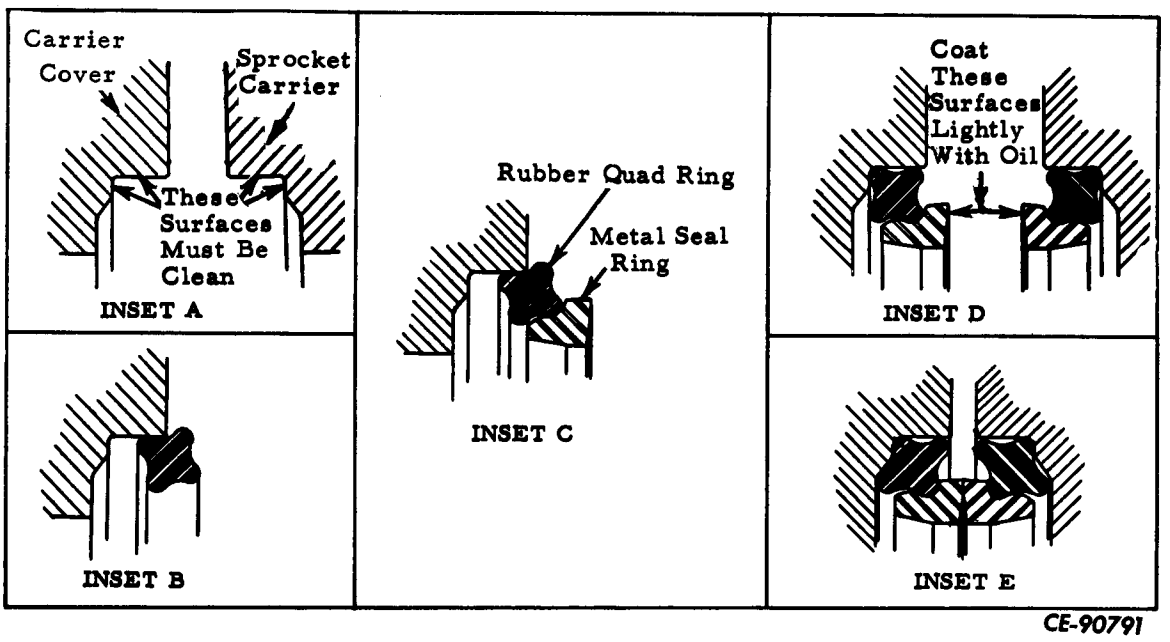
QUAD RING TYPE SEAL: Install the seal as follows (refer to Illust. 22):

(a) Refer to INSET A: Remove corrosion or hardened material that may exist on the surfaces that will contact the rubber quad ring. Use a scraper and/or stiff bristled fiber brush to clean these surfaces with a non-flammable solvent. Wipe dry with a lint free wiper to remove all traces of oil or grease.

(b) Refer to INSET B: Install one of the quad rings in the carrier cover so that one lobe of the ring enters the carrier bore.

NOTE: The quad ring may be installed with two lobes in the bore and then withdrawn half way to the position shown.

(c) Refer to INSET C: Install one of the metal sealing rings in the lobe of the quad ring, then gradually press the quad ring and metal ring all the way to the bottom of the bore until the quad ring is evenly seated and the metal ring is in place as shown in INSET D.



Illust. 22
Quad Ring Type Oil Seal Installing Instructions.

SPROCKET DRIVE CARRIER COVER AND SPROCKET DRIVE GEAR

(d) Repeat steps (b) and (c) to install the other seal half in the sprocket carrier.

(e) Final installation assembly will energize the seal as shown in INSET E, so that the quad rings load, seal and drive the metal rings.

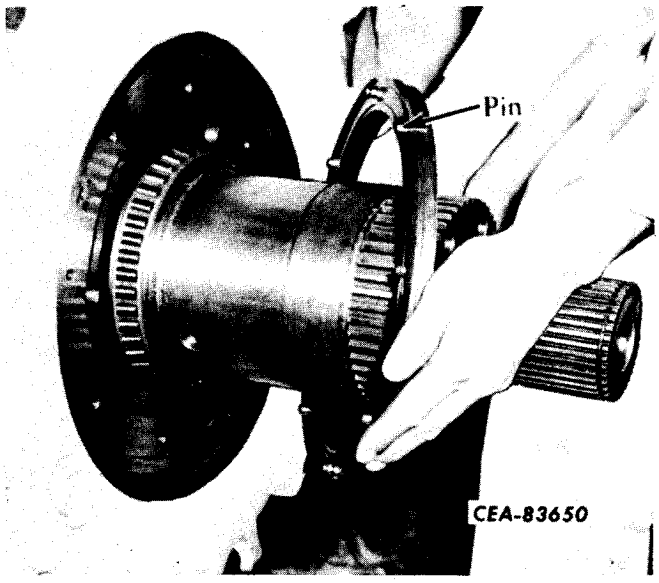
4. Place the bearing spacer (23) on the carrier cover and up against the sprocket carrier inner bearing cone (Illust. 10).

NOTE: METAL FACE TYPE AND QUAD RING TYPE SEALS: Apply a light coat of Grade-30 engine oil to the sealing faces of the metal rings just before the seal halves are mated (INSET D, Illust. 21 or 22).

5. With the aid of a hoist, position the sprocket and sprocket carrier on the cover (17), being sure the carrier inner bearing cup seats properly on its cone (Illust. 8). Heat the bearing cone of the outer bearing (27) to 275 degrees for approximately 45 minutes and assemble onto the cover hub until it bottoms against the spacer (23). To assure cone is solid against spacer, keep pressure against the cone until it reasonably cools down. Remove the hoist and rotate the sprocket carrier to be sure that the bearings are properly seated.

NOTE: The outer bearing (27) must be thoroughly soaked with sprocket drive lubricant to insure initial lubrication.

6. MODEL 250 LOADERS ONLY: Install the track frame coupling link. Place the link in position and secure to the track frame coupling and sprocket drive carrier cover with the link pins. Install the link pin locks and secure with cap screws and washers.



Illust. 23
Installing the Oil Seal Wear Plate.

7. Install the sprocket drive planetary as described in Par. 9, "INSTALLATION."

8. Remove the blocking from under the rear frame and slowly lower the unit until the sprocket rests on the track chain.

9. Install the track chain (refer to "TRACKS AND TRACK FRAME," Section 9).

SPROCKET DRIVE PINION

15. REMOVAL

(Ref. Nos. Refer to Illust. 6)

If it is desired to inspect or replace only the sprocket drive pinion (9), pinion bearings (8 and 11) or pinion oil seal (4), the sprocket, sprocket drive planetary and the sprocket drive carrier cover and sprocket drive gear can be removed as a unit as follows.

NOTE: LATER TYPE PIVOT BRAKES: The following procedure for removing the pinion can be followed starting with step 6 after first removing the complete sprocket drive assembly from the machine, and the pivot brake assembly from the carrier (6) as described in Section 7, "STEERING SYSTEM" under "PIVOT BRAKES". After the track chain is off the sprocket, be sure to move the tractor (if necessary) so the drain plug in the carrier (42) is at the bottom. Drain the sprocket drive through this plug and the lower plug in the rear of the carrier (6).

1. Remove the sprocket rock shield (if equipped).

2. Remove the track chain (refer to "TRACKS AND TRACK FRAME," Section 9). Be sure to move the tractor (if necessary) after the track chain is off the sprocket so the drain plug in the planet gear carrier (42) is at the bottom.

3. Drain the oil from the sprocket drive by removing the plug in the bottom of the planet gear carrier and the lower plug in the rear of the sprocket drive carrier (6).

4. LOADERS ONLY: Remove the track frame coupling link. Remove the cap screws, washers and link pin locks securing the link pins to the coupling at the track frame and at the bottom of the sprocket carrier cover (17). Tap out the link pins to remove the coupling link.

(Continued on next page)

SPROCKET DRIVE PINION

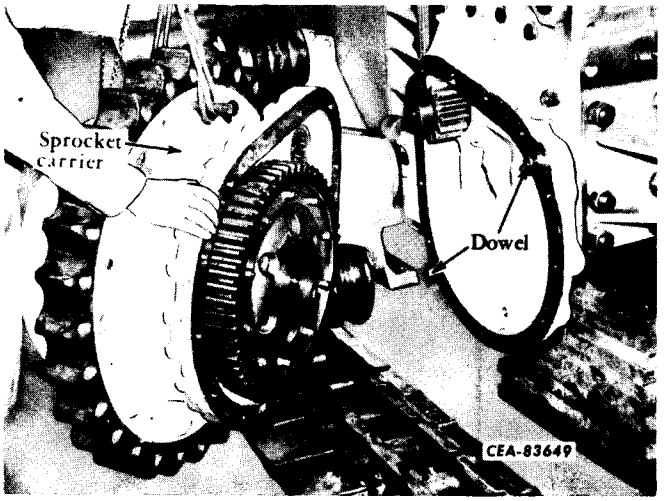
15. REMOVAL - Continued
(Ref. Nos. Refer to Illust. 6)

5. Jack the rear of the tractor enough to allow the sprocket to clear the track chain. Block under the rear frame.

6. EARLIER TYPE PIVOT BRAKE: Remove the cap screws securing the cover (17) to the sprocket drive carrier (6). Attach a hoist to the sprocket carrier in a manner similar to that shown in Illust. 24 to balance the assembly. Use the three hexagon-socket set screws provided in the cover (17) to pull the cover free of the dowels (Illust. 24) in the sprocket drive carrier. If necessary, prybars can also be used to free the cover from the dowels.

◆ CAUTION: KEEP CLEAR OF THE COVER (17) AS THE ASSEMBLY IS REMOVED AS IT IS POSSIBLE THAT THE COVER MAY SWING DOWN ONCE IT IS FREE OF THE DOWELS.

LATER TYPE PIVOT BRAKE: Remove the cap screws securing the cover (17) to the carrier (6). Secure the pinion (9) to the carrier with a rope or strap and use the three hexagon-socket set screws provided in the cover (17) to pull the cover free of the dowels in the sprocket drive carrier. If necessary, prybars can also be used to free the cover from the dowels.



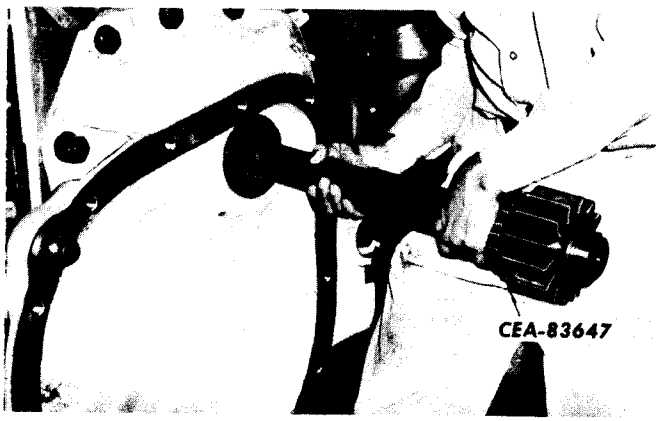
Illust. 24
Removing the Sprocket Drive as a Unit on Units with Earlier Type Brake.

7. EARLIER TYPE PIVOT BRAKE: Depress the brake pedal and lock it with the pedal ratchet. This will keep the internally splined pivot discs locked in position when the pinion (9) is removed.

8. METAL FACE TYPE SEAL: Pull the sprocket drive pinion from the carrier (6) (Illust. 25). The two pinion bearing cones, pinion oil seal rotor and pinion "O" ring (5) will come off with the pinion.

LIP TYPE SEAL: Pull the sprocket drive pinion from the carrier (6) (Illust. 25). The two pinion bearing cones will come off with the pinion. The wear sleeve (5A) used with the conversion oil seal will also come off with the shaft. If replacement of this sleeve becomes necessary, it must be cut from the shaft.

9. Inspect the condition of the pinion inner bearing (8) and oil seal (4). The oil seal or oil seal stator is in the retainer (2) secured to the inside of the sprocket drive carrier.



Illust. 25
Removing the Pinion Shaft on Units with Earlier Type Brake.

10. EARLIER TYPE PIVOT BRAKE: If the oil seal, oil seal stator or pinion inner bearing cup needs replacement, they can be removed from the carrier bore only after first removing the carrier from the main frame and the pivot brake assembly from the carrier. (Refer to Section 7, "STEERING SYSTEM" under "PIVOT BRAKES" for the removal procedure of the carrier and pivot brake assembly.)

LATER TYPE PIVOT BRAKE: If the oil seal, oil seal stator or the pinion inner bearing cup needs replacement, they can be removed from the carrier bore after first removing the oil dam (1A).

11. Working through the pivot brake disc opening in the rear of the carrier (6), remove the cap screws and washers securing the seal retainer to the carrier. Remove the seal retainer (2) with "O" ring (3). If replacement is necessary, the oil seal or seal stator can be pressed

SPROCKET DRIVE PINION

out of the retainer. Using a bearing cup puller, remove the pinion inner bearing cup from the carrier bore.

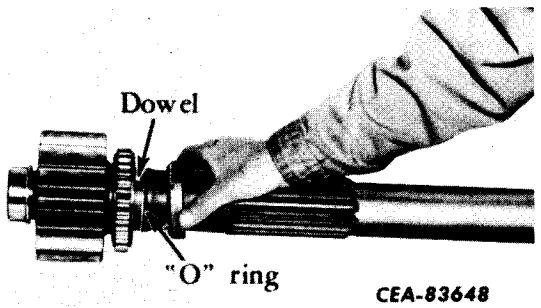
NOTE: METAL FACE TYPE SEAL: If the oil seal stator or rotor is found to be unserviceable, a lip type conversion seal must be installed as described in Par. 18, "REASSEMBLY."

16. DISASSEMBLY

(Ref. Nos. Refer to Illust. 6)

1. METAL FACE TYPE SEAL: Remove the rotor of the oil seal (4), driving dowel (10) and "O" ring (5) from the shaft (Illust. 26).

2. If bearing replacement is necessary, the pinion bearing cones can be pressed from the pinion. The pinion outer bearing cup can easily be pulled from the cover (17).



Illust. 26
Removing the Rotor of the Pinion Oil Seal (Metal Face Type Seal Only).

17. INSPECTION AND REPAIR

(Ref. Nos. Refer to Illust. 6)

1. Wash all parts thoroughly in a dry-cleaning solvent and dry with compressed air.

2. Inspect the bearings for scores, cracks and wear and replace if necessary. Oil bearings that are in a serviceable condition, and keep covered until ready for assembly.

3. Thoroughly scrape the sprocket drive carrier (6) and carrier cover (17) mating surfaces clean. Be careful not to scratch these finished surfaces or the sealing may become ineffective.

4. Inspect the oil seal (4) for excessive wear or damage and replace if necessary. Refer to Par. 18, "REASSEMBLY" for the proper method of installing the oil seal.

5. It is recommended that new "O" rings and sealing rings be installed.

6. Inspect the pinion splines and gear teeth for damage. Slight burrs can be smoothed down with a stone. If the pinion gear teeth are worn enough to cause excessive backlash the pinion (and possibly the sprocket drive gear) will have to be replaced.

18. REASSEMBLY

(Ref. Nos. Refer to Illust. 6)

NOTE: Before installing the pinion inner and outer bearings, immerse them in sprocket drive lubricant. Even if they were not removed they must be thoroughly soaked with sprocket drive lubricant to insure initial lubrication.

1. If pinion bearing replacement was necessary, place the pinion (9) in a press with the long end of the shaft up. Press on the inner bearing cone. This inner bearing cone must be installed so the side with the radius and not the side with the chamfer bottoms on the shaft shoulder allowing the bearing cone to fit properly in the shaft fillet (Illust. 27). Reverse the pinion in the press and install the outer bearing cone so the lip of the cone is up against the pinion shoulder. Install the outer bearing cup into the cover (17) until it bottoms.

2. METAL FACE TYPE SEAL: If this oil seal was inspected and found serviceable, the following method of handling this oil seal must be used.

(a) Be extremely careful not to nick either seal face.

(b) Clean seal faces just prior to their contacting each other.

1. It is usually easier to clean these faces when they are dry.

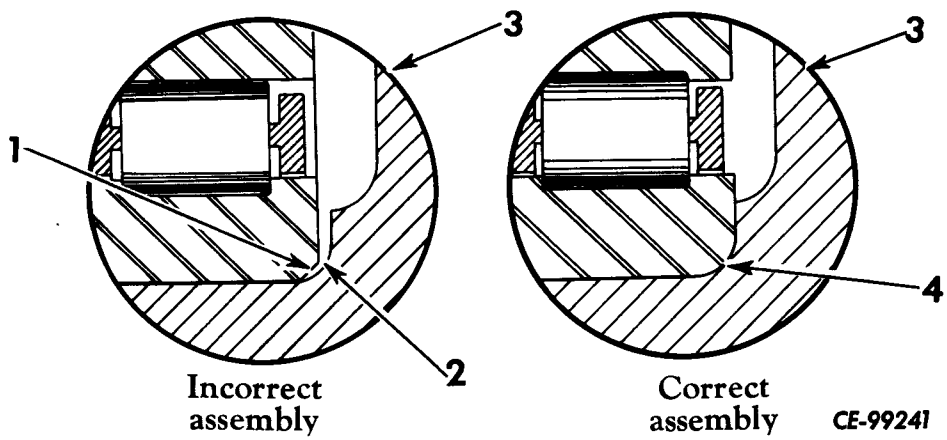
2. Apply Molykote to seat rotor face to permit a few minutes running until the oil can reach the seal faces. Some of this is likely to rub off during the final cleaning.

(Continued on next page)

SPROCKET DRIVE PINION

18. REASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 6)



Illust. 27
Pinion Inner Bearing Cone Installation.

1. Bearing chamfer.
2. Shaft fillet.
3. Pinion shaft.
4. Shaft fillet and bearing radius.

3. Clean rags should be used to wipe the seal faces. If oil is used to wipe the seal faces, it must be clean and be kept in a closed container.

(c) Install the driving dowel (10) in the pinion until it extends 1/4 inch above the shaft. Molykote the oil seal "O" ring bearing surfaces on the pinion shaft and install the "O" ring (5) in the groove provided in the shaft (Illust. 26).

(d) Place the oil seal rotor on the shaft until it engages the dowel (10). The rotor sealing surface must face the long end of the pinion (Illust. 26).

LIP TYPE CONVERSION SEAL: If this seal is being installed for the first time be sure to remove and discard the driving dowel (10) and the "O" ring (5) from the pinion. Before installing the wear sleeve (5A), check that the shaft surface is clean and free of rust. Position the wear sleeve on the shaft with the chamfer in the sleeve ID down and press onto the shaft until it bottoms. Install the oil seal into the retainer (seal part number down) until it is flush with the retainer shoulder (Illust. 28). DO NOT bottom the seal in the retainer bore.

NOTE: It is recommended that when replacing a metal face type seal with the lip type seal, to also install the latest seal retainer (2).

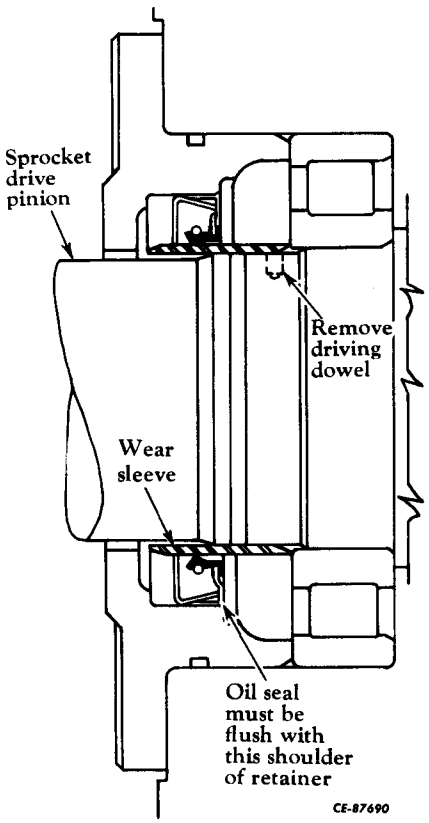
LIP TYPE SEAL WITHOUT WEAR SLEEVE: Install the seal (4) into the retainer (seal part number down) until it is flush with the retainer shoulder (Illust. 28). DO NOT bottom the seal in the retainer bore.

3. Install the "O" ring (3) in the groove on the seal retainer. Working through the opening in the rear of the carrier (6), secure the retainer to the carrier.

4. EARLIER TYPE PIVOT BRAKE: If the pinion inner bearing was removed, drive the pinion inner bearing cup into the carrier bore until it bottoms against the oil seal retainer. The lip of the bearing cup must be against the retainer. Install the pivot brake assembly to the carrier and the carrier to the main frame as described under "PIVOT BRAKES" in Section 7, "STEERING SYSTEM."

LATER TYPE PIVOT BRAKE: If the pinion inner bearing was removed, drive the inner bearing cup into the carrier bore until the cup lip bottoms against the oil seal retainer. Install the oil dam (1A) into the carrier bore (open side facing out) until it is flush with the edge of the carrier bore.

SPROCKET DRIVE PINION



Illust. 28
Lip Type Conversion Seal Installation Shown, Lip Type Seal without Wear Sleeve Similar.

19. INSTALLATION

(Ref. Nos. Refer to Illust. 6)

1. EARLIER TYPE PIVOT BRAKE: Insert the pinion shaft (9) through the carrier and main frame (Illust. 25). The splines of the pinion shaft must engage the pivot brake discs and the sprocket drive pinion shaft gear in the steering planetary. If the carrier (6) was removed, install the pinion shaft using a back and forth motion, keeping some inward pressure to allow the pivot brake discs to pick-up the shaft splines.

2. EARLIER TYPE PIVOT BRAKE: Release the brake pedal ratchet.

3. Be sure the three hexagon-socket set screws in the carrier cover have been turned back into place.

4. Be sure the sealing surfaces of the carrier (6) and cover (17) are clean of the old gasket and apply International Harvester gasket maker to both mating surfaces.

NOTE: The carrier cover (17) must be started square on the dowels to prevent possible damage to the rollers of the pinion outer bearing cup.

5. LATER TYPE PIVOT BRAKE: Insert the pinion (9) into the carrier (6). Secure the pinion to the carrier as was done in removal to prevent it from slipping out. Attach a hoist to the carrier as was done in removal and lower the assembly onto the cover (17) engaging the dowels (7). Secure the cover to the carrier with the cap screws using 290-320 ft. -lbs. torque. On later units using hardened washers, torque from 360-405 ft. -lbs. Remove the rope or strap securing the pinion to the carrier.

EARLIER TYPE PIVOT BRAKE: Attach a hoist to the sprocket carrier in the same manner as was done when removed and position the assembly over the carrier dowels (7). Using the flats on each side of the carrier cover, drive the cover onto the dowels. Secure the cover to the carrier with the cap screws using 290-320 ft. -lbs. torque. On later units using hardened washers, torque from 360-405 ft. -lbs. Remove the hoist.

◆ CAUTION: EARLIER TYPE PIVOT BRAKE: UNTIL THE ASSEMBLY IS STARTED ON THE DOWELS (7), THE CARRIER COVER (17) MUST BE SUPPORTED TO PREVENT IT FROM SWINGING DOWN.

6. LATER TYPE PIVOT BRAKE: Install the pivot brake assembly to the carrier (6) and the complete sprocket drive assembly to the rear main frame as described in Section 7, "STEERING SYSTEM" under "PIVOT BRAKES."

NOTE: LATER TYPE PIVOT BRAKE: Once the sprocket drive is in position but before installing the track chain, fill the sprocket drive as described in the Operator's Manual. Be sure the drain plug in the carriers (6 and 42) are installed and tight.

7. EARLIER TYPE PIVOT BRAKE: Remove the blocking from under the rear frame and slowly lower the unit until the sprocket rests on the track chain.

8. EARLIER TYPE PIVOT BRAKE: LOADERS ONLY: Install the track frame coupling link. Place the link in position and secure to the track frame coupling and sprocket drive carrier cover with the link pins. Install the link pin locks and secure with cap screws and washers.

9. EARLIER TYPE PIVOT BRAKE: Be sure the drain plug in the planet gear carrier (42) and in the sprocket drive carrier (6) are installed and tight. Fill the sprocket drive as described in the operator's manual.

10. EARLIER TYPE PIVOT BRAKE: Install the track chain. (Refer to "TRACKS AND TRACK FRAME," Section 9.) Install the sprocket rock shield (if equipped).

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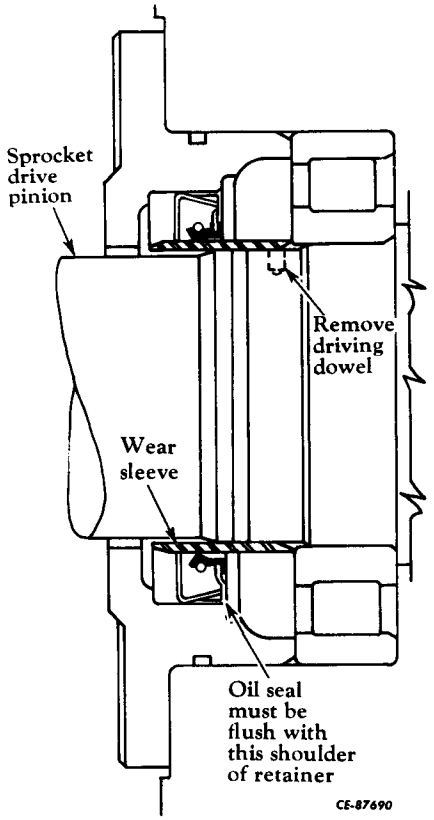
SPROCKET DRIVE PINION



Illust. 28
Lip Type Conversion Seal Installation Shown, Lip Type Seal without Wear Sleeve Similar.

19. INSTALLATION

(Ref. Nos. Refer to Illust. 6)

1. EARLIER TYPE PIVOT BRAKE: Insert the pinion shaft (9) through the carrier and main frame (Illust. 25). The splines of the pinion shaft must engage the pivot brake discs and the sprocket drive pinion shaft gear in the steering planetary. If the carrier (6) was removed, install the pinion shaft using a back and forth motion, keeping some inward pressure to allow the pivot brake discs to pick-up the shaft splines.

2. EARLIER TYPE PIVOT BRAKE: Release the brake pedal ratchet.

3. Be sure the three hexagon-socket set screws in the carrier cover have been turned back into place.

4. Be sure the sealing surfaces of the carrier (6) and cover (17) are clean of the old gasket and apply International Harvester gasket maker to both mating surfaces.

NOTE: The carrier cover (17) must be started square on the dowels to prevent possible damage to the rollers of the pinion outer bearing cup.

5. LATER TYPE PIVOT BRAKE: Insert the pinion (9) into the carrier (6). Secure the pinion to the carrier as was done in removal to prevent it from slipping out. Attach a hoist to the carrier as was done in removal and lower the assembly onto the cover (17) engaging the dowels (7). Secure the cover to the carrier with the cap screws using 290-320 ft. -lbs. torque. On later units using hardened washers, torque from 360-405 ft. -lbs. Remove the rope or strap securing the pinion to the carrier.

EARLIER TYPE PIVOT BRAKE: Attach a hoist to the sprocket carrier in the same manner as was done when removed and position the assembly over the carrier dowels (7). Using the flats on each side of the carrier cover, drive the cover onto the dowels. Secure the cover to the carrier with the cap screws using 290-320 ft. -lbs. torque. On later units using hardened washers, torque from 360-405 ft. -lbs. Remove the hoist.

◆ CAUTION: EARLIER TYPE PIVOT BRAKE: UNTIL THE ASSEMBLY IS STARTED ON THE DOWELS (7), THE CARRIER COVER (17) MUST BE SUPPORTED TO PREVENT IT FROM SWINGING DOWN.

6. LATER TYPE PIVOT BRAKE: Install the pivot brake assembly to the carrier (6) and the complete sprocket drive assembly to the rear main frame as described in Section 7, "STEERING SYSTEM" under "PIVOT BRAKES."

NOTE: LATER TYPE PIVOT BRAKE: Once the sprocket drive is in position but before installing the track chain, fill the sprocket drive as described in the Operator's Manual. Be sure the drain plug in the carriers (6 and 42) are installed and tight.

7. EARLIER TYPE PIVOT BRAKE: Remove the blocking from under the rear frame and slowly lower the unit until the sprocket rests on the track chain.

8. EARLIER TYPE PIVOT BRAKE: LOADERS ONLY: Install the track frame coupling link. Place the link in position and secure to the track frame coupling and sprocket drive carrier cover with the link pins. Install the link pin locks and secure with cap screws and washers.

9. EARLIER TYPE PIVOT BRAKE: Be sure the drain plug in the planet gear carrier (42) and in the sprocket drive carrier (6) are installed and tight. Fill the sprocket drive as described in the operator's manual.

10. EARLIER TYPE PIVOT BRAKE: Install the track chain. (Refer to "TRACKS AND TRACK FRAME," Section 9.) Install the sprocket rock shield (if equipped).

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SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

CONTENTS

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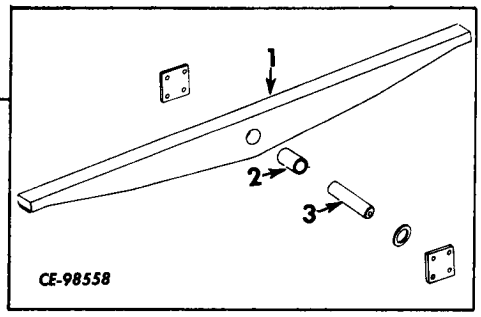
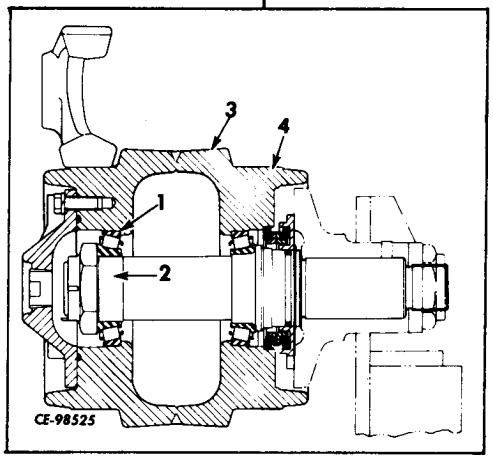
R TRACK AND TRACK FRAME SERVICE CHART



CE-98558

TRACK IDLER

(1) Body bearing bore diameter, inches..	3.8105- 3.8115
(2) Shaft diameter, inches:	
Outer bearing.....	1.1663 - 1.1668
Inner bearing.....	2.2510 – 2.2515
(3) Body flange height, inch.....	5/8
Max. permissible body flange height, inch.....	7/8
(4) Idler rolling diameter, inches (diameter at point of contact with track chain).....	8
Max. permissible wear of rolling diameter, inch.....	9/16



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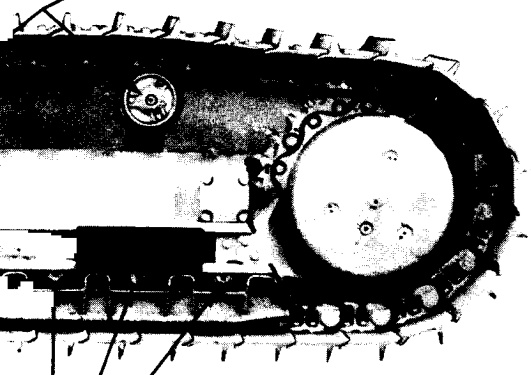
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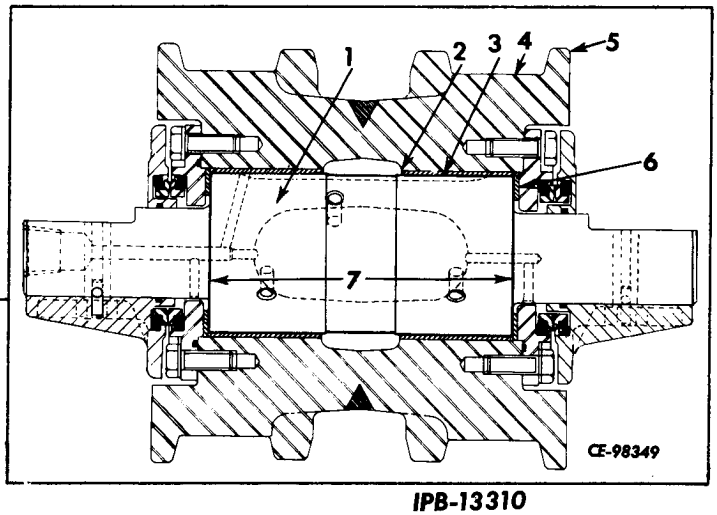
TRACK ROLLER

.hes.....	3.385 – 3.387
eter, inches:	
ıng.....	3.627 – 3.629
ng (.030").....	3.657 – 3.659
) (assembled) inches.....	3.392 – 3.398
ıeter, inches (diameter at point of ck chain).....	8 1/2
wear of rolling diameter, inch.....	3/4
ıt, inch.....	13/16
body flange height, inch.....	1 1/8
ickness, inch.....	.122 – .125
ıshing surface, inches.....	7.666 - 7.672
clearance, inch.....	.012 – .036
track roller end clearance, inch.....	.045



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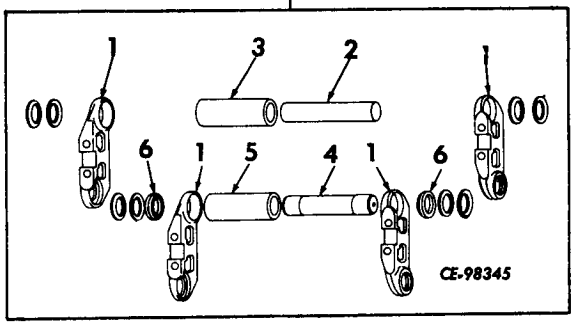
IPB-13310

TD-20 SERIES B AND MODEL 250 SERIES LOADE

TRACKS

(1) Track link height, inches	4 5/8
Max. permissible track link wear, inch	3/8
(2) Track pin diameter, inches	1.746–1.750
Max. permissible track pin wear, inch	1/16*
(3) Track pin bushing, inches	
OD	2.612–2.616
ID	1.763–1.775
Max. permissible track pin bushing wear, inch	
OD	1/8*
ID	1/16*
(2) & (3) Track pitch length (distance between center of pins) inches	7 1/2
Max. permissible pitch length, inches	7 5/8*
(4) Master pin diameter, inches (strutless)	1.7345–1.7360
(strut)	1.742–1.743
(5) Master bushing, inches:	
OD	2.612–2.616
ID	1.763–1.775
(6) Master bushing spacer, inches:	
OD	2.612–2.650
ID	1.755–1.785

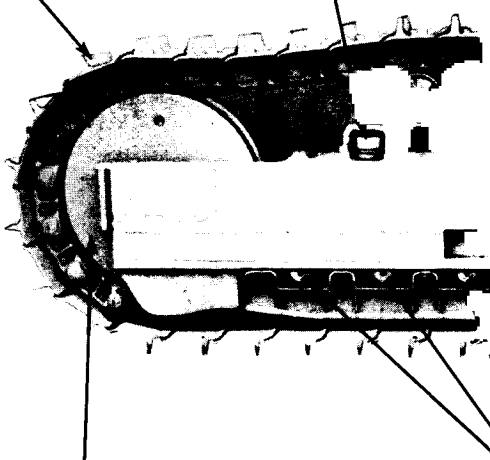
*–Pitch increase (caused by track pin wear and bushing internal wear) and bushing external wear of 1/8 inch is permissible for all applications. However, on less severe operations, wear of 3/16 inch is allowed. The type of operation and soil in which the unit is running determines which wear figure is acceptable. When in doubt, use 1/8 inch as the limit.

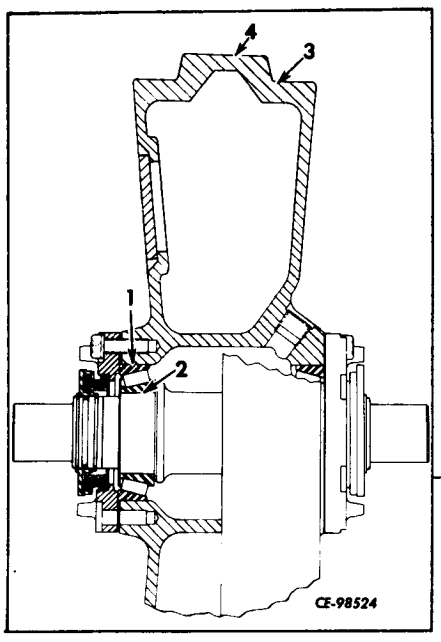


EQUALIZER BAR

Inspect the equalizer bar (1) for cracks and broken welds. Chec the bushing (2) and shaft (3) for excessive wear.

Equalizer bar bushing ID, inches	2.641–2.64
Equalizer bar pivot shaft diameter, inches	2.623–2.62
Equalizer bar pivot shaft support bushing ID, inches	2.635–2.63





FRONT IDLER

(1) Body bearing bore diameter, inches	4.7224–4.7239
(2) Shaft diameter (bearing surface) inches	2.8145–2.8155
(3) Idler rolling diameter, inches (diameter at point of contact with track chain)	29 7/64
Max. permissible wear of rolling diameter, inch	3/4
(4) Idler body flange height, inches	1
Max. permissible body flange height, inches	1 3/8

(1) Shift diameter,
(2) Roller bore dia
standard bu
oversize bush
(3) Roller bushing
(4) Roller rolling
contact with
Max. permissil
(5) Body flange h
Max. permissibl
(6) Thrust washer
(7) Width of shaft
Track roller en
Max. permissibl

1. DESCRIPTION

MODEL 250 and 250B Loaders

The track frames have seven track rollers and two track idlers on each side. The track spring housing is a permanent welded part to the track frame with the heavy coil spring being trapped within it. The track frames are attached to the front and rear rigid crossbars, and they support the weight of the tractor on the track rollers. The front idler is located between the two channels of the track frame and slides back and forth to take up shock loads and for the purpose of adjusting the track chain tension. The track idlers, which support the top part of the track, are mounted to the track frame. On earlier units using rollers with cartridge type seals, the idlers mount on the front frame. The track rollers are supported by brackets which are bolted to the channels of the track frame.

TD-20 SERIES B Tractor

The track frames have six track rollers and two track idlers on each side. The track spring housing is a permanent welded part to the track frame, with the heavy coil spring being trapped within it. The track frames are attached at the rear to the pivot shaft and at the front to the track frame guides. They support the weight of the tractor on the track rollers. A guide bracket is welded to each side of the front frame to provide the proper spacing between the two tracks. The front idler is located between the two channels of the track frame and slides back and forth to take up shock loads and for the purpose of adjusting the track chain tension. The two track idlers, which support the top part of the track, are mounted on the track frame. The track rollers are supported by brackets which are bolted to the channels of the track frame. Each track is free to oscillate vertically, independently of the other track.

2. MAINTENANCE

Lubrication

Various units of the track frame assembly must be lubricated at regular intervals and with the correct grades of lubricants. (Refer to the "LUBRICATION" Section of the operator's manual.)

Tracks

Periodically inspect the track shoe bolts. If necessary, install new bolts. Torque 5/8 inch bolts from 220-250 ft. -lbs. and torque 3/4 inch bolts from 400-450 ft. -lbs. Inspect the tension of the track chain, and adjust if necessary.

3. SPECIFICATIONS

Track pin diameter, inches	1.746 - 1.750
Track pin bushing, inches:	
OD	2.612 - 2.616
ID	1.763 - 1.775
Master pin diameter, inches:	
(Used with strutless type link)	1.7345 - 1.7360
(Used with strut type link)	1.742 - 1.743
Master bushing, inches:	
OD	2.612 - 2.616
ID	1.763 - 1.775
Master bushing spacer, inches:	
OD	2.612 - 2.650
ID	1.755 - 1.785
Maximum permissible track pin wear, inch	1/16 *
Maximum permissible track pin bushing wear, inch:	
OD	1/8 *
ID	1/16 *
Track pitch length (distance between center of pins), inches	7-1/2
Maximum permissible pitch length, inches	7-5/8 *
Track link height, inches	4-5/8
Maximum track link wear, inches	3/8
Track shoe grouser height, inches	2-19/32
Maximum permissible track shoe grouser wear, inches	1-19/32
Front idler shaft diameter (front and rear bearing surfaces), inches	2.8145 - 2.8155
Front idler bearing bore diameter, inches	4.7224 - 4.7239
(Rolling diameter is the diameter at the point of contact with the track chain)	29-7/64

* Pitch increase (caused by track pin wear and bushing internal wear) and bushing external wear of 1/8 inch is permissible for all applications. However, on less severe operations, wear of 3/16 inch is allowed. The type of operation and soil in which the unit is running determines which wear figure is acceptable. When in doubt, use 1/8 inch as the limit.

(Continued on next page)

3. SPECIFICATIONS - Continued

Maximum permissible wear of front idler rolling diameter, inches	3/4
Front idler body flange height, inches	1
Maximum allowable front idler body flange height, inches	1-3/8
Front idler guide rod diameter, inches	2.246 - 2.250
Front idler guide rod bore (in idler guide), inches	2.260 - 2.270
Hydraulic track adjusting rod diameter, inches	2.991 - 2.994
Hydraulic track adjusting cylinder inside diameter, inches	3.000 - 3.010
Track idler shaft diameter, inches:	
Outer bearing surface	2.1663 - 2.1668
Inner bearing surface	2.2510 - 2.2515
Track idler bearing bore diameter, inches:	
For front bearing	3.8105 - 3.8115
For rear bearing	3.8105 - 3.8115
Track idler rolling diameter, inches (rolling diameter is the diameter at the point of contact with the track chain)	8
Maximum permissible wear of track idler rolling diameter, inches	9/16
Track idler body flange height, inches	5/8
Maximum allowable track idler body flange height, inches	7/8
Track roller shaft diameter (bushing surface), inches	3.385 - 3.387
Track roller bore diameter, inches:	
For standard bushing	3.627 - 3.629
For .030 inch oversize bushing	3.657 - 3.659
Track roller bushing ID (assembled into roller), inches	3.392 - 3.398
Bushing pressed in below edge of track roller bore, inch	.278 - .303
Width of roller shaft bushing surface, inches	7.666 - 7.672
Track roller thrust washer thickness, inch	.122 - .125
Track roller rolling diameter (rolling diameter is diameter at point of contact with track chain), inches	8-1/2
Maximum permissible wear of track roller rolling diameter, inches	3/4
Track roller body flange height, inches	13/16
Maximum allowable track roller body flange height, inches	1-1/8
Distance between oil seal retainer surfaces, inches	7.934 - 7.946
Track roller end clearance, inch	.012 - .036
Maximum permissible track roller end clearance, inch	.045
Track roller diametral clearance, inch	.005 - .013
Maximum permissible track roller diametral clearance, inch	.035
Equalizer bar pivot shaft support bushing inside diameter (assembled in equalizer bar shaft support), inches	2.635 - 2.638
Equalizer bar bushing inside diameter (assembled in equalizer bar), inches	2.641 - 2.647
Equalizer bar pivot shaft outside diameter, inches	2.623 - 2.625
Track frame guide plate thickness, inches	1.487 - 1.500
Track frame guide wear plate thickness, inch	1/4
Track frame thrust plate thickness, inch	.865 - .875
Pivot shaft wear plate thickness, inch	.125 - .130
Pivot shaft inner bushing inside diameter (assembled in bore), inches	4.000 - 4.005
Pivot shaft outer bushing inside diameter (assembled in bore), inches	3.500 - 3.505
Track springs:	
Free length, inches	28-31/32
Test length, inches	24-1/4
Test load (per spring), pounds	32,000
Number of track shoes (one track):	
MODEL 250 Loader	43
TD-20 SERIES B	40

Special Nut and Bolt Torque Data (Foot-Pounds)
(Torques given are for bolts and nuts lubricated with SAE-30 engine oil.)

Track idler, track roller and front idler lubrication plugs	15 - 40
Track shoe bolts:	
5/8 inch	220 - 250
3/4 inch	400 - 450
Track idler shaft mounting nut (metal face type seal)	1000 - 1100

Hydraulic track adjuster cylinder flange bolts (guide type adjuster):	
(1/2 inch)	115 - 130
(5/8 inch) ("LOCTITE" grade "B" applied)	225 - 255
Track roller metal face type seal retainer cap screws ("LOCTITE" type "A" applied)	96 - 108
Pivot shaft cover bolts	290 - 320
Track frame thrust plate bolts	630 - 710
Track roller shield spacer bolts ("LOCTITE" grade "B" applied)	160 - 180
Track frame guide retainer bolts ("LOCTITE" grade "B" applied)	880 - 990
Track frame guide plate bolts	525 - 600
Hydraulic track adjuster vent screw	10 - 15
Hydraulic track adjuster ball check assembly	45 - 55
Hydraulic track adjuster combination safety relief and vent valve	45 - 55
Safety relief valve (in underside of idler fork) ("LOCTITE Retaining Compound" applied)	18 - 24

NOTE: Except for the special torques shown, all bolts and nuts are to be given a standard torque. Refer to the "STANDARD TORQUE DATA CHART" in Section 1, "GENERAL."

4. CHECKING MECHANICAL PROBLEMS

PROBABLE CAUSE	REMEDY
Track Chain Comes Off During Operation	
1. Track chain loose	Adjust track tension.
2. Front idler worn	Inspect front idler for wear. Replace if necessary.
3. Front idler misaligned	Inspect idler for excessive wear and front idler guides (if equipped) for distortion. Replace parts as necessary.
4. Rocks in track assembly	Clean out all rocks and packed dirt from the chains, sprockets and idlers.
5. Worn sprocket teeth	Interchange or replace sprockets. (Refer to "SPROCKET AND SPROCKET DRIVE" Section.)
Tractor Creeps to One Side	
1. One pivot brake drags	Refer to "STEERING SYSTEM" Section.
2. One steering clutch slips	Refer to "STEERING SYSTEM" Section.
3. One track loose	Adjust track tension.
4. Track spring weak or broken	Remove and check with the specifications in Par. 3.
Track Chain Loose	
1. Track tension incorrect	Adjust tension.
2. Sprocket worn	Interchange or replace sprocket. (Refer to "SPROCKET AND SPROCKET DRIVE" Section.)
3. Track links or bushings worn	Inspect for wear or damage. Repair or replace sections of the track chain as necessary.
Excessive or Uneven Wear of Track, Track Rollers, Track Idler, Front Idler and Sprocket	
1. Damaged sprocket	Replace the sprocket.
2. Front idler misaligned	Inspect idler for excessive wear and front idler guides (if equipped) for distortion. Replace parts as necessary.
3. Track tension incorrect	Adjust tension.
4. Track frame misaligned	Check for bent track frame, front idler guides (if equipped), rigid crossbar or guide bracket. Replace parts as necessary.
Track Idlers Do Not Turn	
1. Insufficient lubrication	Lubricate as directed in the operator's manual.
2. Dirt or mud packed tight against idler	Remove dirt or mud.
3. Internal seizure	Remove idler and inspect parts. Thoroughly clean and replace parts as necessary.

(Continued on next page)

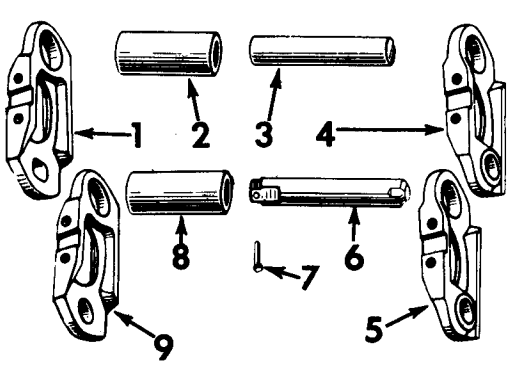
4. CHECKING MECHANICAL PROBLEMS - Continued

PROBABLE CAUSE	REMEDY
Track Rollers Do Not Turn	
1. Insufficient lubrication	Lubricate as directed in the operator's manual.
2. Bushings seized	Remove faulty roller and replace bushings.
3. Packed dirt or mud between track roller and track frame	Remove packed dirt or mud.
Front Idler Does Not Turn	
1. Insufficient lubrication	Lubricate as directed in the operator's manual.
2. Mud packed around idler	Remove mud.
Lubricant Leakage	
1. Leakage at track roller, track idler or front idler	Remove the faulty idler or roller. Inspect and replace the parts as necessary.
Tractor Loses Power	
1. Track chain too tight	Adjust track tension.

TRACK CHAINS

5. DESCRIPTION

The track chain consists of drop-forged, heat-treated steel links which are held together by bushings and pins to form a continuous chain. The bushings and pins are a press-fit in the links, with the pins pivoting inside of the bushings. The left and right track chains are interchangeable. Each track has a master bushing and pin. On earlier units with the strutless type track chain, the master pin is a loose fit in the links and can be identified by a lock wire (Illust. 1). On later units with the strut type track chain, the master pin is a press fit in the links and has both ends center drilled for identification. The strut type track chain uses bellville washers in the counterbored portion of the links to seal against the entrance of abrasives (Illust. 2). The track shoes are attached to the track links, and they are held in place with special heat-treated cap screws and nuts.



IPA-56272 A

Illust. 1
Exploded View of the Strutless Type Track Link Assembly on Interlocking Track Chain.

1. Master track link, right.
2. Track link bushing.
3. Track link pin.
4. Master track link, left.
5. Track link, left.
6. Master link pin.
7. Master link lock wire.
8. Master link bushing.
9. Track link, right.

6. MAINTENANCE

The track links have only one wearing surface which contacts the track rollers, front idler

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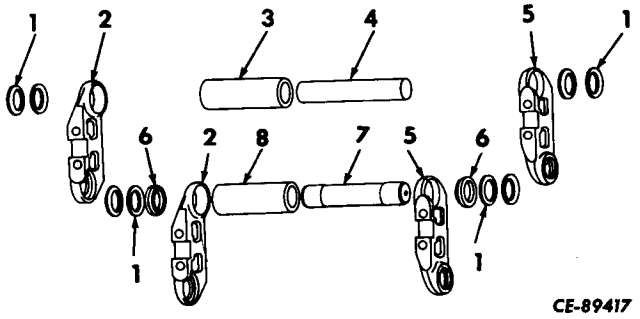
TRACK CHAINS



Illust. 2
Exploded View of the Strut Type Track Link Assembly on Interlocking Track Chain.

1. Sealing washer.
2. Track link, left.
3. Track link bushing.
4. Track link pin.
5. Track link, right.
6. Track master bushing spacer.
7. Track master pin.
8. Track master bushing.

and track idlers. However, it usually becomes necessary to replace pins and bushings before the links wear out, and it is a matter of judgement then whether the links are good enough to justify a new set of pins and bushings. Only the wear on the outside of the bushings is visible. Wear on the pins and interior of the bushings is indicated by track "stretch" (forward adjustment of the front idler). The amount of wear can be determined by measuring the pitch length of the track (distance between centers of pins) under tension and comparing it with the new and maximum allowable pitch lengths listed in Par. 3, "SPECIFICATIONS."

Sprocket wear must also be considered in conjunction with track chain wear. Wear of the sprocket teeth decreases the pitch length of the sprocket, while wear of pins and bushings increases the pitch length of the track. The results are that the pitch lengths of the sprocket and track become more and more out-of-phase, and the bushings ride higher on the sprocket teeth. The combined wear of the sprocket and track should never be allowed to reach this point as spinning of the sprocket may result and cause serious breakage. Whenever new or rebuilt track chains are installed, the sprockets should also be replaced or interchanged to present the better side of the teeth to the bushings.

Never remove one link to bring a "stretched" track to within the range of proper track adjustment. A track that is worn badly enough to take up the length of one link, will be so far out of pitch that the increased wear on the sprocket will far more than offset the saving obtained by the removal of one link in the track chain. (Refer to "Rotating the Track Pins and Bushings" in Par. 8, "TRACK CHAIN REPAIR.")

Checking Track Tension

Place a wooden block, approximately one foot in height, under the foremost track shoe lug. Drive the tractor forward until the track chain is tight along the ground and around the sprocket. Apply and lock the brake; stop the engine. Push the top of the track down between the front idler and the first track idler to accumulate all the chain slack at this point. Place a straightedge on the track so the ends rest over the front idler and track idler. With a ruler, measure the clearance between the bottom of the straightedge and the top of the shoe grouser at the midway point between the idlers. If this distance is more than 1-1/2 inches or less than one inch, adjust the track tension.

Adjusting Track Tension

◆ CAUTION: THE PRESSURE IN THE SYSTEM IS HELD BY THE BALL CHECK ASSEMBLY AND THE VENT SCREW OR COMBINATION SAFETY RELIEF AND VENT VALVE (ILLUST. 39 AND 40). A LOOSE OR IMPROPER THREAD FIT OF THESE PARTS CAN ALLOW THEM TO BE EJECTED UNDER THE PRESSURE OF THE LUBRICANT; CAUSING POSSIBLE INJURY. WHEN INCREASING TRACK TENSION BE SURE THESE PARTS ARE PROPERLY TORQUED. WHEN RELIEVING TRACK TENSION, NEVER LOOSEN THESE PARTS MORE THAN THE PRESCRIBED AMOUNT AND ALWAYS STAND TO THE SIDE.

NOTE: Before relieving track chain tension, always wipe clean the exposed area of the adjusting rod. This will prevent premature failure of the piston scraper.

Track chains are adjusted by hydraulic pressure. Lubricant is introduced into the cylinder (3, Illust. 39) (cylinder is integral with fork (11, Illust. 40) on fork type adjusters) by the use of a lubrication fitting (Illust. 3). This lubricant, acting upon the piston within the cylinder, forces the cylinder or fork and the front idler forward for track adjustment.

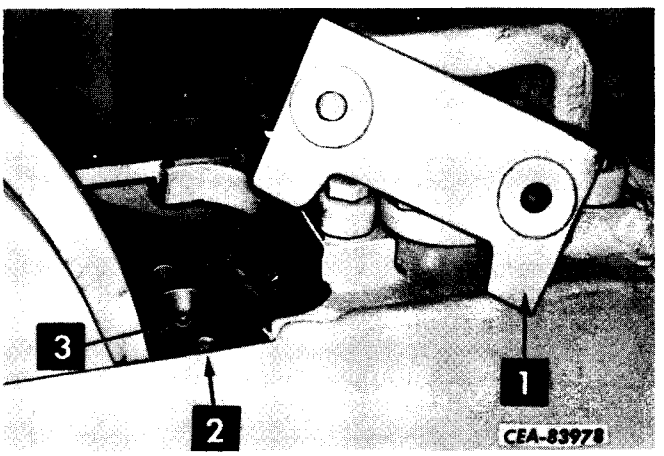
If adjustment becomes necessary, proceed as follows (Illust. 3):

1. Remove the front idler scraper (1) (if equipped). On 250 loader machines with removable cover type track frames, remove the

(Continued on next page)

6. MAINTENANCE - Continued

Adjusting Track Tension - Continued



Illust. 3
Track Adjusting Points (Earlier Fork Type Adjuster Shown).

1. Front idler scraper. 2. Vent screw. 3. Lubrication fitting.

access hole cover (3, Illust. 80) from the track frame front cover.

◆ CAUTION: BEFORE ADDING LUBRICANT FOR TRACK ADJUSTMENT, BE SURE THE BALL CHECK AND THE COMBINATION SAFETY RELIEF AND VENT VALVE (IF EQUIPPED) ARE TORQUED TO 45-55 FT. -LBS. IF EQUIPPED WITH A VENT SCREW IT MUST BE TORQUED FROM 10-15 FT. -LBS.

2. To increase track chain tension, connect a lubricator nozzle to the lubrication fitting (3).

3. Determine the amount of adjustment necessary and add lubricant to obtain the proper track chain tension. It is advisable to move the tractor forward and backward slightly to be sure the correct tension has been obtained.

4. To reduce the track chain tension, loosen the vent screw (17, Illust. 39) (4, Illust. 40) or combination valve (14, Illust. 39) or (15, Illust. 40) one-half to one full turn to allow the pressurized lubricant to escape through the relief passage. If lubricant does not appear, loosen the ball check (12, Illust. 39) or (3, Illust. 40) one-half to one full turn to allow the pressurized lubricant to escape from a second relief passage. To reach the vent screw or relief valve on the TD-20 SERIES B with removable cover type track frames, it will first be necessary to remove the cover secured to the top of the cross plate (19, Illust. 39).

5. When the proper tension has been obtained secure the vent screw using 10-15 ft. -lbs. torque and the ball check and combination valve using 45-55 ft. -lbs. torque.

◆ CAUTION: USE EXTREME CARE WHEN RELIEVING PRESSURE WITH THE FOLLOWING EMERGENCY METHOD. IF LOOSENED EXCESSIVELY, THE BALL CHECK, VENT SCREW OR COMBINATION VALVE CAN BE EJECTED BY THE CYLINDER PRESSURE. NEVER LOOSEN THE BALL CHECK, VENT SCREW OR COMBINATION VALVE MORE THAN A TOTAL OF 2-1/2 TURNS. ON UNITS WITH FORK TYPE ADJUSTER, NEVER LOOSEN THE VENT SCREW (4, ILLUST. 40) MORE THAN ONE TURN.

6. Should the relief passages become blocked, unscrew the ball check (3, Illust. 40), (12, Illust. 39) or the vent screw (17, Illust. 39) or the combination safety relief and vent valve (14, Illust. 39) or (15, Illust. 40) an additional 1-1/2 to two turns (total 2-1/2 turns). This will allow a greater amount of pressurized lubricant to free the passage. Tighten the ball check (45-55 ft. -lbs.), vent screw (10-15 ft. -lbs.) or combination valve (45-55 ft. -lbs.) after the proper tension is obtained.

7. Install the scraper (1) (if equipped). Install the access hole cover (3, Illust. 80) on the track frame front cover (if equipped). After a new track has been thoroughly broken in, it is advisable to check the tension and adjust it if necessary.

8. On the TD-20 SERIES B with removable cover type track frames, secure the cover to the top of the cross plate (19, Illust. 39).

Track Shoe Cap Screws

On a new track chain, the track shoe bolts must be tightened each day of operation until it becomes evident that the shoes have become permanently set. Torque 5/8 inch bolts from 220-250 ft. -lbs. and torque 3/4 inch bolts from 400-450 ft. -lbs. Strike the heads of the bolts several heavy blows with a hammer when retightening them. These bolts are heat-treated and will withstand strain.

NOTE: Do not use common cap screws in the track shoes.

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TRACK CHAINS

7. REMOVAL

1. STRUTLESS TYPE TRACK CHAIN: Drive the tractor forward on level ground until the master link pin (identified by a lock wire) is in front of the front idler. Block the track chain at the shoe just off the ground.

STRUT TYPE TRACK CHAIN: Drive the tractor forward until the track link master pin (pin end center drilled for identification) is at the top of the chain between the front idler and the forward track idler.

2. Loosen the track tension. (Refer to "Adjusting Track Tension" in Par. 6, "MAINTENANCE.")

3. STRUTLESS TYPE TRACK CHAIN: Remove the lock wire from the master link pin and, using a heavy punch bar and sledge, drive out the master link pin.

STRUT TYPE TRACK CHAIN: Press out the track link master pin using the removing and installing tool (Illust. 12). The several sets of this tool that are available and the necessary adapters are listed in service bulletin V-68-3. Remove the tool from the track. The front portion of the track chain should fall free off the front idler.

4. Drive the tractor backward until it is at the end of the track. Place a plank flush against the rear of the track when the track is flat on the ground (Illust. 4). The plank should be approximately the same thickness as the track, and long enough so that the entire tractor can rest on the plank. Now back the tractor off the track and onto the plank. If a new track is to be installed, remove the old chain as previously described. Place the new chain on the ground ahead of the tractor with the open link end flush against the front of the old chain.

8. TRACK CHAIN REPAIR

To repair or replace worn track pins, bushings or links, a hydraulic track press will be necessary. The procedure and operation instructions for each track press will vary, so specific disassembly instructions will be found with the manufacturer's operational instructions. For further information regarding the hydraulic track press, refer to the "Service Tool Manual," ISS-1002.

Interlocking Type Chain

1. To replace a damaged section of track, remove the track shoes and cut out the damaged section with a cutting torch. Remove the end links as described in Step 2. Rebuild the section onto the track by pressing on individual links, link pins and bushings with a hydraulic track press. On the strut type track chain, a section of track can be rebuilt using the master pin removing and installing tool with necessary adapters listed in service bulletin V-68-3.

NOTE: STRUTLESS TYPE TRACK CHAIN: When assembling the track chain, maintain a .000 to .010 inch clearance between the track links and a 5.988 to 6.000 inch dimension between the outer faces of the bushing links (Illust. 7).

NOTE: STRUT TYPE TRACK CHAIN: When assembling the track chain be sure the bushing protrusion at the bushing links and the distance between the outer faces of the bushing links are within the tolerances shown in Illust. 6.

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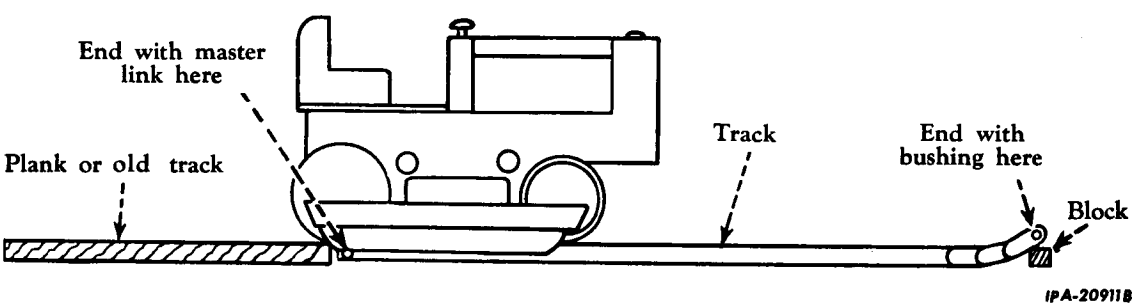

Illust. 4
Removing the Track Chain.

8. TRACK CHAIN REPAIR - Continued

Interlocking Type Chain - Continued

2. To replace an individual link that is damaged, remove the track from the tractor. After the track is free and extended flat, remove three or four of the track shoes adjacent to the damaged part.

Cut the pins and bushings of the damaged link with a torch. The cuts should be made as close to the inside faces of the inner links as possible (Illust. 5) to provide sufficient clearance between the links for removal of the remaining pin and bushing sections.

NOTE: Be careful not to damage the inner faces of the links when cutting the bushings and pins.

The pieces of the pins and bushings remaining in the links must now be securely welded together at the cuts (Illust. 5). It is important that the welds be strong enough to carry the bushing out with the pin. Press each of the pin and bushing assemblies (welded) out of the links. On the strut type track chain, remove the sealing washers from the link counterbores. An aligning pin can be made from a track pin which has been ground down to a slightly smaller diameter than the regular pin. It is used to align the two ends of the track links prior to inserting the new pin. On units with the strut type track chain, the flattened forcing pin (Illust. 11) can be used as the aligning pin.

Remove the replace the damaged link or links. Assemble the two loose, right and left, track links using a master bushing (Illust. 6 or 7). Assemble a master bushing also into the links attached to the track (Illust. 6 or 7). Place master bushing spacers into the counterbore of the links (Illust. 7). On the strut type track chain, place the sealing washers and spacers into the link counterbores (Illust. 6). The

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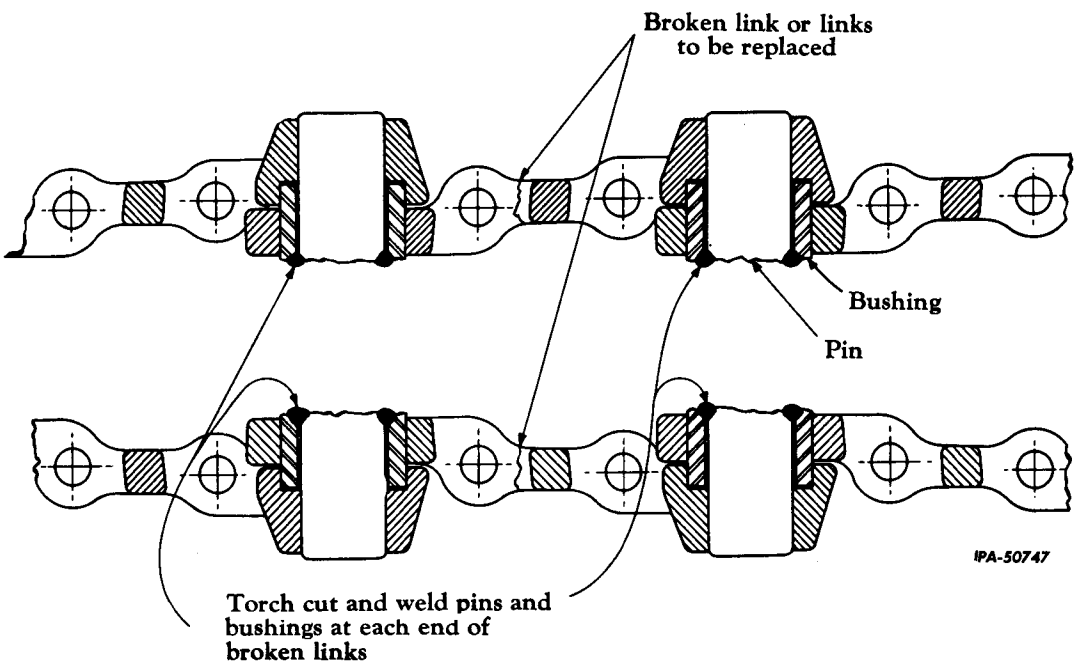
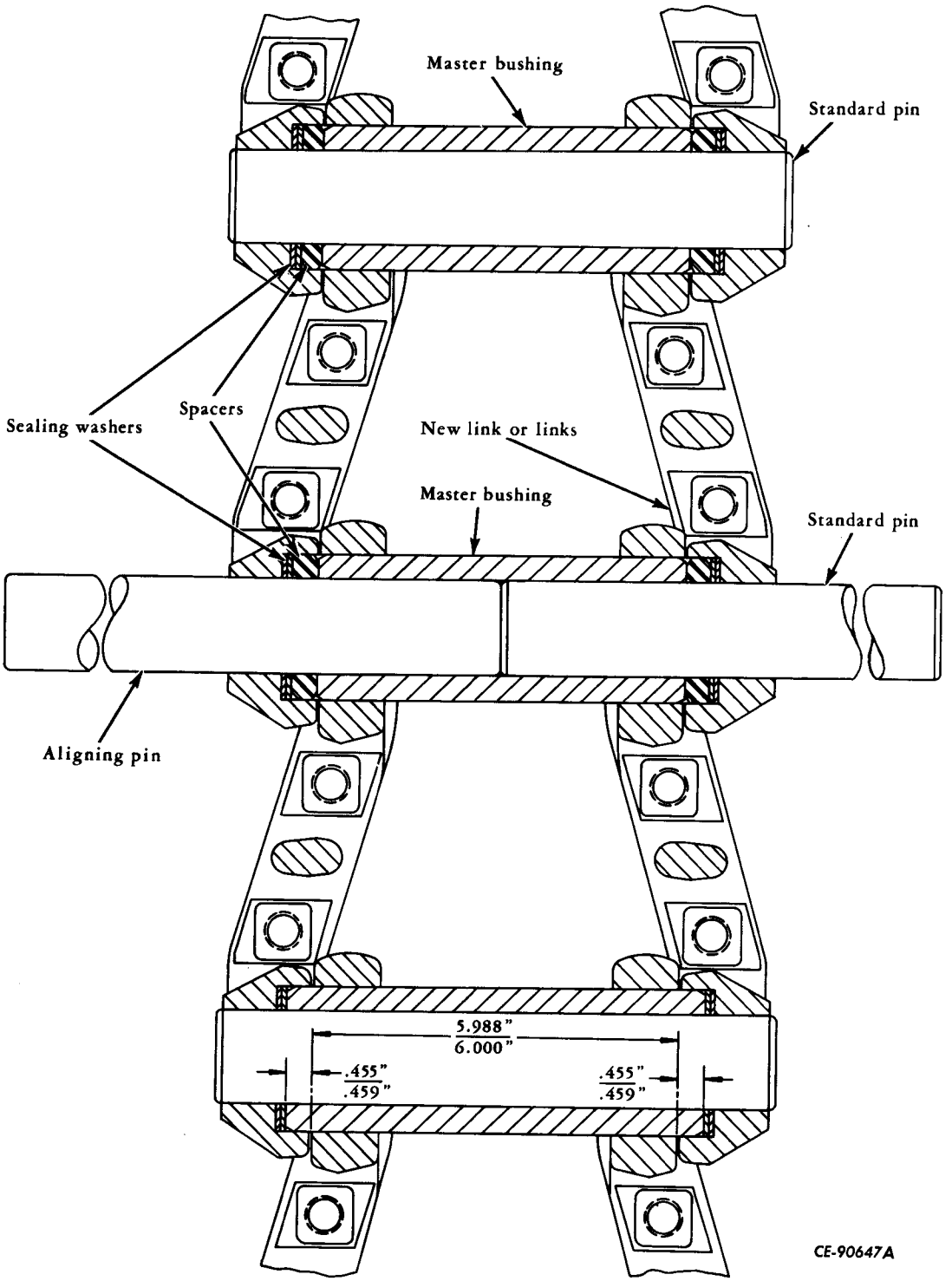


Illust. 5
Removal of Damaged Links.

TRACK CHAINS



Illust. 6
Assembly of New Links (Strut Type Track Chain).

8. TRACK CHAIN REPAIR - Continued

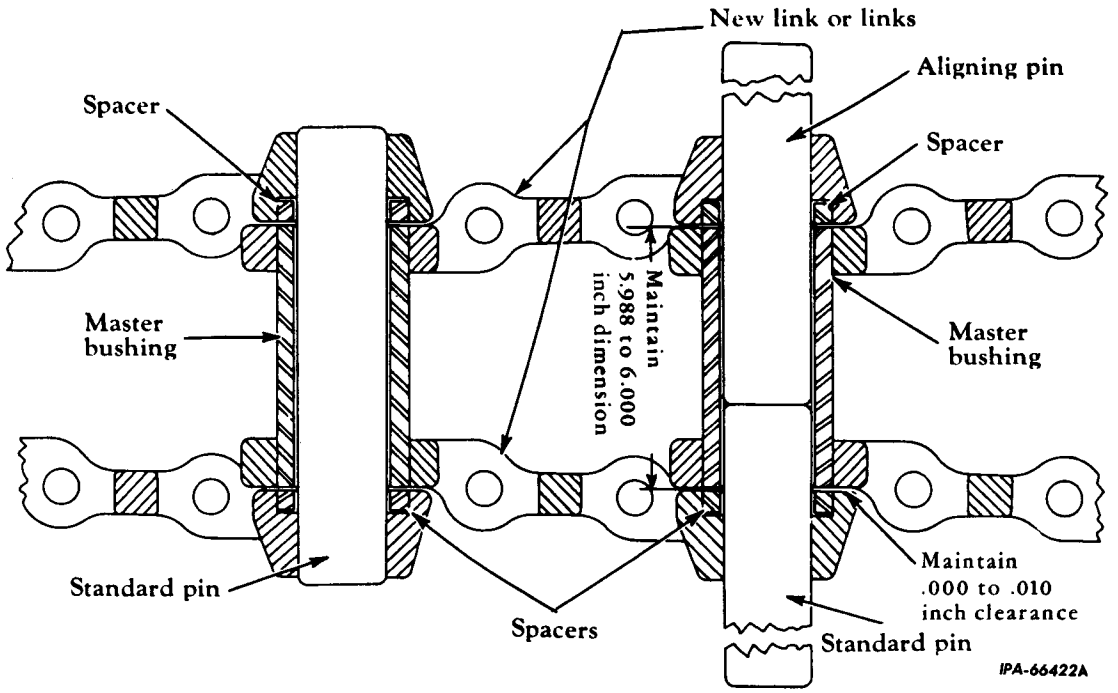
Interlocking Type Chain - Continued

sealing washers must be installed as described in Par. 9, "INSTALLATION." Place the bushing and links assembly onto the track and insert the aligning pin to hold the track link alignment while the new pin is pressed in position (Illust. 6 or 7). Use the aligning pin again when joining the two sections of track.

Rotating the Track Pins and Bushings

As internal and external wear on track pins and bushings develop, the tracks actually get longer and the separations between the parting edges of the links become greater. This gradual wear, in time, produces excessive "stretch" in the track assembly and requires that the idler be adjusted forward to maintain the proper track tension. Improperly adjusted tracks, either too tight or too loose, affect the rates of wear on all track parts such as pins, bushings, links, etc.

Since wear occurs on one side of the link pins and bushing (Illust. 5), the track pins and bushings can be reversed to obtain additional service from the track. To do this, press out all the track pins and bushings. Rebuild the track chain, pressing the pins and bushings in so that they are turned 180 degrees (1/2 turn). Follow instructions furnished with the track pin press or the master pin removing and installing tool. On the strut type track chain, be sure the sealing washers are installed as described in Par. 9, "INSTALLATION." By doing this, the unworn surface of each pin is operating against the unworn surface in its bushing and the unworn outside surface of the bushing which



Illust. 7
Assembly of New Links (Strutless Type Track Chain).

contacts the sprocket. Install the track shoe bolts and nuts, tightening them to the torque specified in Par. 3, "SPECIFICATIONS."

Reconditioning Track Shoe Grousers by Manual Arc Welding

When the wear of the track shoe grousers reaches a point called the "Permissible Wear Limit," it should then be decided whether a set of new shoes is to be installed, or whether the old ones are in good enough condition to be rebuilt be welding a mill-rolled, specially shaped grouser bar to the worn grousers.

9. INSTALLATION

NOTE: STRUT TYPE TRACK CHAIN: Two holding tools as shown in Illust. 9 must be fabricated to facilitate track chain installation.

1. Place the track to be installed on the tractor in position against the plank or old track. The end with the bushing should be in the same position as that shown in Illust. 4.

NOTE: If the track is installed reversed from the position shown in Illust. 4 severe wear on the sprocket teeth and track link bushings will result.

2. Drive the tractor forward on the track until the sprocket is slightly ahead of the rear end of the track.

3. Place a crowbar through the master bushing hole. Pull the track up around the sprocket and forward over the track idlers and front idler as the tractor is driven forward.

4. STRUTLESS TYPE TRACK CHAIN: Position a block (8 to 10 inches high) under the cleat of the shoe on the last link of the track. This will hold the track against the front idler.

STRUT TYPE TRACK CHAIN: Place a block (8 to 10 inches high) under the first shoe, drive forward until the track links to be joined are

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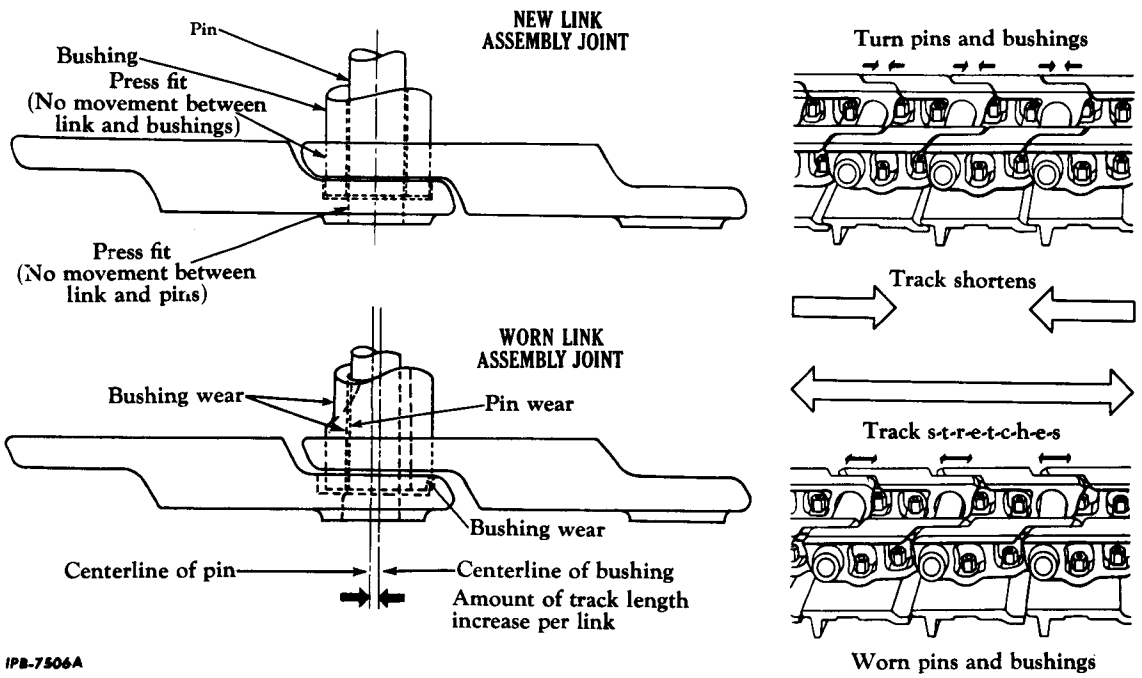
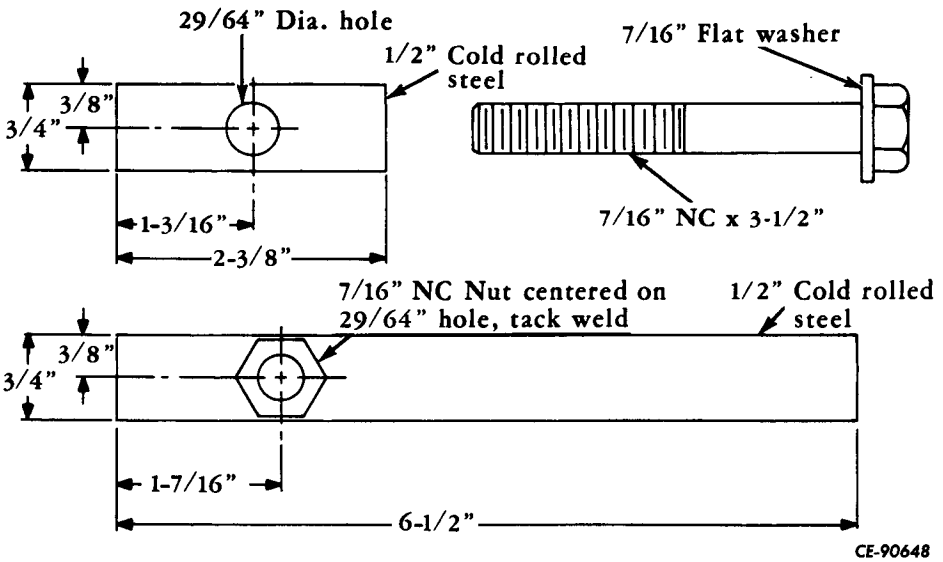


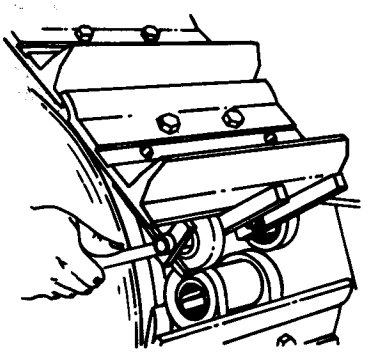
Illust. 8
Showing Effects of Track Pin and Bushing Wear.

TRACK CHAINS

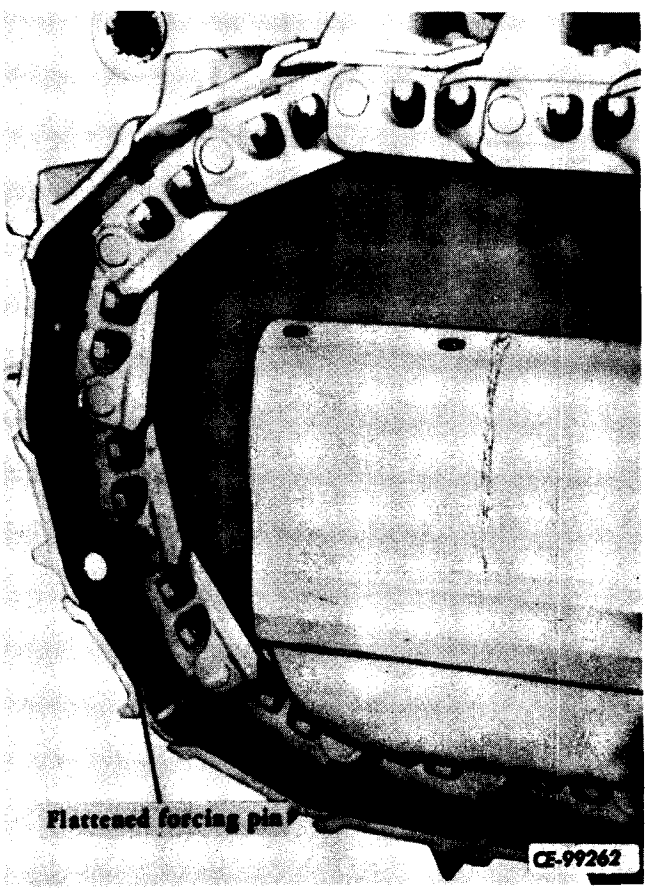
9. INSTALLATION - Continued



Illust. 9
Holding Tool Dimensions.



Illust. 10
Compressing the Sealing Washers with the Holding Tool.



Illust. 11
Flattened Forcing Pin Installed.

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TRACK CHAINS

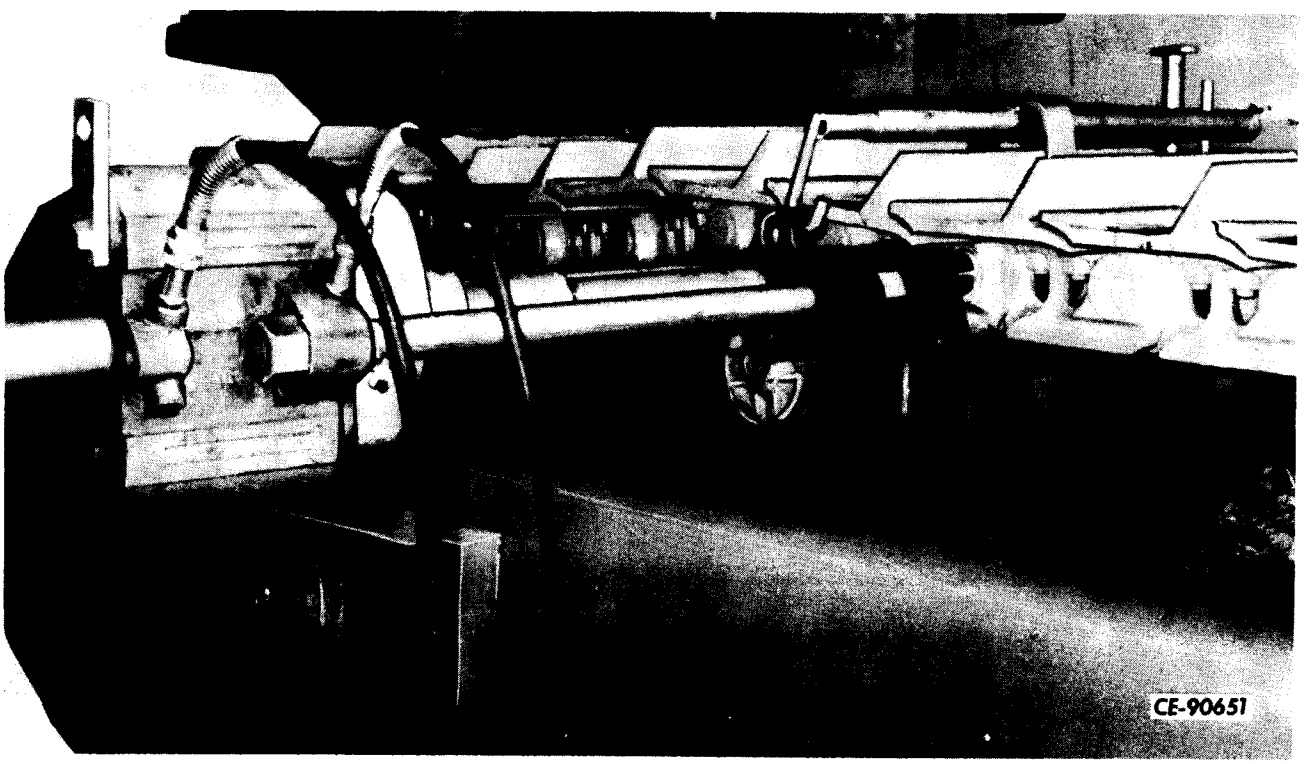
approximately one inch apart and install the two sealing washers and the bushing spacer in the counterbore of each link. The sealing washers must be installed with the concave side (hollow side) facing away from one another so their inside diameters are touching. Then insert the spacer with the beveled edge facing out and secure in place with the holding tool (Illust. 9). To properly compress the sealing washers, tighten the bolt on each holding tool until the spacer is flush with the face of the link (Illust. 10).

Move the tractor forward until the bushing spacers are held in place by the edges of the connecting link. Then remove the holding tools, align the link holes and install the flattened forcing pin provided with the removing and installing tool (Illust. 11).

5. STRUTLESS TYPE TRACK CHAIN: Start the engine. Apply just enough power in the forward speed to take the slack out of the bottom part of the track. Coat the master link pin and the holes in both links with "NEVER-SEEZ." Install the master pin into place, and secure it with a lock wire.

STRUT TYPE TRACK CHAIN: Start the engine and slowly move the tractor backward until the flattened forcing pin is between the forward track idler and front idler. Mount the removing and installing tool to the track and install the master pin following the instructions furnished with the tool (Illust. 12).

6. Adjust track tension (refer to "Adjusting Track Tension" in Par. 6, "MAINTENANCE").



Illust. 12
Installing and Removing Tool in Position.

FRONT IDLERS

10. DESCRIPTION

The front idlers provide a freely rotating, guiding support for the track chains and protect the track mechanism from damage. The front idlers absorb shocks with their slide mountings and connection to the track springs.

Cartridge Type Seal
(Illust. 13 and 19)

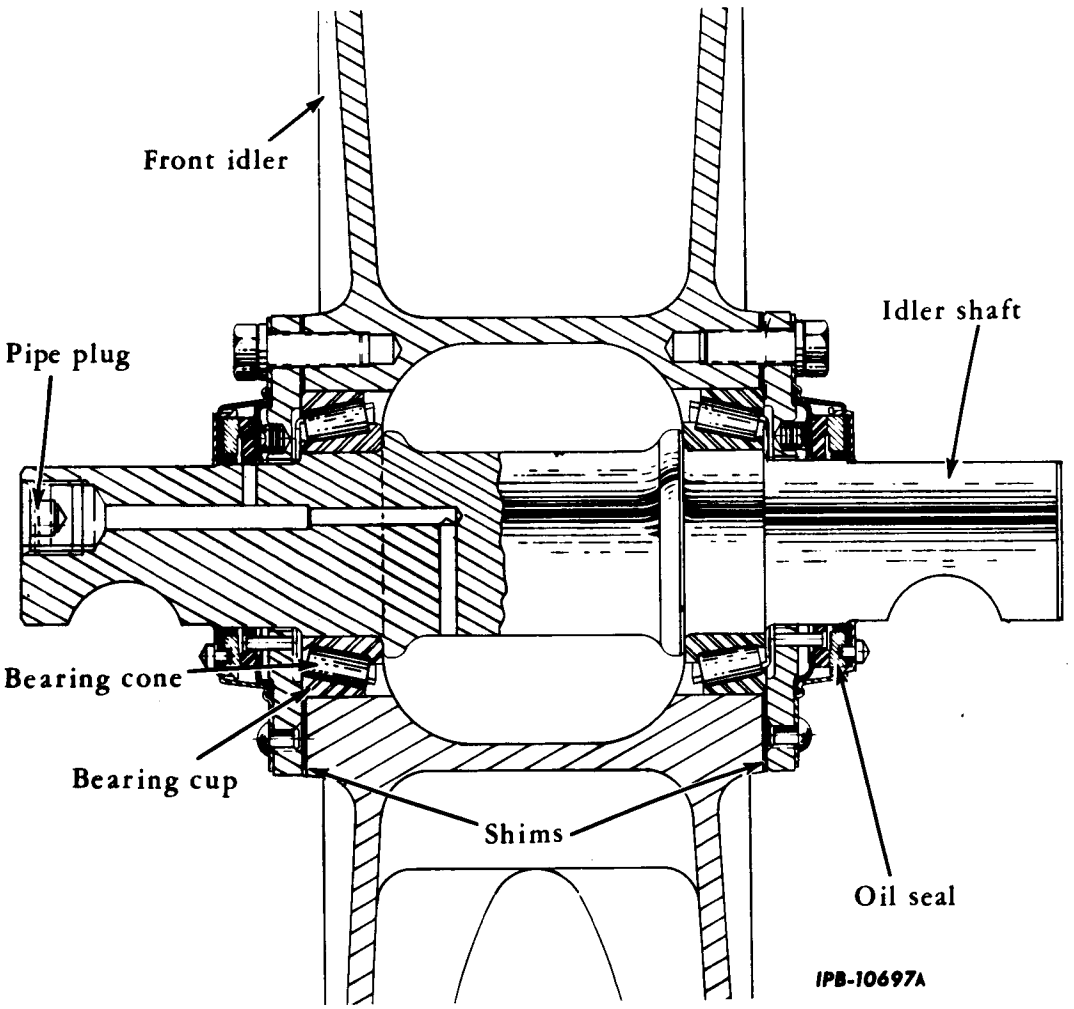
The front idlers are equipped with tapered roller bearings which rotate on a heat-treated steel shaft. The idlers are sealed by spring-loaded, rotary type oil seals which ride against the machined surfaces of the front idler guides.

The front idler is held by two front idler guides which are slide mounted on two guide rods. The rods are supported in two steel blocks welded to the track frame. The two front idler guides are bolted to the front idler cross plate, which is either welded or bolted to the hydraulic track adjusting cylinder. The adjusting rod within the adjusting cylinder is supported at the rear by the track spring front seat.

Metal Face Type Seal
(Illust. 14 and 40)

The front idlers are equipped with tapered roller bearings which rotate on a heat-treated steel shaft and are sealed with metal face type oil seals.

The front idler is supported by the front idler fork which is slide mounted on replaceable wear bars welded on the track frame channels. The adjusting cylinder (integral part of idler fork) supports the front of the adjusting rod. The rear of the adjusting rod is supported in the track spring front seat.



Illust. 13
Cut-away View of Front Idler Assembly with Cartridge Type Oil Seals.

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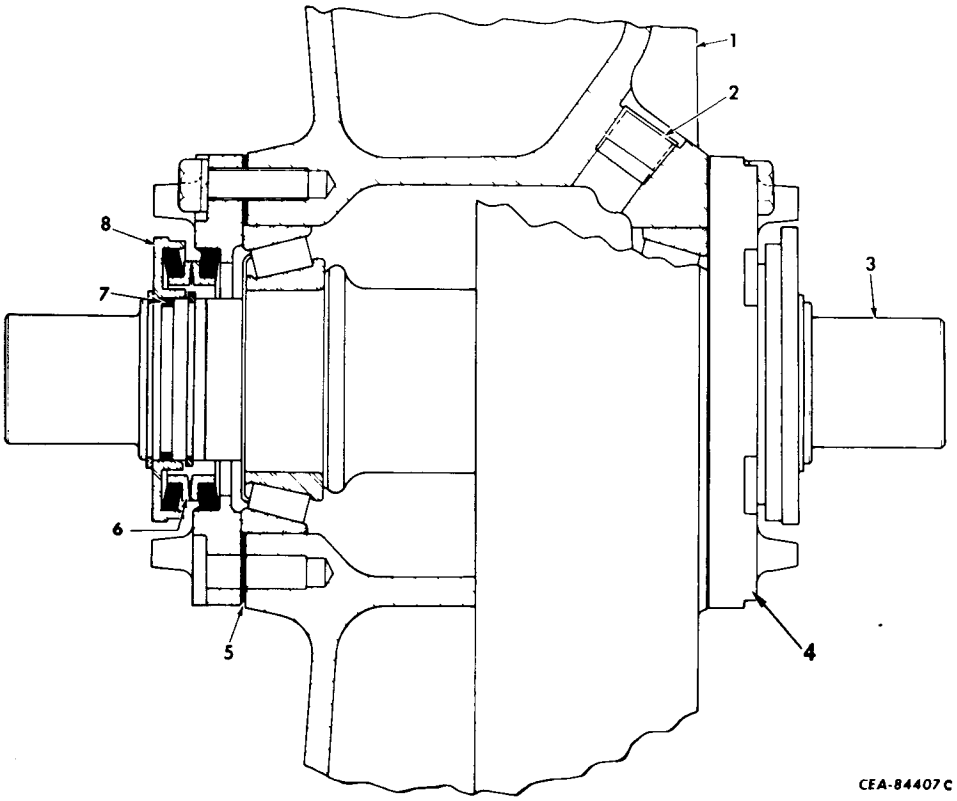
FRONT IDLERS



Illust. 14
Cut-away View of Front Idler Assembly with Metal Face Type Seals.

1. Idler body.
2. Lubrication plug.
3. Idler shaft.
4. Bearing retainer.
5. Shims.
6. Oil seal.
7. "O" ring.
8. Seal retainer.

11. REMOVAL

Cartridge Type Seal
(Ref. Nos. Refer to Illust. 19)

1. Remove the track chain (refer to Par. 7, "REMOVAL"). It is only necessary to lift the track chain free of the front idler.

2. LOADERS ONLY: Remove the track frame front cover (2, Illust. 80).

3. Place a wood block under the front idler to support its weight while driving out the guide rods (14). Remove the cap screws securing the guide rods in the rod blocks welded to the front of the track frame (Illust. 15). Remove the cap screws in the front end of the guide rods. Pull the two guide rods out the front of the blocks with a slide hammer or in a manner similar to that shown in Illust. 15.

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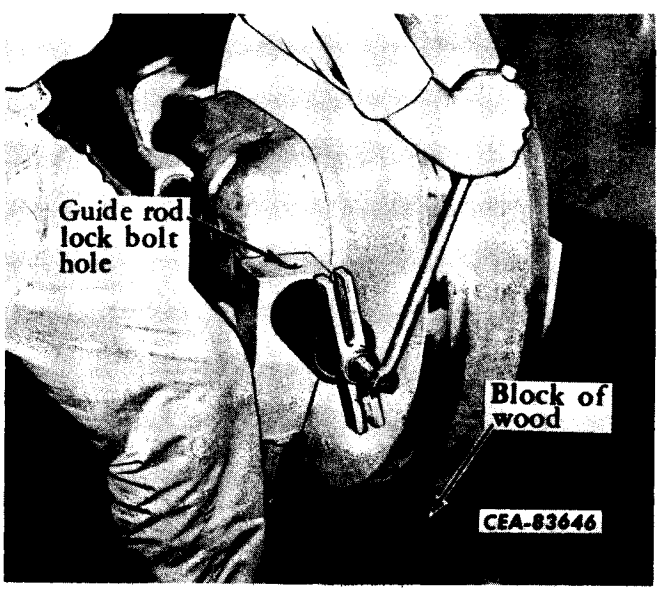


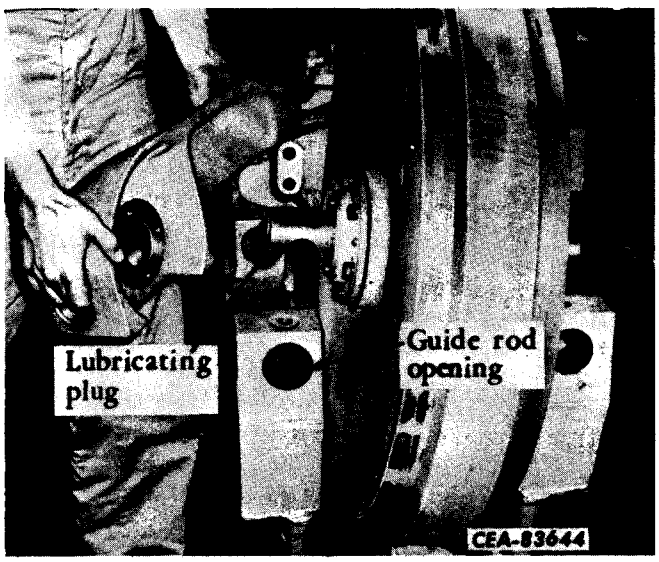
Illust. 15
Removing the Front Idler Guide Rod.

FRONT IDLERS

11. REMOVAL - Continued

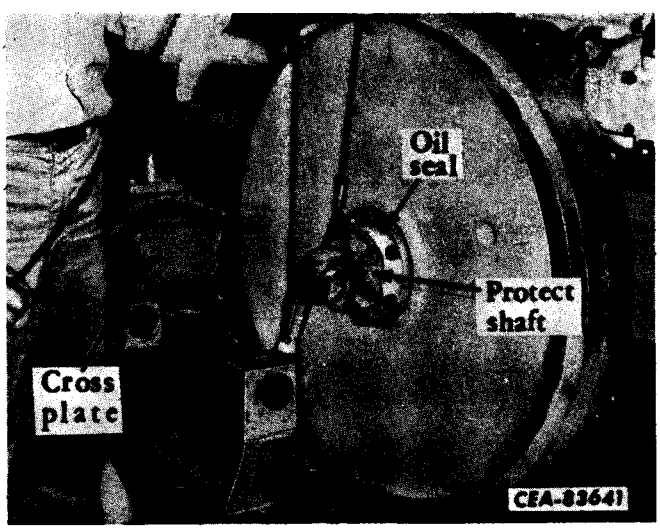
Cartridge Type Seal - Continued
(Ref. Nos. Refer to Illust. 19)

4. Pry the front idler forward until the cap screws securing the idler guides (1 and 13) to the cross plate (Illust. 17) are accessible. Remove the four cap screws securing the cross plate to the idler guides (1 and 13). Remove the idler guides from each end of the front idler shaft (Illust. 16).



Illust. 16
Removing the Front Idler Guide.

5. Protect the idler shaft while lifting the idler (Illust. 17).



Illust. 17
Removing the Front Idler.

Metal Face Type Seal

1. Remove the track chain (refer to Par. 7, "REMOVAL"). It is only necessary to lift the track chain free of the front idler.

2. Remove the front idler stop (16, Illust. 73) or (17, Illust. 81) from each channel of the track frame.

3. Pry the front idler and fork assembly forward until it is positioned at the front of the track frame as shown in Illust. 18. The idler and fork assembly can be removed by attaching a lifting device as shown in Illust. 33. To remove the idler without the fork, attach a hoist to the idler body and remove the cap screws securing the caps to the idler fork (Illust. 18).

Illust. 18
Front Idler and Fork Positioned for Removal.

12. DISASSEMBLY

Cartridge Type Seal
(Ref. Nos. Refer to Illust. 19)

1. Remove the cap screws and lock washers which secure the oil seals (3) to each side of the front idler (Illust. 17). Remove the oil seals from their positions on the idler shaft.

2. Remove the shims (4, 5, 6 and 7) from each end of the shaft (12). Keep shims separated and attach to the oil seals to facilitate reassembly.

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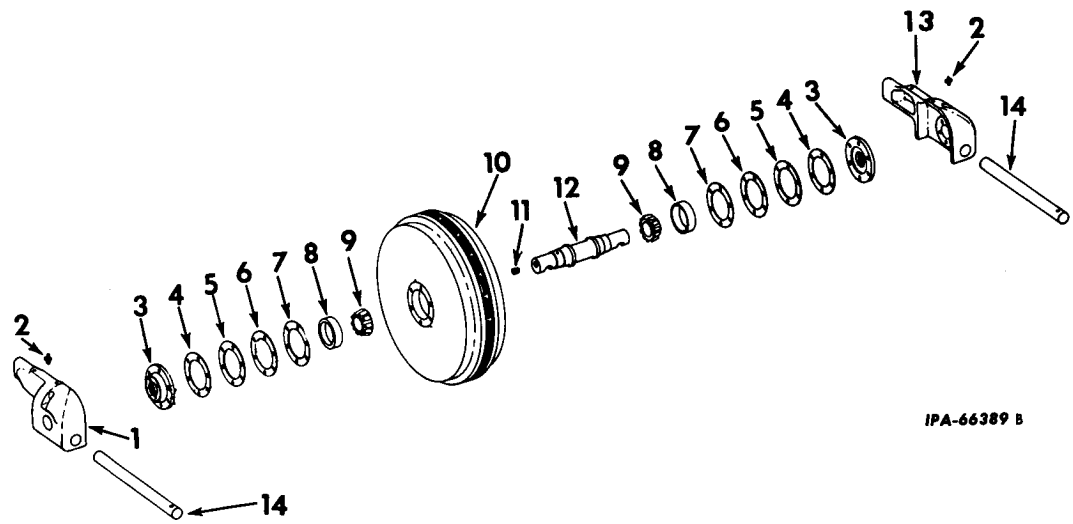
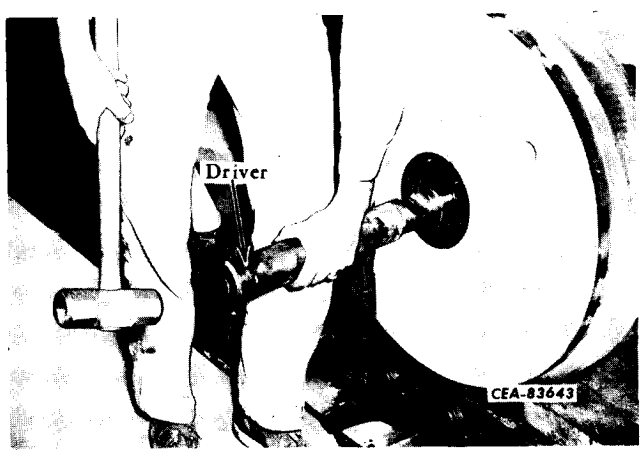
FRONT IDLERS



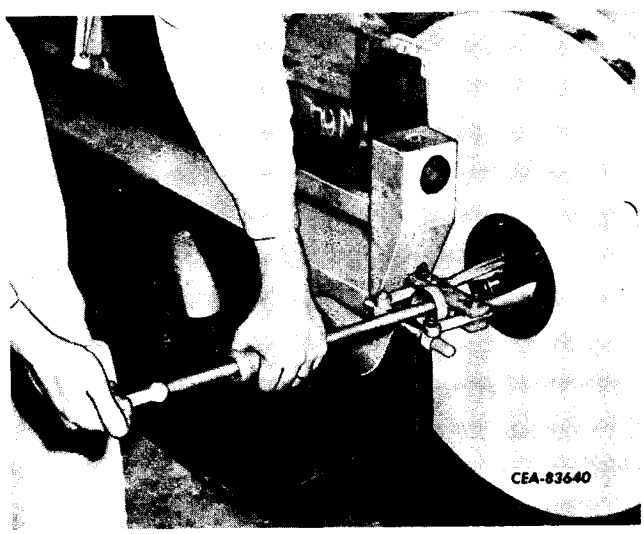
Illust. 19
Exploded View of Front Idler with Cartridge Type Seals.

1. Idler guide, RH.
2. Lubrication fitting.
3. Oil seal.
4. Shim.
5. Shim.
6. Shim.
7. Shim.
8. Bearing cup.
9. Bearing cone.
10. Front idler.
11. Lubrication plug.
12. Shaft.
13. Idler guide, LH.
14. Guide rod.

3. Tap the shaft out of the idler body (Illust. 20). The bearing cones (9) and one bearing cup (8) will come out with the shaft. The other bearing cup (8) will remain in the front idler, and it can be removed using a bearing cup puller and slide hammer (Illust. 21).



Illust. 20
Removing the Front Idler Shaft.



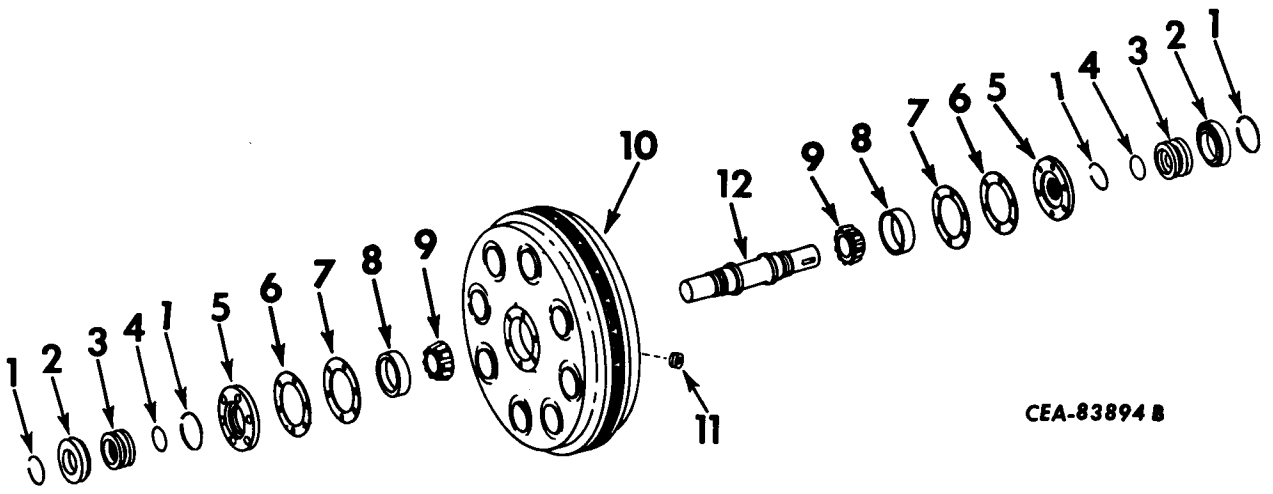
Illust. 21
Removing the Front Idler Bearing Cup.

4. To replace the bearing cones, support the front idler shaft in an arbor press under the bearing cone and press the shaft from the cone (9).

(Continued on next page)

FRONT IDLERS

12. DISASSEMBLY - Continued



Illust. 22
Exploded View of Front Idler with Metal Face Type Seals.

1. Snap ring.
2. Seal retainer.
3. Oil seal.
4. "O" ring.
5. Bearing retainer.
6. Retainer shim.
7. Retainer shim.
8. Bearing cup.
9. Bearing cone.
10. Idler body.
11. Lubrication plug.
12. Idler shaft.

Metal Face Type Seal
(Ref. Nos. Refer to Illust. 22)

1. Remove the snap ring (1) from the idler shaft. Remove the seal retainer (2) with the stator of the oil seal (3). Remove the other snap ring (1) from the shaft (if equipped). Remove the seal stator from the retainer and discard the rubber ring.

2. Remove the cap screws and washers securing the bearing retainer (5) to the idler body and remove the retainer with the rotor of the oil seal (3). Remove the shims (6 and 7). Remove the seal rotor from the retainer and discard the rubber ring.

3. Remove the "O" ring (4) from the idler shaft.

4. Disassemble the opposite side of the idler in the same manner.

NOTE: Keep original mated metal rings as a set. Do not mix a metal ring from the oil seal in one side of the idler with a metal ring from the oil seal on the opposite side of the idler.

5. Support the idler body in a press and press the shaft (12) out. Both bearing cones (9) and one bearing cup (8) will come out with the shaft. The bearing cup remaining in the idler body can be removed, if necessary, with a bearing cup puller and slide hammer (Illust. 21). To replace the bearing cones (9), support the idler shaft in a press under the bearing cone and press the shaft from the cone.

13. INSPECTION AND REPAIR

1. Wash all parts thoroughly in a dry-cleaning solvent and dry with compressed air. Clean and flush out the hub of the front idler.

2. Inspect the bearings for cracks, scores and wear. Replace if necessary. Soak them in oil and wrap them until ready for assembly.

3. Inspect the front idler and idler shaft for excessive wear or scoring. (Refer to Par. 3, "SPECIFICATIONS.") Inspect the idler and shaft for cracks or other damage and replace if necessary.

Cartridge Type Seal

4. Inspect the front idler guide rods to be sure they are not bent or excessively worn. (Refer

FRONT IDLERS

to Par. 3, "SPECIFICATIONS.") Straighten or replace as necessary.

5. Inspect the front idler guides (1 and 13, Illust. 19) for distortion, cracks, excessive wear of the guide rod bores and excessive scoring of the sealing surfaces. (Refer to Par. 3, "SPECIFICATIONS.") Replace the guides if any of these conditions are found.

6. Inspect the oil seals for excessive wear, broken or weak springs. Inspect the seal diaphragm for damage. Replace the seal if necessary.

Metal Face Type Seal

7. Inspect the front idler fork for proper alignment. Inspect the idler fork guide bars (16 and 17, Illust. 40) for distortion or broken welds. Also at this time check the wear bar (31, Illust. 73) or (19, Illust. 81) in each lower channel of the track frame for distortion and broken weld. If replacement of either the fork guide bars or the track frame wear bars is necessary, these parts are available with installing instructions in a field service package (refer to the parts catalog for the proper part number).

8. Whenever the idler is disassembled, it is suggested that the seal rubber rings be replaced. A package is available for rebuilding the seal. This package contains two rubber rings, two plastic unitization bands and two wipers. The unitization bands are used to hold the metal rings together for assembly into the idler. This band will automatically disintegrate after several hours of operation. Whether or not new rubber rings are installed, the oil seal must be installed in the idler as an assembly. A package containing unitization bands and instructions for this purpose is available. Rebuild oil seals as described in the following instructions.

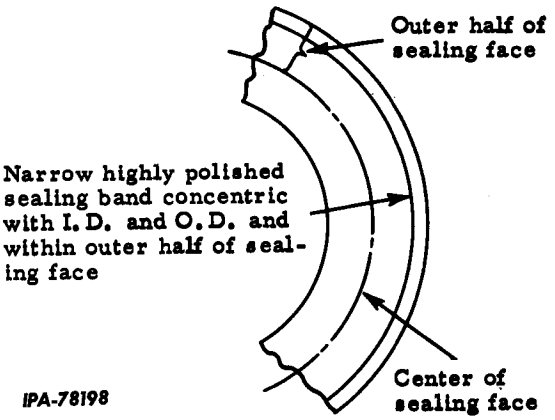
Oil Seal rebuild instructions (metal face type)

9. Before rebuilding the seal, inspect the metal rings as follows:

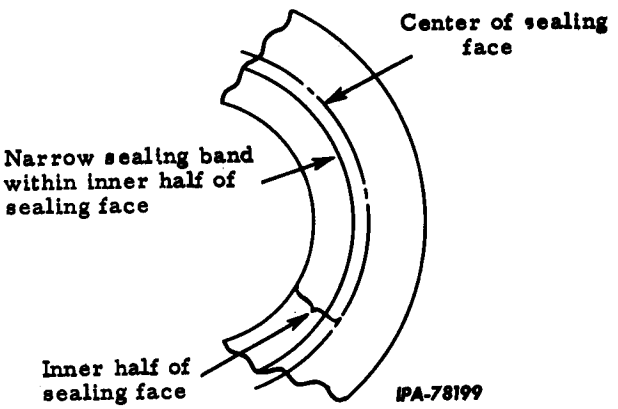
(a) The narrow, highly polished sealing band must be within the outer half of the sealing face (Illust. 23 and 24).

(b) The narrow band must be uniform and concentric with the ID and OD (Illust. 23 and 25).

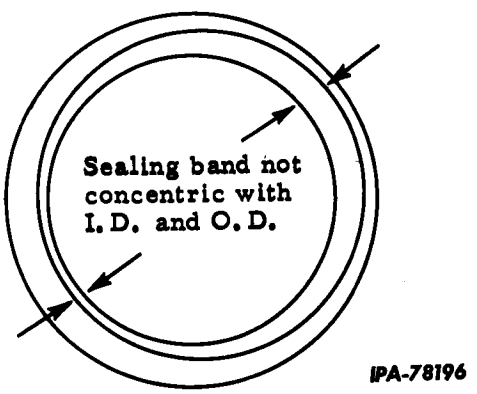
NOTE: If the metal rings do not conform to these specifications, DO NOT rebuild the seal; use a completely new seal assembly.



Illust. 23
Metal Ring Acceptable for Rebuild.



Illust. 24
Metal Ring Not Acceptable for Rebuild.



Illust. 25
Metal Ring Not Acceptable for Rebuild.

10. Clean metal rings as follows:

(a) Remove any corrosion or hardened material that may exist on surfaces (A, Illust. 26). Use a scraper and/or any

(Continued on next page)

13. INSPECTION AND REPAIR - Continued

Oil Seal rebuild instructions (metal face type) - Continued

stiff bristled fiber brush to remove this material from the entire surface.

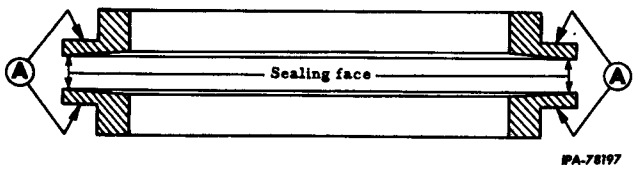
(b) Wash the metal rings with a non-flamable solvent to remove all oil and wipe dry. Use the wiper furnished in the seal package to remove all traces of oil or grease from all surfaces.

11. Apply a thin film of clean grade-30 oil on the sealing face of only one of the metal rings (Illust. 26). DO NOT ALLOW THE OIL TO WET OTHER SURFACES.

12. Slide the sealing surfaces of the two metal rings together.

13. Place one of the plastic unitization bands (the second band furnished is a spare) in a container of clean water, and allow it to soak for several minutes until soft and pliable.

14. Hold the metal rings (face to face) in one hand (Illust. 27) and stretch the softened plastic unitization band around the OD of the sealing rings. The plastic band can be stretched slightly, and a nail or small stick can be used to facilitate assembly. Keep the plastic band centered equally on both rings. After the band is completely installed, immediately check again to be sure it is centered. Minor repositioning can be done while the band is still pliable.



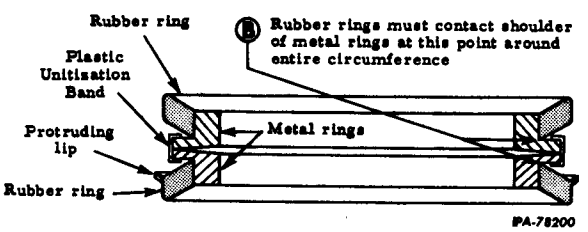
Illust. 26
Rubber Ring and Sealing Surfaces of Metal Rings.

15. Set the assembly aside for 30 minutes to allow the plastic band to shrink and dry on the metal rings.

NOTE: Do not at any time handle the rubber rings with greasy, oily or dirty hands.

16. Assemble the rubber rings to the metal rings assembly as shown in Illust. 28. Be sure the rubber rings are seated completely, and are flush against the inside shoulder of the metal rings at point (B, Illust. 28).

Illust. 27
Installing Unitization Bank on Metal Rings.



Illust. 28
Installing the Rubber Rings.

14. REASSEMBLY

Cartridge Type Seal
(Ref. Nos. Refer to Illust. 19)

NOTE: The stator gasket in each of the oil seals (gasket that contacts idler shaft) must be adequately lubricated with the same type of oil that is used in the idler assembly just prior to installing the seal on the idler shaft.

1. Install the front idler shaft in a press, and press the bearing cones (9) into position over

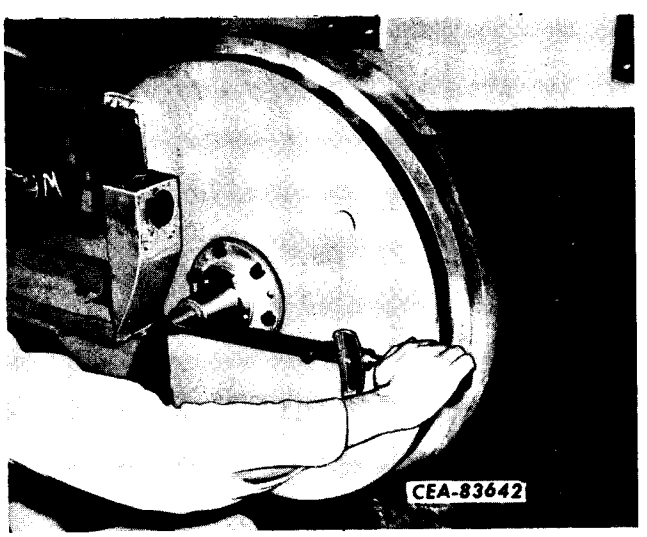
FRONT IDLERS

the shaft (Illust. 13). Be sure the cones are pressed solidly against the shoulders of the shaft.

2. Install one of the bearing cups in the idler so it protrudes slightly from the idler hub face. From the opposite end of the idler, install the shaft and the remaining bearing cup, allowing it also to protrude slightly.

3. Apply a thin coat of Permatex No. 3 to both idler hub faces. Install one .023 inch shim on one side and one .023 and three .007 inch shims on the other side. Install both oil seals and tighten them down securely while rotating the shaft (Illust. 29).

Illust. 29
Installing the Front Idler Oil Seal.



Illust. 30
Checking Front Idler Bearing Pre-load.

4. Rotate the shaft six to eight complete turns. Check the rolling torque of the shaft. To do this, place a torque wrench in the plug on the end of the shaft and read the torque while making one complete revolution. The torque should be 6 to 12 ft-lbs (Illust. 30).

5. If torque is more than 12 or less than 6 ft-lbs, remove the oil seal from the side containing the 0.007 inch shims and add or remove shims as required. Adding shims reduces the torque. Removing shims increases the torque. Shims are also available in 0.002 and 0.003 inch thickness. Reassemble the oil seal and recheck as in Step 4.

NOTE: Do not lubricate the front idler until it is in its proper operating position on the tractor.

Metal Face Type Seal
(Ref. Nos. Refer to Illust. 22)

NOTE: Do not at any time handle this seal with greasy, oily or dirty hands.

1. Press both bearing cones (9) on the idler shaft until they are solid against the shaft shoulders. Use a feeler gauge to be sure they are solid against the shaft shoulders.

2. With the idler body (10) in a horizontal position, press the bearing cup (8) into the hub of the idler body until it protrudes approximately .060 of an inch. Install one .030 inch and one .0075 inch shim on the idler hub and install and secure the bearing retainer (5).

3. Turn the idler body over and insert the shaft assembly so the keyway in the shaft is on the same side as the lubrication plug (11) in the idler body. Press the remaining bearing cup into the idler body so it protrudes approximately .060 of an inch.

4. Install one .030 inch shim and four .0075 inch shims on the idler hub and install and secure the bearing retainer (5) with two mounting screws using full torque. Spin the shaft by hand. If shaft rotates freely (more than one revolution and stops slowly), remove the bearing retainer and remove one .0075 inch shim. Install the bearing retainer and spin the shaft. Repeat this procedure until the shaft binds (stops quickly). Install the remaining bearing retainer mounting screws.

(Continued on next page)

14. REASSEMBLY - Continued

Metal Face Type Seal - Continued
(Ref. Nos. Refer to Illust. 22)

NOTE: If the shaft is extremely hard to turn, the .030 inch shim may have been removed by mistake or the assembly procedure was not followed properly. In this case, remove the bearing retainer and shims. Install one .030 inch and four .0075 inch shims on the idler hub and secure the bearing retainer. Strike the opposite end of the idler shaft to seat the bearing cup against the retainer and repeat Step 4.

5. If the idler shaft has two snap ring grooves on each end of the shaft, install snap ring (1) on each side of the idler in the groove closest the bearing retainer.

6. Before installing the seal (3) thoroughly clean the surfaces of the bearing retainer and seal retainer that will contact the rubber rings of the seal. Similar surfaces exist in the track roller assembly and are indicated by (A and B, Illust. 57). These surfaces must be cleaned with a non-flamable solvent to remove all oil and wipe dry.

Corrosion or hardened foreign material may exist on the area of the bearing and seal retainers (similar to surface A, Illust. 57) that has not been in contact with the rubber rings of the former seal. Using coarse paper, a file or a hand grinder, remove the corrosion or hardened material on the entire circumference. Do this carefully to avoid changing the dimensions of the bore.

7. Use the lint-free wiper (furnished with the new seal or rebuild package) to remove all final traces of oil or grease from the rubber ring contacting surfaces within the bearing and seal retainers.

NOTE: A plastic unitization band holds this seal together for assembly into the idler. DO NOT REMOVE THIS BAND. This band will automatically disintegrate after several hours of operation.

8. A close look at the seal will reveal that one of the rubber rings has a small protruding lip around its outer diameter. This is used to correctly position the seal in the idler (Illust. 31). Before installing the seal, carefully check the following.

BE SURE THE:

(a) Rubber rings are in the correct position on the metal rings. (Refer to Illust. 31.)

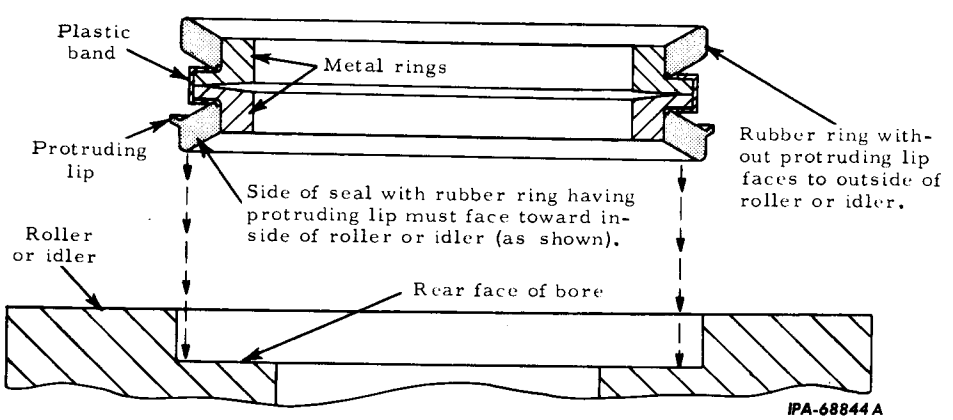
(b) Rubber rings are seated completely, and are flush against the inside shoulder of the metal rings (refer to (C, Illust. 64).

(c) Rubber rings are completely free of dirt, oil or grease.

9. Install the oil seal assembly into the idler so the rubber ring with the protruding lip enters the bearing retainer (refer to Illust. 31). Check to be sure that the rubber ring is against the rear face of the bearing retainer.

10. Install the "O" ring (4) into the groove on the shaft and lubricate the "O" ring with chassis lubricant.

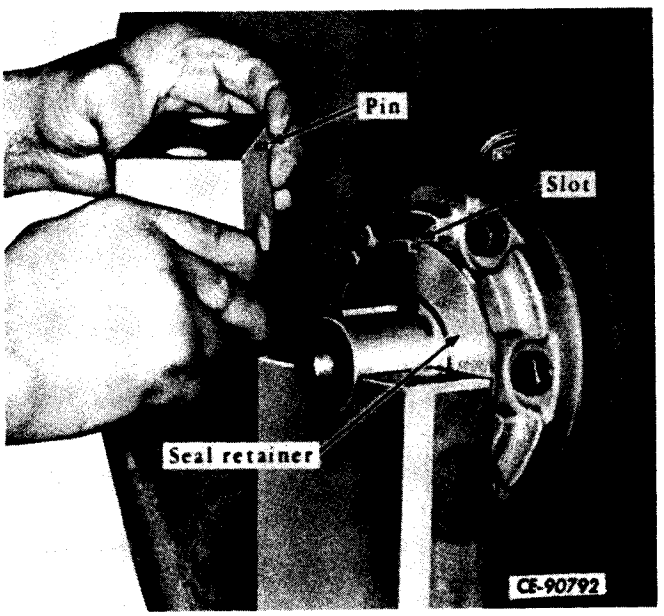
11. Install the seal retainer (2) on the shaft so that the seal bore of the retainer uniformly en-



Illust. 31
Cross-section of Seal.

FRONT IDLERS

velopes the rubber ring. The retainer is correctly positioned when the snap ring groove in the shaft is exposed and the slot in the retainer is positioned to engage the pin in the idler fork cap when installed in the track frame (Illust. 32). On units that do not have the slot in the retainer, but have a lug on the idler fork, the flat on the retainer must be positioned to meet the lug on the idler fork. Install the snap ring (1).



Illust. 32
Aligning Fork Cap to Seal Retainer.

12. Follow the same procedure outlined in steps 6 through 11 for installing the seal on the opposite side of the idler.

15. INSTALLATION

Cartridge Type Seal

1. Place the front idler into position between the channels of the track frame so that the plug in the end of the idler shaft is to the outside and the idler is supported on a wooden block between the track links (Illust. 16).

2. Apply "NEVER SEEZ" to each end of the front idler shaft (approximately three inches). Install the front idler guides on the ends of the front idler shaft, being sure to engage the pins on the oil seals with the holes in the idler guides (Illust. 16).

NOTE: Before installing the idler guides, be sure the notches in the idler shaft are facing down.

3. Position the front idler assembly so the guide rod bore in the guides is aligned with the notch in the idler shaft and the holes in the guide rod blocks welded to the track frame. Apply "NEVER SEEZ" to the portion of the guide rods that locate in the rod blocks and install the guide rods through the rod blocks and idler guides from the front until the cap screw holes in the rods and front rod blocks are aligned. Secure the rods to the rod blocks with the cap screws (Illust. 15 and 16). Install the cap screw in the front end of each of the guide rods.

NOTE: It may be necessary to compress the oil seals by pushing in on the idler guide before the second guide rod can be installed.

4. Secure the front idler guides to the cross plate (Illust. 17) with four cap screws. Remove the wooden block from under the front idler.

5. LOADERS ONLY: Install the track frame front cover (2, Illust. 80).

6. Install the track chain. (Refer to Par. 9, "INSTALLATION.")

7. Lubricate the front idler with a clean grade of lubricant. (Refer to the "LUBRICATION GUIDE" in the operator's manual.)

Metal Face Type Seal

1. Install the woodruff key in the idler shaft. Using a hoist, position the idler body in the idler fork so the lubrication plug (11, Illust. 22) is up and will be to the outside when assembled to the tractor. Turn the idler shaft so the woodruff key will engage the slot in the idler fork cap and install and secure the caps with the cap screws (Illust. 18). If caps are equipped with a pin, be sure the pin enters the slot in the retainer (Illust. 32).

2. If the front idler and fork was removed as an assembly, attach a strap or rope to the fork and to the hoist to keep the fork aligned for installation in the track frame (Illust. 33).

3. Move the idler and fork assembly into position between the channels of the track frame until the guide bars welded on the idler fork engage the wear bars welded in the track frame channels (Illust. 33).

4. Remove the lubrication plug (11, Illust. 22) from the idler body and pour two pints of SAE-30 engine oil (Series 3) into the idler body. When filling the front idler be sure the lubrica-

(Continued on next page)

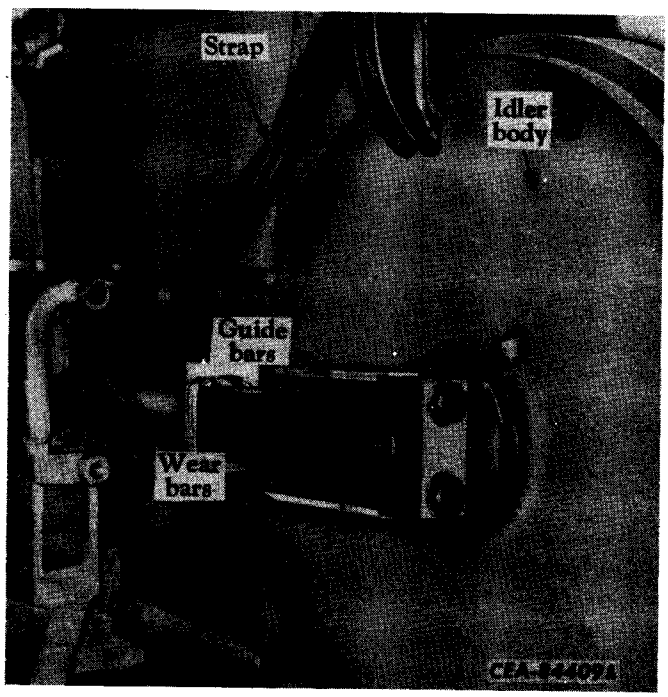
FRONT IDLERS

15. INSTALLATION - Continued

Metal Face Type Seal - Continued

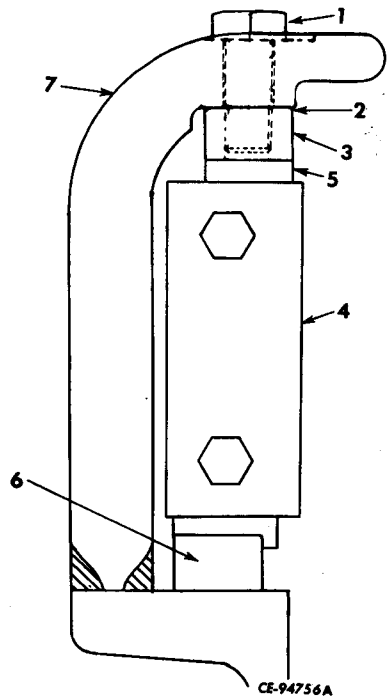
tion hole in the idler body is on the idler center line which is parallel to the ground. Apply Permatex No. 2 to the plug threads and install the plug (using 15-40 ft. -lbs. torque).

5. Remove the strap or rope from the hoist and idler fork and push the assembly back on the track frame until the adjusting rod in the fork enters the track spring front seat. Remove the hoist.



Illust. 33
Installing the Front Idler and Fork Assembly.

6. TRACTORS WITH ADJUSTABLE TRACK FRAME WEAR BAR: Loosen the four cap screws (1, Illust. 33A) securing the wear bars on each side of the front idler. Tap on the cap screw heads to seat the wear bar (3) on the front idler fork guide bar (5). Install shims (2) (refer



Illust. 33A
Track Frame Upper Wear Bar Shim Location.

1. Cap screw.
2. Shim.
3. Track frame wear bar (adjustable).
4. Front idler fork cap.
5. Front idler fork guide bar.
6. Track frame wear bar (welded).
7. Track frame.

to parts catalog for part number) between the wear bar and track frame until the gap is closed to within .010 - .062 inches, then torque the cap screws. Recheck between the track frame wear bar and the front idler fork guide bar for the specified gap and correct if necessary.

7. Install the front idler stop (16, Illust. 73) or (17, Illust. 81) to each channel of the track frame.

8. Install the track chain (refer to Par. 9, "INSTALLATION").

9. Adjust the track tension (refer to "Adjusting the Track Tension" under "MAINTENANCE," Par. 6).

HYDRAULIC TRACK ADJUSTERS

16. DESCRIPTION

Guide Type Adjuster (Illust. 39)

The hydraulic track adjuster is located between the track spring and front idler on each side of the track frame. The adjusting rod (1) is supported at the rear by the track spring front seat (7, Illust. 80) or (28, Illust. 72) and at the front by the hydraulic cylinder (3). The cross plate (Illust. 34) is either bolted or welded to the hydraulic cylinder. Lubricant is introduced into the cylinder by the use of a lubrication fitting located on the front idler cross plate. This lubricant acting upon the packing and rod within the cylinder (which are held by track spring tension) forces the front idler cross plate, hydraulic cylinder and front idler forward for track adjustment. On units with the welded cross plate, the relief valve (14, Illust. 39) prevents overloading of the track spring due to mud and dirt build-up in the track assembly.

Fork Type Adjuster (Illust. 40)

The hydraulic track adjuster is located between the track spring and front idler on each side of the track frame. The front idler fork (11) supports the front idler at the front and serves as a cylinder for the piston assembly at the rear. The adjusting rod (9) is supported at the rear by the track spring front seat (5, Illust. 81) or (17, Illust. 73) and at the front by the fork cylinder. Lubricant is introduced into the cylinder by the use of a lubrication fitting (2) located on the idler fork. This lubricant acting upon the piston (7) and adjusting rod within the cylinder (which are held by track spring tension) forces the idler fork and front idler forward for track adjustment. A relief valve (13) in the underside of the idler fork prevents overloading of the track spring due to mud and dirt build-up in the track assembly. On later units this is accomplished with the combination safety relief and vent valve (15).

17. REMOVAL AND DISASSEMBLY

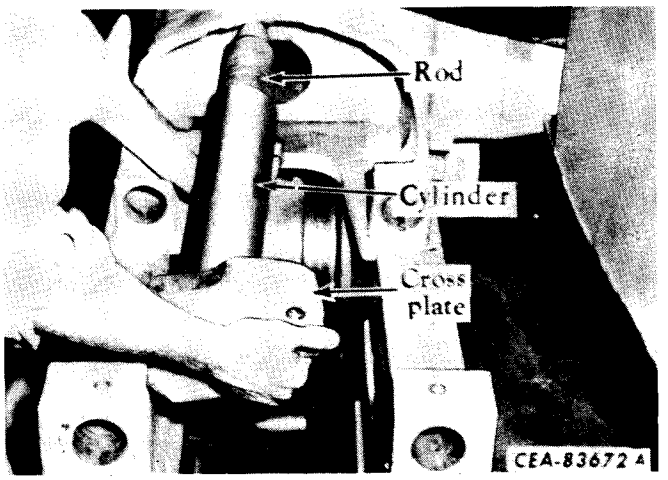
Guide Type Adjuster (Ref. Nos. Refer to Illust. 39)

1. Remove the front idler. (Refer to Par. 11, "REMOVAL.")

2. Remove the track frame rear cover (1, Illust. 80) or (4, Illust. 72).

3. Pull the adjuster assembly forward to clear the track frame and lift the assembly out (Illust. 34).

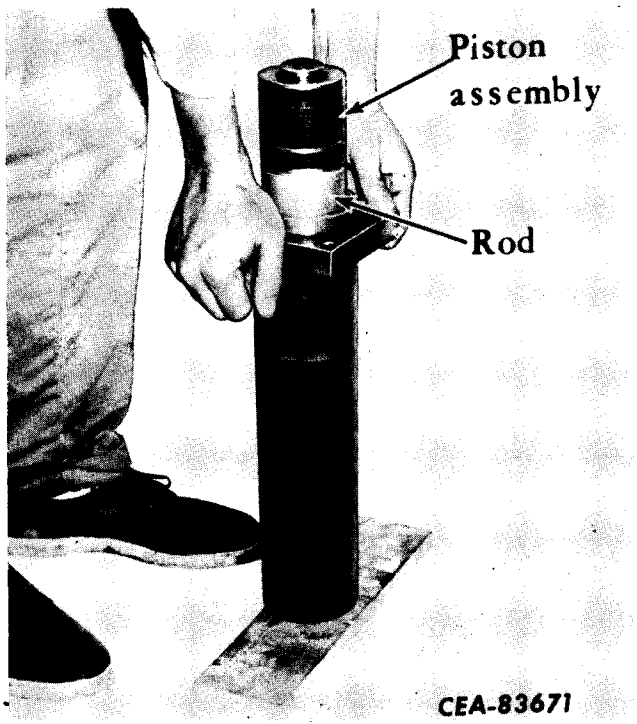
4. BOLTED TYPE CROSS PLATE: Remove the cap screws and washers securing the front idler guide cross plate to the hydraulic cylinder and remove the cross plate. Remove the "O" ring (4) from the cylinder.



Illust. 34
Removing the Hydraulic Track Adjuster.

5. BOLTED TYPE CROSS PLATE: Push the adjusting rod (1) and the piston assembly out the front of the cylinder (3) (Illust. 35). Remove the three-ring dirt seal (2) from the groove in the rear of the cylinder.

(Continued on next page)



Illust. 35
Separating the Adjusting Cylinder, Rod and Piston Assembly.

HYDRAULIC TRACK ADJUSTERS

17. REMOVAL AND DISASSEMBLY - Continued

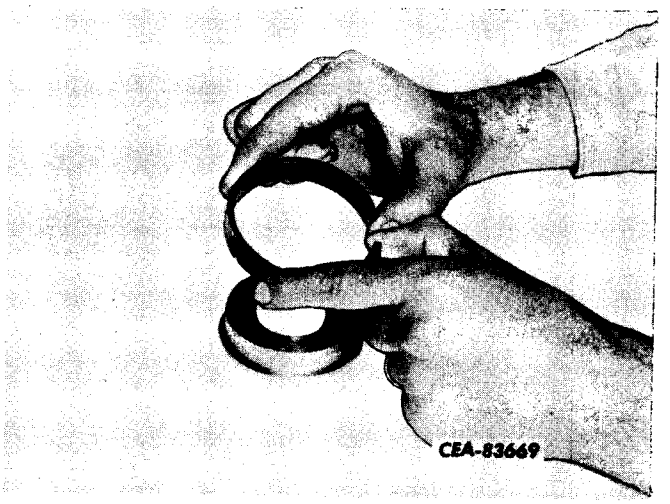
Guide Type Adjuster - Continued
(Ref. Nos. Refer to Illust. 39)

WELDED TYPE CROSS PLATE: Pull the adjusting rod out from the cylinder. Remove the piston scraper (13) from the cylinder bore. Use a new scraper when reassembling. To remove the piston assembly from the cylinder bore, attach a grease gun to the fitting (11) and build up pressure behind the piston.

6. SEAL TYPE PISTON: Remove the seal (16) from the piston.

PACKING TYPE PISTON: Remove the snap ring (9) and lift off the piston end (8) with wear ring (5) (Illust. 36). Remove the wear ring from the piston end (Illust. 37). Remove the packing (7) from the piston body. Remove the wear ring (5) from the piston body (Illust. 38).

Illust. 36
Removing the Piston End.



Illust. 37
Removing the Piston End Wear Ring.

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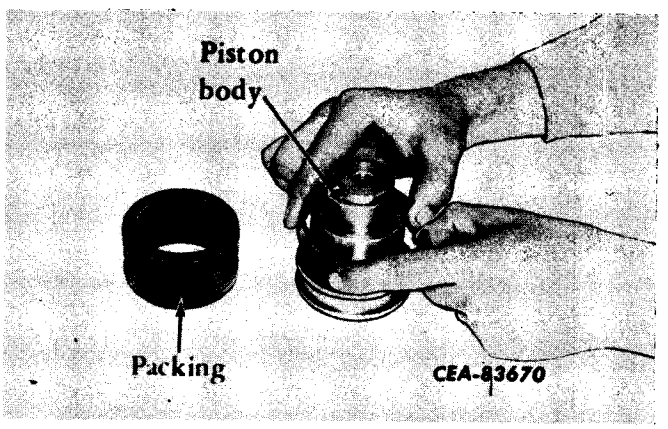
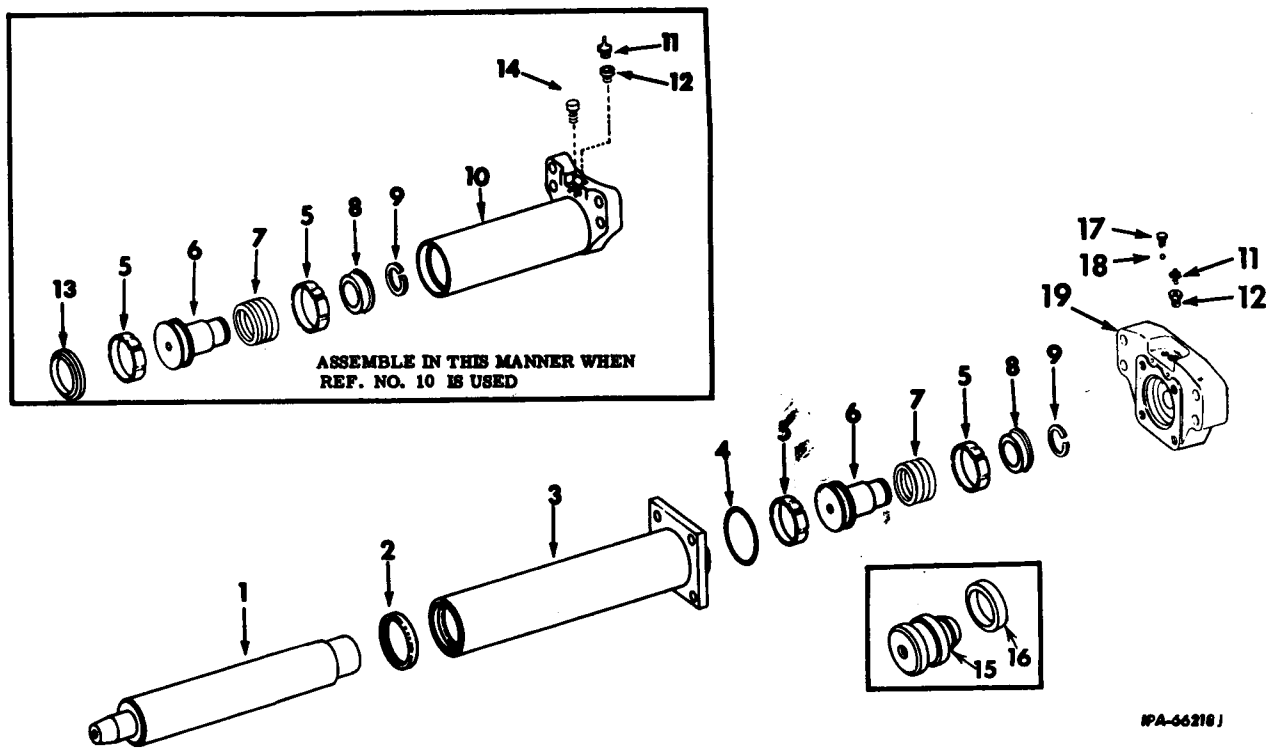


Illust. 38
Removing the Piston Body Wear Ring.

HYDRAULIC TRACK ADJUSTERS



Illust. 39
Exploded View of Hydraulic Track Adjuster (Guide Type).

1. Adjusting rod.
2. Dirt seal.
3. Hydraulic cylinder.
4. "O" ring.
5. Wear ring.
6. Piston body.
7. Packing.
8. Piston end.
9. Snap ring.
10. Hydraulic cylinder.
11. Lubrication fitting.
12. Ball check.
13. Piston scraper.
14. Combination safety relief and vent valve.
15. Piston.
16. Piston seal.
17. Vent screw.
18. Ball.
19. Cross plate.

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HYDRAULIC TRACK ADJUSTERS

17. REMOVAL AND DISASSEMBLY - Continued

Fork Type Adjuster
(Ref. Nos. Refer to Illust. 40)

1. Remove the front idler (refer to Par. 11, "REMOVAL").

2. Remove the idler scraper (1) from the idler fork and attach a hoist to the fork. Pull the fork and adjusting rod (9) from the track frame.

3. Pull the adjusting rod (9) out from the rear of the fork.

4. Remove the piston scraper (8) from the cylinder bore. Use a new scraper when reassembling.

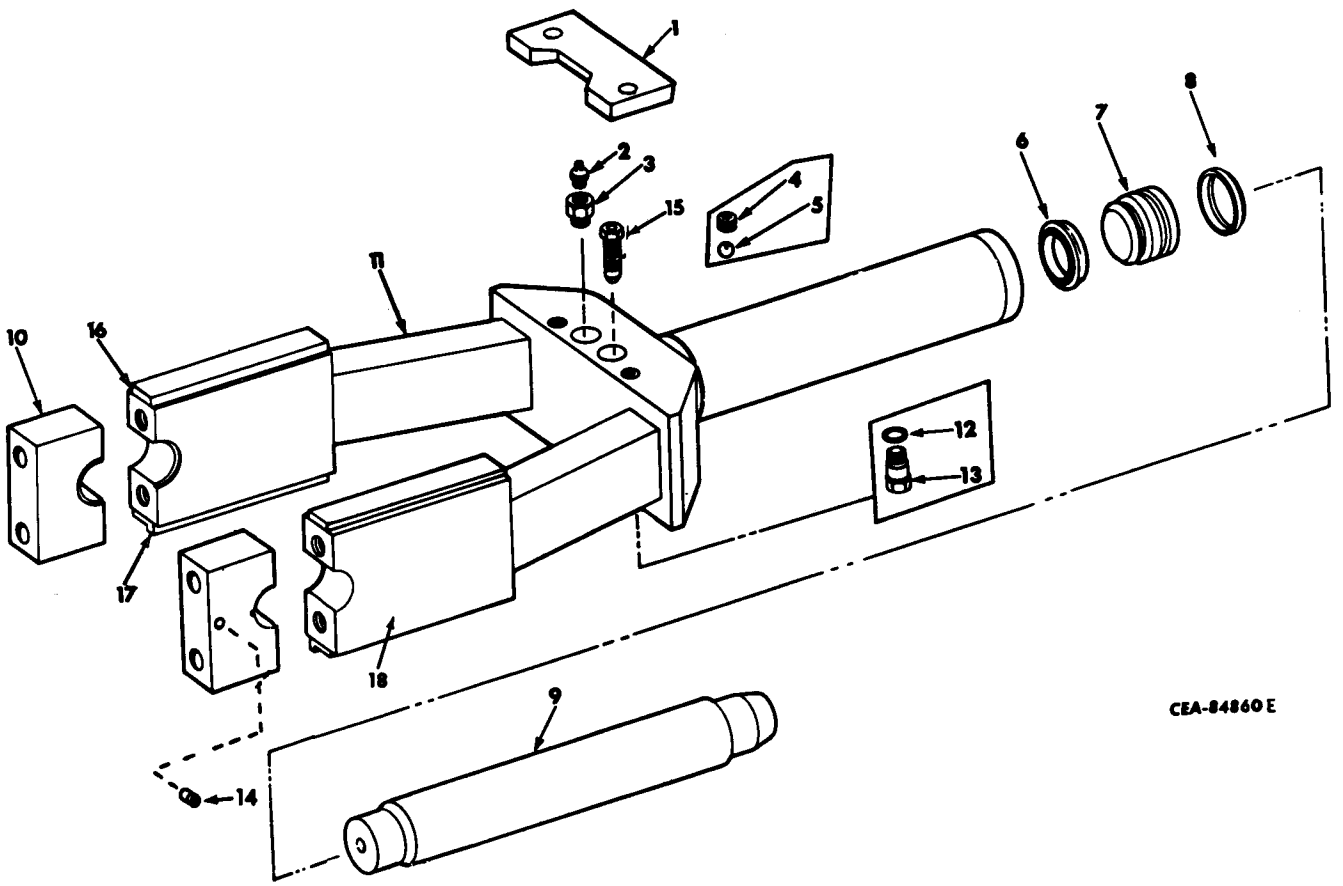
5. Remove the piston (7) from the cylinder. A 1/2" NC tapped hole is provided in the piston to facilitate removal. Remove the seal (6) from the piston. Save the old seal (6) to be used as an aid for "Reassembly."

18. INSPECTION AND REPAIR

Guide Type Adjuster

PACKING TYPE PISTON: Inspect the wear rings, dirt seal and piston packing for excessive wear or damage. Replace parts as necessary. Inspect the snap ring groove in the piston body for nicks and the piston body and piston end diameters for excessive wear. Replace parts as necessary.

(Continued on next page)



Illust. 40
Exploded View of Hydraulic Track Adjuster and Front Idler Fork.

1. Idler scraper.
2. Lubrication fitting.
3. Ball check assembly.
4. Vent screw (earlier machines).
5. Ball (earlier machines).
6. Piston seal.
7. Piston.
8. Piston scraper.
9. Adjusting rod.
10. Fork cap.
11. Front idler fork.
12. Washer (earlier machines).
13. Relief valve (earlier machines).
14. Spring pin (if equipped).
15. Combination safety relief and vent valve.
16. Idler fork upper guide bar.
17. Idler fork lower guide bar.
18. Front idler shaft block.

18. INSPECTION AND REPAIR - Continued

Guide Type Adjuster - Continued

SEAL TYPE PISTON: Inspect the piston body for grooving. Inspect the threads of the piston body for damage. Replace the piston scraper and seal.

Inspect the cylinder "O" ring (4, Illust. 39) (if equipped) for damage. Inspect the adjusting rod and hydraulic cylinder for damage, scores, grooving or excessive wear and replace parts as necessary. Refer to Par. 3, "SPECIFICATIONS" for dimensions of new parts.

BOLTED TYPE CROSS PLATE: Remove the vent screw (17, Illust. 39) and ball (18), lubrication fitting (11) and ball check assembly (12) from the cross plate and clean. Flush out the oil passages in the cross plate and dry thoroughly with compressed air. Reassemble parts to the cross plate.

WELDED TYPE CROSS PLATE: Remove the relief valve (14, Illust. 39), lubrication fitting (11) and ball check assembly (12) from the hydraulic cylinder cross plate and clean. Flush out the oil passages in the cross plate and dry thoroughly with compressed air. Thoroughly clean the inside of the hydraulic cylinder. Do not reassemble the relief valve or the ball check assembly at this time.

Fork Type Adjuster

Inspect the idler fork guide bars (16 and 17, Illust. 40) for distortion and broken welds. Also at this time check the wear bar (31, Illust. 73) or (19, Illust. 81) in each lower channel of the track frame for distortion and broken weld. If replacement of either the fork guide bars or the track frame wear bars is necessary, these parts are available with installing instructions in a field service package (refer to the parts catalog for the correct part number).

Inspect the front idler shaft block (18, Illust. 40) for damage. If replacement is necessary, a new block and cap (10) is available with installing instructions in a field service package (refer to the Parts Catalog for the correct part number).

Inspect the piston body for grooving. Inspect the threads of the piston body for damage. Replace the piston scraper and seal.

Inspect the adjusting rod and fork cylinder for damage, scores, grooving or excessive wear. Thoroughly clean the inside of the fork assembly. Refer to Par. 3, "SPECIFICATIONS" for dimensions of new parts.

Remove the vent screw and ball and the lubrication fitting and ball check assembly from the idler fork. Later units are equipped with a combination safety relief and vent valve instead of the vent screw and ball. Clean the parts. Flush out the oil passages in the fork and dry thoroughly with compressed air. Thoroughly clean the inside of the fork cylinder. Do not reassemble the ball check assembly and the combination valve or vent screw and ball (as equipped) at this time.

The relief valve (13, Illust. 40) (if equipped) located in the underside of the front idler fork must not be removed or tampered with unless replacement is necessary due to damage or a leaking valve. If installing a new relief valve, be sure to use a new washer (12, Illust. 40) and torque the valve to 18-24 ft. -lbs. ("LOCTITE" retaining compound applied to threads).

19. REASSEMBLY AND INSTALLATION

Guide Type Adjuster
(Ref. Nos. Refer to Illust. 39)

1. PACKING TYPE PISTON: Install the packing (7) and wear ring (5) on the piston body (6) (Illust. 38). Install the other wear ring (5) on the piston end (8). Position the piston end on the piston body and secure with the snap ring (9) (Illust. 36).

NOTE: Be sure to install the packing (7) on the piston body so the packing cup (concave side) will face toward the tapped hole in the piston body.

SEAL TYPE PISTON: Install a new seal (16) on the piston so the seal cup (concave side) is away from the tapped end of the piston. Apply a light coat of "NEVER SEEZ" to the piston outside diameter.

2. BOLTED TYPE CROSS PLATE: Assemble the dirt seal (2) by placing a smaller ring on each end of the larger center ring. Install the dirt seal into the groove in the rear of the cylinder (3). Install the "O" ring (4) on the front of the cylinder against the front face of the cylinder flange (Illust. 41). Lubricate the portion of the adjusting rod (1) that comes in contact with the cylinder with "NEVER SEEZ." Install the adjusting rod into the rear of the cylinder, being careful not to damage the seal (2) (Illust. 41).

WELDED TYPE CROSS PLATE: Install a new piston scraper (13) into the groove of the cylinder bore so the scraper lip is facing out.

3. BOLTED TYPE CROSS PLATE: Insert the piston into the front of the cylinder (flange end) so the cup of the seal or packing (concave side) faces away from the adjusting rod (Illust. 41).

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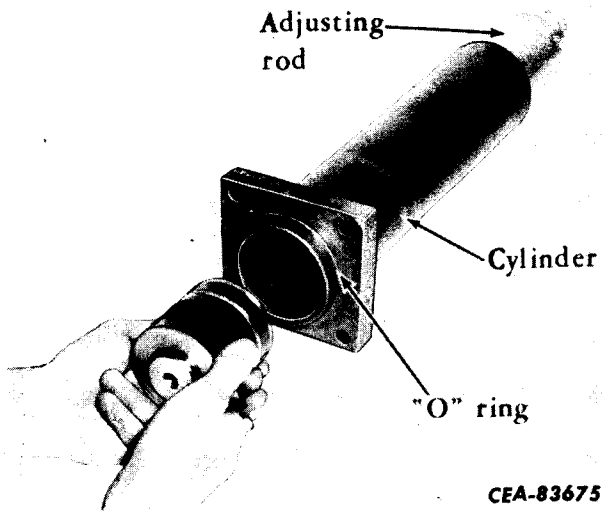
HYDRAULIC TRACK ADJUSTERS



Illust. 41
Installing the Piston Assembly in the Hydraulic Cylinder (Bolted Type Cross Plate Shown).

Some assemblies have adjusting rods with an undercut (smaller outside diameter) at the front end for approximately the first 2-1/4 inches. On these assemblies it will be necessary to place enough grease in the cylinder to fill the space created by the undercut just prior to installing the piston assembly.

WELDED TYPE CROSS PLATE: Place a small amount of grease in the hydraulic cylinder and then install the piston so the tapped hole is facing into the cylinder. Install the piston until it bottoms so that all the air will be expelled through the valve openings in the cross plate. Tighten the ball check (12), with fitting (11) installed, and the combination valve (14) from 45-55 ft. -lbs. On assemblies that have adjusting rods with an undercut (smaller outside diameter at the front end for approximately 2-1/4 inches) it will be necessary to place enough grease in the cylinder to fill the space created by the undercut after installing the piston assembly. Coat the adjusting rod and the cylinder bore with "NEVER SEEZ" and install the adjusting rod slowly and evenly into the rear of the cylinder until it bottoms. If too much grease was installed in the cylinder on assemblies with adjusting rod that has an undercut, the scraper (13) may be forced out as the adjusting rod is inserted. If this happens, remove the rod and reinstall the scraper.

4. BOLTED TYPE CROSS PLATE: Secure the front idler cross plate to the hydraulic cylinder flange with the cap screws and washers. Torque the 1/2 inch cap screws to 115-130 ft. -lbs. with engine oil applied to the threads. Assemblies with 5/8 inch cap screws must be torqued to 225-255 ft. -lbs. with "LOCTITE" grade "B" applied to the threads.

5. Install the adjusting cylinder and rod assembly being sure the rod enters the track spring front seat (Illust. 34).

6. Install the track frame rear cover (1, Illust. 80) or (4, Illust. 72).

7. Install the front idler (refer to Par. 15, "INSTALLATION").

Fork Type Adjuster
(Ref. Nos. Refer to Illust. 40)

1. Install the new seal (6) on the piston body so the groove of the seal is away from the tapped end of the piston body. (See NOTE.)

NOTE: If difficulty is encountered installing seal (6), the old seal may be used as a tool. Place the old seal on an arbor press bed. Position the new seal on the old and press the piston into the seal.

2. Place a small amount of grease in the cylinder and then install the piston (7) into the cylinder (seal end first) until it bottoms so that all the air will be expelled through the valve openings in the fork. Tighten the ball check (3), with fitting (2) installed, and the combination relief valve (15) from 45-55 ft. -lbs. If equipped with vent screw (4), tighten it from 10-15 ft. -lbs.

NOTE: Some adjusting rods have an undercut (smaller outside diameter) at the front end for approximately the first 2-1/4 inches. On these assemblies it will be necessary to place enough grease in the cylinder (after installing the piston assembly) to fill the space created by the undercut on the adjusting rod.

3. Install a new piston scraper (8) in the groove of the fork cylinder so the lip of the scraper is facing out.

4. Install the adjusting rod slowly and evenly into the rear of the cylinder until it bottoms. If too much grease was installed in the cylinder on assemblies with adjusting rod that has an undercut, the scraper (8) may be forced out as the adjusting rod is inserted. If this happens, remove the rod and reinstall the scraper.

5. Attach a hoist to the idler fork and position in the track frame. As the fork nears the track frame channels, engage the guide bars on the fork with the wear bars in the channels (Illust. 33). Remove the hoist.

6. Install the front idler (refer to Par. 15, "INSTALLATION").

7. Install the front idler stop (16, Illust. 73) or (17, Illust. 81) to each of the track frame channels.

8. Install the track chain (refer to Par. 9, "INSTALLATION"). Adjust the track tension, Par. 6, "MAINTENANCE."

TRACK IDLERS

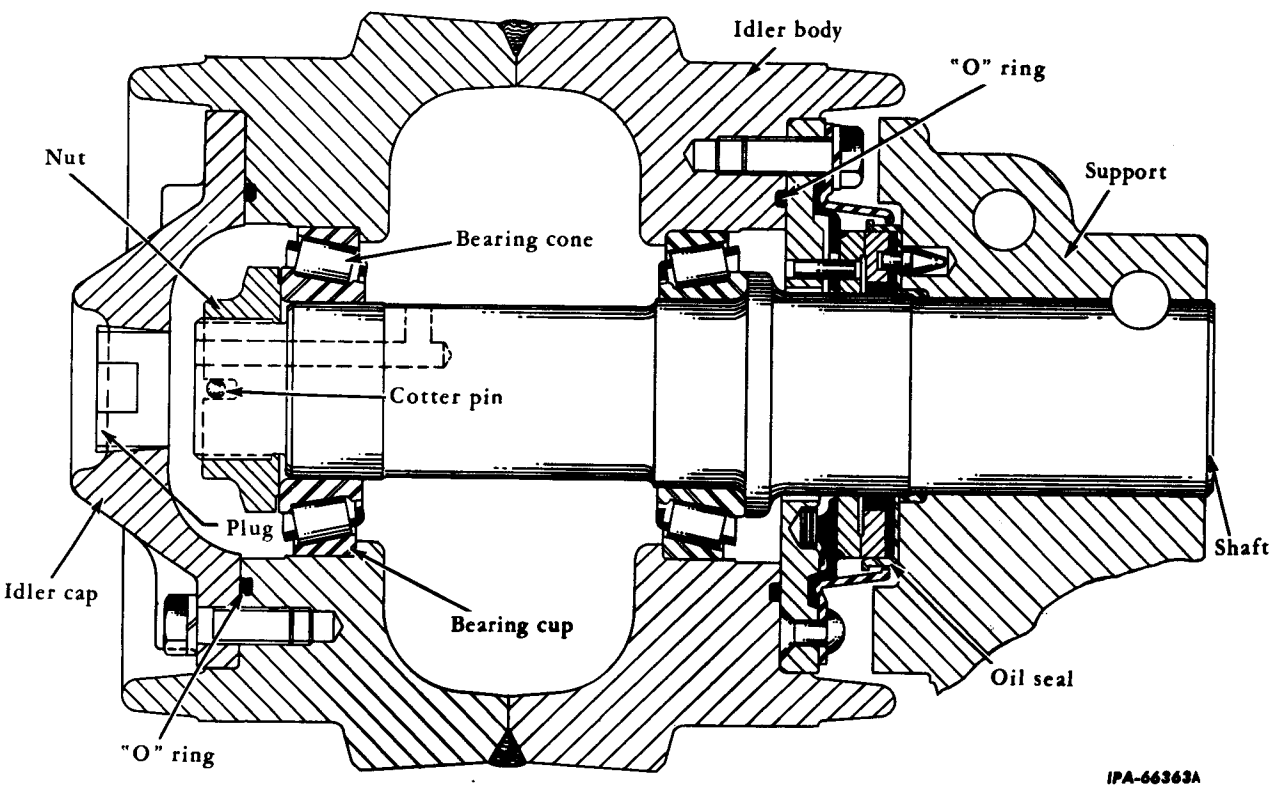
20. DESCRIPTION

Cartridge Type Seal (Illust. 42)

The upper section of the track between the sprocket and the front idler is supported by two track idlers. The track idlers revolve on replaceable steel shafts which are secured to the idler supports with clamping screws and nuts. On the MODEL 250 LOADERS, the idler supports are mounted to the front frame. On the TD-20 (SERIES B) tractors, the idler supports are an integral part of the track frame. The idlers are sealed against the entrance of dirt, water and the loss of lubricant by a rotary type oil seal at the rear and by an "O" ring at the front.

Metal Face Type Seal (Illust. 43)

The upper section of the track between the sprocket and the front idler is supported by two track idlers. These idlers revolve on replaceable steel shafts secured to the idler supports with a lock nut. On the MODEL 250 loaders, the idler supports are an integral part of the track frame. On the TD-20 (SERIES B), the idler supports are welded to the track frame. The idlers are sealed against the entrance of dirt, water and the loss of lubricant by a metal face type oil seal at the rear and by an "O" ring at the front.



Illust. 42
Cut-away of Track Idler Assembly with Cartridge Type Seal.

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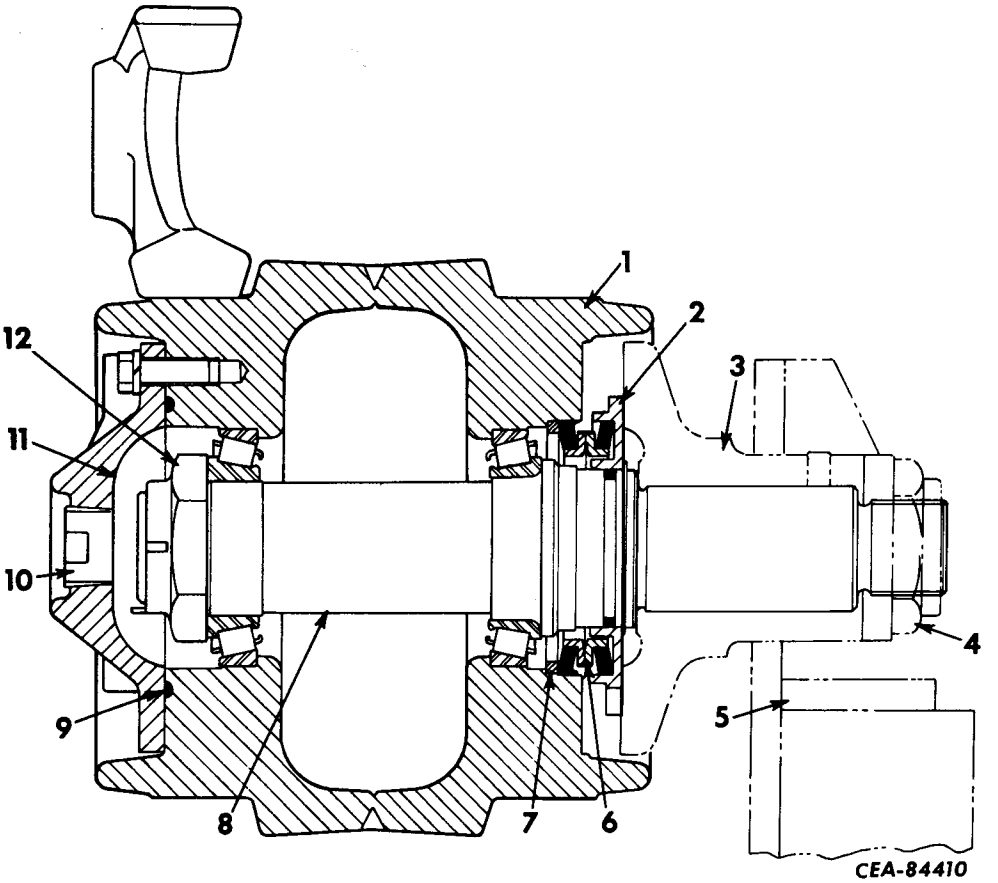
TRACK IDLERS



Illust. 43
Cut-away of Track Idler Assembly with Metal Face Type Seal.

1. Idler body.
2. Seal retainer.
3. Idler support.
4. Mounting nut.
5. Track frame.
6. Oil seal.
7. Seal retainer.
8. Idler shaft.
9. "O" ring.
10. Lubrication plug.
11. Idler cap.
12. Adjusting nut.

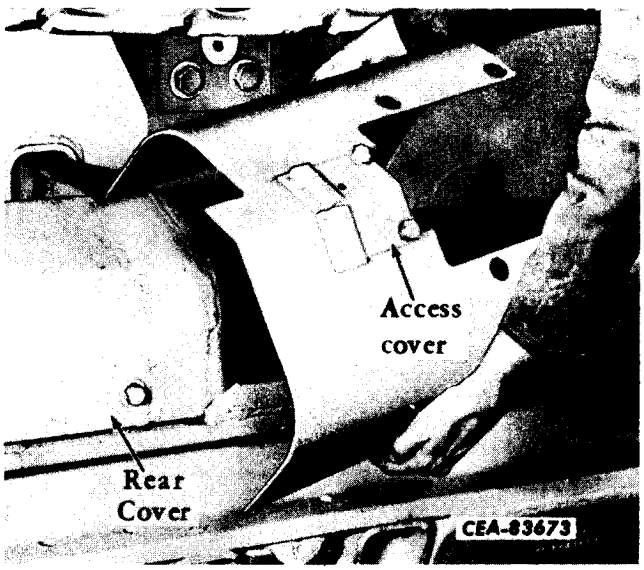
TRACK IDLERS

21. REMOVAL AND DISASSEMBLY

Cartridge Type Seal
(Ref. Nos. Refer to Illust. 49)

1. TD-20 (SERIES B) ONLY: Remove the track frame rear cover (4, Illust. 72). Remove the lubrication fitting cover from the top of the cross plate (19, Illust. 39).

LOADERS ONLY: Remove the track frame front and rear covers (Illust. 44).



Illust. 44
Removing the Track Frame Front Cover.

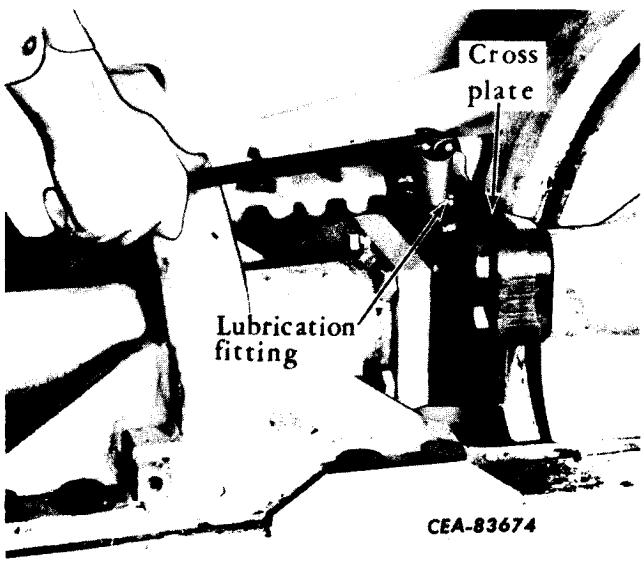
2. Release the track tension. Follow the instructions and caution outlined in Par. 6, "MAINTENANCE."

3. Loosen the cap screws securing the idler cap (2) to the idler body (7).

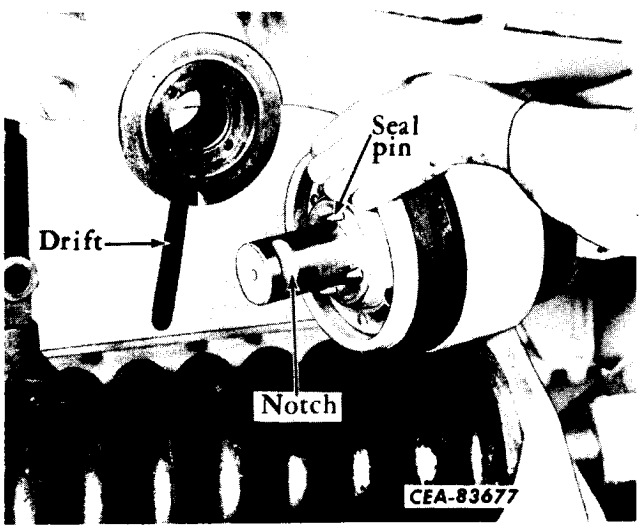
4. Place a jack between the track spring and track chain (using a wooden block on the jack to prevent possible slippage) and raise the track chain until it clears the idler body (Illust. 46).

5. Remove the idler cap (2) and "O" ring (4) from the idler body. Remove the cotter pin securing the nut (3) to the idler shaft and break loose the nut torque. Do not remove the nut from the shaft.

6. Remove the two cap screws and nuts securing the idler shaft to the idler support. Tap a drift into the split end of the support to aid in releasing the clamping effect on the shaft. Pull the idler assembly from the support (Illust. 46).



Illust. 45
Releasing Track Tension.



Illust. 46
Removing the Track Idler.

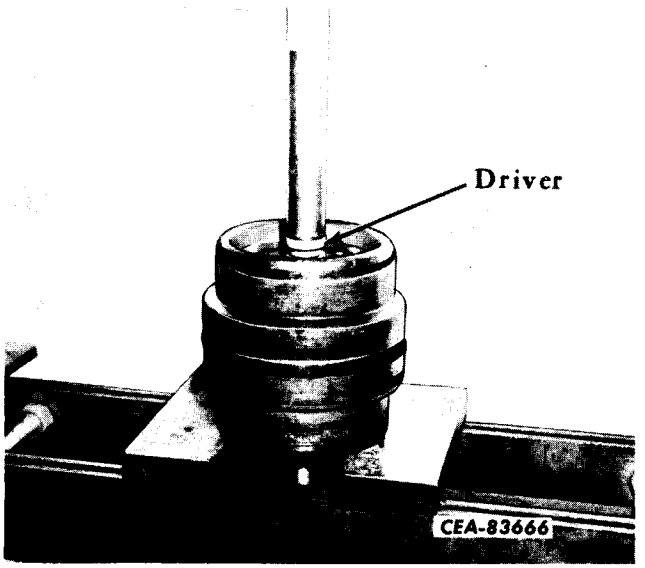
TRACK IDLERS

7. Remove the nut (3) from the idler shaft.

8. Remove the cap screws and washers securing the oil seal (11) to the idler body and remove the oil seal. Remove the "O" ring (4) from the groove in the rear of the idler body (Illust. 47).

Illust. 47
Removing the Track Idler Oil Seal.

9. Support the idler body in a press with the threaded end of the shaft up. Use a suitable driver on the end of the shaft and press the shaft from the idler body (Illust. 48). The rear bearing cone (9) will come off with the shaft and can easily be removed if replacement is necessary. As the threaded end of the shaft passes through the front bearing cone (5), the cone should be removed to prevent any possible damage.



Illust. 48
Removing the Idler Shaft.

10. The front and rear bearing cups can be driven out of the idler body if replacement is necessary.

(Continued on next page)

TRACK IDLERS

21. REMOVAL AND DISASSEMBLY - Continued

Cartridge Type Seal - Continued
(Ref. Nos. Refer to Illust. 49)

11. LOADERS ONLY: If it is necessary to remove the support (13), be sure to keep the shims (14) together to facilitate installation.

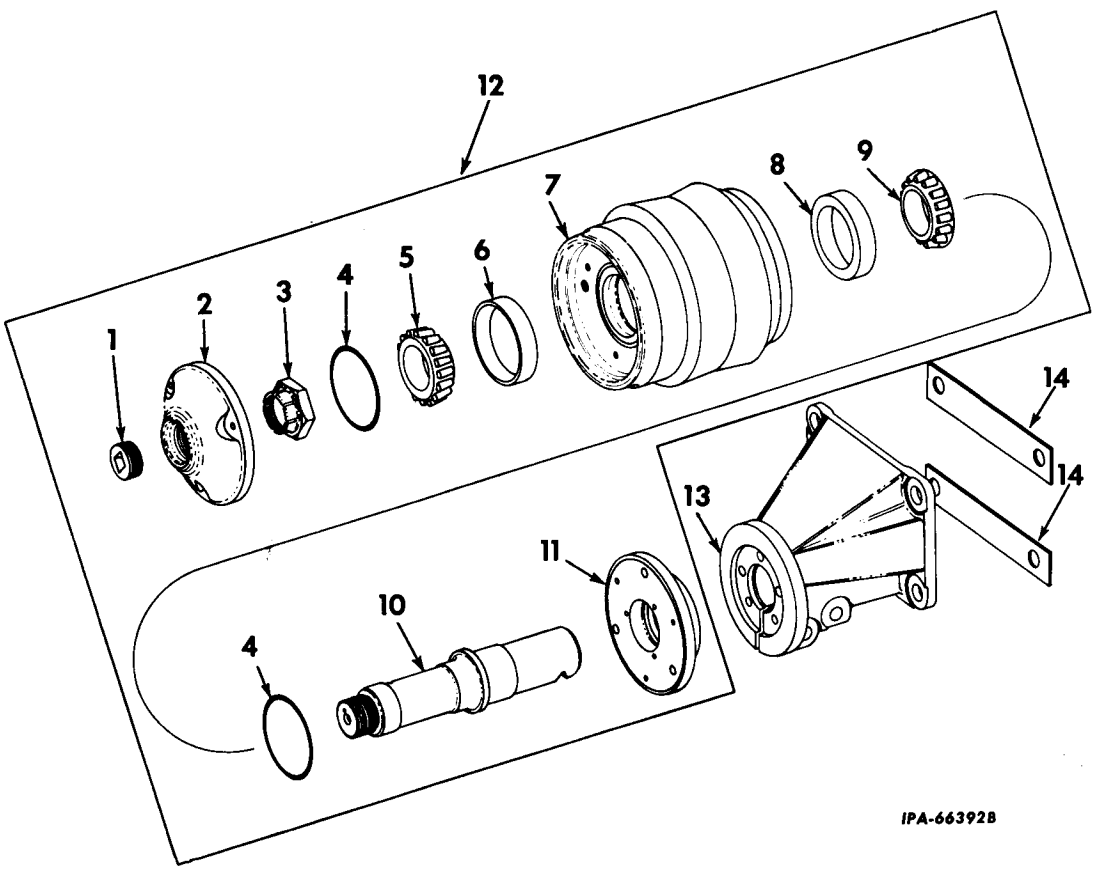
Metal Face Type Seal
(Ref. Nos. Refer to Illust. 50)

1. Release the track chain tension. Follow the instructions and caution outlined in Par. 6, "MAINTENANCE."

2. Using wood blocking and a hydraulic jack between the top of the track frame and the underside of the track chain, raise the track chain until it is clear of the track idler body.

3. Remove the mounting nut (17) and mounting nut washer (16) securing the idler shaft to the idler support (3, Illust. 43).

4. Tap on the end of the idler shaft to free the idler assembly from the idler support. On the TD-20 (SERIES B) the idler assembly can be pulled or pried from the idler support.



Illust. 49
Exploded View of Track Idler with Cartridge Type Seal.

1. Pipe plug.
2. Cap.
3. Nut.
4. "O" ring.
5. Bearing cone.
6. Bearing cup.
7. Idler body.
8. Bearing cup.
9. Bearing cone.
10. Idler shaft.
11. Oil seal.
12. Idler assembly.
13. Idler support. (Part of track frame on TD-20 SERIES B.)
14. Idler support shim (Loaders Only).

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TRACK IDLERS

5. Insert a drift into the opening in the top of the idler support and drive the guide pin from the support.

6. Remove the snap ring (15) from the idler shaft. Remove the seal retainer (14) with the stator of the oil seal (12). Remove the seal stator from the retainer and discard the rubber ring.

7. Remove the "O" ring (13) from the shaft and discard the ring.

8. Pull the rotor of the seal (12) from the idler body and discard the rubber ring.

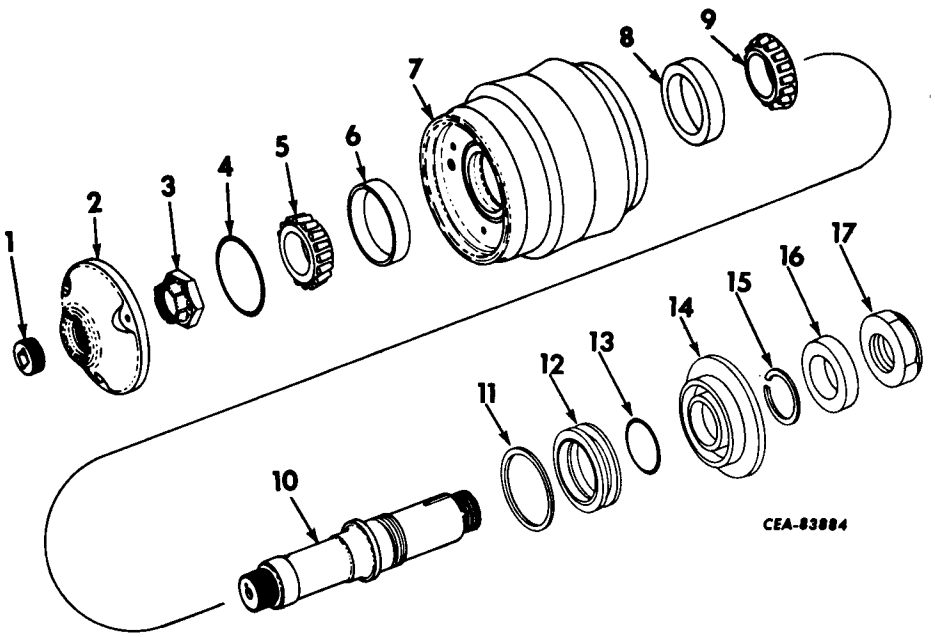
9. Using a bearing cup puller, remove the seal retainer (11) from the idler body.

10. Remove the idler cap (2) with lubrication plug (1). Remove the "O" ring (4) from the idler body and discard the ring.

11. Remove the cotter pin securing the adjusting nut (3) to the idler shaft and remove the adjusting nut.

12. Support the idler body in a vertical position so the lubrication end of the idler shaft (10) is up. Tap the shaft from the idler body (7). Lift the outer bearing cone (5) from its cup in the idler.

13. The inner bearing cone (9) will come off with the shaft and can be pressed off if replacement is necessary. The bearing cups (6 and 8) can be removed from the idler body with a bearing cup puller.



Illust. 50
Exploded View of Track Idler with Metal Face Type Seal.

1. Lubrication plug.
2. Cap.
3. Adjusting nut.
4. "O" ring.
5. Outer bearing cone.
6. Outer bearing cup.
7. Idler body.
8. Inner bearing cup.
9. Inner bearing cone.
10. Idler shaft.
11. Seal retainer.
12. Oil seal.
13. "O" ring.
14. Seal retainer.
15. Snap ring.
16. Washer.
17. Mounting nut.

TRACK IDLERS

22. INSPECTION AND REPAIR

1. Clean the idler body and shaft in a dry-cleaning solvent. Blow parts dry with compressed air.

2. Inspect the bearing bores in the idler body for scoring or other evidence of bearings turning in their bores. Inspect for cracks and other damage. Inspect the idler shaft for excessive wear or damage. Slight burrs can be smoothed down with a stone (refer to Par. 3, "SPECIFICATIONS" for dimensions of new parts).

3. Clean bearings in the proper solution and inspect for cracks, scores and wear. Reusable bearings should be soaked in oil and covered with lint-free paper until ready for assembly.

4. CARTRIDGE TYPE SEAL: Inspect the seal for excessive wear or damage and replace if necessary.

5. METAL FACE TYPE SEAL: Whenever the track idler is disassembled, the oil seal must be rebuilt or replaced with a new oil seal. Follow the instructions outlined in the "INSPECTION AND REPAIR" paragraph under "FRONT IDLER" for determining if the seal is acceptable for rebuild and for rebuilding the seal.

23. REASSEMBLY AND INSTALLATION

Cartridge Type Seal
(Ref. Nos. Refer to Illust. 49)

NOTE: The stator gasket of the oil seal (gasket that contacts idler shaft) must be adequately lubricated with the same type oil that is used in the idler assembly just prior to installing the seal on the idler shaft.

NOTE: Do not lubricate the track idler until it is in its proper operating position on the tractor.

1. LOADERS ONLY: If the support (13) was removed, install the support to the front frame using the same number of shims which were removed.

2. If they were removed, press the bearing cups (large end of taper up) into each end of the idler body until they are solid against the shoulder in the body bore (Illust. 42).

3. Place the idler shaft in a press with the threaded end up. Press on the rear bearing cone (9) until it is solid against the shaft shoulder. This bearing cone has a larger inside diameter than the front bearing cone (5) and must be pressed on so the small taper is facing up.

4. With the shaft (10) in a vertical position, place the idler body (7) over the shaft until it rests on the inner bearing assembly and rotate the body to seat the bearing. Press the outer cone (5) on the shaft (large diameter of the taper up) leaving it high enough so that it does not come in full contact with the outer cup. As the cone is pressed on, check for end play and install the cone until there is a slight end play in the assembly.

NOTE: The outer bearing cone must not be bottomed in its cup upon installation. Final seating of the cone is accomplished when installing the adjusting nut (3).

5. Position the assembly on a bench and support the shaft (outer bearing up) in a vertical position. While keeping the idler body in motion by rotating it, install the adjusting nut (3) until the idler body binds and stops rotating. Then back off the nut to the nearest locking position and secure with the cotter pin.

6. Support the idler body and hit the outer end of the shaft to knock the outer cone against the nut. At this point, the bearings should not bind but rotate freely.

7. Install the "O" ring (4) into the groove in the oil seal end of the idler body. Secure the oil seal (11) to the rear of the idler body with cap screws and washers.

8. Install the idler assembly to the support (13), being sure to align the oil seal pins with the holes in the support. Turn the shaft to align the notch in the shaft with the locking bolt hole in the support. After the idler is installed in the support, remove the drift (Illust. 46).

9. Secure the idler assembly to the support with the two cap screws and nuts.

10. Install the "O" ring (4) in the idler body. Install the idler cap (2) and tighten the cap screws and washers finger tight.

11. Lower the track chain slowly onto the idler body and remove the jack and wooden block from the track spring. Torque the idler cap mounting cap screws.

12. Adjust the track tension. (Refer to Par. 6, "MAINTENANCE.")

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TRACK IDLERS

13. TD-20 (SERIES B) ONLY: Install the track frame rear cover (4, Illust. 72).

LOADERS ONLY: Install the front and rear track frame covers (Illust. 44).

14. Lubricate the track idler with the proper grade of lubricant as specified in the operator's manual.

Metal Face Type Seal
(Ref. Nos. Refer to Illust. 50)

1. If bearing replacement was necessary, press a new inner bearing cone (9) on the shaft (small diameter of the taper up) until it bottoms against the shaft shoulder. Press new bearing cups (16 and 8) into the idler body (large diameter of the taper up) until they bottom in the bore.

2. With the shaft (10) in vertical position, place the idler body over the shaft until it rests on the inner bearing assembly and rotate the idler body to seat the bearing.

3. Press the outer bearing cone (5) on the shaft (large diameter of the taper up), leaving it high enough so that it does not come in full contact with the outer cup. As the cone is pressed on, check for end play and install cone until there is a slight end play in the assembly.

NOTE: The outer bearing cone must not be bottomed in its cup upon installation. Final seating of the cone is accomplished when installing the adjusting nut (3).

4. Position the assembly on a bench and support the shaft (outer bearing up) in a vertical position.

5. While keeping the idler body in motion by rotating it, take up on the adjusting nut (3) until the idler body binds and stops rotating. Then back off the nut to the nearest locking position and secure with the cotter pin.

6. Support or hold the idler body and hit the outer end of the shaft to knock the outer cone against the nut. At this point the bearings should not bind but rotate freely.

7. Install a new "O" ring (4) in the groove in the idler body and secure the idler cap (2) to the idler body with the cap screws and washers.

8. Place the idler assembly in a press and using a suitable driver, press the seal retainer (11) (tapered end down) into the idler body until it bottoms.

NOTE: Do not at any time handle the seal (12) with greasy, oily or dirty hands.

9. Before installing the seal assembly be sure the seal contacting surfaces of the idler body bore and seal retainer are clean. Also that the rubber rings of the seal assembly are correctly positioned on the metal rings. Refer to the instructions outlined in the "REASSEMBLY" paragraph under "FRONT IDLER."

10. Install the oil seal assembly into the idler body so the rubber ring with the protruding lip enters the idler body (refer to Illust. 31). Check to be sure that the rubber ring is against the rear face of the seal retainer (11) in the idler bore.

11. Install the "O" ring (13) into the groove on the shaft (10) and lubricate the "O" ring with chassis lubricant.

12. Install the seal retainer (14) on the shaft so that the seal bore of the retainer uniformly envelopes the rubber ring. The retainer is correctly positioned when the snap ring groove in the shaft is exposed. Install the snap ring (15).

13. Clamp the idler assembly in a horizontal position so the lubrication passage and guide pin slot in the ends of the idler shaft are at the top. Apply Permatex No. 2 to the lubrication plug (1). Use only Grade-30, series 3 engine oil to lubricate the track idlers. Insert the lubricator nozzle all the way into the shaft. Pump lubricant in until air is forced out and lubricant backflows freely; then quickly remove the lubricator nozzle and install and torque the lubrication plug to 15-40 ft. -lbs.

14. Install the idler assembly in the idler support (3, Illust. 43) on the track frame, aligning the slot in the idler shaft with the guide pin opening in the support. Drive the guide pin into the support to engage the slot in the idler shaft.

15. Install the washer (16) and the mounting nut (17) on the idler shaft. Torque the mounting nut to 1000-1100 ft. -lbs.

16. Remove the jack and blocking from position on the track frame.

17. Adjust the track tension (refer to "MAINTENANCE," Par. 6).

TRACK ROLLERS

24. DESCRIPTION

Track rollers are attached to the underside of the track frame and carry the weight of the tractor. The rollers are heat-treated steel forgings and rotate around bushings. The rollers are equipped with sealing rings and either cartridge type or metal face type seals which maintain a leak and dirt-proof seal.

The rollers are single and double flange types and should be installed in the positions described in Par. 32, "ARRANGEMENT OF TRACK ROLLERS."

25. MAINTENANCE

Cartridge Type Seal

1. Lubricate the track rollers as instructed in the operator's manual.

2. At regular intervals, inspect the track rollers for traces of leakage, showing faulty or worn oil seals.

26. REMOVAL

1. Release the tension in the track chain.

2. Remove the track roller shield (if equipped).

3. Place jacks under the rigid crossbars or under the equalizer bar on the side of the tractor from which the roller is to be removed. Place a steel plate between the jacks and the rigid bars or equalizer bar to prevent any damage. Run up the jacks until there is sufficient clearance between the track frame and track chain to permit removal of the roller.

4. Remove the cap screws securing the track roller shaft brackets to the underside of the track frame and remove the roller (Illust. 51). A tap with a soft hammer will usually free the roller if it tends to stick in the frame.

NOTE: If there is not enough track chain slack to remove the roller, position two small jacks between the track and track frame. Jack up until sufficient clearance exists to remove the track roller (Illust. 51).

27. DISASSEMBLY

Cartridge Type Seal
(Ref. Nos. Refer to Illust. 53)

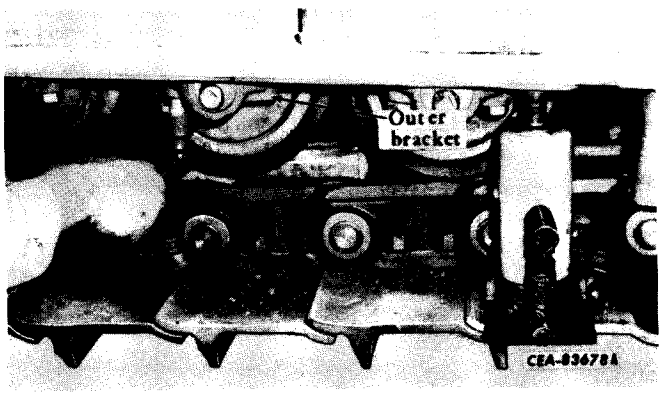
1. Pull the mounting bracket (1) from the locating pins in the oil seal (4). The bracket should be pulled off straight to prevent possible damage to the seal (Illust. 52).

2. Using a punch, straighten the ends of the lock plates (3) and remove the seal mounting screws and lock plates (Illust. 45). Remove the oil seal, thrust washer (15) and sealing ring (14) (Illust. 54).

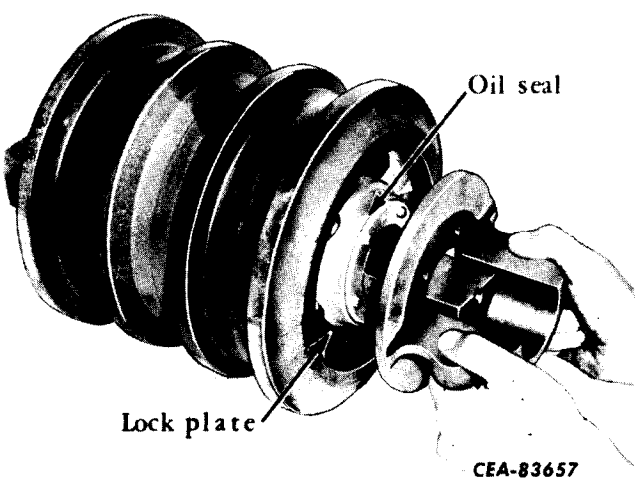
Disassemble the other side of the track roller in the same manner.

3. With parts removed from both sides of the track roller, remove the shaft from the track roller shell and bushings.

4. The bushings (16) are a press-fit into the track roller and, when replacement is necessary, can be pressed from position.

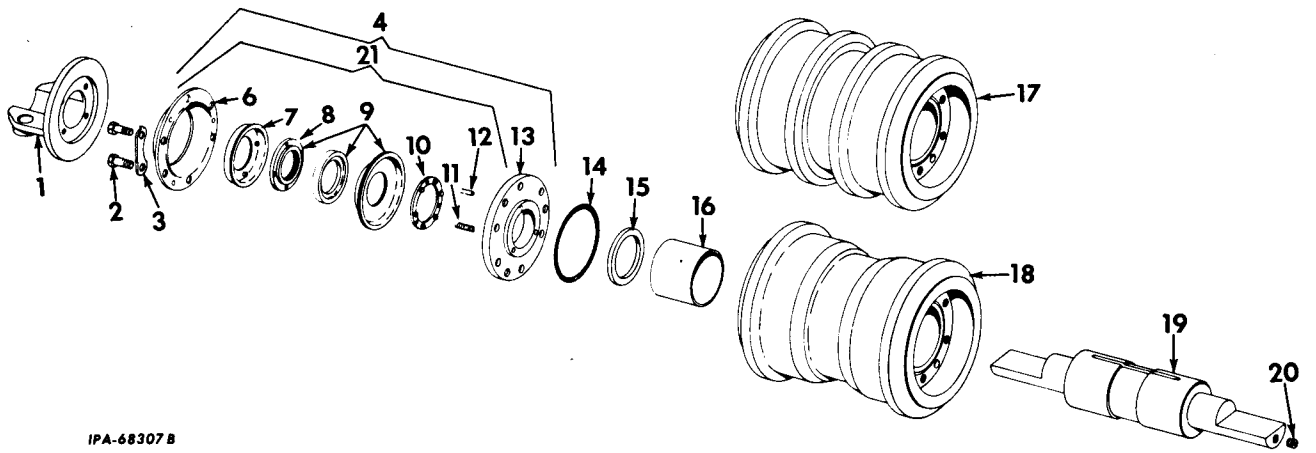


Illust. 51
Disconnecting the Track Roller Outer Mounting Bracket.



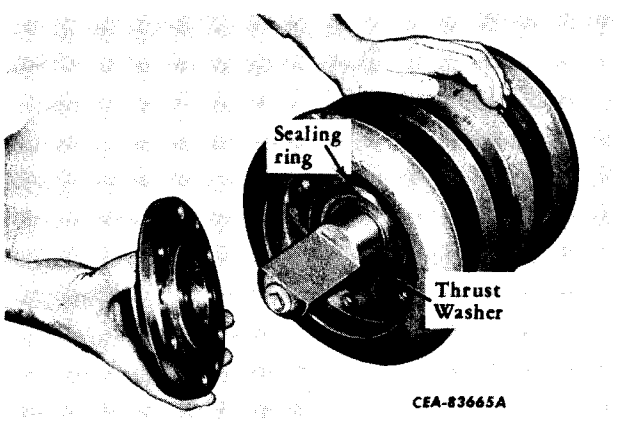
Illust. 52
Removing the Track Roller Mounting Bracket.

TRACK ROLLERS



Illust. 53
Exploded View of Track Roller with Cartridge Type Seal.

1. Inner and outer bracket.
2. Cap screw.
3. Lock plate.
4. Oil seal assembly.
6. Outer shell.
7. Top plate.
8. Gasket.
9. Stator, rotor and back gasket.
10. Spring holder (if equipped).
11. Spring.
12. Pin.
13. Retainer plate.
14. Sealing ring.
15. Thrust washer.
16. Bushing.
17. Double flange roller.
18. Single flange roller.
19. Roller shaft.
20. Plug.
21. Oil seal field service package components.



Illust. 54
Removing the Track Roller Oil Seal.

Metal Face Type Seal
(Ref. Nos. Refer to Illust. 55)

1. Drive out the spring pin (if equipped) securing the brackets (1) on each side of the shaft (11). Remove the brackets (1) with the "O" rings (2) and the stators of the oil seals (3). Discard the "O" rings. Remove the seal stators from the brackets and discard the rubber rings.

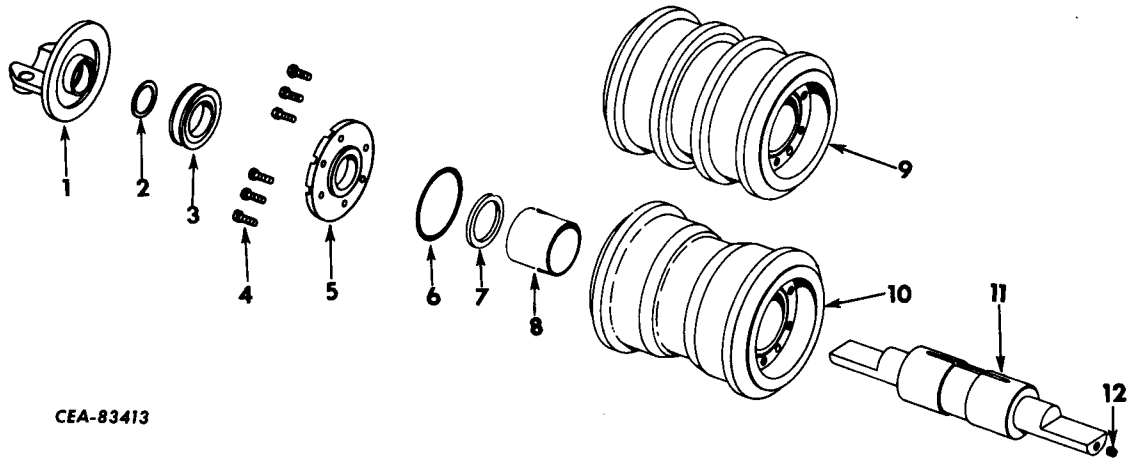
2. Remove the cap screws (4) and the washers securing the seal retainers (5) to each side of the roller body and remove the retainers with the rotors of the seals (3). Remove the sealing rings (6) located in the grooves of the roller body. Discard the sealing rings (6). Remove the seal rotors from the retainers and discard the rubber rings.

(Continued on next page)

TRACK ROLLERS

27. DISASSEMBLY - Continued

Metal Face Type Seal - Continued
(Ref. Nos. Refer to Illust. 55)



Illust. 55
Exploded View of Track Roller with Metal Face Type Seal.

1. Shaft bracket.
2. "O" ring.
3. Oil seal.
4. Retainer bolts.
5. Seal retainer.
6. Sealing ring.
7. Thrust washer.
8. Bushing.
9. Double flange roller.
10. Single flange roller.
11. Roller shaft.
12. Lubrication plug.

NOTE: Keep original mated metal rings as a set. Do not mix a metal ring from the oil seal on one side of the roller with a metal ring from the oil seal on the opposite side of the roller.

3. Remove the thrust washers (7). With parts removed from both sides of the roller body, remove the shaft (11) from the roller body and bushings (8).

4. The bushings (8) are a press fit into the roller body. When replacement is necessary, they can be pressed from position.

28. INSPECTION AND REPAIR

1. Clean all parts with a solvent and dry with compressed air. Clean and flush out the bore of the track roller, as well as the oil passages in the roller shaft.

2. Inspect the roller shafts, bushings and rollers for cracks, scores or excessive wear. (Refer to Par. 3, "SPECIFICATIONS.") Refer to Par. 30, "REASSEMBLY" for installing new bushings.

3. Inspect the sealing rings for wear or damage and replace if necessary. Check the thrust washers for wear and, if worn beyond the limits given in Illust. 56, replace with new.

4. Check the end clearance and diametral clearance given in Illust. 56. A 0.015 inch oversize thrust washer is available for service to maintain the end clearance given in Illust. 56. Oversize track roller bushings (0.030 inch) are available for service to maintain the diametral clearance given in Illust. 56. Before installing oversize bushings, the track roller bores must be machined to the correct dimension shown in Par. 3, "SPECIFICATIONS." A final check of the roller end clearance will be made with a dial indicator after the track roller has been assembled.

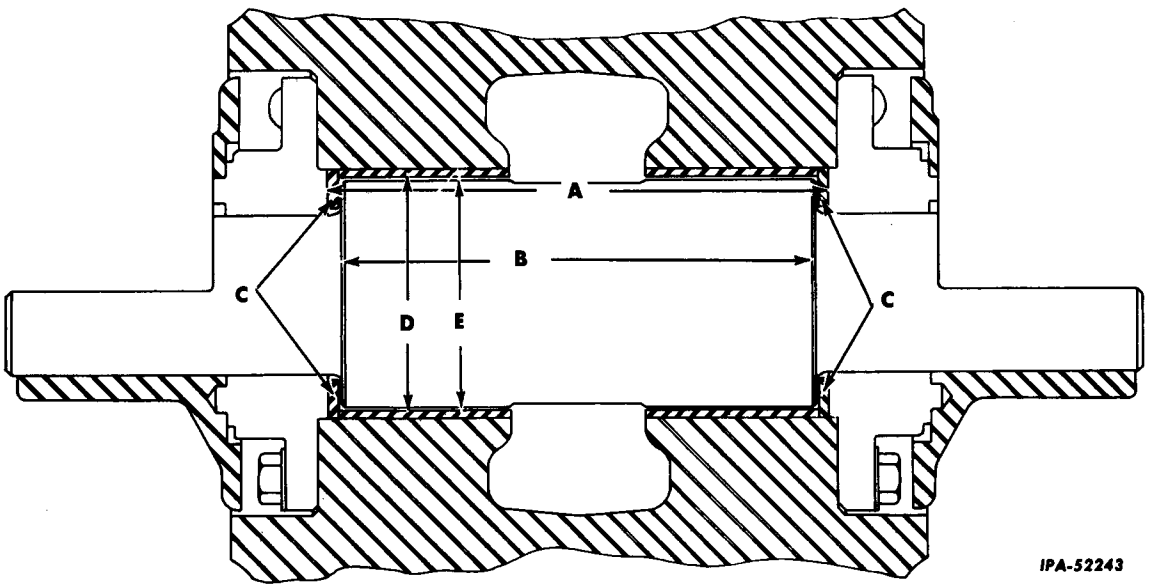
5. CARTRIDGE TYPE SEAL ONLY: Inspect the oil seals for wear, damage or leaks. The components of the cartridge type seal are serviceable. (Refer to "TRACK ROLLER OIL SEAL REPAIR," Par. 29.)

TRACK ROLLERS

6. METAL FACE TYPE SEAL ONLY: Whenever the track roller is disassembled, the oil seal must be rebuilt or replaced with a new seal. Follow the instructions outlined in the "INSPECTION AND REPAIR" paragraph under "FRONT IDLER" for determining if the seal is acceptable for rebuild and for rebuilding the seal.

Clearance Limits for Track Roller Bushings

A - Distance between oil seal retainer surfaces.
B - Width of roller shaft bushing surface.
C - Thrust washer thickness.
D - Bushing inside diameter (assembled).
E - Roller shaft diameter.



Illust. 56
Track Roller Bushing Clearances.

	A	B	C	D	E
Track Roller Dimensions	7.934 to 7.946	7.666 to 7.672	.122 to .125	3.392 to 3.398	3.385 to 3.387
Diametral Clearance	"D" Minus "E" = .005 to .013				
End Clearance	"A" Minus "B" and "C" = .012 to .036				

TRACK ROLLERS

29. TRACK ROLLER OIL SEAL REPAIR (CARTRIDGE TYPE)

The components of the cartridge type oil seal are serviceable. Use the following instructions for rebuilding this seal.

Disassembly

1. Put supports under the retainer plate and punch out three rivets.

2. Carefully remove the oil seal housing assembly from the retainer plate.

3. Press the inner assembly out from the oil seal housing. Remove the individual parts.

Inspection and Repair

NOTE: Cleanliness is of the utmost importance in assembling the track roller oil seal. It is therefore suggested that the assembly of the oil seal be done in the injection pump room. When handling the rotor or the stator, handle only the outer edges of these parts to prevent dirt smudges. Wipe them clean with a lint-free cloth and coat both sealing surfaces with a light engine oil.

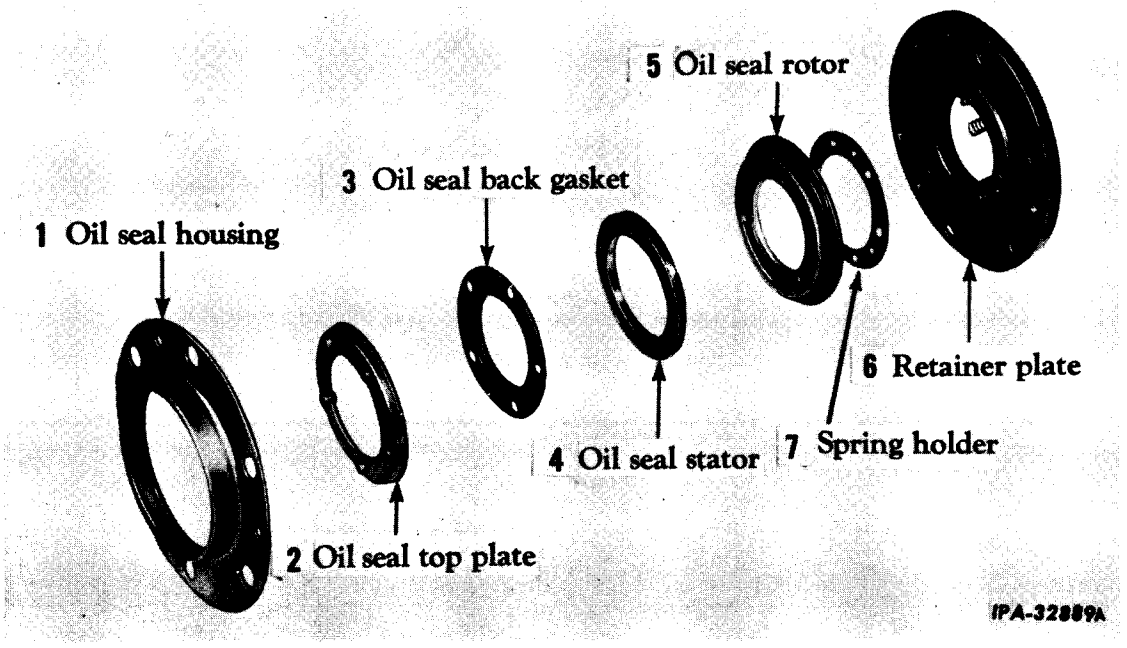
NOTE: Do not drop or mis-handle the rotor or stator, as these surfaces have been very closely lapped.

Reassembly (Ref. Nos. Refer to Illust. 57)

1. Set the retainer plate (6) over the base of the assembly tool, 1 020 328 R91. Install the springs into the retainer plate and position the spring holder (7), if equipped, on the springs. Put the rotor (5) over the retainer plate, being sure that the holes in the rotor line up with the pins in the retainer plate.

2. Assemble the gasket (3), top plate (2) and the stator (4) together. Place these assembled parts on the surface of the rotor (5).

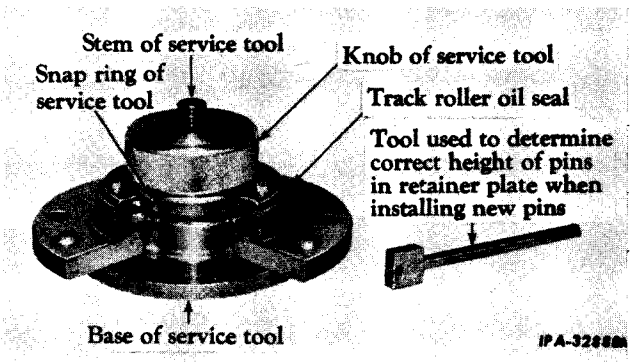
3. Assemble the knurled knob and snap ring assembly (Illust. 58) to the threaded stem of the assembly tool and tighten to bring the assembled parts down to the proper operating height on the retainer plate. The rubber diaphragm portion of the rotor should meet the retainer plate. Run a finger around the rubber diaphragm portion of the rotor to be sure that the diaphragm is riding on the outside shoulder of the retainer plate.



Illust. 57
Track Roller Oil Seal Assembly.

4. Assemble the oil seal housing (1) over the assembled parts, peen three button head rivets over the counterbored holes of the retainer plate. Remove the assembly tool.

NOTE: When installing the new track roller oil seal anchor pins into the retainer plate, be sure that the pins are pressed in to the correct height by using the tool as shown in Illust. 58. Start the pins into the retainer plate. Place the tool over the pin and tap the pin into the retainer plate until it is flush with the top face of the tool.



Illust. 58
Cut-away View of Service Tool and Track Roller Oil Seal.

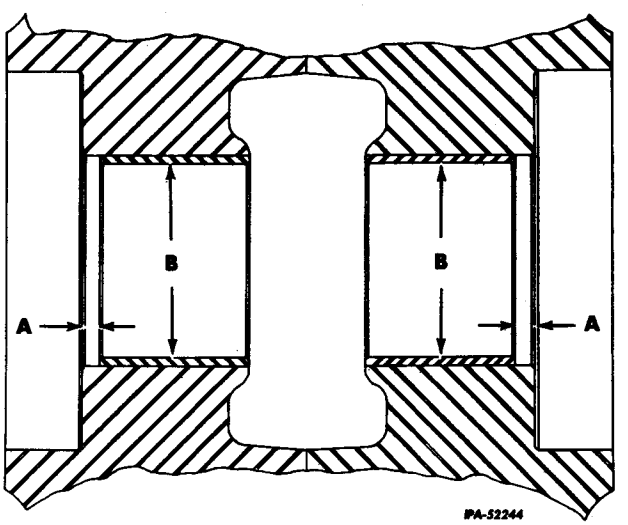
30. REASSEMBLY

NOTE: Under no circumstances should a metal face type seal and a cartridge type seal be intermixed on the same track roller.

1. Apply a thin coat of Grade "AA" Loctite to the bushings. Press the bushings into the track roller and position the bushings as indicated in Illust. 59.

NOTE: If installing oversize bushings be sure the track roller bores have been machined to the dimension shown in Par. 3, "SPECIFICATIONS."

		Dimension
A	Bushing pressed in below edge of track roller bore, inch	.278 to .303
B	Bushing inside diameter (Assembled), inches	3.392 to 3.398



Illust. 59
Track Roller and Bushing.

Cartridge Type Seal
(Ref. Nos. Refer to Illust. 53)

2. With the bushings assembled in the roller body, install the sealing ring (14) in one side of the roller body.

NOTE: The stator gasket in each of the oil seals (gasket that contacts roller shaft) must be adequately lubricated with the same type oil that is used in the roller assembly just prior to installing the seal on the roller shaft.

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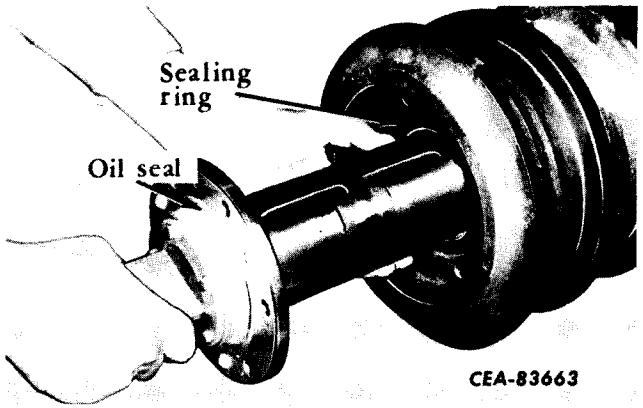
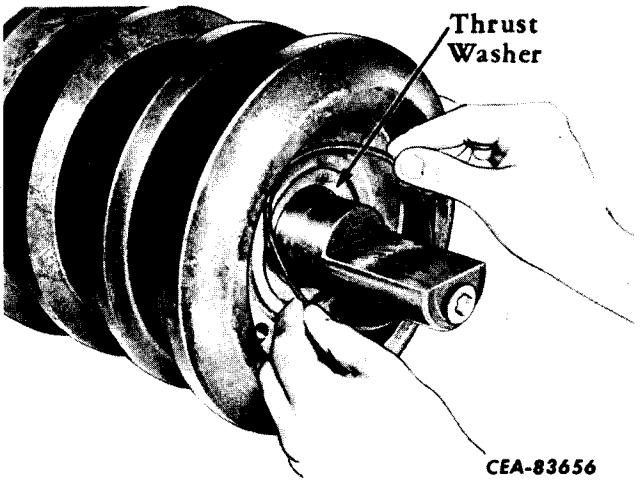
TRACK ROLLERS

30. REASSEMBLY - Continued

Cartridge Type Seal - Continued
(Ref. Nos. Refer to Illust. 53)



Illust. 60
Installing the Shaft with Oil Seal and Thrust Washer.



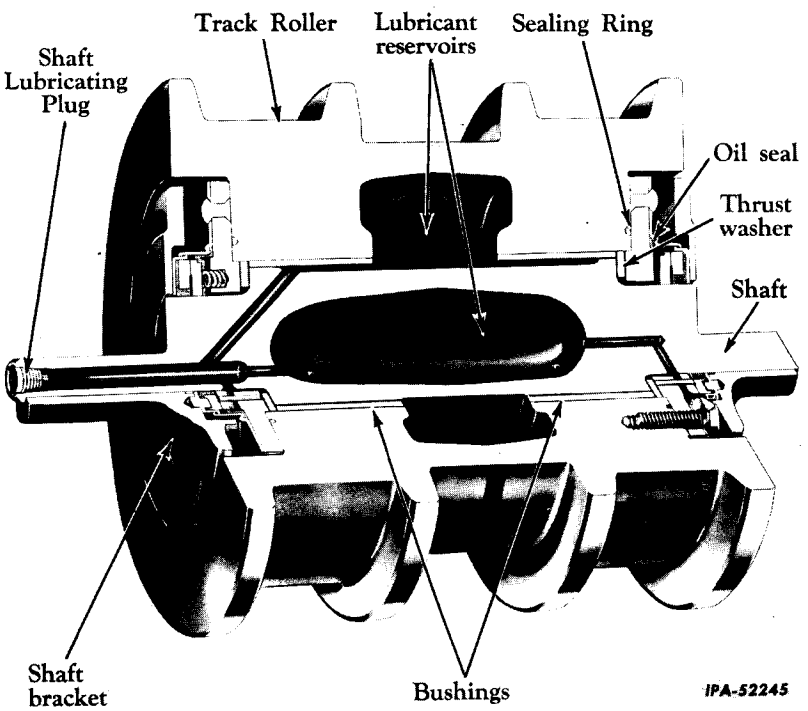
Illust. 61
Installing the Sealing Ring in the Roller Body.

3. Position the thrust washer (15) and oil seal (4) on the shaft and insert the other end of the shaft into the roller body (Illust. 60).

NOTE: As the shaft and oil seal are positioned be sure that the sealing ring (14) has remained in the groove of the roller body.

4. Secure the oil seal using the cap screws and lock plates (2 and 3). Torque the cap screws to 80-90 ft. -lbs.

5. Install the thrust washer (15), sealing ring (14) and oil seal (4) on the opposite side (Illust. 61). Torque the cap screws to 80-90 ft. -lbs.

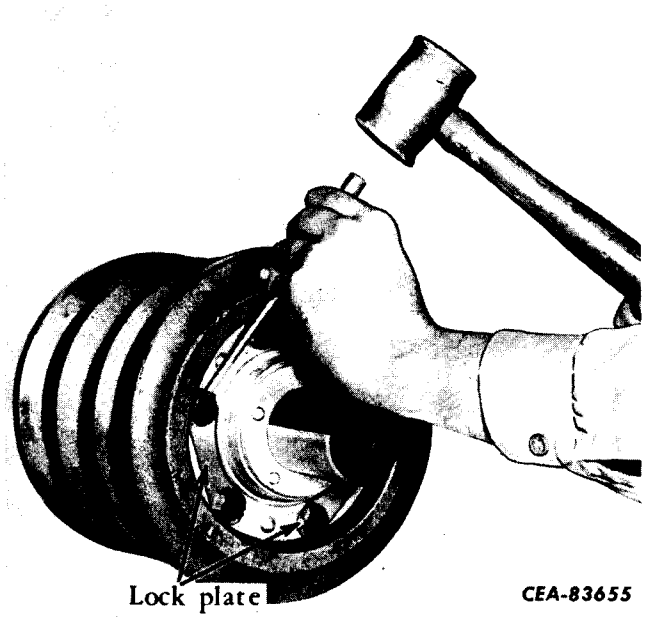


Illust. 62
Cut-away of Track Roller Assembly with Cartridge Type Seal.

TRACK ROLLERS

6. Check that the track roller end clearance is within the tolerance given in Par. 3, "SPECIFICATIONS." From the side of the roller the dial indicator is to be mounted, push the roller shaft into the body to be sure it is bottomed against the thrust washer. Place the dial indicator magnetic base on the roller body with the indicator pointer resting against the end of the shaft. Set the indicator at zero. Keeping pressure against the roller body, pull on the shaft until it bottoms and take a reading. If the reading obtained is below specification, check the measured surfaces (A, B, C, Illust. 56) for squareness. If above specification, check parts for excessive wear.

7. Bend the tabs of the lock plates over the cap screw heads on each side of the roller body (Illust. 63).



Illust. 63
Securing the Cap Screw with Lock Plate.

8. If the lubricating plug (20) was removed, it must be installed in the end of the shaft finger tight. Final torque will be applied after lubrication.

9. Install the inner and outer shaft brackets (1) on the ends of the track roller shaft engaging the openings in the brackets with seal pins.

NOTE: Do not lubricate the track roller assembly until it is in its proper operating position on the tractor.

Metal Face Type Seal
(Ref. Nos. Refer to Illust. 55)

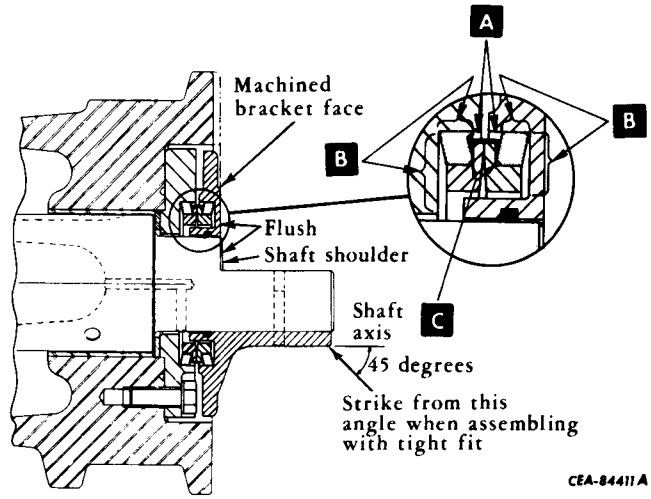
NOTE: Do not at any time handle this seal with greasy, oily or dirty hands. The track rollers must not be filled with lubricant until the rollers and track frame are in position on the tractor.

NOTE: New roller assemblies have the seal retainers and the exposed portion of the shaft "Nox-Rusted." All "Nox-Rust" must be thoroughly removed from these parts with a good cleaning solvent before the new seal is assembled in the track roller.

2. Before installing the seal assembly, thoroughly clean the surfaces of the seal retainer and track roller shaft bracket that will contact the rubber rings of the seal. These surfaces are indicated by (A and B, Illust. 64). Clean these surfaces with a non-flamable solvent to remove all oil and wipe dry.

Corrosion or hardened foreign material may exist on the area of the surfaces (A, Illust. 64) that have not been in contact with the rubber rings of the former seal. Using coarse paper, a file or a hand grinder, remove the corrosion or hardened material on the entire circumference. Do this carefully to avoid changing the

(Continued on next page)



Illust. 64
Cross-section of Track Roller (with Metal Face Type Seal).

30. REASSEMBLY - Continued

Metal Face Type Seal - Continued
(Ref. Nos. Refer to Illust. 55)

dimensions of the bore. Do not contact surfaces (B, Illust. 64) when removing the corrosion.

3. Use the lint-free wiper (furnished with the new seal or rebuild package) to remove all final traces of oil or grease from the rubber ring contact surfaces within the seal retainer and roller shaft bracket.

NOTE: A plastic unitization band holds this seal together for assembly into the roller. DO NOT REMOVE THIS BAND. This band will automatically disintegrate after several hours of operation.

4. A close look at the seal will reveal that one of the rubber rings has a small protruding lip around its outer diameter. This is used to correctly position the seal in the roller (Illust. 25). Before installing the seal, carefully check the following:

BE SURE THE:

(a) Rubber rings are in the correct position on the metal rings (refer to Illust. 31).

(b) Rubber rings are seated completely, and are flush against the inside shoulder of the metal rings (refer to C, Illust. 64).

(c) Rubber rings are completely free of dirt, oil or grease.

5. Install the thrust washer (7) in the roller bore. Install the sealing ring (6) in the groove of the roller body. Apply "Loctite" (Type A) to the retainer bolts and secure the seal retainer to the roller body using 96-108 ft. -lbs. torque.

6. Insert the shaft (11) into the roller body so the end of the shaft with the lubrication plug (12) is on the same side as the two 21/32" drilled holes in the roller body.

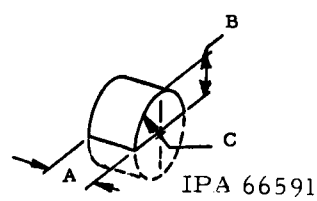
7. Assemble the thrust washer, sealing ring and seal retainer on the opposite side of the roller body as was done in step 5.

8. Check that the track roller end clearance is within the tolerance given in Par. 3, "SPECIFICATIONS." From the side of the roller the dial indicator is to be mounted, push the roller shaft into the body to be sure it is bottomed against the thrust washer. Place the dial indicator magnetic base on the roller body with the indicator pointer resting against the end of the shaft. Set the indicator at zero. Keeping pressure against the roller body, pull on the shaft until it bottoms and take a reading. If the reading obtained is below specification, check the measured surfaces (A, B, C, Illust. 56) for squareness. If above specification, check parts for excessive wear.

9. Install the seal assembly (3) in the seal retainer so the rubber ring with the protruding lip enters the retainer (refer to Illust. 31). Check to be sure that the rubber ring is against the rear face of the seal retainer.

10. Install the "O" ring (2) into the groove on the inside of the roller shaft bracket (1) and lubricate the "O" ring with chassis lubricant.

NOTE: To prevent the possibility of damaging the "O" ring (2) on the stepped section of the roller shaft as the bracket (1) is installed and to insure correct alignment of the bracket with the seal lip, construct a wooden or metal installing block as shown in Illust. 65 to fit on the flat of the roller shaft.



Illust. 65
Installing Block (Used with Metal Face Type Seal).

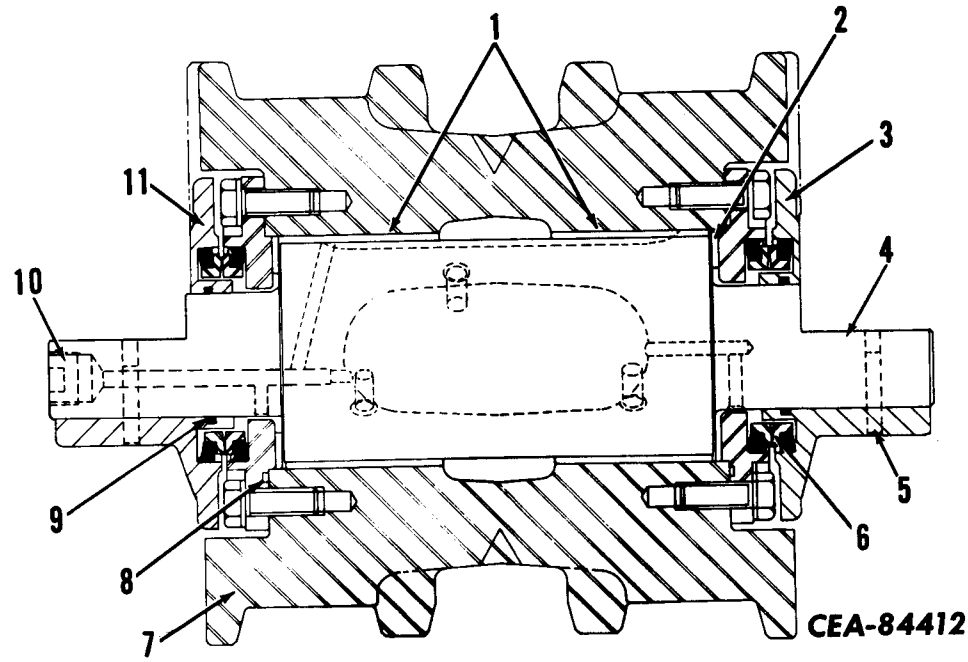
	A	B	C	General
See Illust. 65	3-3/16"	29/32"	1-11/64" radius	Break and polish all corners

11. Install the shaft bracket (1) on the shaft. As the bracket is moved inward on the shaft, be sure the seal bore of the bracket uniformly envelopes the rubber ring. If the bracket is a tight fit on the shaft, strike the bracket at a 45 degree angle to the shaft axis (Illust. 64) to avoid cocking. On roller assemblies equipped with spring pin (5, Illust. 66), be sure to align the pin hole in the bracket and shaft as the

TRACK ROLLERS

bracket is installed and to peen over the bracket casting once the spring pin is in place. On roller assemblies without the spring pin (5, Illust. 66), special holding clamps as described in Par. 31 "INSTALLATION" must be used to retain the bracket (1) in the fully seated position until the seal on each side is installed and the roller is assembled to the track frame.

12. Repeat steps 9, 10 and 11 for installing the seal assembly (3), "O" ring (2) and shaft bracket (1) on the other side of the shaft.

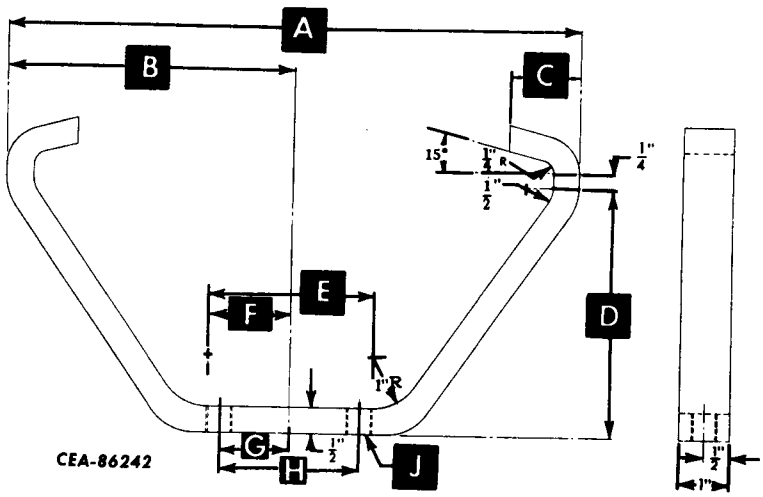


Illust. 66
Cross-section of Track Roller Assembly with Metal Face Type Seal.

1. Bushings.
2. Thrust washer.
3. Shaft inner bracket.
4. Track roller shaft.
5. Spring pin (if equipped).
6. Oil seal.
7. Roller body.
8. Sealing ring.
9. "O" ring.
10. Lubrication plug.
11. Shaft outer bracket.

TRACK ROLLERS

31. INSTALLATION



Illust. 67
Special Holding Clamp (2 Required).

See Illust. 67	A	B	C	D	E	F	G	H	J
	11-1/4"	5-5/8"	1-3/8"	4-7/8"	3-1/4"	1-5/8"	1-3/8"	2-3/4"	3/8-16 UNC

1. METAL FACE TYPE SEAL WITHOUT SPRING PIN: Two special holding clamps must be constructed as shown in Illust. 67 to maintain the shaft brackets in the fully seated position obtained in reassembly. Place these clamps on the assembled roller as shown in Illust. 68 until both roller brackets are contained within the track frame. THE MACHINED FACE OF THE BRACKET MUST BE KEPT FLUSH WITH THE SHAFT SHOULDER (Illust. 64) UNTIL THE ROLLER IS INSTALLED.

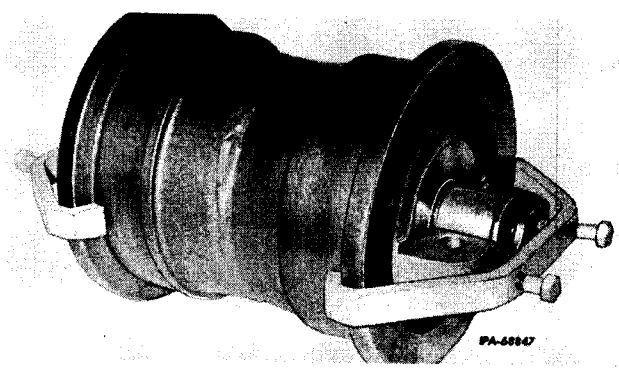
NOTE: METAL FACE TYPE SEAL: Clean the inside and lower faces of the track frame inner and outer rails in the areas that contact the brackets when the roller assembly is in position.

2. Place the track roller in position under the track frame, with the lubricating plug to the outside, and secure the roller shaft brackets to the track frame (Illust. 51).

NOTE: When securing the track roller shaft bracket to the track frame, install the forward cap screw with just enough force to bring the bracket in contact with the bottom of the track frame. Install the rear cap screw completely and torque. Apply full torque to the front cap screw.

3. Remove any jacks between the track and track frame. Remove the jacks below the rigid cross bars or equalizer bar, lowering the rollers onto the track.

4. Apply "LOCTITE" Grade "B" to the track roller shield spacer bolt threads and install the



Illust. 68
Holding Clamp Installed.

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TRACK ROLLERS

track roller shield (if equipped) using 160-180 ft. -lbs. torque. Adjust the track tension as described in Par. 6,"MAINTENANCE. "

5. CARTRIDGE TYPE SEAL: Lubricate the track rollers as described in the operator's manual.

METAL FACE TYPE SEAL: Apply Permatex No. 2 to the lubrication plug threads and keep it ready for installation. When re-using a plug, clean the plug before applying new Permatex to assure a tight seal. Use only Grade-30, series 3 engine oil to lubricate the track rollers. Insert the lubricator nozzle all the way into the shaft. Pump lubricant in until air is forced out and lubricant backflows freely. Then quickly remove the lubricator nozzle and install and torque the lubrication plug to 15-40 ft. -lbs.

32. ARRANGEMENT OF TRACK ROLLERS

The seven-roller track frame uses four double-flange and three single-flange track rollers on each side of the tractor. The six-roller track frame uses three double-flange and three single-flange track rollers on each side. Refer to the following "Track Roller Chart" for proper location of track rollers.

Track Roller Chart

Type of Track	Roller Location						
	7	6	5	4	3	2	1
6 Roller		D	S	D	S	D	S
7 Roller	D	S	D	S	D	S	D
S - Single Flange Roller							
D - Double Flange Roller							

TRACK FRAME GUIDE (TD-20 SERIES B TRACTOR)

33. DESCRIPTION

The track frame guides allow the track frames to oscillate vertically on guide plates. The guide plates are secured to the guide bracket (welded part of front frame) by six cap screws. The wear plates and guide spacers are secured between the track frame and guide retainer by four cap screws (Illust. 69 or 70).

34. REMOVAL

(Refer to Illust. 69 or 70)

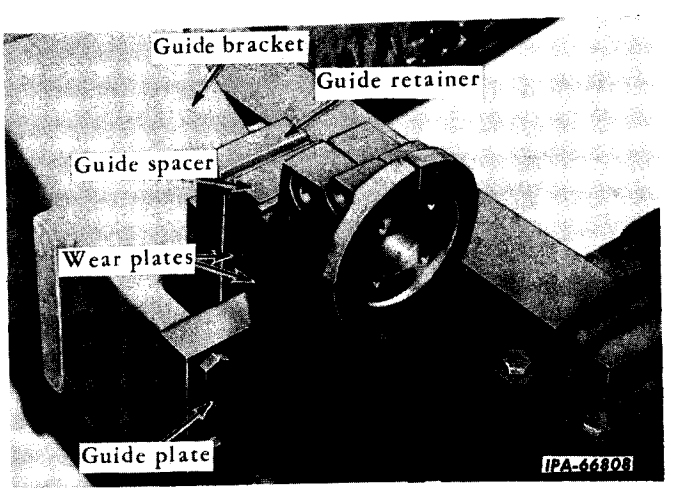
1. Remove the four cap screws securing the guide retainer, wear plates and spacer to the track frame. Remove these parts.

2. Remove the six cap screws securing the guide plate to the guide bracket. Remove the guide plate and shims (if equipped) and the outer wear plate. If equipped with shims, they must be kept with the guide plate to facilitate proper installation.

35. INSPECTION AND REPAIR

1. Inspect the wear plates and guide plate for damage or excessive wear. If either of these parts are worn more than 1/8 inch, they must be replaced. Refer to Par. 3, "SPECIFICATIONS," for the dimensions of the parts when new.

2. Check the guide bracket for a broken weld. Any track frame guide parts that are damaged must be replaced with new parts.



Illust. 69
Track Frame Guide (Removable Cover Type Track Frame).

TRACK FRAME GUIDE
(TD-20 SERIES B TRACTOR)

36. INSTALLATION

(Refer to Illust. 69 or 70)

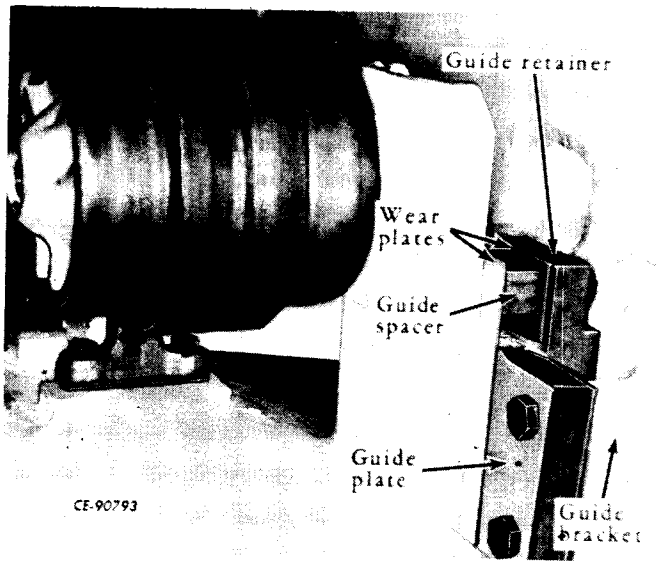
NOTE: If equipped with shims (30, Illust. 72) or (8, Illust. 73), the same shim thickness that was removed must be reinstalled between the guide plate and bracket.

1. Secure the guide plate to the guide bracket with the six cap screws using 525-600 ft. -lbs. torque.

NOTE: Before installing the track frame guide retainer cap screws, apply "LOCTITE" Grade "B" to the cap screw threads.

2. Place a cap screw in the two upper holes of the guide retainer. Position the inner wear plate on the cap screws and up against the guide retainer. Lower the guide retainer and wear plate between the guide plate and guide bracket with the cap screws rest on the guide bracket.

3. Working from underneath the tractor, position the outer wear plate between the guide plate and track frame and position the lower guide spacer between the wear plates. Use a punch to line up the mounting holes in the guide retainer, wear plates and lower spacer.



Illust. 70
Track Frame Guide (Enclosed Spring Type Track Frame).

Lift the assembly until the punch lines up with the mounting hole in the track frame. This will position the assembly until the top mounting cap screws can be installed. Position the upper guide spacer between the wear plates and secure the assembly at the top to the track frame. Secure the bottom of the assembly to the track frame with the cap screws. Torque the guide retainer cap screws to 880-990 ft. -lbs.

EQUALIZER BAR
(TD-20 SERIES B TRACTOR)

37. DESCRIPTION

The equalizer bar supports the front of the track and permits free track oscillation. The equalizer bar is fitted with a bushing to take the wear as the track frames oscillate. The ends of the equalizer bar ride on hardened pads inserted into the track frames. The equalizer bar pivot shaft is free to rotate on bushings fitted in the equalizer bar support (welded part of the front frame). The pivot shaft is held in the support at each end with a retaining plate. Earlier machines are equipped with a fixed pivot shaft which is secured with a locking pin to the equalizer bar support.

38. REMOVAL AND DISASSEMBLY

(Ref. Nos. Refer to Illust. 71)

1. Remove the track chain from one side of the tractor. (Refer to "REMOVAL," Par. 7.)

2. Jack the front of the tractor until all the weight is off the front of the track frames.

3. Remove the 14 cap screws securing the front access hole cover at the bottom of the tractor front frame.

4. Remove the eight cap screws securing the center access hole cover to the bottom of the front frame.

EQUALIZER BAR
(TD-20 SERIES B TRACTOR)

5. FIXED PIVOT SHAFT ONLY: Reach in through the front access hole and drive the locking pin (4) from the pivot shaft (5). Remove the pivot shaft from the equalizer bar and support.

FLOATING PIVOT SHAFT ONLY: Reach in through the center and front access holes and remove the cap screws securing the pivot shaft retaining plates (9) to the equalizer bar support and remove the plates. Insert a puller screw in the tapped hole in the end of the pivot shaft (7) and pull the pivot shaft from the equalizer bar and support. Remove the spacer or spacers (8) (if equipped).

6. Remove the rebound brackets (1) and shims (2) from the track frames. Keep the shims attached to the brackets for proper reassembly.

7. Move the equalizer bar out toward the side of the tractor, where the track chain was removed, until a hoist can be attached near the pivot point. Remove the equalizer bar from the side of the tractor.

8. If replacement is necessary, the bushing (6) in the equalizer bar must be pressed out.

9. FLOATING PIVOT SHAFT ONLY: The pivot shaft bushings located in the equalizer bar support can be easily removed if replacement is necessary.

39. INSPECTION AND REPAIR

1. Clean all parts thoroughly.

2. Check the equalizer bar hub and the pads on the ends of the bar for broken welds.

3. Inspect the bushing in the equalizer bar, the bushings in the equalizer bar support, if equipped, and pivot shaft for excessive wear and replace if necessary. For the dimensions of the parts when new, refer to Par. 3, "SPECIFICATIONS."

4. Check the equalizer bar pads in the track frame for excessive wear and replace if necessary.

5. Any damaged parts must be replaced.

40. REASSEMBLY AND INSTALLATION

(Ref. Nos. Refer to Illust. 71)

1. If the equalizer bar bushing (6) was removed, be sure the new one is properly installed. The bushing should be packed with a good grade of chassis lubricant and pressed into the bar until it is flush with the ends of the bar hub.

2. FLOATING PIVOT SHAFT ONLY: If the pivot shaft bushings were removed from the equalizer bar support, the new bushings must be installed flush with the inner edge of the chamfer in the support bore.

3. With the aid of a lifting device, position the equalizer bar in the tractor front frame. Align the opening in the equalizer bar support with the equalizer bar hub.

4. FIXED PIVOT SHAFT ONLY: Install the pivot shaft (5) through the center access hole. The pivot shaft must be installed so the pin opening in the shaft is toward the front of the tractor and is aligned with the pin opening in the equalizer bar support. Reach in through the front access hole and drive the spring pin (4) through the equalizer bar support and pivot shaft (5).

FLOATING PIVOT SHAFT ONLY: Install the pivot shaft (7) through the center access hole. Tap the pivot shaft through the equalizer bar support and equalizer bar until the spacer or spacers (8), if equipped, can be positioned on the shaft. Then continue to tap the shaft into the front hub of the equalizer bar support. Se-

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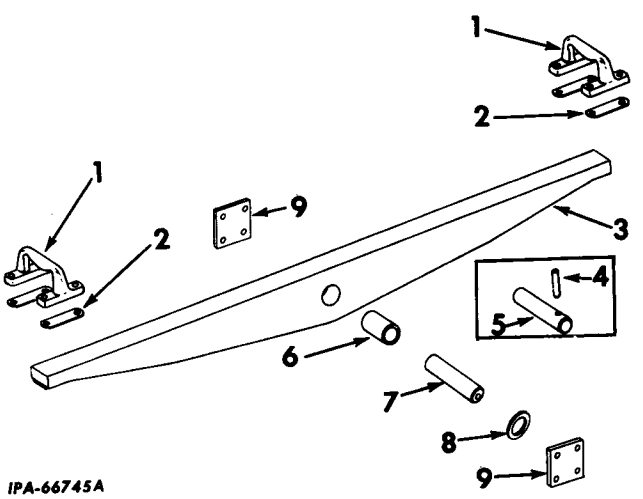

Illust. 71
Exploded View of the Equalizer Bar.

1. Rebound brackets.
2. Bracket shims.
3. Equalizer bar.
4. Locking pin.
5. Fixed pivot shaft.
6. Bushing.
7. Floating pivot shaft.
8. Spacer (if equipped).
9. Retaining plate.

EQUALIZER BAR (TD-20 SERIES B TRACTOR)

40. REASSEMBLY AND INSTALLATION - Continued

(Ref. Nos. Refer to Illust. 71)

cure the retaining plate (9) to the equalizer bar support at each end of the pivot shaft.

NOTE: Spacers (8) may have been needed on machines converted from the fixed pivot shaft to the floating pivot shaft type equalizer bar mounting. On these machines, the same number of spacers removed must be reinstalled between the equalizer bar support and the front side of the equalizer bar to maintain a 1/8 inch maximum back and forth movement of the equalizer bar. Measure for the 1/8 inch maximum clearance between front of bar and hub of the equalizer bar support with the back side of the bar touching the machined pads on the track frame guide bracket (Illust. 69).

5. Install the front and center access hole covers to the bottom of the tractor front frame and secure with cap screws.

6. Remove the lifting device from the equalizer bar. Lower the front end of the tractor and remove the jack.

7. Be sure the equalizer bar pads in the track frames are in place. Install the shims (2) and rebound brackets (1) and secure with cap screws.

8. Check the clearance between the top of the equalizer bar and bottom of the rebound bracket. A minimum clearance of 1/8 inch must be maintained to prevent damaging the rebound bracket during operation. Add shims (2), if necessary, under the rebound bracket.

9. Install the track chain. (Refer to "INSTALLATION," Par. 9.)

10. Adjust the track tension. (Refer to "MAINTENANCE," Par. 6.)

TRACK FRAME (TD-20 SERIES B TRACTOR)

41. REMOVAL AND DISASSEMBLY

(Ref. Nos. Refer to Illust. 72 or 73)

Legend for Illust. 72.

1. Spacer shims.
1A. Pivot shaft spacer.
2. Pivot shaft.
3. Pivot shaft cap.
4. Rear cover.
5. Retainer cap screw.
6. Guide retainer.
7. Guide plate cap screw.
8. Guide wear plate.
9. Guide plate.
10. Guide spacer.
11. Equalizer bar pad.
12. Track frame.
13. Cover cap screw.
14. Pivot shaft cover.
15. Pivot shaft wear plate.
16. Thrust plate cap screws.
17. Thrust plate.
18. Pivot shaft shims.
21. Pivot shaft outer bushing.
22. Pivot shaft inner bushing.
24. Oil seal.
25. Oil seal sleeve.
26. Spring rear seat.
27. Track spring.
28. Spring front seat.
29. Oil filler plug.
30. Guide plate shims (if equipped).
31. Track roller shaft bracket spacer (if equipped).

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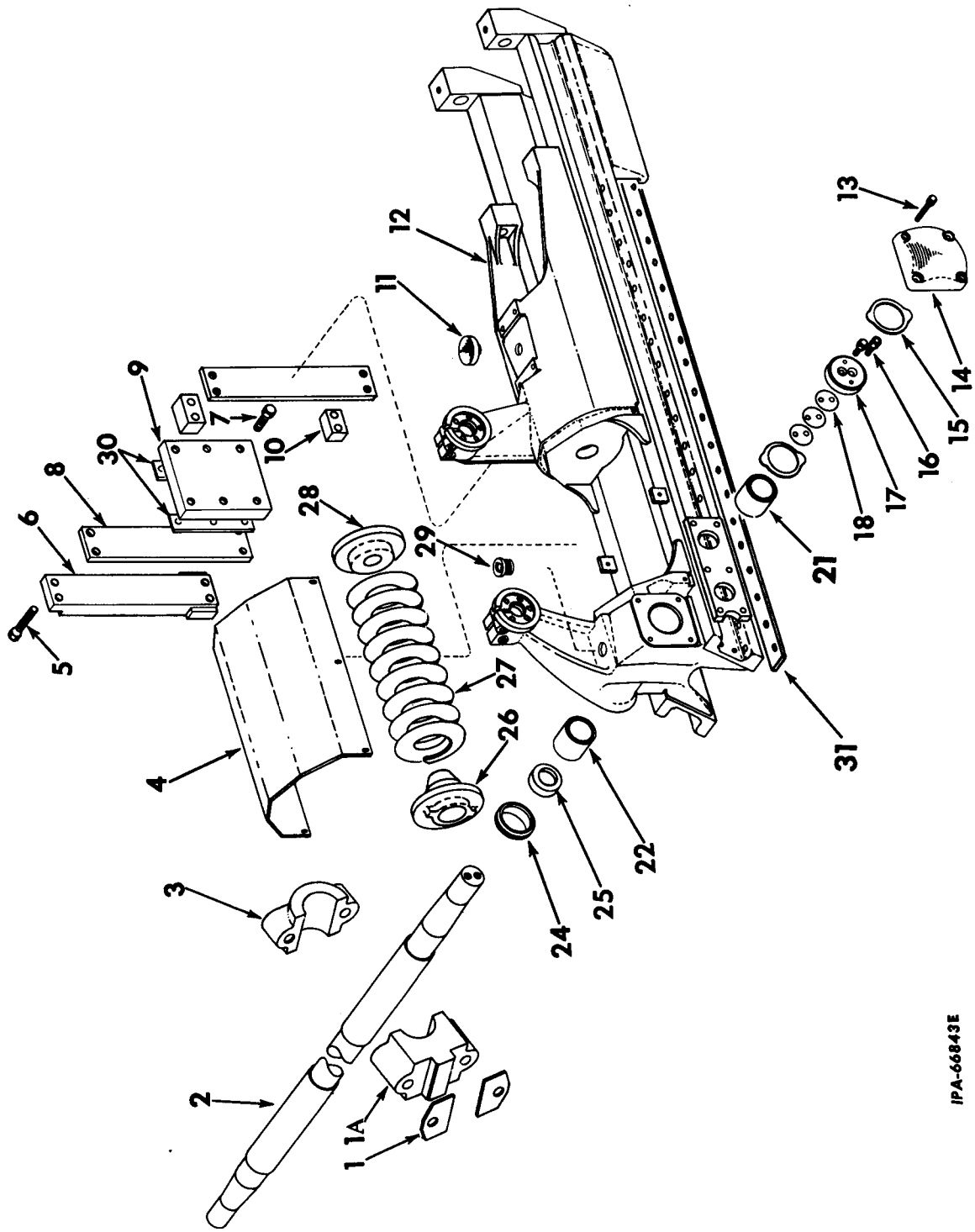
TRACK FRAME
(TD-20 SERIES B TRACTOR)

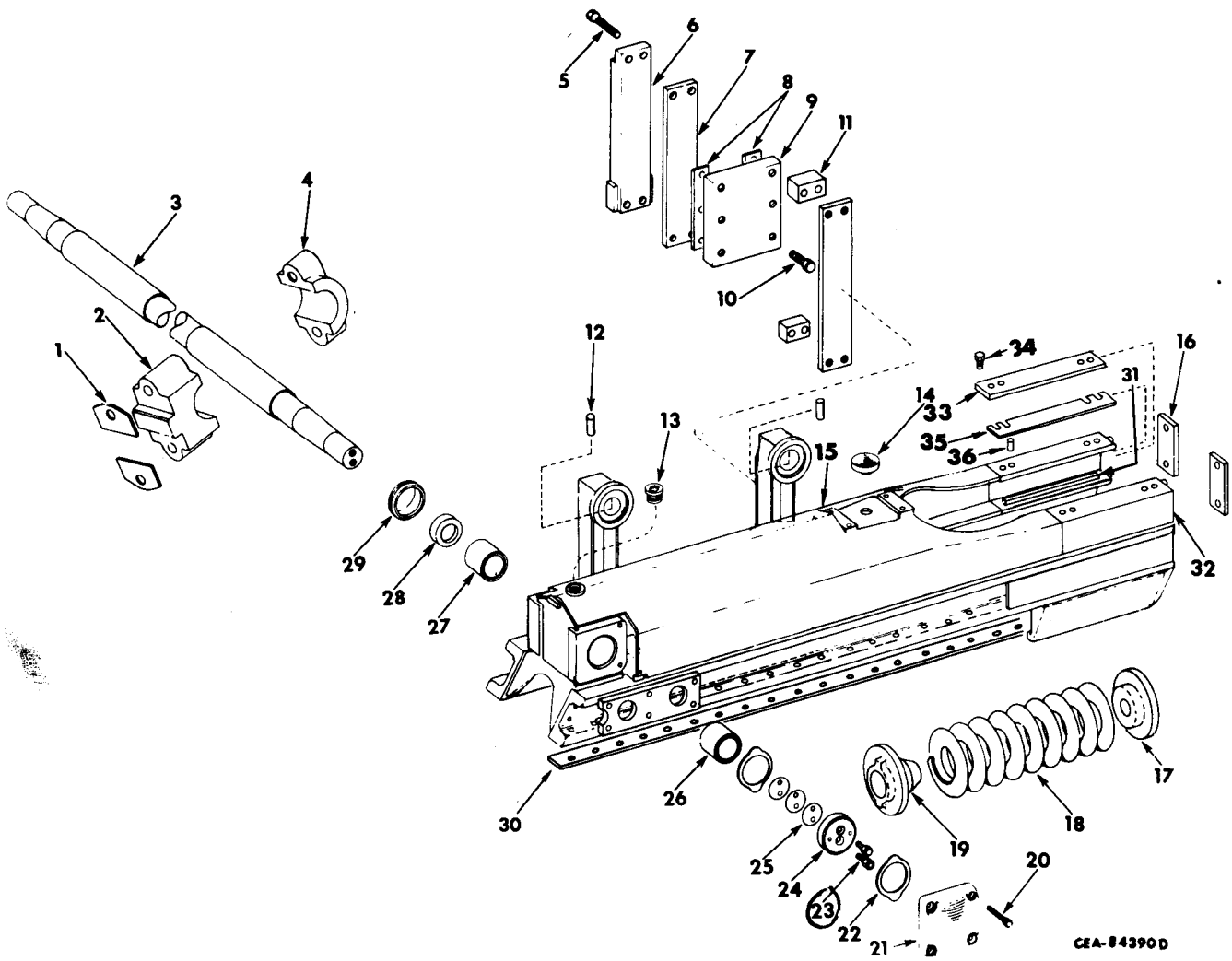


Illust. 72
Exploded View of Track Frame (Removable Cover Type).

TRACK FRAME
(TD-20 SERIES B TRACTOR)

41. REMOVAL AND DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 72 or 73)



Illust. 73
Exploded View of Track Frame (Enclosed Spring Type).

1. Spacer shims.
2. Pivot shaft spacer.
3. Pivot shaft.
4. Pivot shaft cap.
5. Retainer cap screw.
6. Guide retainer.
7. Guide wear plate.
8. Guide plate shims (if equipped).
9. Guide plate.
10. Guide plate cap screw.
11. Guide spacer.
12. Track idler support pin.
13. Oil filler plug.
14. Equalizer bar pad.
15. Track frame.
16. Front idler stop.
17. Spring front seat.
18. Track spring.
19. Spring rear seat.
20. Cover cap screw.
21. Pivot shaft cover.
22. Pivot shaft wear plate.
23. Thrust plate cap screws.
24. Thrust plate.
25. Pivot shaft shims.
26. Pivot shaft outer bushing.
27. Pivot shaft inner bushing.
28. Oil seal wear sleeve.
29. Oil seal.
30. Track roller shaft bracket mounting spacer.
31. Track frame wear bar (welded to track frame).
32. Front idler guide bracket.
33. Adjustable wear bar.
34. Wear bar mounting bolt.
35. Wear bar shim.
36. Wear bar dowel.

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TRACK FRAME
(TD-20 SERIES B TRACTOR)

1. Remove the track chain (refer to Par. 7, "REMOVAL").

2. ENCLOSED SPRING TYPE TRACK FRAME: Remove the front idler and fork assembly (refer to Par. 11, "REMOVAL").

REMOVABLE COVER TYPE TRACK FRAME: Remove the front idler (refer to Par. 11, "REMOVAL"). Remove the track frame rear cover (4). Pull the hydraulic adjusting cylinder and adjusting rod from position (Illust. 34).

3. Remove the inner and outer sprocket shields from the rear of the track frame (if equipped).

4. Remove the track frame guide. (Refer to Par. 34, "REMOVAL.")

5. Remove the equalizer bar rebound bracket and shims (Illust. 71).

6. Jack up the rear and front of the tractor on the side from which the track frame is being removed, and block it securely. The tractor should be jacked up so the track rollers will clear the track chain.

7. Attach a hoist to the two track idler brackets and take all the slack out of the chain (Illust 76).

8. Remove the four cap screws securing the pivot shaft cover (14 or 21) to the pivot shaft bracket (welded part of track frame) and remove the cover with outer wear plate (15 or 22). Remove the wear plate from the cover (Illust. 74).

9. Remove the two cap screws securing the track frame thrust plate (17 or 24) to the end of the pivot shaft (2 or 3). Remove the thrust plate, inner wear plate (15 or 22) and shims (18 or 25). Keep the shims together with the thrust plate to facilitate installation (Illust. 75).

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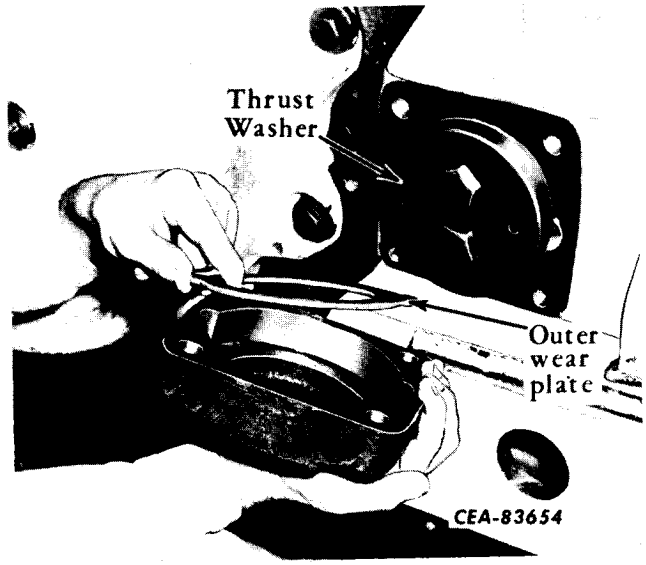
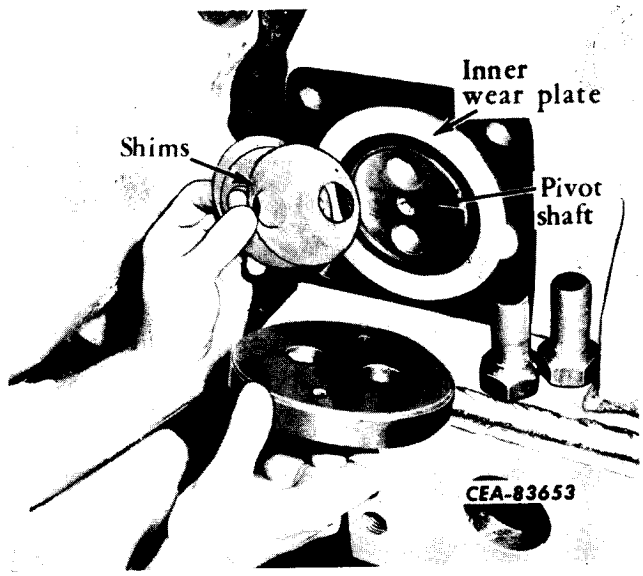


Illust. 74
Removing the Pivot Shaft Cover and Wear Plate.



Illust. 75
Removing the Pivot Shaft Thrust Plate and Shims.

TRACK FRAME
(TD-20 SERIES B TRACTOR)

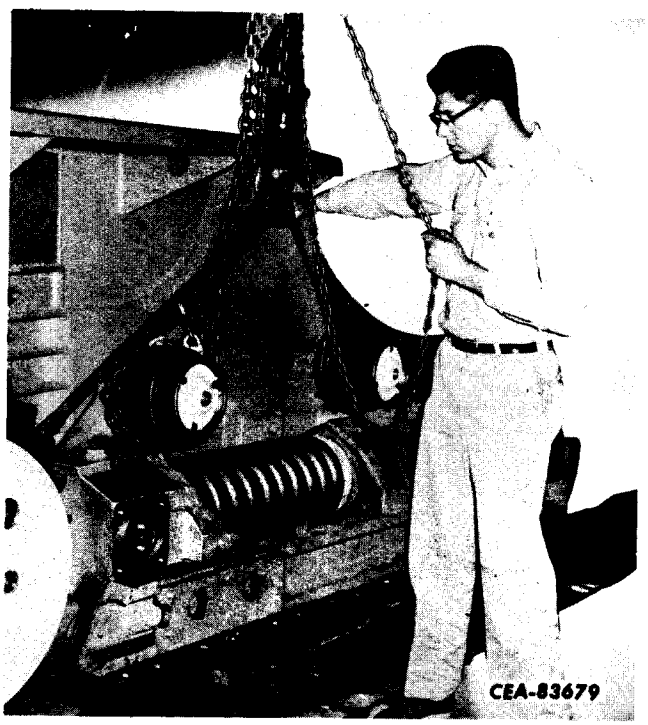
41. REMOVAL AND DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 72 or 73)

10. Use a pry bar between the rear frame and track frame to free the frack frame from the pivot shaft. Swing the track frame from the pivot shaft and away from the tractor (Illust. 76).

11. The oil seal wear sleeve (25 or 28) and pivot shaft bushings (21 and 22 or 26 and 27) will come off with the track frame. If necessary, the wear sleeve can easily be pulled from the pivot shaft bracket. If the bushings need replacement they can be removed with the use of a portable hydraulic press.

12. If replacement is necessary, remove the oil seal (24 or 29) from the pivot shaft.



Illust. 76
Removing the Track Frame (Removable Cover Type Shown).

42. INSPECTION AND REPAIR

1. Clean all parts thoroughly.

2. Inspect the pivot shaft oil seal for excessive wear or damage. Inspect the oil seal wear sleeve for damage. If either piece is damaged, they both must be replaced.

3. Inspect the track frame thrust plate and pivot shaft wear plates for excessive wear or damage and replace as necessary. (Refer to Par. 3, "SPECIFICATIONS," for the dimensions of new parts.)

4. Inspect the pivot shaft bushings for damage or excessive wear. (Refer to Par. 3, "SPECIFICATIONS.") Replace if necessary. (Refer to Par. 43, "REASSEMBLY AND INSTALLATION" for method of installing the bushings.

5. Inspect all parts for damage and replace if necessary. Inspect the track frame for twisting or bending and, if badly bent, replace the frame.

43. REASSEMBLY AND INSTALLATION

(Ref. Nos. Refer to Illust. 72 or 73)

1. Apply "Loctite" to the inside diameter of the oil seal and install the new oil seal (24 or 29) until the sealing lip of the seal is 15.553 inches from the end of the pivot shaft. The oil seal must be installed so the part number on the seal is facing toward the outside of the tractor.

2. If the pivot shaft bushings were removed, the new ones must be properly installed. The outer bushing (21 or 26) must be pressed into the track frame pivot shaft bracket until it is 0.080 inch above the edge of the bracket flange. The inner bushing (22 or 27) must be pressed into the bracket until it is 0.75 inch below the edge of the bracket flange. The bushings can

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TRACK FRAME
(TD-20 SERIES B TRACTOR)

be pressed into position with the use of a portable hydraulic press (Illust. 77).

3. If the oil seal wear sleeve (25 or 28) was removed apply "Loctite" to the outside diameter of the new one and tap it into the pivot shaft bracket until it bottoms against the shoulder in the bore. The wear sleeve must be installed with the smaller inside diameter toward the pivot shaft bracket.

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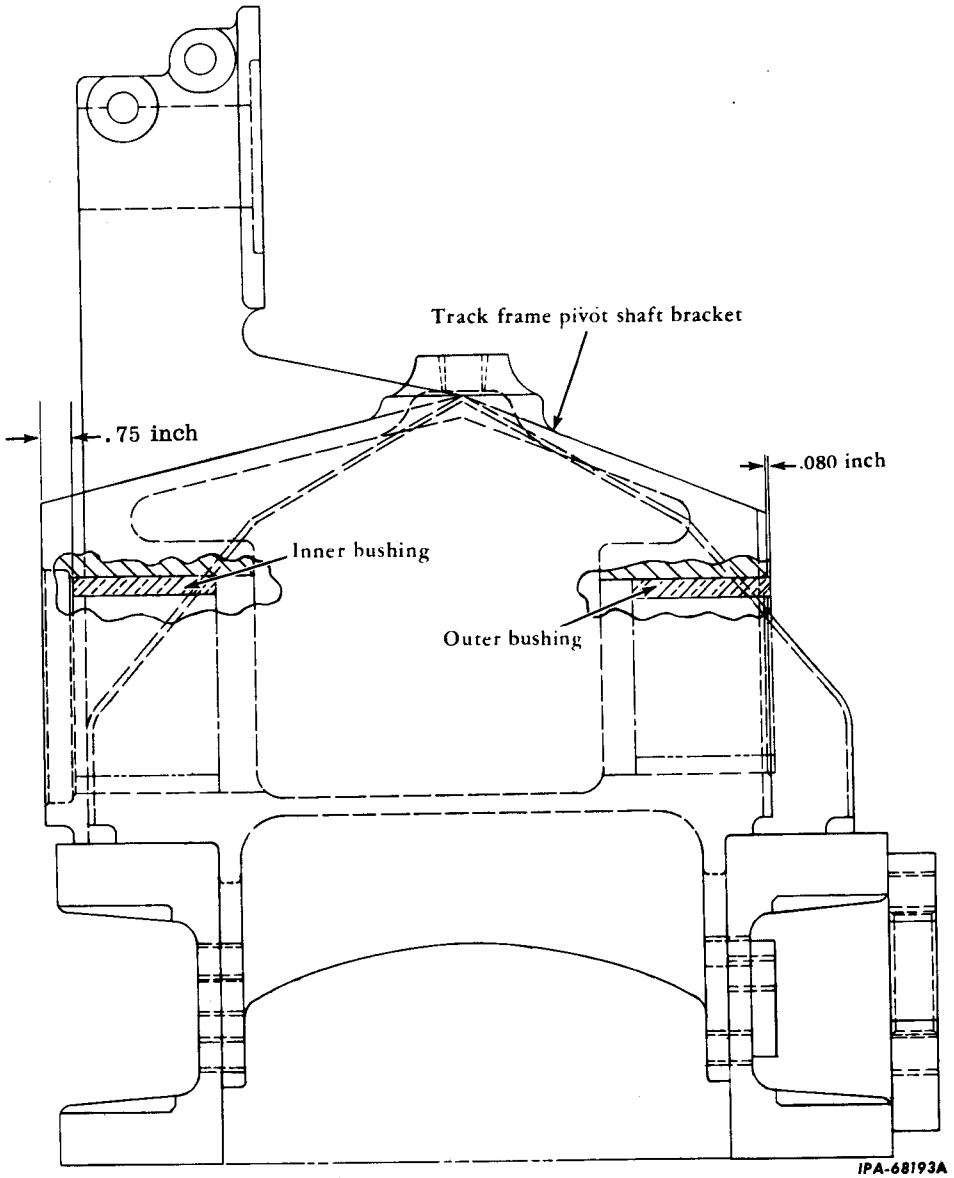

Illust. 77
Pivot Shaft Bushings Installed (Removable Cover Type Track Frame Shown; Enclosed Spring Type Similar).

TRACK FRAME
(TD-20 SERIES B TRACTOR)

43. REASSEMBLY AND INSTALLATION - Continued

(Ref. Nos. Refer to Illust. 72 or 73)

4. Hoist the track frame into position on the pivot shaft (Illust. 76). When mounted, the track frame should rotate freely.

5. Install the track frame guide components. (Refer to Par. 36, "INSTALLATION.")

6. Place the inner wear plate (15 or 22) on the pivot shaft outer bushing (Illust. 75).

7. Position the same thickness of shims (18 or 25) that were removed on the end of the pivot shaft. Secure the thrust plate to the pivot shaft with the two cap screws using 630-710 ft. -lbs. torque (Illust. 75).

NOTE: The inner wear plate (15 or 22) on the pivot shaft outer bushing must be in position so the notches will align with the slots on the cover (14 or 21) when the cover is installed.

8. Be sure all the old liquid sealer has been removed from the pivot shaft bracket and from the cover mounting surface. Apply New International Harvester liquid gasket to both surfaces.

9. Place the outer wear plate (15 or 22) in the cover (14 or 21) and secure the cover to the bracket using 290-320 ft. -lbs. torque (Illust. 74).

10. Remove the hoist from the track frame. Remove the blocking from the tractor and lower the tractor onto the track chain.

11. Install the equalizer bar rebound bracket and shims on the track frame and secure with cap screws. Check the clearance between the bottom of the rebound bracket and the top of the equalizer bar. If a clearance of less than 1/8 inch exists, add shims to obtain a minimum clearance of 1/8 inch.

12. ENCLOSED SPRING TYPE TRACK FRAME: Install the front idler and fork assembly (refer to Par. 15, "INSTALLATION").

REMOVABLE COVER TYPE TRACK FRAME: Insert the adjusting rod and cylinder through the opening in the front of the track frame and position the rod in the track spring front seat (28) (Illust. 34). Install the rear cover (4). Install the front idler (refer to Par. 15, "INSTALLATION").

13. Remove the filler plug (13 or 29) from the top of the pivot shaft bracket and fill with the proper grade and amount of lubricant as described in the operator's manual. Install the plug.

14. Install the track chain. (Refer to Par. 9, "INSTALLATION.")

15. Install the inner and outer sprocket shields to the track frame (if equipped).

16. Whenever a new track frame is installed, the track frame alignment must be checked. Refer to Par. 44, "TRACK FRAME ALIGNMENT."

44. TRACK FRAME ALIGNMENT

(Refer to Illust. 78)

Checking track frame alignment

1. Operate the tractor on level terrain stopping the tractor in forward direction.

2. Measure the distance between the sprocket and track links A and B on both sides of the tractor.

(Continued on page 60)

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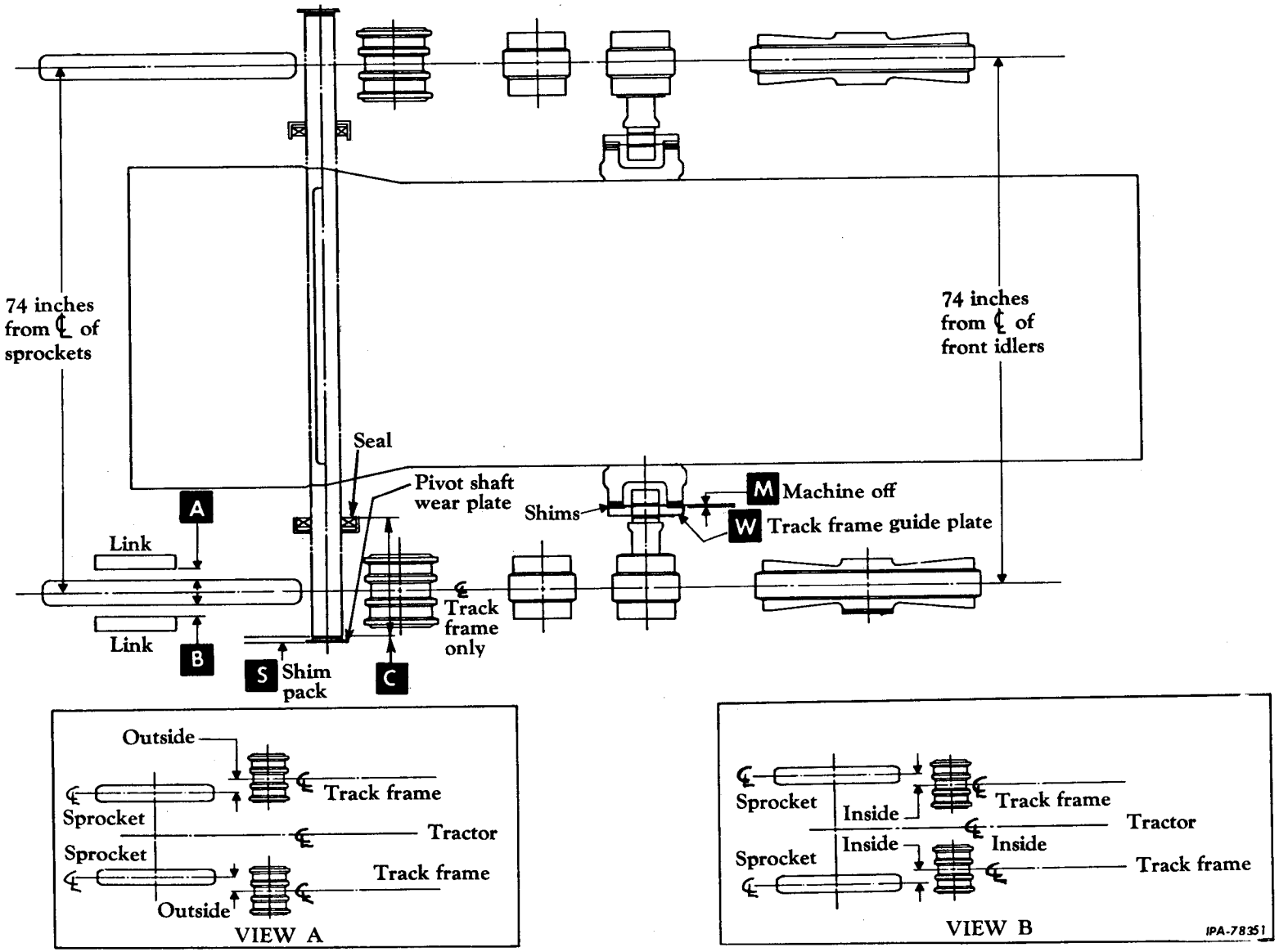


Illust. 78
Top View of Tractor.

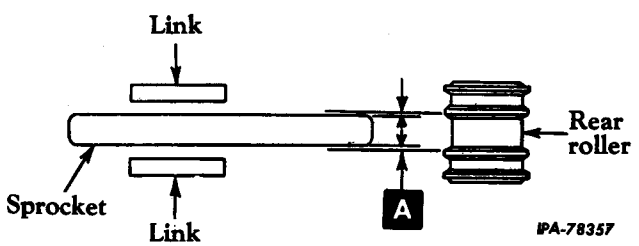
TRACK FRAME
(TD-20 SERIES B TRACTOR)

44. TRACK FRAME ALIGNMENT - Continued

(Refer to Illust. 78)

3. Measure the distance between the center line (℄) of the sprockets and the center line (℄) distance between front idlers. These should both check out to 74 inches.

4. Check to see if sprocket is in line and parallel to inside of center flange of rear roller. The clearance from the outside of the sprocket to the inside center flange of the rear roller should be 13/64 inch as indicated by (A) in Illust. 79.



Illust. 79
Proper Relationship of Sprocket to Rear Track Roller.

5. Study these measurements and determine which direction the track frame or frames must be moved to obtain proper alignment in relationship to the sprocket.

6. Track frame alignment is correct when the center line (℄) dimensions between the sprockets are equal to the center line (℄) dimensions of the front idlers and the sprocket indexes correctly with the inside of center flanges of the rear roller. If the alignment is not correct, proceed as follows:

Correcting alignment

7. If dimension B is greater than dimension A it will appear as shown in view A of Illust. 78 which is greatly exaggerated. If this condition exists, remove some or all of the shims S (refer to reference (18, Illust. 72) or (25, Illust. 73) at the pivot shaft until dimensions A and B are equal. Then machine off distance M from the track frame guide plate W (refer to reference (9, Illust. 72 or 73) equal to the amount of shims that were taken off at the pivot shaft.

8. If dimension A is greater than dimension B it will appear as shown in view B of Illust. 78 which is greatly exaggerated. If this condition exists, add the same amount of shims at the pivot shaft and shims at the track frame guide plate until dimensions A and B are equal.

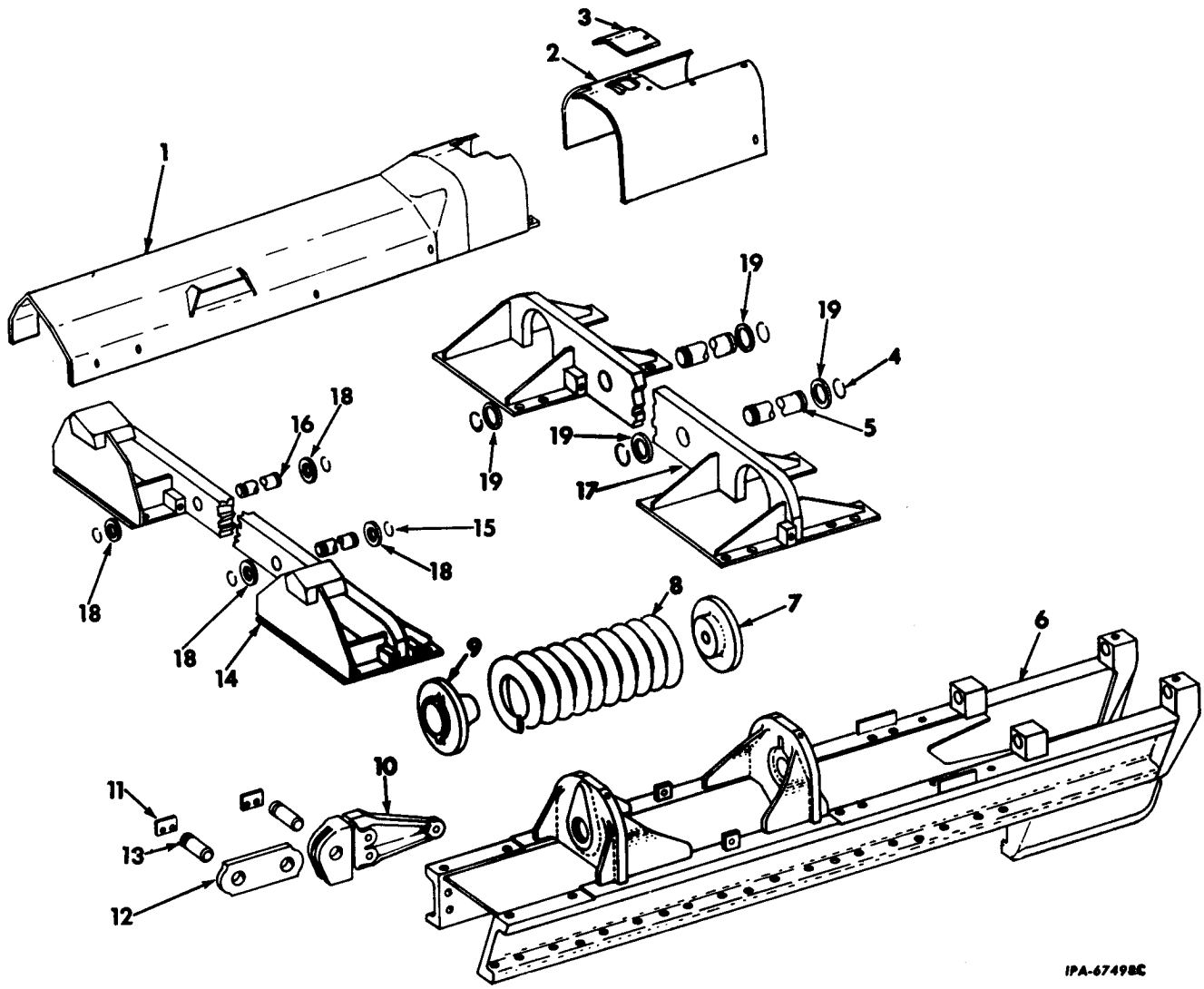
9. Check the pivot shaft seal (24, Illust. 72) or (29, Illust. 73) to see that it does not protrude from the wear sleeve of the seal. The seal face must ride within the wear sleeve. If the sealing member protrudes from the wear sleeve, remove the track frame and sealing member. Apply "LOCTITE" to the inside diameter of the main sealing member and relocate on the shaft until its sealing lip is 15.553 inches from the end of the pivot shaft (C). Push track frame on until new shim pack dimension S is measured from the end of the pivot shaft to the pivot shaft inner wear plate (15, Illust. 72) or (22, Illust. 73).

NOTE: Care must be taken when mounting the track frame so as not to push track frame on too far as the pivot shaft seal will then be pushed up against the pivot shaft shoulder.

TRACK FRAME
(MODEL 250 AND 250 SERIES B LOADERS)

45. REMOVAL

(Ref. Nos. Refer to Illust. 80 or 81)



Illust. 80
Exploded View of Track Frame (Removable Cover Type).

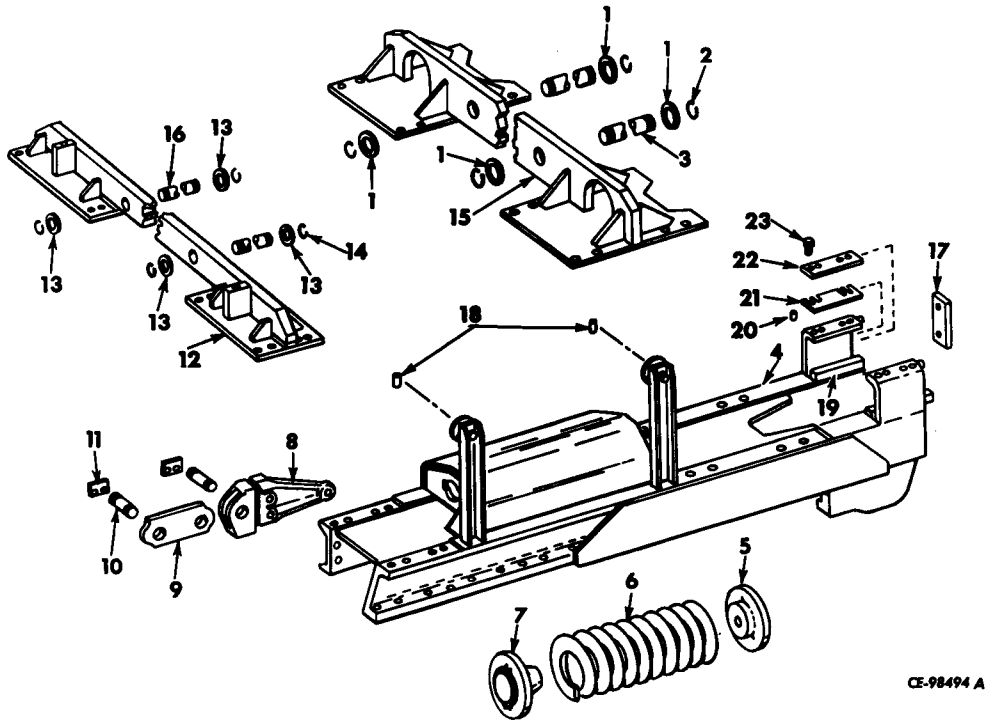
1. Track frame rear cover.
2. Track frame front cover.
3. Access hole cover.
4. Retaining ring.
5. Pin.
6. Track frame.
7. Spring front seat.
8. Track spring.
9. Spring rear seat.
10. Track frame coupling.
11. Link pin lock.
12. Coupling link.
13. Link pin.
14. Rear cross bar.
15. Retaining ring.
16. Pin.
17. Front cross bar.
18. Wear ring.
19. Wear ring.

(Continued on next page)

TRACK FRAME
(MODEL 250 AND 250 SERIES B LOADERS)

45. REMOVAL - Continued

(Ref. Nos. Refer to Illust. 80 or 81)



Illust. 81
Exploded View of Track Frame (Enclosed Spring Type).

1. Wear ring.
2. Retaining ring.
3. Pin.
4. Track frame.
5. Spring front seat.
6. Track spring.
7. Spring rear seat.
8. Track frame coupling.
9. Coupling link.
10. Link pin.
11. Link pin lock.
12. Rear cross bar.
13. Wear ring.
14. Retaining ring.
15. Front cross bar.
16. Pin.
17. Front idler stop.
18. Track idler support guide pin.
19. Track frame wear bar (welded to track frame).
20. Wear bar dowel.
21. Wear bar shim.
22. Adjustable wear bar.
23. Wear bar mounting bolt.

TRACK FRAME
(MODEL 250 AND 250 SERIES B LOADERS)

1. Remove the track chain. (Refer to Par. 7, "REMOVAL.")

2. ENCLOSED SPRING TYPE TRACK FRAME: Remove the front idler and fork assembly (refer to Par. 11, "REMOVAL").

REMOVABLE COVER TYPE TRACK FRAME: Remove the front idler (refer to Par. 11, "REMOVAL"). Remove the track frame rear cover (1). Pull the hydraulic adjusting cylinder and rod assembly from position (Illust. 34).

3. Remove the inner and outer sprocket shields from the rear of the track frame (if equipped).

4. Remove the track frame coupling link (9 or 12). Remove the cap screws, washers and link pin locks (11) securing the link pins (10 or 13) to the coupling (8 or 10) at the track frame and at the sprocket drive carrier cover. Tap out the link pins to remove the link.

5. Raise the rigid cross bars (14 and 17 or 12 and 15) with jacks on the side of the loader from which the track frame is to be removed and block securely. The loader must be raised until the track rollers clear the track chain.

6. Attach a hoist to the track frame and take all the slack out of the hoist chain. Remove the cap screws securing the front and rear cross bars to the track frame.

7. Loosen the tension on the hoist slightly and pry the track frame from the cross bars. Remove the track frame by swinging it out and away from the loader.

46. INSPECTION AND REPAIR

1. If necessary to disassemble the track frame, refer to the pertinent paragraphs in this section.

2. Clean all parts thoroughly with steam cleaning equipment.

3. Inspect all parts for damage and replace as necessary.

4. Inspect the track frame for twisting or bending and, if badly bent, replace the frame.

47. INSTALLATION

(Ref. Nos. Refer to Illust. 80 or 81)

1. Hoist the track frame into position under the cross bars. Apply "LOCTITE" Grade "B" to the cross bar mounting cap screws. Secure the track frame to the cross bars with the cap screws.

2. Remove the blocking and lower the loader onto the track chain.

3. Install the link (9 or 12). Place the link in position and secure to the coupling (8 or 10) and to the sprocket drive carrier with the link pins. Install the pin locks (11) and secure with the cap screws and washers.

4. ENCLOSED SPRING TYPE TRACK FRAME: Install the front idler and fork assembly (refer to Par. 15, "INSTALLATION").

REMOVABLE COVER TYPE TRACK FRAME: Insert the adjusting rod and cylinder through the opening in the front cross bar (17) and position the rod in the track spring front seat (7, Illust. 34). Install the rear cover (1). Install the front idler (refer to Par. 15, "INSTALLATION").

5. Install the track chain. (refer to Par. 9, "INSTALLATION.")

6. Install the inner and outer sprocket shields from the track frame (if equipped)

TRACK FRAME PIVOT SHAFT (TD-20 SERIES B TRACTOR)

48. DESCRIPTION

The pivot shaft supports the rear of the track frames. The pivot shaft is secured to the front of the rear frame and to the sprocket drive carriers with caps. Two dowels pressed into the rear frame fit into openings provided in the pivot shaft. The pivot shaft must not be removed unless replacement is necessary.

49. REMOVAL AND INSTALLATION

(Ref. Nos. Refer to Illust. 72 or 73)

1. Remove both track frames. (Refer to Par. 41, "REMOVAL AND DISASSEMBLY.")

2. Remove the oil seal (24 or 29) from each side of the pivot shaft.

3. Remove the pivot shaft caps securing the pivot shaft to the rear frame. Remove the cap screws securing the caps (3 or 4) to the sprocket drive carriers and remove the caps.

4. Remove the pivot shaft from the dowel or dowels in the rear frame. Remove the spacers (1A or 2) and shims (1). Keep the shims together with the individual spacer to facilitate installation.

5. To install, reverse the removal procedure. Although the pivot shaft available for service has two dowel holes, only one is used to center the shaft on the rear main frame. The dowel hole located approximately 23 inches from the end of the shaft is utilized with the fabricated rear main frame and the dowel hole approximately 24-1/8 inches from the end is utilized with the cast rear main frame. On earlier units where two dowels were used to center the pivot shaft, be sure to remove one of the dowels from the rear main frame and plug the dowel hole before installing the new pivot shaft. Be sure to install the same number of shims (1) that were removed and to install the oil seal (24 or 29) as described in Par. 43, "REASSEMBLY AND INSTALLATION" under "TRACK FRAME."

NOTE: Refer to Section 7, "STEERING SYSTEM," under installation of "PIVOT BRAKES" for the procedure of installing the shims (1) and how to determine the shim thickness if a new pivot shaft cap or cap spacer is installed.

NOTE: Whenever a new pivot shaft is installed, the track frame alignment must be checked. Refer to Par. 44, "TRACK FRAME ALIGNMENT."

TRACK SPRINGS

50. DESCRIPTION

A heavy coil spring is provided in each track frame for tensioning the front idler and track. They permit the front idlers to recoil under shock loads, but exert no tension on the track in normal operation position. Each track spring is contained in a welded housing, which is a permanent part of the track frame. The track spring is compressed and trapped in the ends of the housing between a front and a rear seat. The rear of the adjusting rod (1, Illust. 39) or (9, Illust. 40) bears against the track spring front seat.

51. REMOVAL

1. Remove the track chain. (Refer to Par. 7, "REMOVAL.")

2. REMOVABLE COVER TYPE TRACK FRAME: Remove the front idler. (Refer to Par. 11, "REMOVAL.")

ENCLOSED SPRING TYPE TRACK FRAME: Remove the front idler and fork assembly (refer to Par. 11, "REMOVAL").

3. REMOVABLE COVER TYPE TRACK FRAME: Remove the track frame rear cover (4, Illust. 72) or (1, Illust. 80). Pull the hydraulic adjusting cylinder and adjusting rod assembly from position (Illust. 34). If necessary, remove the track idler as described in Par. 21, "REMOVAL AND DISASSEMBLY."

ENCLOSED SPRING TYPE TRACK FRAME: Remove the track frame (refer to Par. 41, "REMOVAL AND DISASSEMBLY" or Par. 45, "REMOVAL"). Lay the track frame on its side. On the MODEL 250 LOADER, remove track rollers three, four and five and on the TD-20 SERIES B, remove track rollers two, three, four and five.

4. The track spring must be compressed before it can be removed from the track frame. It is recommended that tools be constructed for this purpose according to the instructions shown in Illust. 82 or 83 and in Illust. 84 and 85.

NOTE: A 50 ton hydraulic ram must be used to compress the spring for removal.

(Continued on page 68)

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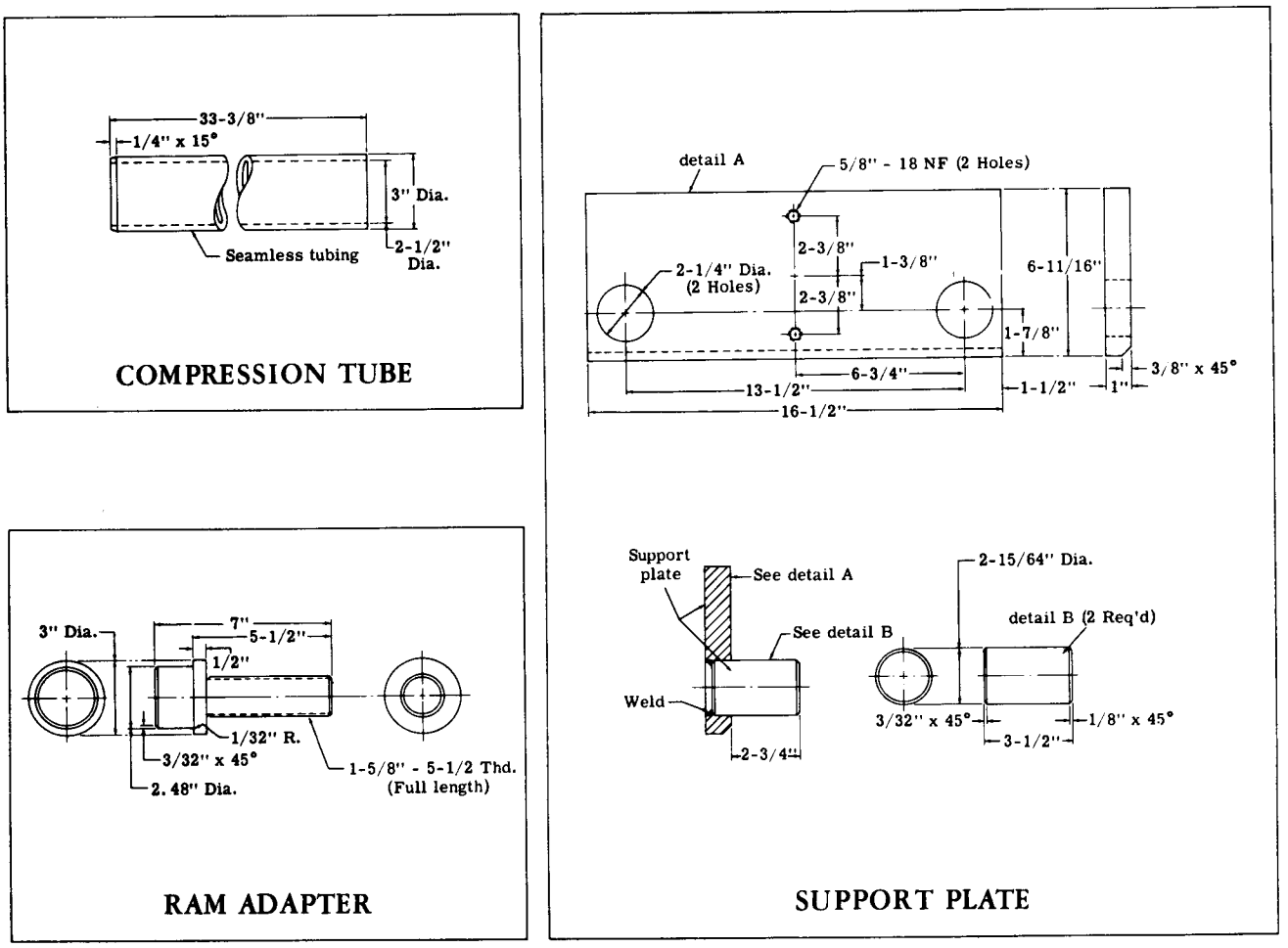
TRACK SPRINGS

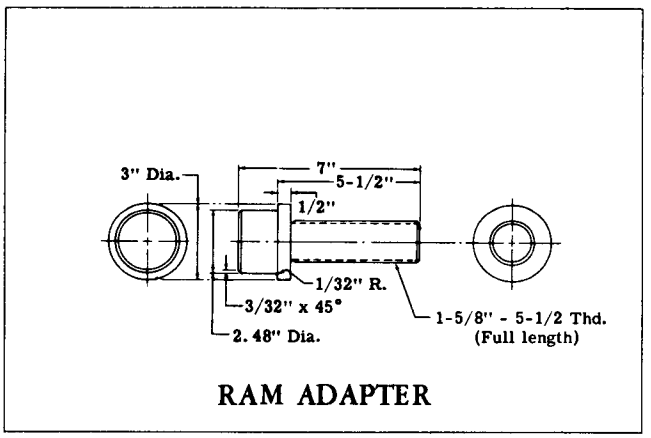


IPA-78590A

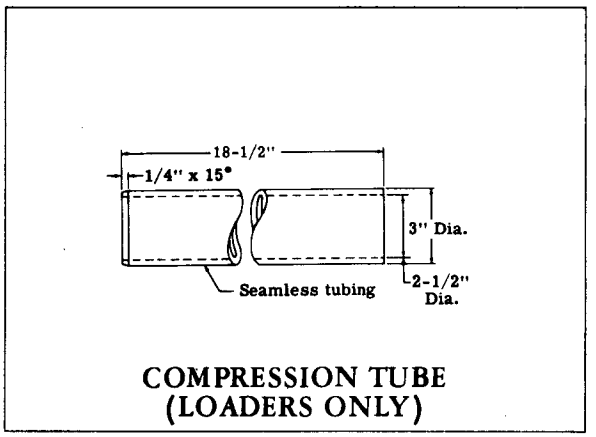
Illust. 82
Detail Parts for Track Spring Compression Tube, Ram Adapter, and Support Plate Tools Shown in Illust. 87 (For Use with Removable Cover Type Track Frame).

TRACK SPRINGS

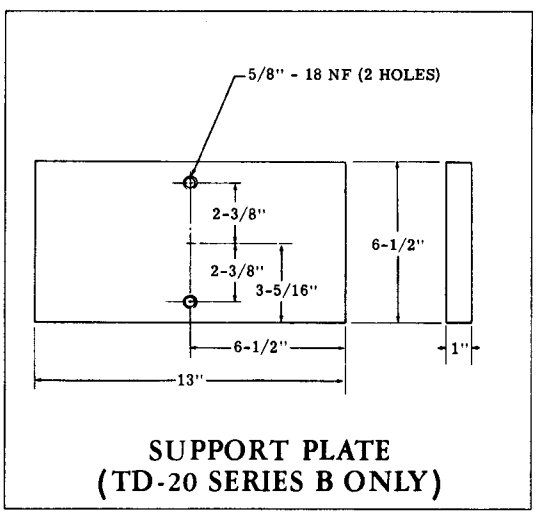
51. REMOVAL - Continued



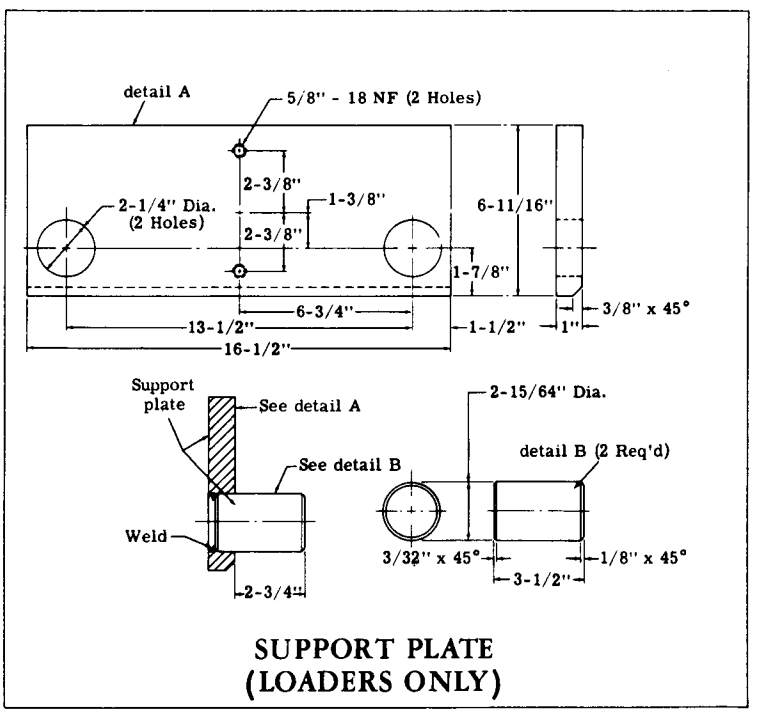
RAM ADADPTER



COMPRESSION TUBE
(LOADERS ONLY)



SUPPORT PLATE
(TD-20 SERIES B ONLY)

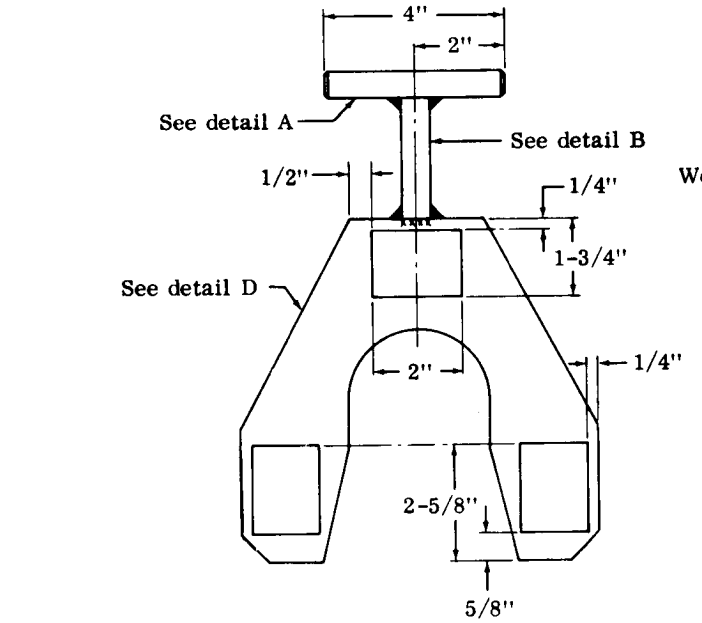


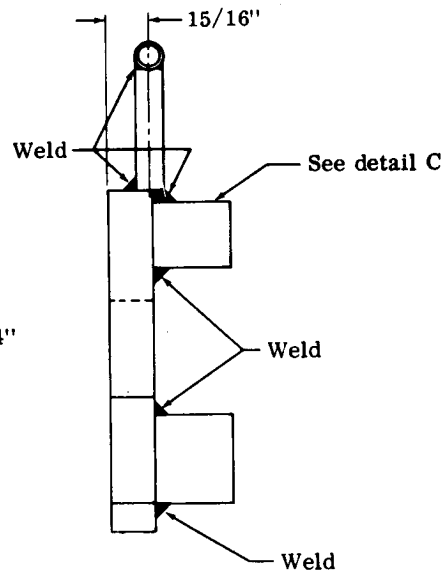
SUPPORT PLATE
(LOADERS ONLY)

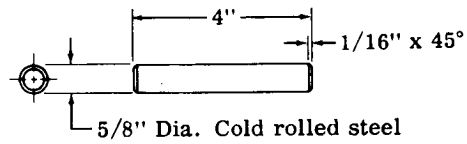
CEA-84413

Illust. 83
Detail Parts for Track Spring Compression Tube, Ram Adapter, and Support Plate Tools Shown in Illust. 88 and 89 (For Use with Enclosed Spring Type Track Frame).

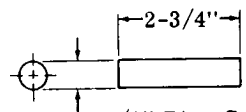
TRACK SPRINGS



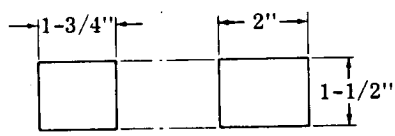




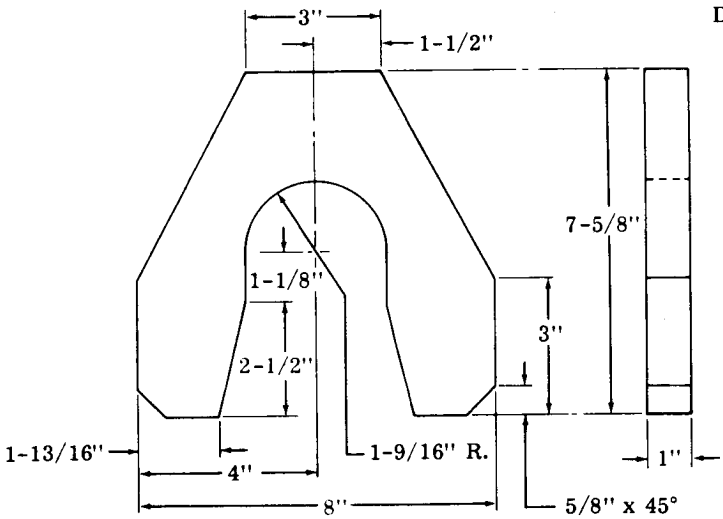
Detail A



Detail B



Detail C (3 Req'd)



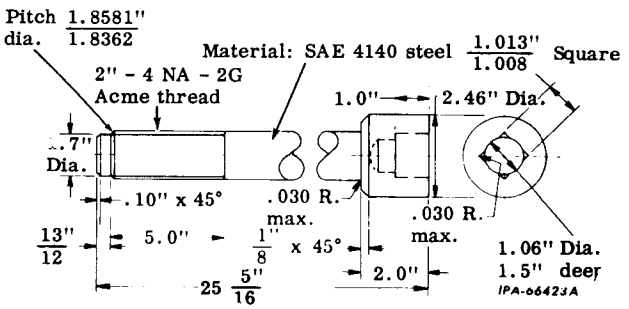
Detail D

IPA-78571A

Illust. 84
Detailed Parts for Track Spring Spacer Shown in Illust. 87, 88 and 89.

TRACK SPRINGS

51. REMOVAL - Continued

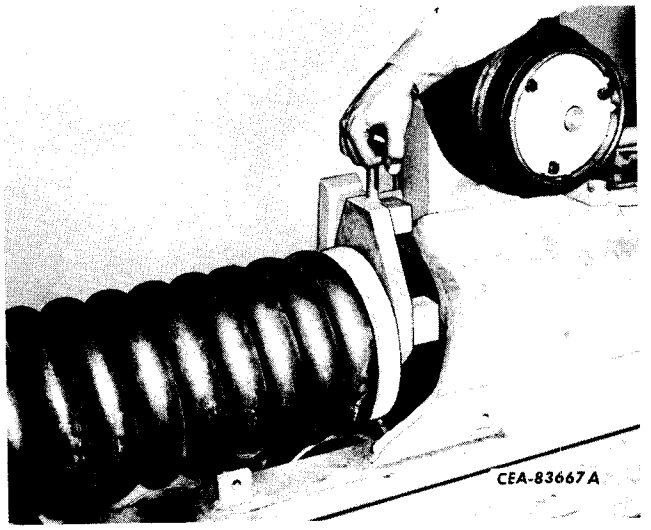


Illust. 85
Track Spring Holding Tool.

5. REMOVABLE COVER TYPE TRACK FRAME: Secure the ram adapter and support plate (Illust. 82) to the hydraulic ram. Insert the support plate into the front idler guide rod support blocks welded to the front of the track frame (Illust. 87). Insert the compression tube (Illust. 82) through the equalizer bar housing (TD-20 Series B) or rigid crossbar (Model 250 Loaders) and against the track spring front seat. Place the other end of the tube on the ram adapter (Illust. 87).

ENCLOSED SPRING TYPE TRACK FRAME: Secure the ram adapter and support plate (Illust. 83) to the hydraulic ram. On the TD-20 SERIES B, position the assembly in the underside of the track frame so the support plate is against the welded plates of the track frame and the ram adapter is against the track spring front seat (Illust. 88). On LOADERS, place the compression tube (Illust. 83) on the ram adapter and position the assembly on the track frame between the track spring front seat and the track frame channels (Illust. 89).

6. Apply pressure to the hydraulic ram to compress the track spring until the spacer (Illust 84) can be inserted as shown in Illust. 86, 87, 88 or 89. Release the pressure on the hydraulic ram and remove the ram with support plate and adapter. Remove the compression tube.

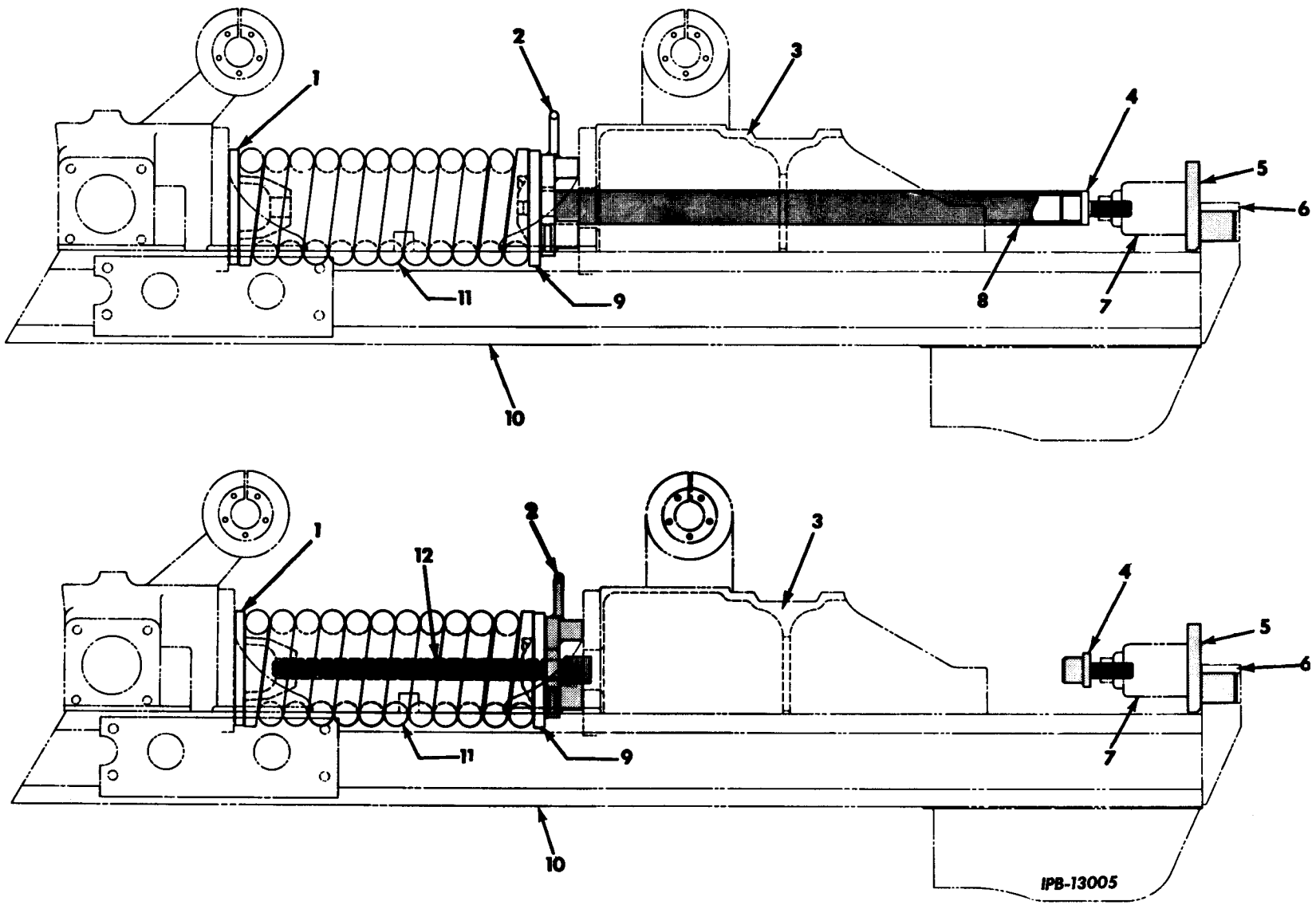


Illust. 86
Installing the Track Spring Spacer
(Removable Cover Type Track Frame).

7. Using a one-inch extension, thread the holding tool (Illust. 85) into the track spring rear seat until it bottoms in the counterbore of the front seat (Illust. 87, 88 or 89). Remove the wrench and extension.

8. Reposition the tools and ram to compress the track spring until the spacer can be removed. Then release the pressure on the ram to free the spring in its housing. Remove the tools and ram.

9. To remove the holding tool from the track spring, the spring must be held compressed in a hydraulic press. After the tool has been removed, release the pressure slowly to allow the spring to expand to its free length of approximately 29 inches.

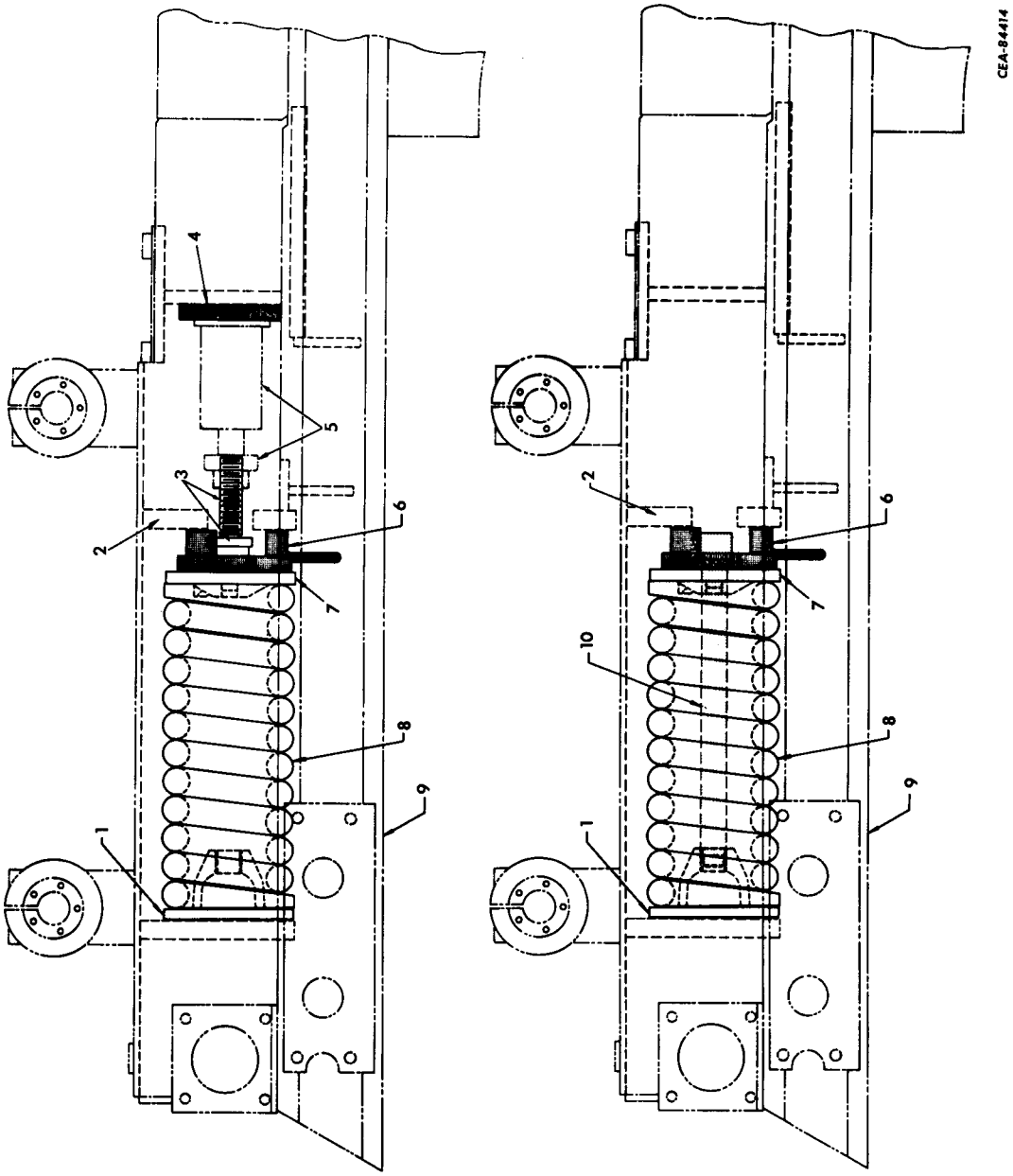


Illust. 87
Track Spring Removing and Installing Tools Assembled (TD-20 SERIES B Shown, Loaders Similar) (Removable Cover Type Track Frame).

1. Spring rear seat.
2. Track spring spacer.
3. Equalizer bar housing.
4. Ram adapter.
5. Support plate.
6. Guide rod support block.
7. Hydraulic ram.
8. Compression tube.
9. Spring front seat.
10. Track frame.
11. Track spring.
12. Spring holding tool.

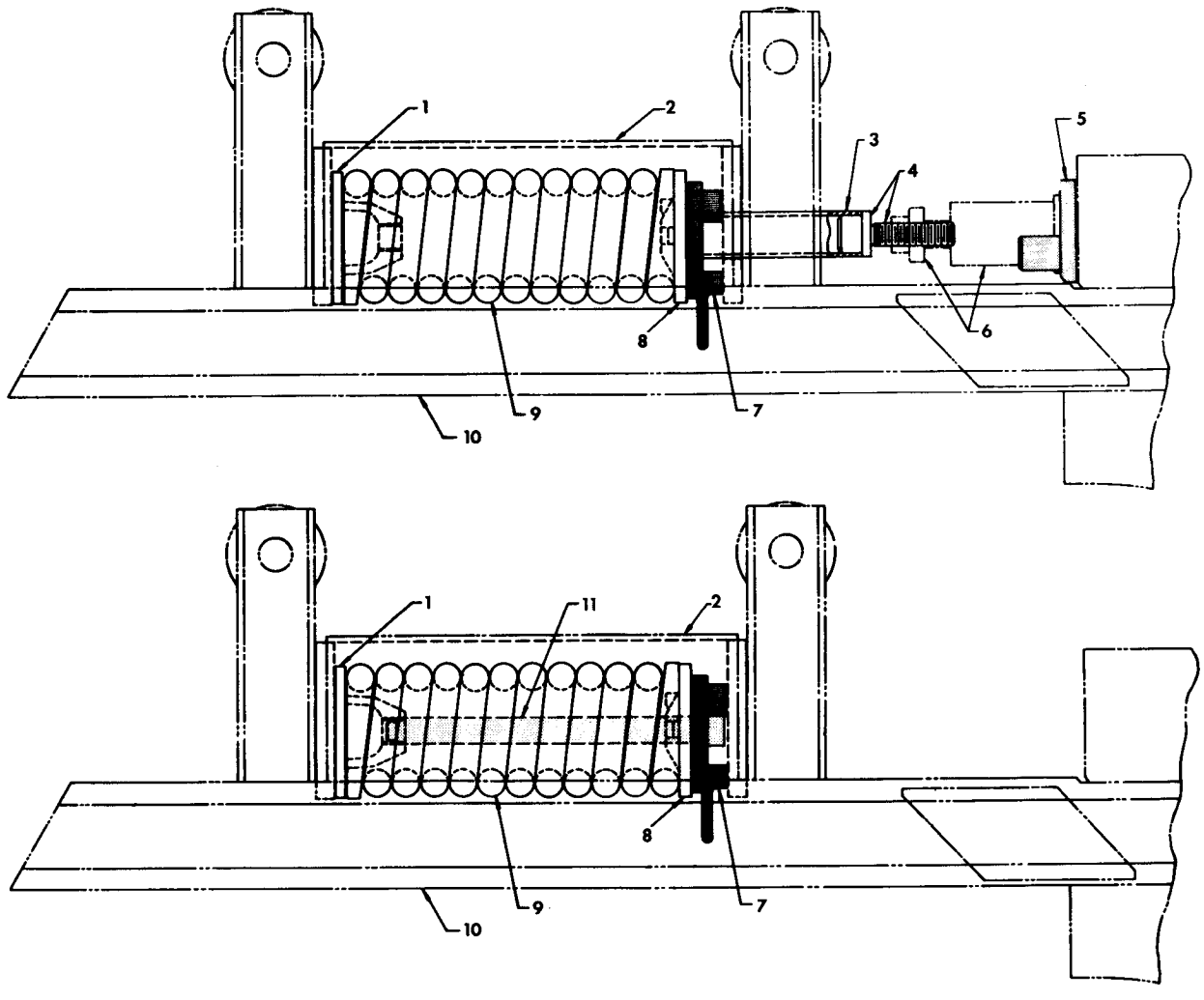
TRACK SPRINGS

51. REMOVAL - Continued



Illust. 88
TD-20 SERIES B Track Spring Removing and Installing Tools Assembled (Enclosed Spring Type Track Frame).

1. Spring rear seat.
2. Spring housing plate.
3. Ram adapter.
4. Support plate.
5. Hydraulic ram.
6. Track spring spacer.
7. Spring front seat.
8. Track spring.
9. Track frame.
10. Spring holding tool.



Illust. 89
MODEL 250 AND 250B LOADER Track Spring Removing and Installing Tools Assembled (Enclosed Spring Type Track Frame).

1. Spring rear seat.
2. Spring housing.
3. Compression tube.
4. Ram adapter.
5. Support plate.
6. Hydraulic ram.
7. Track spring spacer.
8. Spring front seat.
9. Track spring.
10. Track frame.
11. Spring holding tool.

TRACK SPRINGS

52. INSPECTION AND REPAIR

1. Clean all parts thoroughly.

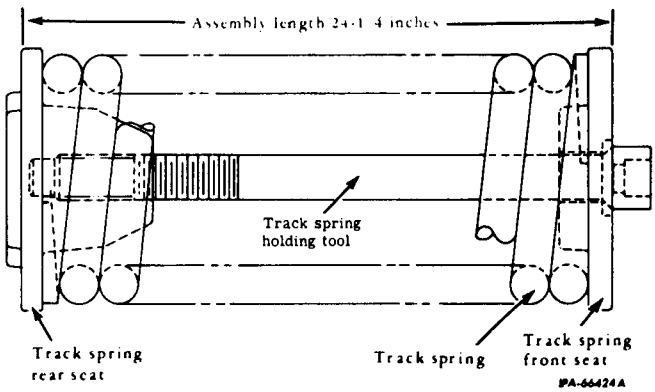
2. Inspect the front and rear track spring seat for cracks or other damage.

3. Inspect the track spring for cracks and test for weakness. (Refer to Par. 3, "SPECIFICATIONS," for spring tensions.)

53. INSTALLATION

1. Place the front and rear track spring seats in the track spring and position the assembly in a hydraulic press.

2. Compress the spring assembly until a distance of 24-1/4 inches, measured at the front and rear track spring flanges, is obtained (Illust. 90).



Illust. 90
Track Spring Compressed for Installation.

3. Insert the spring holding tool (Illust. 85) through the front of the assembly and thread it into the track spring rear seat enough to keep the spring compressed to the assembly length of 24-1/4 inches.

4. Be sure that the shoulder of the tool is seated properly in the counterbore of the track spring front seat (Illust. 90). Remove the spring assembly from the hydraulic press.

5. Place the track spring in position in the track frame. Using the 50 ton hydraulic ram and tools (Illust. 82 or 83 and 84) as was done in removal, compress the spring until the track spring spacer can be installed (Illust. 86). Then release the pressure on the ram and remove the ram and tools (refer to Illust. 87, 88 or 89). Check the position of the spring assembly for proper alignment.

6. Remove the holding tool from the track spring assembly using a socket wrench (and extension if necessary) with a one-inch square drive. Reinstall the ram and tools and compress the track spring to remove the track spring spacer. Slowly release the pressure on the hydraulic ram to seat the track spring. Remove the hydraulic ram and tools from the track frame.

NOTE: As the track spring expands, be sure that the pilot shoulder of the rear track spring seat enters the hole in the welded housing and that the front seat and housing openings are aligned.

7. ENCLOSED SPRING TYPE TRACK FRAME: Install the track rollers that were removed to the track frame (refer to Par. 31, "INSTALLATION"). Install the track frame, front idler and track chain in the sequence given in Par. 43, "REASSEMBLY AND INSTALLATION" or Par. 47, "INSTALLATION."

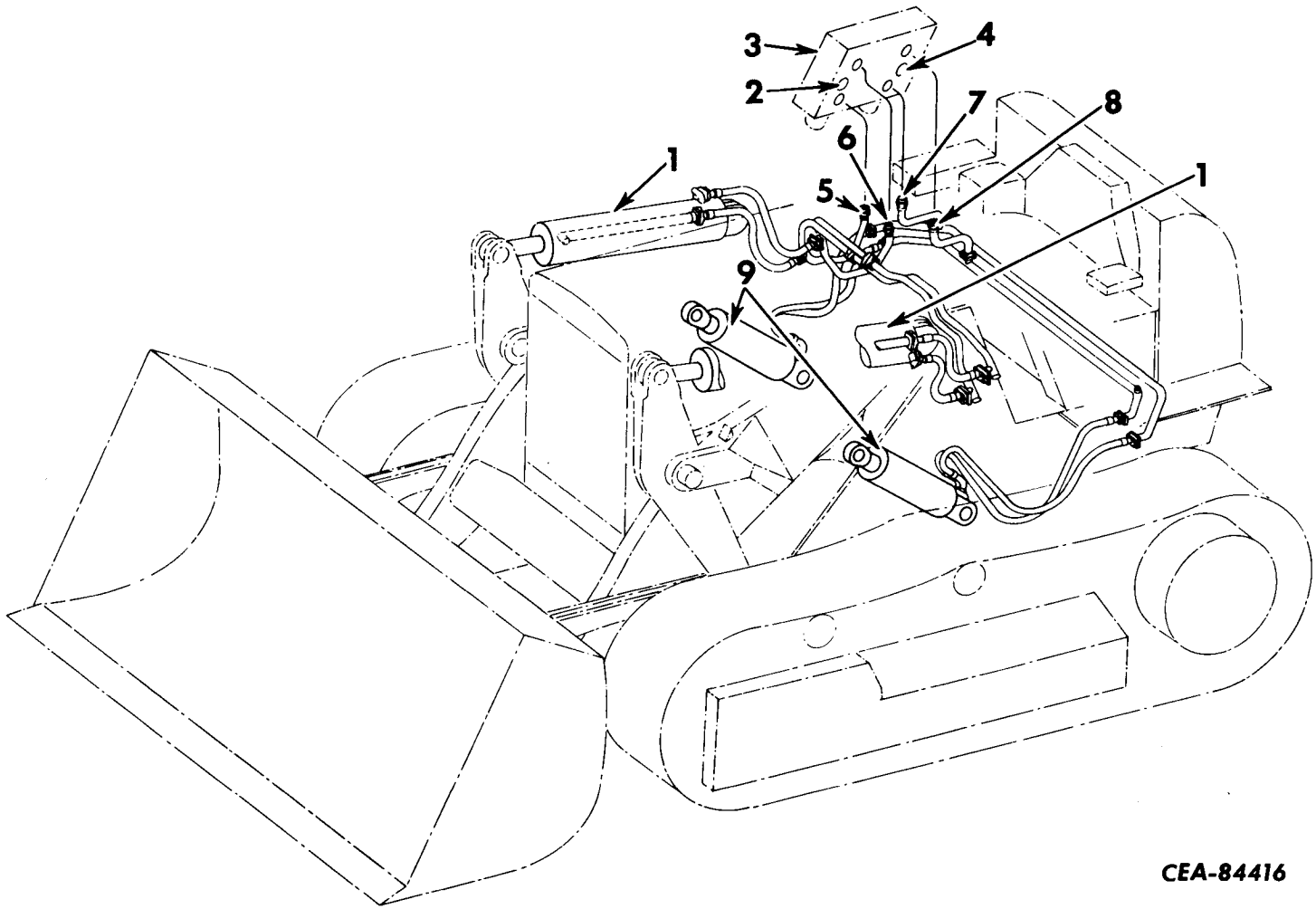
REMOVABLE COVER TYPE TRACK FRAME: If it was removed, install the track idler to the side of the front frame or track frame as described in Par. 23, "REASSEMBLY AND INSTALLATION." Insert the adjusting rod and cylinder through the opening in the front frame crossbar and position the rod in the track spring front seat (Illust. 34). Install the track frame rear cover (4, Illust. 72) or (1, Illust. 80).

8. REMOVABLE COVER TYPE TRACK FRAME: Install the front idler (refer to Par. 15, "INSTALLATION"). Install the track chain (refer to Par. 9, "INSTALLATION").

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

CONTENTS



Illust. 1
Hydraulic Piping.

1. Hydraulic tilt cylinder.
2. Valve outlet port (to hydraulic reservoir).
3. Hydraulic valve.
4. Valve inlet port (from hydraulic pump).
5. Hydraulic tilt cylinder circuit (rod end).
6. Hydraulic tilt cylinder circuit (head end).
7. Hydraulic lift cylinder circuit (rod end).
8. Hydraulic lift cylinder circuit (head end).
9. Hydraulic lift cylinder.

1. SPECIFICATIONS

Special Nut and Bolt Torque Data (Foot-Pounds)
(Torques given are for bolts and nuts lubricated with SAE-30 engine oil).

Bucket teeth shank bolts	650 - 730
Hydraulic reservoir oil filler cap	Max. 30

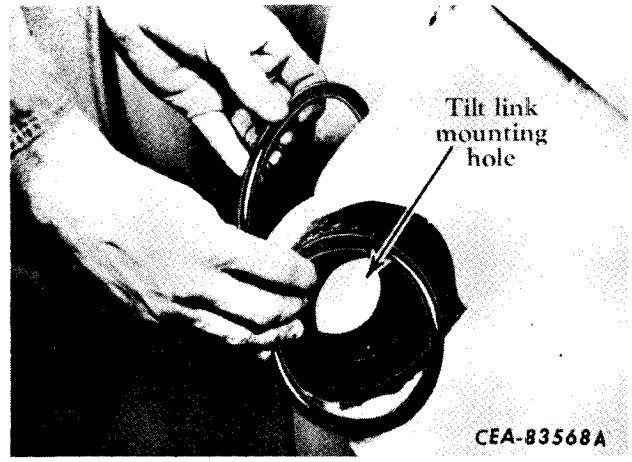
BUCKET

2. REMOVAL

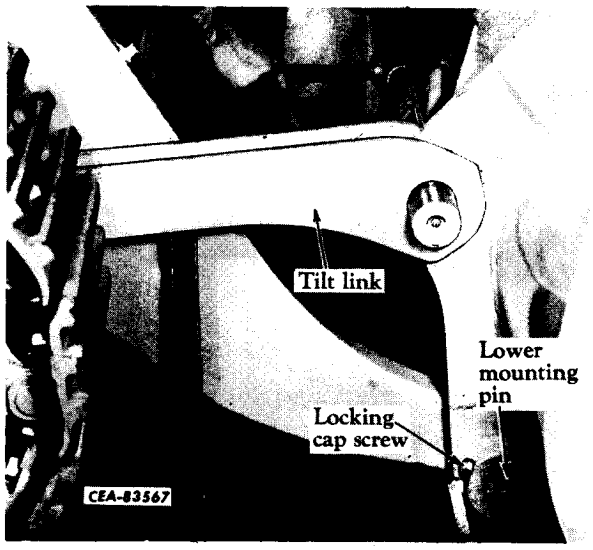
1. Disconnect the two tilt links from the rear of the bucket. Support the tilt link with a block of wood to keep it from falling. Remove the mounting pin locking cap screw and nut. Drive out the mounting pin using a punch and hammer (Illust. 2).

NOTE: If the mounting pin locking cap screw will not clear the bucket for removal, start the engine and tilt the bucket forward. Remove the cap screw and reposition the bucket on the ground.

2. Remove the supporting block and lower the tilt links to the ground. Remove the cord rings from the tilt link mounting on the rear of the bucket (Illust. 3).



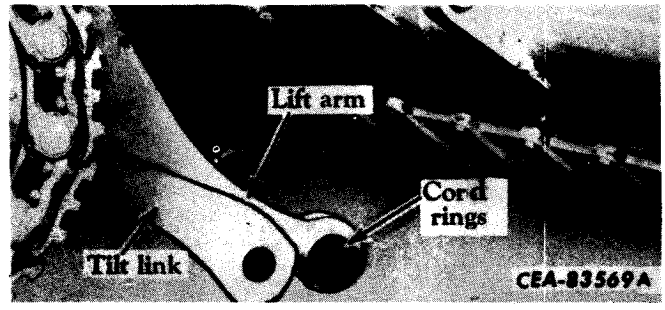
Illust. 3
Removing the Tilt Link Cord Rings.



Illust. 2
Removing the Tilt Link Mounting Pin.

3. Remove the lower mounting pin at the lift arm mountings on the rear of the bucket in the same manner (Illust. 2).

4. Attach a hoist to the lifting eye on the rear of the bucket and remove the bucket. As the bucket clears the lift arms, remove the cord rings (Illust. 4).



Illust. 4
Removing the Bucket.

BUCKET

3. INSPECTION AND REPAIR

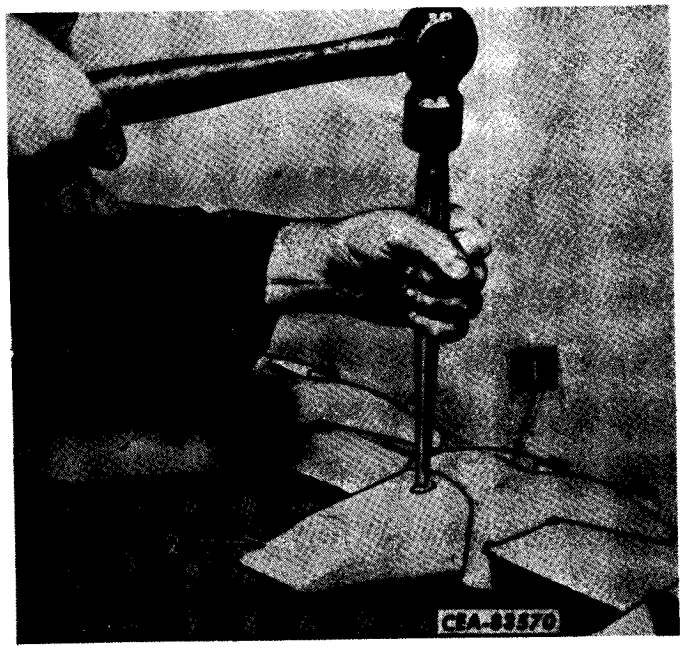
1. Inspect the cord rings for damage and replace if necessary.

2. Check the bucket for cracked or broken welds and repair or replace parts as necessary.

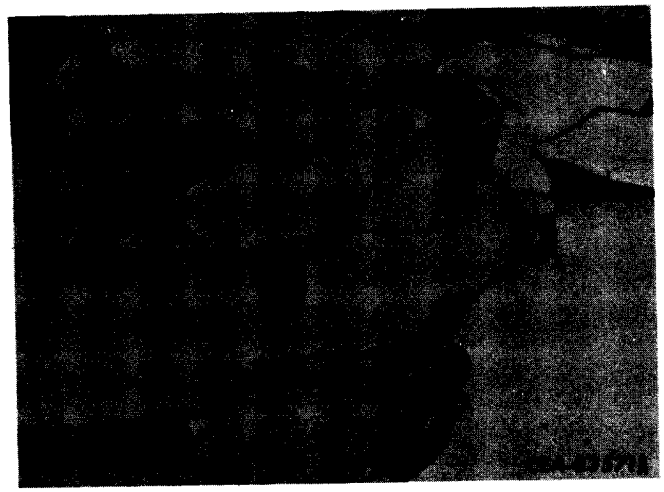
3. The cutting edge, skid shoes, LH and RH corners of the bucket are serviceable parts. Refer to Welding Manual, ISS - 1512 for proper installation of new parts.

4. Inspect the bucket teeth for damage and the mountings for looseness. The tooth tips are reversible for longer life.

When necessary, drive out the locking pin securing the tooth tip to the shank with a punch and hammer (Illust. 5). Pull the tooth tip from the shank (Illust. 6). If replacement of the pin lock is necessary, it can be driven from the shank. When installing the tooth tip, be sure to engage the serrations on the locking pin with those on the pin lock. When installing the tooth shank torque the mounting bolts from 650-730 ft. -lbs.



Illust. 5
Removing the Tooth Locking Pin.
1. Tooth shank.
2. Tooth tip.



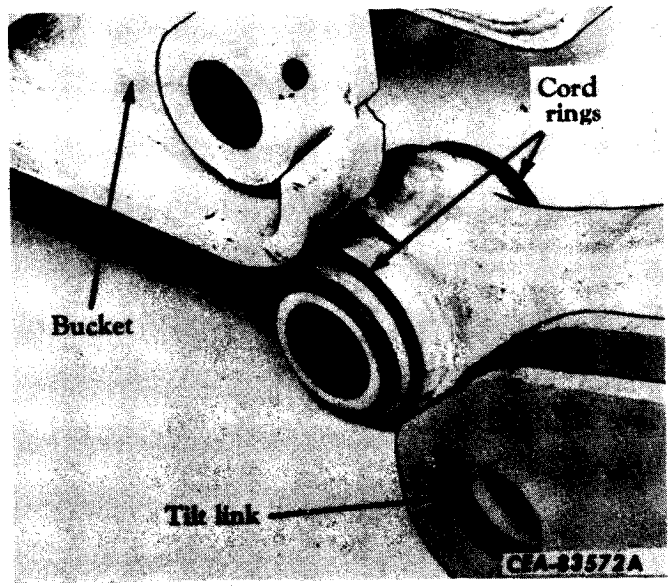
Illust. 6
Removing the Tooth Tip.
1. Pin lock.
2. Locking pin.

4. INSTALLATION

1. Place the cord rings on the flanges of the lift arm (two rings on each bucket mounting). With a hoist, lower the bucket into position over the lift arms (Illust. 7).

2. Start the engine and raise the lift arm until the mounting holes in the arm and bucket are aligned. Stop the engine. Tap in the mounting

(Continued on next page)



Illust. 7
Bucket Positioned for Mounting.

BUCKET

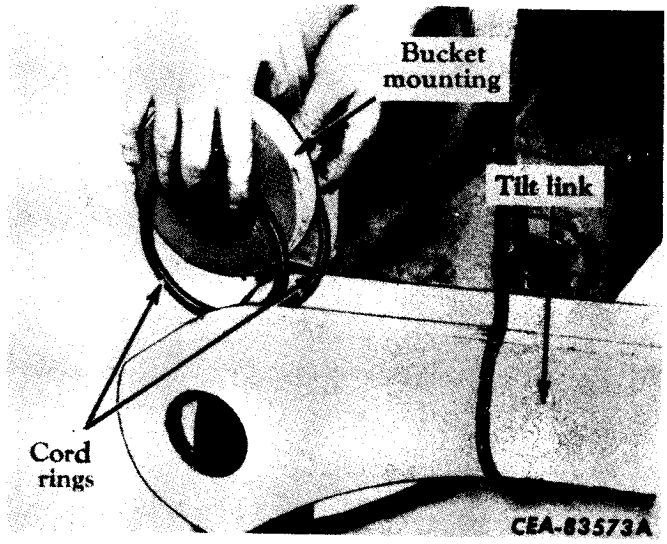
4. INSTALLATION - Continued

pins. If necessary, a slight adjustment can be made by raising or lowering of the bucket to align the mounting holes as the mounting pin is installed.

3. Push the cord rings located on the lift arm flanges onto the tapered ends of the flanges against the bucket skid shoes. Secure the mounting pins with the locking cap screws and nuts. Do not tighten the nuts at this time.

4. With a hoist raise the tilt link until it is slightly below its mounting position on the bucket. Position the cord rings between the link and bucket as shown in Illust. 8. Slowly raise the link. As the link moves into position, the inside face of the link will force the cord rings against the bucket. At this time, stretch the rings at the top so they are over the tapered ends of the bucket mounting. Then as the mounting holes begin to align, keep the cord rings on the taper at the bottom of the bucket mounting by working through the mounting pin openings with a small punch. Install the mounting pin.

5. Install the tilt link on the other side of the bucket in the same manner. Then insert each of the mounting pin locking cap screws in from the bottom and loosely tighten the nut.



Illust. 8
Installing the Tilt Link and Cord Rings.

6. Start the engine and tilt the bucket forward until sufficient clearance is available to reverse the tilt link mounting pin locking cap screw in the mounting pin. Remove the cap screws and reinstall through the top.

7. Tighten the four bucket mounting pin locking cap screws to standard torque.

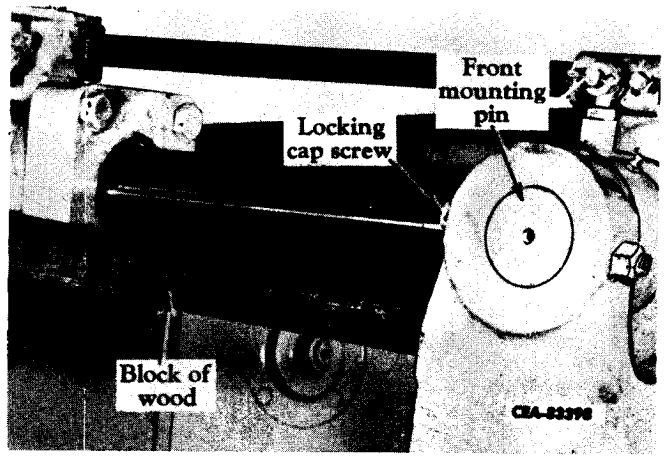
LIFT ARM

5. REMOVAL

1. Remove the bucket as described in Par. 2, "REMOVAL."

2. Tap a block of wood under the tilt cylinder front mounting to keep it from falling. Remove the locking cap screw and nut securing the mounting pin to the lift arm bell crank. Drive out the mounting pin with a punch and hammer. Disconnect the other tilt cylinder at the lift arm bell crank in the same manner (Illust. 9).

3. Tip back the tilt cylinders as far as they will go and tie them in position using a heavy rope.



Illust. 9
Tilt Cylinder Front Mounting.

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LIFT ARM

4. Remove the hood side sheet (snap on type) from each side of the engine.

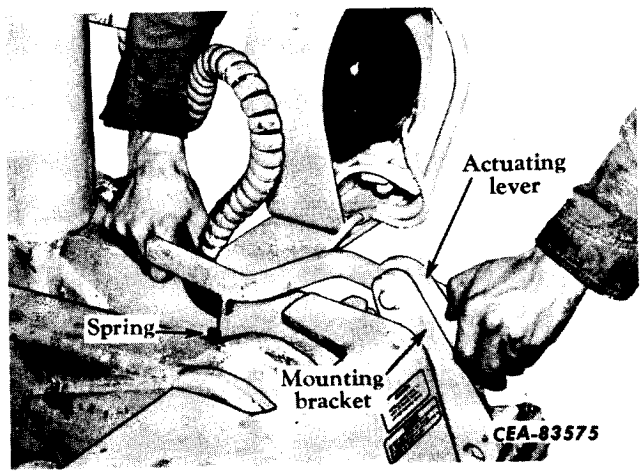
5. Remove the exhaust pipe. Disconnect the air cleaner and any other parts connected to the hood. Remove the hood mounting cap screws and washers and lift off the hood.

6. Wrap a cable around the lift arm bracket behind each of the bell crank pivot points (Illust. 12). Connect each of the cables to an individual hoist. If two hoists are not available, a spreader bar can be used in conjunction with one hoist and the cables connected to the spreader bar.

7. Raise the lift arm assembly with the hoist until sufficient clearance is available between the lift arm and the engine to drive out the lift cylinder front mounting pins. Block under the lift cylinder on each side of the loader and lower the lift arm so the cylinders are resting on the blocking. Leave the hoist connected for lift arm removal.

8. Remove the locking cap screw and nut securing the cylinder mounting pins to the lift arm. Drive out the mounting pin with a punch and hammer (each side of the loader).

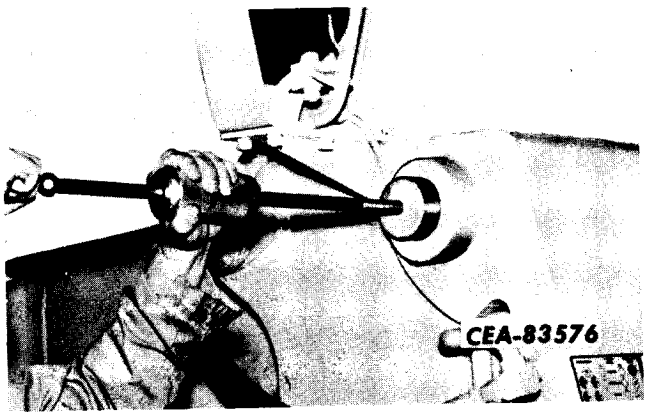
9. LOADERS EQUIPPED WITH AUTOMATIC KICKOUT: The actuating lever and cam must be removed from the RH side of the loader to facilitate removal of the locking cap screw for the lift arm pivot mounting pin. Disconnect the spring from the actuating lever, then remove the cotter, castellated nut and flat washer securing the cam and lever to the mounting bracket (Illust. 10).



Illust. 10
Disconnecting the Actuating Lever Spring. (Loader with Automatic Kickout Only).

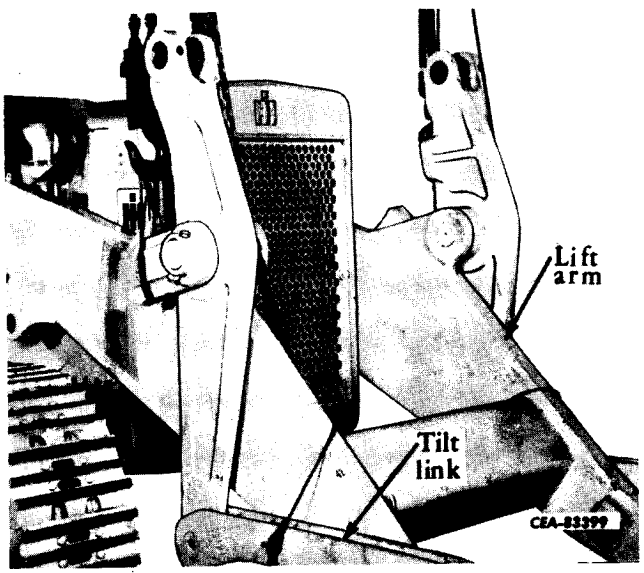
10. Secure the tilt links to the lift arm with a cable to keep them from dragging and to aid in balancing the lift arm assembly during removal (Illust. 12).

11. Remove the locking cap screw and nut securing the lift arm pivot mounting pin on each side of the loader. Remove the mounting pins with a slide hammer (Illust. 11).



Illust. 11
Removing the Lift Arm Pivot Mounting Pin.

12. Move the lift arm assembly forward and down past the loader frame (Illust. 12). As the rear of the lift arm approaches the radiator guard, the assembly must be raised above the radiator guard as the flanges on the lift arm mountings will not clear the guard.



Illust. 12
Removing the Lift Arm Assembly.

LIFT ARM

6. INSTALLATION

1. Move the lift arm assembly into position with the hoist. After the rear of the lift arm passes the radiator guard, it should be lowered until it passes the tilt cylinder mountings on the loader frame and then brought to its mounting between the bosses of the loader frame.

NOTE: If the lift arm will not enter the mounting boss of the loader frame, a hydraulic ram and a bar can be used to slightly spread the lift arm.

2. Drive in the lift arm mounting pin on each side of the loader so the locking cap screw hole in the loader frame and pin are aligned (Illust. 11). Install the locking cap screws from the top and secure with the nuts.

3. LOADER EQUIPPED WITH AUTOMATIC KICKOUT: Secure the actuating lever and cam to the mounting bracket with the flat washer, castellated nut and cotter. Connect the spring to the actuating lever (Illust. 10).

4. Secure the lift cylinder on each side of the loader with the mounting pin, locking cap screw and nut. When installing the mounting pin be sure the holes in the pin and lift arm are aligned. The locking cap screw must be inserted from the top. With both lift cylinders connected, raise the lift arm with the hoist and remove the blocking from under the cylinders.

5. Connect the tilt cylinder to the lift arm bell crank on each side of the loader (Illust. 9). Remove the rope securing the cylinder in an upright position and position it in its mounting on the bell crank. Secure with the mounting pin, locking cap screw and nut. Insert the cap screw from the rear of the bell crank. If necessary, the bell crank can be moved back and forth to align the mounting pin openings.

6. Install the hood. Loosely insert the hood mounting cap screws and washers. Connect the air cleaner and any other items that were disconnected to facilitate hood removal. Install the exhaust pipe. Tighten the hood mounting cap screws.

7. Install the hood side sheet (snap on type) on each side of the engine.

8. Install the bucket as described in Par. 4, "INSTALLATION."

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SERVICE BULLETIN REFERENCE

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1. DESCRIPTION

The hydraulic system consists of a hydraulic pump, control valve, reservoir, single stage-double acting type hydraulic cylinders and piping.

The IH (SERIES 28) hydraulic pump is used in this system. The pump is flange mounted to the torque converter and driven by the converter accessory driven gear. The pump operates continually when the engine is running, but is under load only when the control valve demands pressure.

The IH (SERIES 7) hydraulic control valve used in this system is located on the right hand fender (part of front frame) next to the operator's seat. This is a three spool valve. One spool directs oil to the bucket lift cylinders and another spool directs oil to the bucket tilt cylinders. Both spools are operated by the same control lever. An auxiliary circuit controlled by the third spool operates such equipment as a scarifier or controls clamp operation. A 4-in-1 loader using all three circuits may be equipped with another single spool diverter valve. This valve, in series with the control valve, is used to operate a scarifier. This section covers the removal and installation of the main components of the hydraulic system. For further description, operation and servicing of these components and for testing of the hydraulic system, refer to the International Crawler Tractor and Loader Hydraulic Equipment Service Manual, ISS-1511.

HYDRAULIC PUMP

2. REMOVAL

(Ref. Nos. Refer to Illust. 1)

◆ CAUTION: BE SURE THAT THE BUCKET HAS BEEN LOWERED TO THE GROUND.

NOTE: Disconnected hydraulic lines must be capped with the correct size plastic cap. If caps are not available, use tape or rubber stoppers. Openings must never be plugged with rags. This practice could introduce dirt or lint into critical hydraulic components.

1. Remove the plug in the bottom of the hydraulic reservoir and allow the bucket hydraulic system to drain completely.

2. Disconnect the decelerator pedal adjustable clevis at the pedal by removing the cotter and end pin. Remove the platforms.

3. Disconnect the items necessary to facilitate removal of the platform support (2). Remove the platform support.

NOTE: On units equipped with automatic decelerator, the decelerator cylinder (6) can be removed with the platform support by disconnecting the hydraulic lines (5) and removing the cap screws and washers securing the cylinder at the rear to the seat support bar.

4. Disconnect the hydraulic hoses at the suction filter (7). Remove the suction filter from the seat support bar.

5. Disconnect the pressure filter inlet hose (9) at the filter base. Unthread the pressure filter hold-down bolt securing the filter case (8) to the base and remove the case with bolt. Lift the spring and element from the base. Disconnect the clutch pressure gauge tube (11) at the base. Remove the filter base mounting hardware and allow the base to lay in the loader frame.

6. Remove the cap screws, lock washers and clamp halves securing the equipment pump inlet tube (4) to the top of the pump (12). Loosen the clamp nuts securing the other end of the tube to the hose connection below the seat support bar. Remove the pump inlet tube.

7. Remove the rear cover from the underside of the front frame. Remove the cap screws, lock washers and clamp halves securing the pump outlet hose to the bottom of the pump.

8. Insert an eyebolt into one of the inlet tube mounting holes in the top of the pump and attach a hoist. Remove the two pump mounting bolts and free the pump from the converter housing. Lower the pump until it rests in the front frame and transfer the hoist sling to one of the pump mounting holes. Remove the eyebolt from the pump.

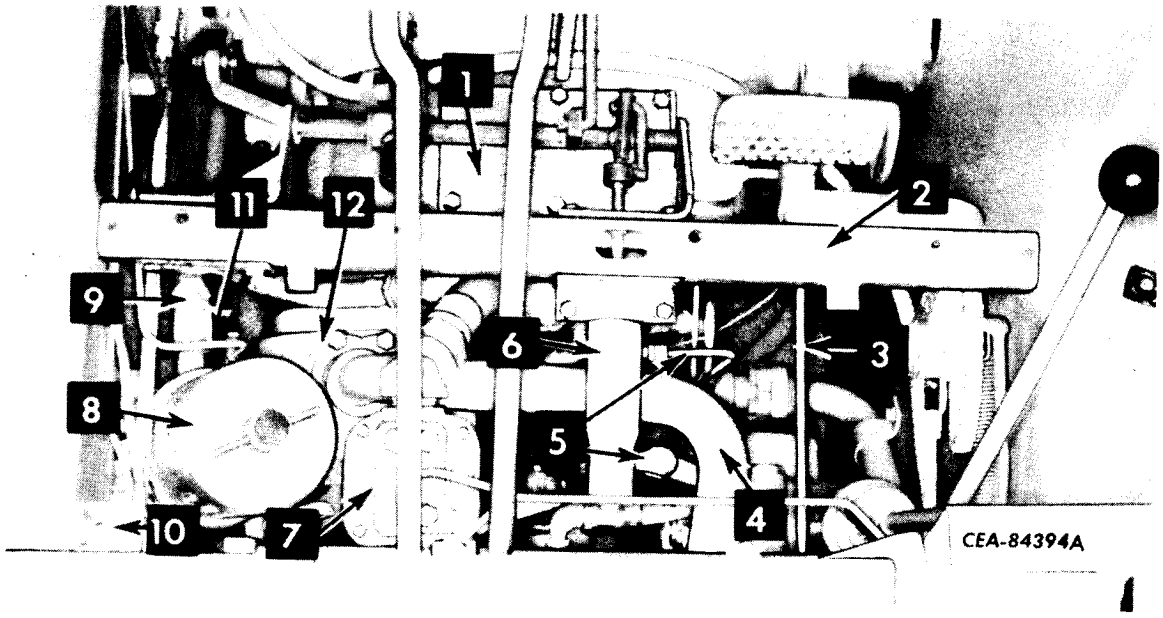
9. Raise the pump out the top of the unit. As the pump is being lifted out, it may be necessary to maneuver the filter base to the rear as far as possible and then down under the pump to provide clearance.

(Continued on next page)

HYDRAULIC PUMP

2. REMOVAL - Continued

(Ref. Nos. Refer to Illust. 1)



Illust. 1
Equipment Pump in Position.

1. Converter inspection cover.
2. Platform support.
3. Converter vent tube.
4. Equipment pump inlet tube.
5. Decelerator cylinder lines (if equipped).
6. Decelerator cylinder (if equipped).
7. Suction filter.
8. Pressure filter case.
9. Pressure filter inlet hose.
10. Test connection header block.
11. Clutch pressure gauge tube.
12. Equipment pump.

3. INSTALLATION

(Ref. Nos. Refer to Illust. 1)

1. Lower the pump (12) into position, repositioning the hoist sling as was done in removal and secure to the converter housing with the two mounting bolts. If necessary, be sure to maneuver the pressure filter base as the pump is being lowered so the base is above the pump when the pump is secured.

2. Be sure the "O" ring in the end of the pump outlet hose is in place and in good condition and secure the hose to the bottom of the pump with the clamp halves, cap screws and lock washers. Install the rear cover to the underside of the front frame.

3. Insert the pump inlet tube (4), in the connecting hose below the seat support bar. Be sure the "O" ring in the pump end of the tube is in place and in good condition and secure the tube to the pump with the clamp halves, cap screws and lock washers. Tighten the clamp on the connecting hose end of the tube.

4. Secure the pressure filter base to the front frame. Connect the clutch pressure gauge tube (11) at the filter base.

> NOTE: The hold-down bolt that secures the pressure filter case (8) to the base must not be tightened excessively or leakage may result. Lubricate the bolt threads with SAE-30 engine oil and torque the bolt to 55 ft. lbs maximum (hex-hd type bolt) or from 10 - 15 ft. lbs (cross bar type bolt).

5. Position the element and spring on the pressure filter base. Be sure the "O" ring on the hold-down bolt and in the filter case (8) are in place and in good condition and secure the filter case to the base. Connect the pressure filter inlet hose (9) at the filter base.

6. Secure the suction filter (7) to the seat support bar. Connect the hydraulic hoses at the suction filter.

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HYDRAULIC PUMP

7. Install the platform support (2). Connect the items that were disconnected to facilitate removal of the platform support.

8. Install and secure the LH front platform with decelerator pedal. Connect the adjustable clevis to the decelerator pedal with the end pin and cotter.

9. Be sure the drain plug is installed in the bottom of the hydraulic oil reservoir and fill and vent the hydraulic system as described in the operators manual.

10. Run the engine and check for leaks.

11. Install the platforms.

CONTROL VALVE

4. REMOVAL

(Ref. Nos. Refer to Illust. 2)

◆ CAUTION: BE SURE THAT THE BUCKET HAS BEEN LOWERED TO THE GROUND.

NOTE: Disconnected hydraulic lines must be capped with the correct size plastic cap. If caps are not available, use tape or rubber stoppers. Openings must never be plugged with rags. This practice could introduce dirt or lint into critical hydraulic components.

1. Remove the plug in the bottom of the hydraulic reservoir and allow the bucket hydraulic system to drain completely.

2. Remove the valve side cover plate.

3. If equipped with automatic kickout, disconnect the four hoses (6, 7 and 13) at the control valve and tag for proper installation.

4. Remove the cap screws, nuts and washers securing the support bracket (5) to the loader frame and seat side sheet. Loosen the nut securing the bottom of the support bracket to the seat side sheet but do not remove the nut. Pivot the support bracket down to allow clearance for disconnecting the piping on the inner side of the valve.

5. If equipped with an anti-cavitation valve (in tilt cylinder circuit), disconnect the hydraulic tube at the elbow in the control valve and allow the tube with check valve and hose to lay on the frame.

6. Loosen the nuts on all of the cylinder piping (9, 14, 15 and 16) and the valve inlet and outlet pipes (8) and (18) at the control valve. If any of the nuts become hard to turn off, disconnect the valve mounting plate (2) as described in step 7 to prevent damaging the pipe or nut.

7. Remove the vertical circuit relief valve (17) to facilitate loosening of the lift cylinder (head end) pipe nut.

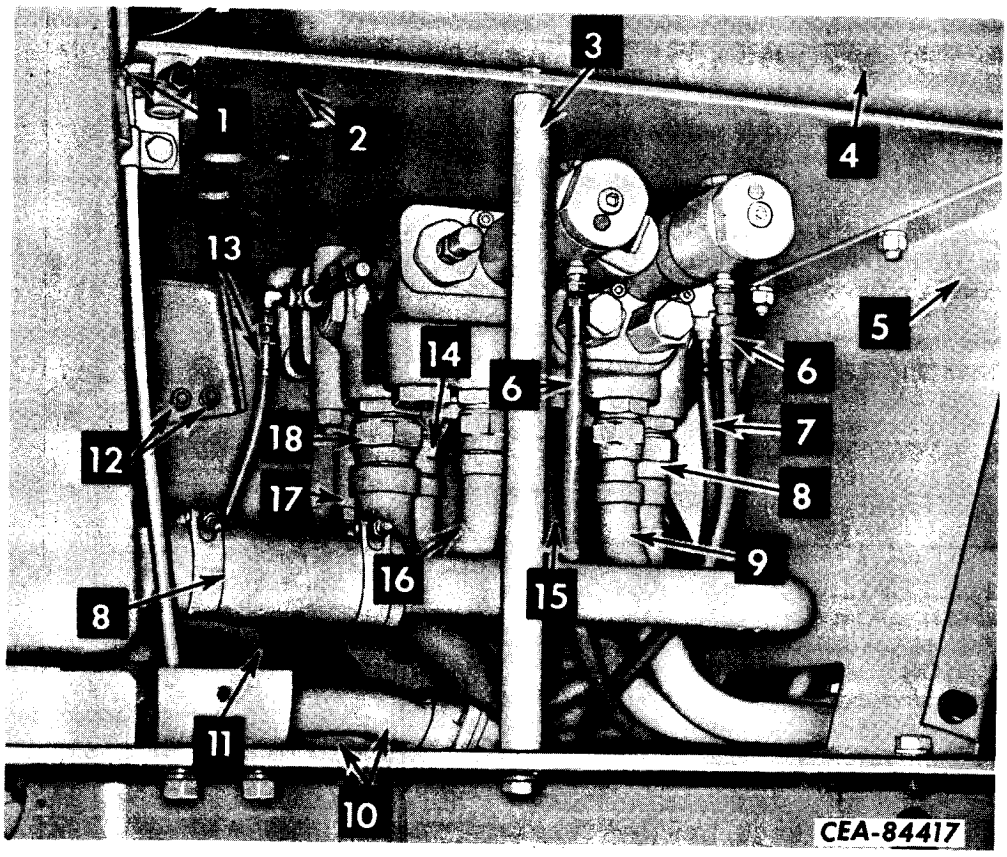
NOTE: Some of the cylinder piping nuts will not be able to be completely turned off the valve at this time. Final release will be accomplished as the valve is lifted off the unit.

(Continued on next page)

4. REMOVAL - Continued

CONTROL VALVE

(Ref. Nos. Refer to Illust. 2)



Illust. 2
Control Valve Disconnect Points (Valve with Automatic Kickout Shown).

1. Hydraulic reservoir support bracket.
2. Valve mounting plate.
3. Plate support bar.
4. Tool box.
5. Support bracket.
6. Kickout valve pressure outlet hoses.
7. Return hose (kickout circuit).
8. Control valve outlet-to-reservoir pipe.
9. Tilt cylinder pipe (rod end).
10. RH lift cylinder hose connection.
11. Reservoir-to-pump inlet hose.
12. Mounting nuts.
13. Pressure supply hose (kickout circuit).
14. Lift cylinder pipe (head end).
15. Tilt cylinder pipe (head end).
16. Lift cylinder pipe (rod end).
17. Vertical circuit relief valve.
18. Pump-to-control valve inlet pipe.

8. Remove the tool box (4). Remove the cap screws, nuts and washers securing the valve mounting plate (2) to the seat side sheet, hydraulic reservoir support bracket (1) and the plate support bar (3).

NOTE: To disconnect the valve mounting plate from the seat side sheet, hold the bolts by placing an open end wrench between the seat frame and seat side sheet and remove the nuts (12) and washers. Move the bolts back to clear the mounting plate.

9. Attach a hoist and sling to the hand lever stud and to two of the tool box mounting holes in the valve mounting plate to balance the assembly. As the valve and hand lever assembly is slowly lifted off the hydraulic piping, turn off piping nuts that could not be completely freed from the valve previously.

5. INSTALLATION

(Ref. Nos. Refer to Illust. 2)

1. Attach a hoist to the valve mounting plate and the hand lever stud as was done in removal and position the valve on the hydraulic pipes.

2. Start all the hydraulic piping nuts on the valve but do not tighten. Secure the valve

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CONTROL VALVE

mounting plate (2) to the seat side sheet, hydraulic reservoir support bracket (1) and the plate support bar (3) with the cap screws nuts and washers. Tighten the hydraulic piping nuts.

3. Install the vertical circuit relief valve (17).

4. Install the tool box (4).

5. Connect the tilt circuit anti-cavitation tube to the elbow in the control valve (if equipped).

6. Move the support bracket (5) into position and secure to the loader frame and seat side sheet with the cap screws, nuts and washers.

7. If equipped with automatic kickout, connect the four hoses (6, 7 and 13) to the control valve.

8. Be sure the drain plug is installed in the bottom of the hydraulic reservoir and fill and vent the hydraulic system as described in the operator's manual.

9. Run the engine and check for leaks.

10. Install the valve side cover plate.

TILT CYLINDER

6. REMOVAL

1. Wrap a cable around each end of the cylinder and attach to a hoist. The cables must be attached so when a strain is taken on the cables, the front cable will not bear against the welded pipe on the cylinder housing (Illust. 3).

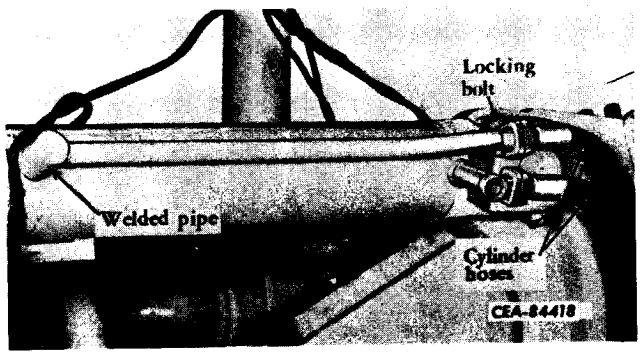
2. Remove the clamp halves securing the two cylinder hoses and cap hoses to prevent dirt from entering.

3. Take the slack out of the hoist sling. Remove the cylinder mounting pin locking bolt and nut at each end of the cylinder and drive out the mounting pins (Illust. 3).

4. Lift the cylinder from the loader.

7. INSTALLATION

1. Lower the cylinder into position between the loader frame and lift arm bell crank mountings. Align the locking bolt hole in the mounting pin cylinder and drive the mounting pin into position. Secure with the locking bolt and nut (Illust. 3).



Illust. 3
Tilt Cylinder Disconnect Points.

Secure the cylinder to the lift arm bell crank in the same manner. If necessary the cylinder rod or the bell crank can be moved to aid in alignment for pin installation.

2. Remove the caps from the cylinder hoses. Install a new "o" ring in the end of each cylinder hose, and connect the hoses to the cylinder with the clamp halves.

3. Vent the hydraulic system and add oil as necessary (refer to the operators manual.)

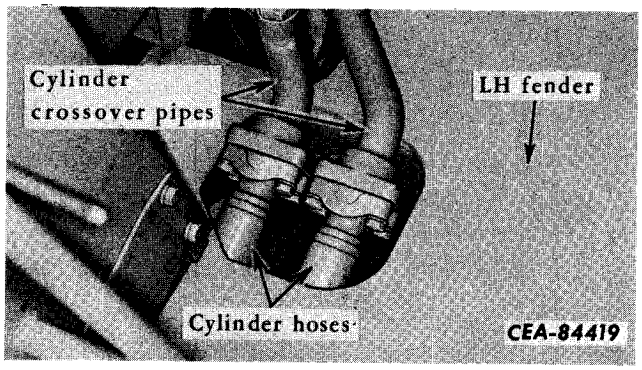
LIFT CYLINDER

8. REMOVAL

1. Remove the hood side door (quick disconnect type) to facilitate removal of the cylinder front mounting pin.

2. With the engine running, raise the lift arm until the safety bar can be installed. Lower the lift arm to lock the safety bar and shut-off the engine. If both lift cylinders are to be removed, the lift arm must be raised and blocked at a point that will provide clearance for driving out the cylinder front mounting pin toward the engine.

3. Disconnect the cylinder hoses and position them so they can be removed with the cylinder. If removing the left hand cylinder, it will first be necessary to remove the batteries and battery box on the fender to provide clearance to disconnect the hoses at the rear pipes (Illust. 4). If removing the right hand cylinder, first remove the valve side cover plate and disconnect the hoses at the rear pipe connection (10, Illust. 2). Hoses are easily disconnected by removing one hose clamp halve and loosening the other. Cap the tube openings to prevent dirt from entering.

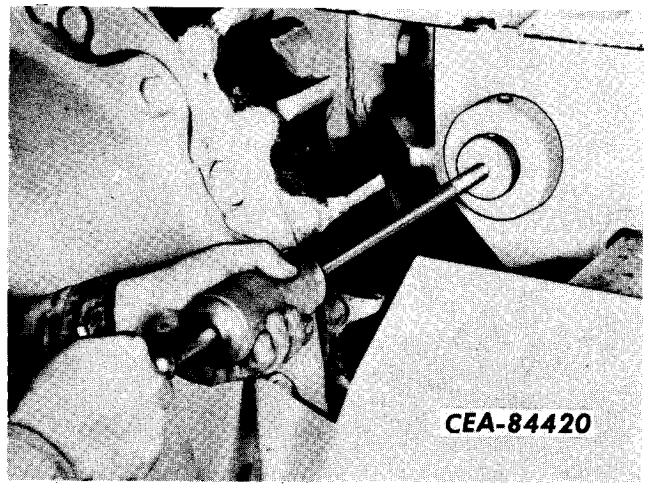


Illust. 4
LH Lift Cylinder Disconnect Points.

4. Attach a hoist to the cylinder directly behind the cylinder cap. Remove the locking bolt and nut securing the cylinder front mounting pin to the lift arm. Drive out the mounting pin.

5. Remove the locking bolt and nut securing the cylinder rear mounting pin to the loader frame and pull the pin from position with a slide hammer (Illust. 5).

NOTE: As the cylinder is removed, downward pressure must be exerted on the piston rod to balance the assembly. Move the cylinder between the loader frame and the engine and lay the assembly on the track chain, guiding the two cylinder hoses out to prevent them from being damaged. Also, when the rear of the cylinder leaves its mounting in the loader frame, remove the two cord rings used for sealing. This can easily be accomplished from under the unit.



Illust. 5
Removing the Cylinder Rear Mounting Pin.

9. INSTALLATION

1. Place the two cord rings on the rear of the cylinder. If they will not stay in position, a small wire can be hooked around each of the rings to keep them from rolling off.

2. Attach a hoist to the cylinder and move the cylinder into position, balancing the cylinder as was done in removal. Be sure to guide the cylinder hoses into position as the cylinder is moved to the rear.

3. Align the locking bolt holes in the rear mounting pin and loader frame and drive the pin into position. Secure with the locking bolt and nut.

4. Working under the unit, remove the wire securing the cord rings on the cylinder and move them into position against the loader frame.

5. Install a new "o" ring in the end of each of the cylinder hoses and secure the hoses with the clamp halves, cap screws and washers (Illust. 2 and 4). If the left hand cylinder was removed, install the batteries and battery box.

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LIFT CYLINDER

6. Start the engine and extend and retract the cylinder rods as necessary to install the front mounting pin. Secure the pin with the locking bolt and nut. Raise the lift arm and remove the safety bar or blocking.

7. Vent the hydraulic system and add oil as necessary (refer to the operator's manual.)

8. Check for leakage at the cylinder and hose connections.

9. If the RH cylinder was removed, install the valve side cover plate.

10. Install the hood side door.

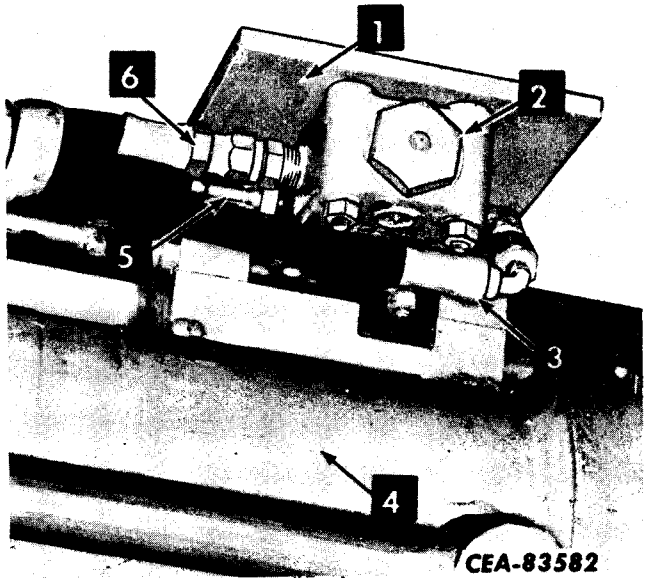
KICKOUT VALVE (IF EQUIPPED)

On units equipped with automatic kickout, two kickout valves are used. One in the lift circuit and one in the tilt circuit. The valve assemblies are identical, only the mounting and hose connections are different.

10. REMOVAL

NOTE: Cap disconnected hydraulic hoses with the correct size plastic cap. If caps are not available, use tape or rubber stoppers. Openings must never be plugged with rags. This practice could introduce dirt or lint into critical hydraulic components.

Tilt Circuit (Illust. 6)



Illust. 6
Kickout Valve Disconnect Points.

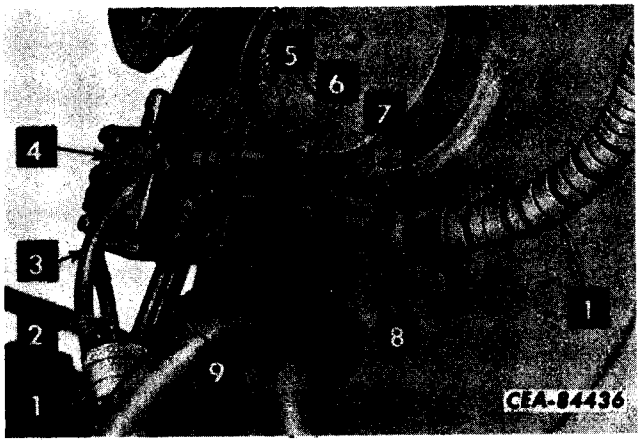
1. Mounting bracket.
2. Kickout valve.
3. Pressure outlet hose.
4. Tilt cylinder.
5. Return hose.
6. Pressure supply hose.

1. Disconnect the pressure outlet and supply hoses (3 and 6) at the valve.

2. Remove the three cap screws, washers and nuts securing the valve (2) to the mounting bracket (1) and pull the valve from between the bracket and tilt cylinder.

3. Hold the return hose (5) with a wrench and turn the valve from the hose.

Lift Circuit (Illust. 7)



Illust. 7
Kickout Valve Disconnect Points.

1. Hose guard.
2. Pressure outlet hose.
3. Return hose.
4. Kickout valve.
5. Mounting bracket.
6. Return hose (from tilt circuit kickout valve).
7. Pressure supply hose (to tilt circuit kickout valve).
8. Pressure outlet hose (from tilt circuit kickout valve).
9. Pressure supply hose.

(Continued on next page)

KICKOUT VALVE (IF EQUIPPED)

10. REMOVAL - Continued

Lift Circuit (Illust. 7) - Continued

1. Disconnect the return hoses (3 and 6) at the valve (4). Disconnect the pressure outlet hose (2) at the valve.

2. Remove the three cap screws and washers securing the valve (4) to the mounting bracket (5).

3. Remove the control valve side cover plate and disconnect the pressure supply hose (13, Illust. 2) from the control valve. Break the pressure supply hose (9) loose at the kickout valve and turn the hose from the valve. The hose will hang in the hose guard (1).

4. Disconnect the pressure supply hose (7) at the kickout valve for the tilt circuit (refer to (6. Illust. 6). Then turn the hose tree of the lift circuit kickout valve and let the hose hang in the hose guard (1).

11. INSTALLATION

Lift Circuit (Illust. 7)

1. Connect the pressure supply hose (7) to the lift circuit kickout valve and then to the tilt circuit kickout valve.

2. Connect the pressure supply hose (9) to the kickout valve and then to the control valve.

3. Secure the kickout valve to the mounting bracket (5) with the three cap screws and washers.

4. Connect the pressure outlet hose (2) at the valve. Connect the return hoses (3 and 6) at the valve.

5. If the kickout valve for the tilt circuit was removed, it must be installed. Then bleed the system as described in Par. 12, "VENTING."

Tilt Circuit (Illust. 6)

1. Connect the return hose (5) to the kickout valve.

2. Secure the valve (2) to the mounting bracket (1) with the three cap screws, washers and nuts.

3. Connect the pressure outlet and supply hoses (3 and 6) to the valve.

4. If the kickout valve for the lift circuit was removed, it must be installed. Then bleed the system as described in Par. 12, "VENTING."

12. VENTING

Whenever the hydraulic hoses in the kickout circuit have been disconnected, the system must be vented of air. It is not necessary to vent the complete loader hydraulic system if only the kickout circuit has been disturbed.

1. Open the bleeder screw on the swivel tube of the lift and tilt valve spools. These bleeder screws can be reached through the openings provided in the control valve top plate (2) (Illust. 2).

2. Start the engine. Raise the lift arm and roll back the bucket to actuate the kickout valves. Close the bleeder screws when oil flows freely from the screws.

3. Stop the engine.

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1. DESCRIPTION

The hydraulic system consists of a hydraulic pump, control valve, reservoir, single stop - double acting type cylinders and piping.

The IH (SERIES 28) hydraulic pump is used in this system. On the 250 loader, the pump is flange mounted to the torque converter and driven by the converter accessory driven gear. On the TD-20 SERIES B, the pump is flange mounted to the right hand side of the flywheel housing and is driven through a series of gears by the engine crankshaft. This gear type pump operates continually when the engine is running; but is under load only when the control valve demands pressure.

The IH (SERIES 7) hydraulic control valve used in this system controls the pressures to operate the hydraulic equipment. The valve is located on the right hand fender (part on loader frame on loader) next to the operator's seat. The valve used on the 250 loader is a three spool valve. The TD-20 SERIES B uses either a one spool or a three spool valve. On the 250 loader, the spools that operate the lift cylinder and tilt cylinders are controlled by the same hand lever. The third spool (when in use) operates the scarifier or controls bucket clamp operation and is controlled by a second hand lever. A 4-in-1 loader using all three circuits may be equipped with another single spool diverter valve. This valve, in series with the control valve, is used to operate the scarifier. On the TD-20 SERIES B, the single spool valve is used to raise and lower the blade. When a blade tilt or scarifier is used, a three spool valve is necessary. On these tractors, one control lever operates the blade and another control lever operates the scarifier.

This section covers the removal and installation of the hydraulic pump and valve. For further description, operation and servicing of these components and for testing of the hydraulic system, refer to the International Tractor and Loader Hydraulic Equipment Service Manual, ISS - 1511.

HYDRAULIC PUMP

2. REMOVAL AND INSTALLATION

◆ CAUTION: BE SURE THE BUCKET OR BLADE IS BLOCKED UP OR LOWERED TO THE GROUND.

NOTE: When disconnecting hydraulic lines for any reason, they should be properly capped with the correct size plastic cap. If these caps are not available, tape or clean rubber corks may be used. Hydraulic openings must NEVER be plugged with rags. This practice could easily introduce dirt or lint into critical hydraulic components of the tractor.

1. Drain the blade or loader hydraulic system. Refer to the pertinent operator's or instruction manual.

2. MODEL 250 Loader Only: Remove the platforms. Remove the access plate in the bottom of the front frame to facilitate removal of the pump bottom mounting bolt.

TD-20 SERIES B Only: Remove the engine side sheet from the right hand side of the tractor. Disconnect and remove (if necessary) the cylinder supply lines to provide clearance for pump removal.

3. Disconnect the pump inlet and outlet lines at the pump.

4. Attach a hoist to the pump. Remove the two mounting flange bolts and remove the pump.

5. To install the pump, reverse the removal procedure. The hydraulic system must be filled and vented as described in the pertinent operator's or instruction manual.

CONTROL VALVE

3. REMOVAL AND INSTALLATION

(Ref. Nos. Refer to Illust. 1)

◆ CAUTION: BE SURE THE BUCKET OR BLADE IS BLOCKED UP OR LOWERED TO THE GROUND.

NOTE: When disconnecting hydraulic lines for any reason, they should be properly capped with the correct size plastic cap. If these caps are not available, tape or clean rubber corks may be used. Hydraulic openings must NEVER be plugged with rags. This practice could easily introduce dirt or lint into critical hydraulic components of the tractor.

1. Drain the blade or loader hydraulic system. Refer to the pertinent operator's or instruction manual.

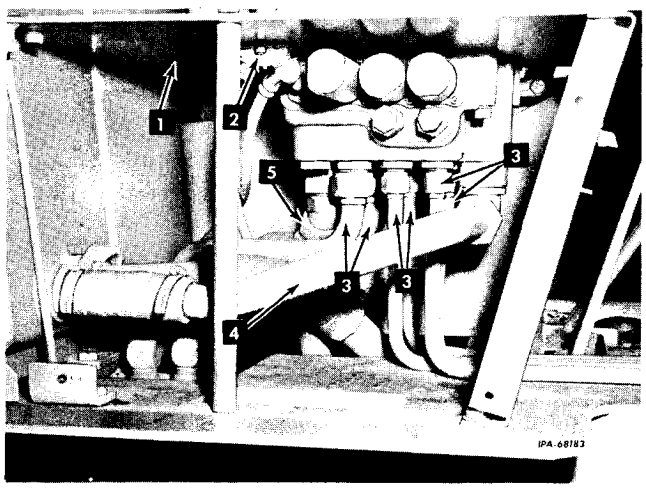
2. Remove the cover enclosing the hydraulic control valve.

3. Disconnect the master switch (2).

4. Disconnect the valve inlet and return lines (4 and 5). Disconnect the cylinder supply lines (3) at the valve body.

5. Remove the top cover mounting bolts and remove the top cover (1) with the valve and control levers attached.

6. To install the valve assembly, reverse the removal procedure. The hydraulic system must be filled and vented as described in the pertinent instructions or in the operator's manual.



Illust. 1
Hydraulic Control Valve Assembly (MODEL 250 Loader Shown, TD-20 SERIES B Similar).

1. Valve top cover.
2. Master switch.
3. Cylinder supply lines.
4. Valve return line.
5. Valve inlet line.

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SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES