Pay Line Group

Service Manual

INTERNATIONAL MODEL 560

RUBBER TIRED LOADER

FORM

SM-560-2

MARCH, 1979

(Supersedes Form SM-560)

PAYLINE PUBLICATIONS INFORMATION

The following basic publications are available for additional information on this particular machine. Special publications, other than the basic publications shown below, can be ordered from the PAYLINE Index and Price List. (*) Please tear out this page and check the publications desired. Fill in ALL the information requested and mail to:

International Harvester Company, Printing and Distribution Services, 807 Blackhawk Drive, Westmont, Illinois, 60559
Attn: PAYLINE CUSTOMER SALES

Please send me (Check items in box)

	FORM NO.	DESCRIPTION	Price
☐	EPC-817C-2	Engine Parts Catalog	$ 5.60
☐	EPC-817B-2		7.20
☐	PM-560-7	Chassis Parts Catalog	18.40
☐		Chassis Parts Catalog	
☐	OM-560-3	Operator's Manual	5.70
☐		Operator's Manual	
☐	SM-817C-2	Engine Service Manual	13.50
☐	ISS-1519-3		12.90
☐		Chassis Service Manual	
☐		Chassis Service Manual	26.60
(*) ☐	1 019 104 R12 (Or later)	PAYLINE Index and Price List . . . . . (List of all PAYLINE publications available)	2.00

Prices subject to change without notice.

NOTE: Enclose check or money order payable to International Harvester Company. DO NOT SEND CASH. (Please allow up to 30 days for delivery).

TYPE or PRINT information in the spaces below.

Date _____ Amount Enclosed $ _____

Name _____

Address _____

City _____ State _____ Zip _____

IMPORTANT: THE FOLLOWING IS YOUR RETURN SHIPPING LABEL. PLEASE FILL OUT COMPLETELY AND LEGIBLY. DO NOT DETACH!

FROM: International Harvester Company
Printing and Distribution Services
807 Blackhawk Drive
Westmont, Illinois 60559

TO: Name _____

Address _____

City _____ State _____ Zip _____

PRINTED IN UNITED STATES OF AMERICA

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

CAUTION

Read the Service Manual

Learn to operate this machine SAFELY

Be alert, Observe ALL SAFETY PRACTICES

Machines can be hazardous in the hand of an UNFAMILIAR, UNTRAINED or COMPLACENT Serviceman

Don't risk INJURY or DEATH

GENERAL SAFETY PRECAUTIONS

A great deal of material contained in this service manual concerns itself with the removal and installation of exceptionally heavy items. During the time these operations are being carried out, safe working conditions and procedures are mandatory, to not only insure personal safety but the safety of others in the area. The following items are listed as a reminder of basic shop safety practices, too often neglected in day-to-day operation.

Before doing any work on the machine, remove the ground cable from the battery and tag it so personnel are aware someone is working on the machine.

During service operation be sure frame locking bar is properly installed on tractor frame.

Hoists must be of sufficient capacity to lift the heavier units (i.e. engine, grille, fuel tank) and have an ample safety margin.

Bucket and/or boom must be resting on ground at all times during machine servicing and periods of idleness.

Do not start an engine indoors unless adequate exhaust ventilators are provided. Once an engine is running, move the machine outdoors as soon as possible. Be sure air pressure is sufficient to provide positive brake application.

Floors must be clean and dry. After draining operations be sure all spillage is cleaned up. Electrical cords and wet floors make a dangerous combination.

Provide sturdy step ladders to mount and dismount from the engine compartment; do not climb on tires.

Be sure heavy items are properly supported from hoist or floor jack before removing supporting members from tractor.

Have sufficient service personnel available when removing or installing large heavy items in order to maintain control at all times.

If a heavy item begins to fall, let it fall; don't try to catch it.

Keep hands, feet, clothing away from rotating engine parts.

As a machine is being moved, the operator must face the direction of travel.

Think before you act. Carelessness is one luxury the serviceman cannot afford.

PRINTED IN UNITED STATES OF AMERICA

Page

INTRODUCTION

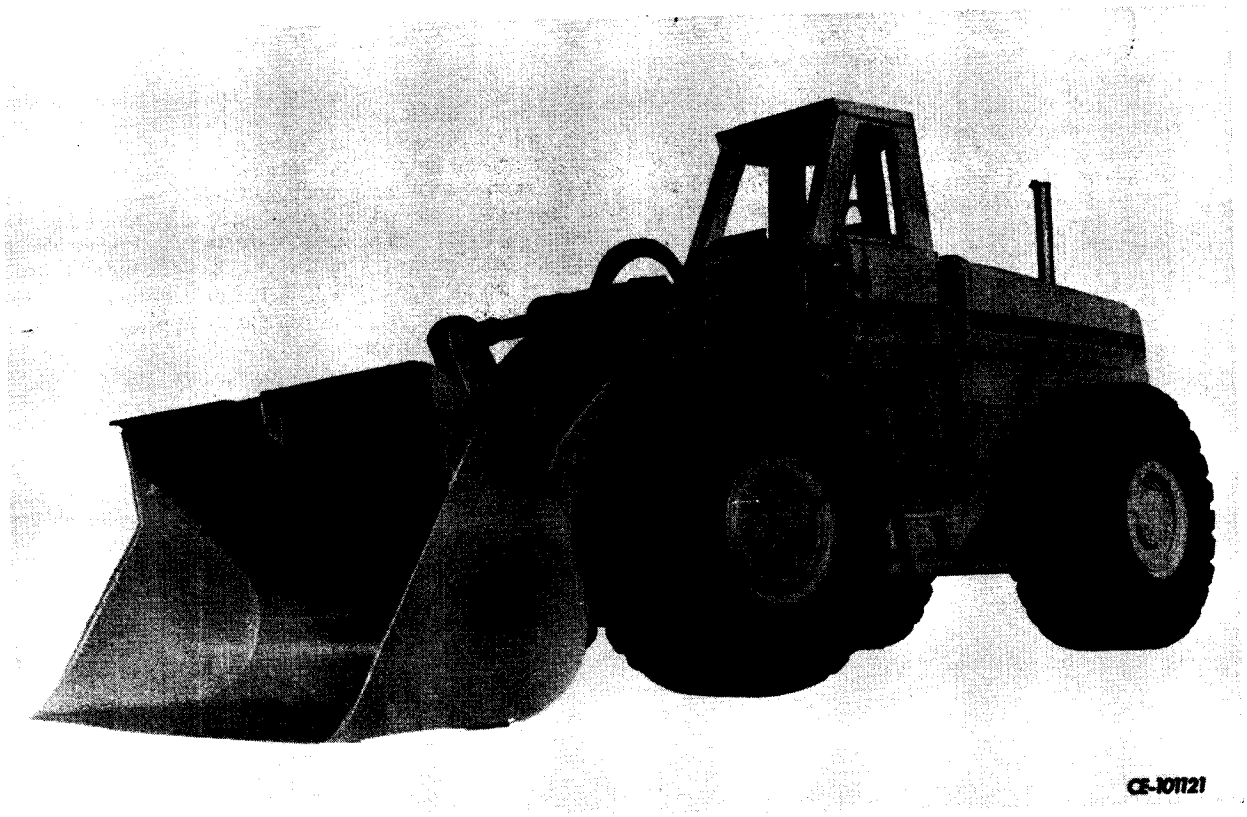
PRINTED IN UNITED STATES OF AMERICA

GENERAL

The instructions contained in this service manual are for the information and guidance of servicemen responsible for the overhaul and repair of the Model 560 PAY loader.

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

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



Model 560 PAY loader.

PRINTED IN UNITED STATES OF AMERICA

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.

SERVICE PARTS

IH Construction Equipment deserves genuine service parts. The best material obtainable and experience gathered through many years of manufacturing power equipment, enable International 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 parts.

For the correct service parts to be used on a machine, always refer to the parts catalog for that particular machine. 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

The tractor serial number is located on the left hand door post of the operator's compartment.

The IH diesel engine serial number is stamped on the left side of the block near the flywheel housing.

ENGINE

The Model 560 comes equipped with either a IH-DT-817 engine or a KT 1150 Cummins engine. Instructions are shown for removal and installation of the engine from the chassis.

For detailed information on overhauling and adjusting the engine, refer to Service Manual ISS-1519 for the I.H. engine and refer to your nearest Cummins dealer for the Cummin's engine.

DIESEL FUEL SYSTEM

If detailed information on the fuel system of the I.H. engine is desired, refer to the Injection Pump Manual, ISS-1042.

SERVICE TOOLS

The design of IH Construction Equipment machines requires a minimum of service tools other than those in the mechanic's tool kit. Whenever 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 as required. Information regarding special tool equipment is available thru International Harvester Company Parts and Service Development Department, 600 Woodfield, Schaumburg, IL 60196. The IH PAYLINE distributors have most of this equipment and are in an excellent position to service these rubber tired loaders.

PRINTED IN UNITED STATES OF AMERICA

GASKETS AND SEALS

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

Do not "roll" an "O" ring seal during installation. To correctly install the "O" ring, position the ring at one point and using a blunt, narrow tool, stretch the "O" ring into position (refer to Fig. I-1).

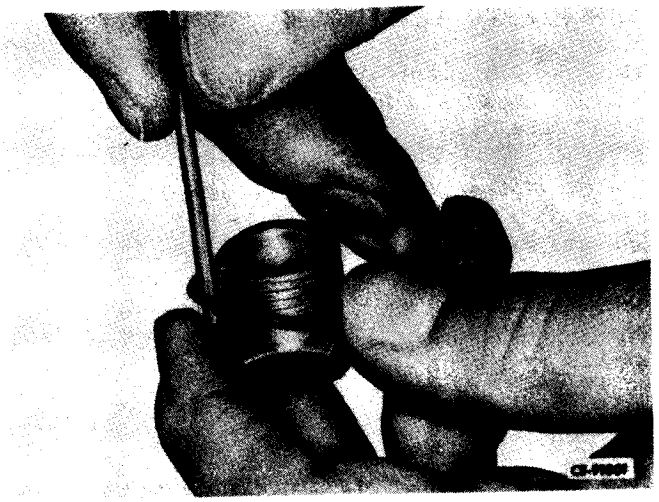


Figure I-1
Correct "O" Ring Installation.

RECOMMENDED BEARING PROCEDURES

NEW BEARINGS

Keep bearings in original cartons or wrappings until ready for use. If package is opened and bearing is not used immediately, protect it by re-wrapping.

Before wrapping and packing, bearings are carefully cleaned by the manufacturer and are thoroughly coated with a protective lubricant.

Keep bearings clean and away from moisture.

Handle bearings with clean hands and use clean tools. Handle bearings as little as possible. Finger marks are hard to wash off and perspiration starts corrosion.

Don't wash the oil or grease out of a new bearing.

Don't take new bearings apart. They were assembled correctly in the first place.

BEARING REMOVAL

Wash off bearing housing; take care to prevent loose dirt from entering the housing.

Take a few moments to study the assembly. Determine the best way to undertake bearing removal.

Be careful and avoid damage. The bearings may be good enough to use again.

The best tool for removing a bearing is usually an arbor press. Most field work however, is done with some type of bearing puller. Where required, this manual will refer to the correct tool to employ. Use it for speed and safety.

To remove a bearing, press or pull only on the race that is tight.

Press or pull straight and square to keep the race from cocking and scoring the shaft or damaging the bearing.

Never press or pull against bearing shields or separators.

Keep the press table and support blocks clean and square. Provide some means to keep the shaft from falling on the floor. Protect the end of the shaft with a pad of lead, copper or other soft metal or a hardwood block.

Use pullers properly. Set them up so that they will push or pull straight and square. Take care not to damage shaft threads, keyways or shoulders in the process.

With proper care, bearings may be removed quite safely with improvised methods when the right tools are not available.

A vise may do in place of an arbor press and a drift can take the place of the press ram. If the shaft is held in a vise, protect its surface with copper sheet or hardwood blocks.

(Continued on next page)

RECOMMENDED BEARING PROCEDURES

BEARING REMOVEL - Continued

A suitable block, placed over the end of a tube type driver, will allow the hammer blows to be struck in dead center. This will prevent the bearing from cocking.

If bearing fit does not permit the use of a bearing puller or arbor press the bearing will have to be cut off. Cut the outer race and ball retainer with an acetylene torch. Burn the inner race only part way through. This will protect the shaft. Crack the race the rest of the way with a hammer and chisel, using care to prevent personal injury from flying parts.

CLEANING

Don't judge the condition of a bearing until after it has been cleaned.

Don't spin dirty bearings. Rotate them slowly while washing.

Don't spin any bearings with an air hose. Rotate one race by hand, when using air, to expose all parts of the bearing.

Bearings with a shield or seal on one side only should be washed, inspected and handled in the same manner as bearings without shields or seals.

Bearings with shields or seals on both sides should not be washed. Wipe them off to keep dirt from working inside. Smooth turning bearings may be coated with protective lubricant and then wrapped and stored or used in their original application.

If a small tank and wire baskets to soak and wash bearings are not available, a clean grease can or bucket filled with solvent may be used.

Let the bearing soak long enough to loosen the grease and dirt. This may require several hours or longer. Then slosh the bearing around near the top of the container, giving it a turn now and then until it is clean. Rinse in a clean container of clean solvent.

A short, clean bristle brush from which the bristles will not come out or break off is a help in removing dirt, scale or chips.

After bearings have been thoroughly cleaned, inspect them immediately.

INSPECTION

A little tarnish, stain or corrosion on the outside surfaces of the races is not detrimental to the operation of the bearing and need not be removed.

Bearings are inspected by holding the inner race so that its axis is vertical (bearing is then horizontal), and turning the outer race slowly.

Bearings should not be rejected because they feel slightly rough or have a tendency to stick at certain points when rotated by hand until the bearings have been re-cleaned. If bearings still feel rough and/or have a catch, inspect them closely to determine the cause.

The following defects are common causes of bearing rejection:

Broken or cracked races.

Dented seals or shields.

Cracked or broken separators.

Broken or cracked balls or rollers.

Flaked areas on balls, rollers or raceways.

Bearings that have been overheated. These bearings are generally darkened to brownish blue or blue-black color.

Bearings whose raceways are indented or "brinelled" by ball or roller impressions in the races.

An anti-friction bearing, properly lubricated, should not wear unless dirt or abrasive foreign matter gets into it. If dirt is allowed to enter a bearing it mixes with the grease or oil and forms a lapping compound that will quickly lap down the balls or rollers.

The load carrying surfaces of anti-friction bearings are finished with extreme care and will sustain very heavy loads unless the surfaces are damaged by abuse in handling or by foreign matter which may be abrasive or corrosive.

BEARING INSTALLATION

Clean shafts and bearing housings thoroughly. Remove all dirt from keyways, splines and grooves. Remove burrs and slivers.

Clean and oil bearing seats.

Press bearings in straight and square.

Press only on the tight fitting race.

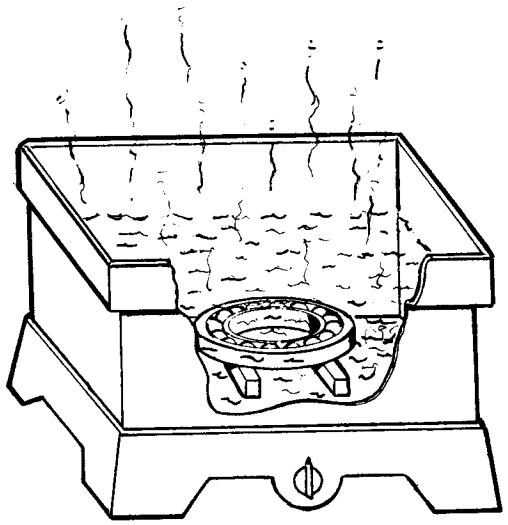
Press bearings until they are seated against the shaft or housing shoulder.

RECOMMENDED BEARING PROCEDURES

Bearing installation is just the reverse of bearing removal. Use an arbor press if available. Press the shaft into the bearing, supporting the inner race on blocks or a suitable press adapter to prevent bearing damage. Be sure the blocks or adapter does not scrape the shaft or threads.

If the distance between the end of the shaft and the bearing seat is fairly short, hold the shaft in a vise or suitable support and press the bearing onto the shaft with a clean tube. This may be done either in an arbor press or by tapping with a hammer. Cover the end of the tube with a suitable soft metal or hardwood block. This will allow the hammer blows to strike the tube dead-center and avoid cocking the bearing.

Do not leave bearings exposed in partial assemblies. Cover the bearings until ready to complete the assembly, to prevent damage by moisture, dirt or other foreign matter. Any clean cloth or paper will do as long as the bearings are well covered.



CE-111608

Fig. 3. Expanding Bearing in Heated Oil

Figure I-2
Expanding Bearing in Heated Oil.

HEATING BEARINGS FOR INSTALLATION

This is a very simple operation consisting of heating the bearing in clean oil (Fig. 1-2) or temperature controlled oven to a temperature of between 93.3 - 121.1°C (200° and 250°F.) This expands the inner race sufficiently to allow it to slip over the shaft to the bearing seat. DO NOT OVERHEAT THE BEARING OR IT WILL LOSE ITS HARDNESS. Do not keep the bearing in the oil or oven after the correct temperature has been reached.

If expanding the race is not enough to get it on the shaft, freeze the shaft in dry ice for approximately 30 minutes. This will shrink the shaft and allow bearing installation.

ADJUSTMENT

Certain types of ball bearings and most dual-purpose bearings with tapered or barrel shaped roller require adjustment in assembly. Specific instructions covering bearing adjustment are contained in this manual where required.

If a bearing is set up too tight it will heat up and fail. Loose bearings will pound and fail or cause component parts to fail. Be sure to follow the bearing adjustment procedures carefully.

SPECIFICATIONS

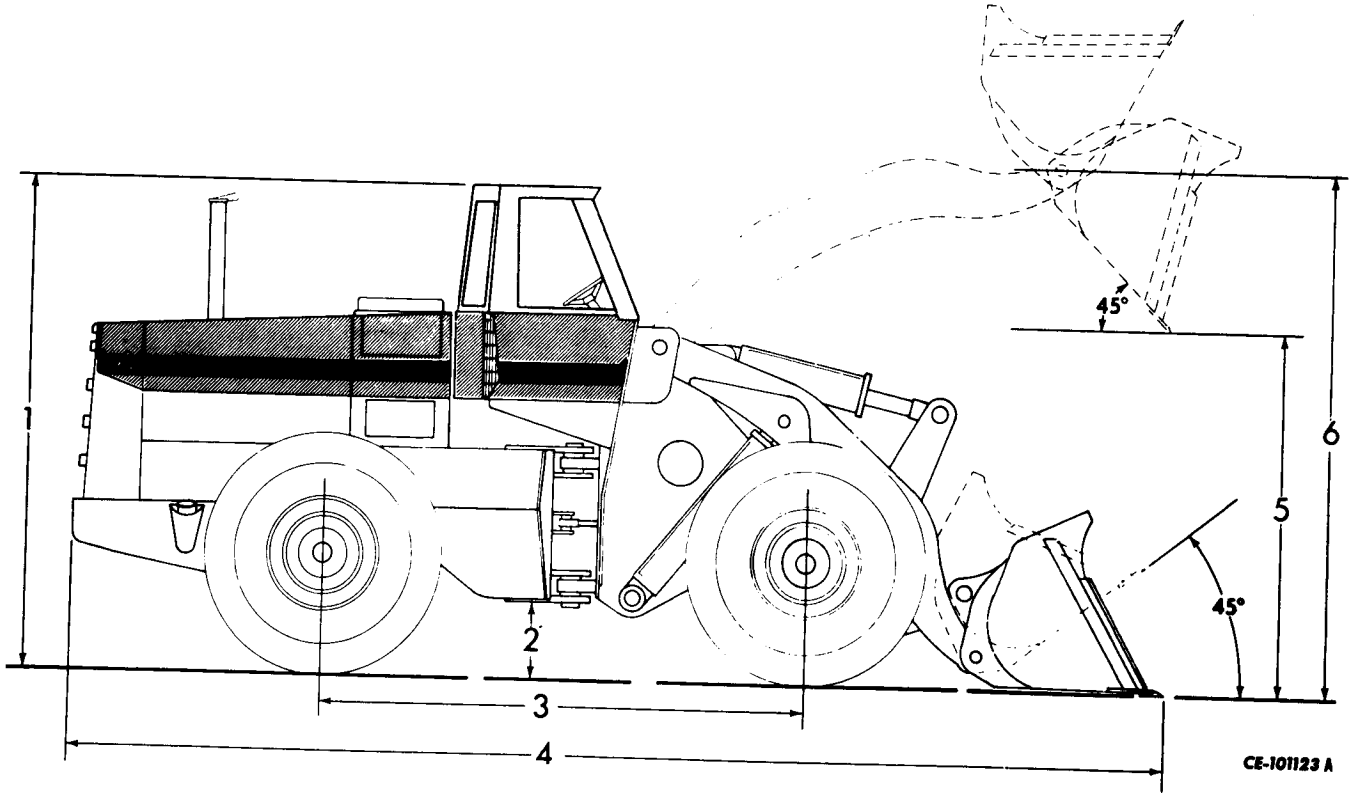


Figure I-3
Dimension Diagram.

DIMENSIONS

A.	Height to top of cab	3988 mm (157 in.)
B.	Ground clearance	528 mm (20.8 in.)
C.	Wheel base	508 mm (155 in.)
D.	Length with bucket on ground	9144 mm (360 in.)
E.	Dumping clearance at full raised	3795 mm (149.4 in.)
F.	Bucket hinge pin height at full raise	7112 mm (199.2 in.)
	Tread width - front and rear	3391 mm (133.5 in.)
	Max. turning radius	8534 mm (336 in.)
	Rear axle oscillation	30°
	Max. articulated steering angle	35°

WEIGHT

Total weight	35,720 kg (78,750 lb.)

LOCTITE RETAINING AND SEALING COMPOUNDS

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

GENERAL

Compound Description

These products are single component, self-curing, polyester compounds which remain liquid while exposed to air, and harden by chemical action into tough structural solids when confined between closely mated metal parts. These compounds will resist solvents, heat, shock and vibration and are intended to provide a positive seal against leakage, and shear strength resistance to loosening when used in the assembly of threaded, slip fit, or press fitted parts.

Loctite Grades (General Usage)

1. GRADE 262 (RED) - Straight threaded fasteners.

2. GRADE "AVV" (RED) - Straight threaded fasteners, higher strength for studs, etc.

3. PLASTIC GASKET (RED) - Use as seal between mating surfaces (face sealant).

4. UNFILLED PIPE SEALANT (BROWN) - Use on pipe threads. DO NOT substitute grades or usage unless specified.

Temperature Range

Once cured, these compounds have an operating temperature range of 18.3 - 148.9°C (65 to 300°F) and will resist attack by oils, chemicals, hydraulic fluids and solvents.

Exceptions - DO NOT use Loctite:

1. Where other means of retaining the assembly are provided such as, prevailing torque fasteners (fasteners with distroted threads or plastic inserts), lock washers, lock plates and lock wires.

2. On items requiring frequent servicing.

3. When the operating temperature exceeds 148.9°C (300°F.) (Example: Engine exhaust systems.)

4. On brass fittings and plugs.

SURFACE PREPARATION

Plain and Phosphate Coated Parts

Clean the surfaces where compounds are to be applied to remove heavy coatings of oil, grease and dirt (rust or light oil film are not detrimental). Normal shop practice of cleaning or degreasing is adequate. Phosphate and oiled hardware is used in the "as received" condition.

Zinc or Cadmium Plated Parts or for Rapid Hardening

At least one of the mating surfaces should be degreased with a cleaning solution to which concentrated primer has been added. (1 part primer concentrate to 30 parts trichlorethylene or 1-1-1-trichlorethylene.) Allow surfaces to dry for 3 to 5 minutes before applying compound.

Drawbar Studs or Special Stud Applications

Degrease parts with a cleaning solution to which concentrated primer has been added. (1 part primer concentrate to 30 parts trichlorethylene or 1-1-1-trichlorethylene.) Allow surfaces to dry for 3 to 5 minutes before applying compound. In blind holes be sure to remove all chips and oil.

Face Sealant (Plastic Gasket)

Mating parts must be cleaned as for plain and phosphate coated parts.

APPLICATION

Cap Screws and Pipe Threads

Fill the first 2 to 3 leading threads in area of engagement with compound. For large quantities of cap screws, may also be applied by tumbling method (refer to manufacturer's instructions).

Studs

Apply by hand to individual studs. Fill full length of thread with one strip on diameters up to 25.4 mm (1 in.), two strips 180° apart on diameters up to 50.8 mm (2 in.), and three strips 120° apart on diameters over 50.8 mm (2 in.). In all cases apply one strip into tapped holes.

Blind hole applications - apply enough compound to fill the bottom 2 to 3 threads of engagement, then insert stud. If engagement length exceeds one diameter use proportionally more compound.

For non-seated studs (studs that can go deeper in hole than required) turn stud one turn deeper than required. After bubbling stops, apply a ring of compound around stud at top of hole, then turn back to required height.

Face Sealant (Plastic Gasket)

Spread an even coat on one of the mating surfaces. Assemble and tighten bolts.

(Continued on next page)

LOCTITE RETAINING AND SEALING COMPOUNDS

APPLICATION - Continued

Face Sealant (Plastic Gasket) - Continued

NOTE: On crawler tractor applications only, when compound is used as a gasket, bolts which attach the parts should be coated with MPL (gear lubricant) to prevent compound from sticking to bolts.

SETTING TIME (BEFORE PLACING IN OPERATION)

A. Normal time for compound grades without use of any primer - 6 to 24 hours at room temperature with machined carbon steel parts. Higher temperatures will accelerate cure and lower temperatures will retard cure. Other base metals will provide more or less catalytic effect on cure.

B. Primed surfaces - 2 to 6 hours. This may be speeded by pretreating mating surfaces with special primers. Some metals (such as zinc and cadmium plate, anodized aluminum, and passivated stainless steel) are inactive and require heat or primer to cure the compound.

C. A fast curing type primer will fix parts for normal handling in 10 to 15 minutes and will achieve 75 per cent of ultimate strength in 1 hour and full cure in 2 to 4 hours.

REMOVAL

Parts difficult to remove can be preheated to 204.4 - 260°C (400° to 500°F) prior to removal.

APPLICATION AT LOW TEMPERATURES

A. Without special precautions, these compounds can be applied and will cure at temperatures down to 10°C (50°F) and at that temperature full strength will be obtained within 72 hours.

B. At temperatures from 10 - 0°C (50° to 32°F), only a job-identified compound with the use of primer can be recommended.

C. If necessary, the compounds can be applied at temperatures below 0°C (32°F), only if heat is used to accelerate the cure as follows:

65.6°C (150°F) for 60 minutes
93.3°C (200°F) for 45 minutes
121.1°C (250°F) for 30 minutes

PRINTED IN UNITED STATES OF AMERICA

STANDARD TORQUE DATA

This chart provides tightening torque for general purpose applications using original equipment standard hardware as listed in the Parts Catalog for the machine involved. DO NOT SUBSTITUTE. Original equipment standard hardware is defined as IH Type 8, coarse thread bolts and nuts and thru hardened flat washers (Rockwell "C" 38-45), all phosphate coated and assembled without supplemental lubrication (as received condition).

The torques shown below also apply to the following:

1. Phosphate coated bolts used in tapped holes in steel or gray iron.
2. Phosphated coated bolts used with prevailing torque nuts (nuts with distorted threads or plastic inserts).
3. Phosphate coated bolts used with coper plated weld nuts.
4. Plain finish (uncoated) bolts and nuts that are clean, rust free and oiled and used in the same manner as described above.

Markings on bolt heads or nuts indicate material grade ONLY and are NOT to be used to determine required torque.

NOMINAL THREAD DIAMETER	STANDARD TORQUE ± 10%	
	FOOT LBS.	NEWTON METERS
1/4	7	10
5/16	14	19
3/8	24	32
7/16	38	51
1/2	60	80
9/16	80	110
5/8	115	155
3/4	200	270
7/8	320	440
1	480	650
1-1/8	590	800
1-1/4	830	1100
1-3/8	1100	1500
1-1/2	1400	1900
1-3/4	2300	3100
2	3400	4600

SPECIAL TORQUES

Each machine has some non-standard torques which are necessary for proper component function. These are listed under "SPECIAL TORQUES" shown elsewhere in this manual. Typical examples are hose clamps, non-rigid joints (gaskets), non-ferrous fasteners or tapped holes, spanner nuts, fine thread fasteners, jam nuts, and cases where loading or distortion are critical factors. Split flange clamps have special torques also. These are listed on the following page. All other special torques are shown in the section (General Information) where they are used.

PRINTED IN UNITED STATES OF AMERICA

TORQUE VALUES FOR SPLIT FLANGE CONNECTIONS

The following chart provides the tightening torques for split flange connections used in hydraulic systems. Split flanges and fitting shoulders should fit squarely. Install all bolts finger tight and then torque evenly.

NOTE: Overtorquing bolts will damage the flanges and/or bolts, which may cause leakage.

Flange Size (*)			Bolt Torque			
			N-m		Ft. Lb.	
mm	in.	Bolt Size (NC)	Min.	Max.	Min.	Max.
12,7	1/2	5/16	20	24	15	18
19	3/4	3/8	30	37	22	27
25,4	1	3/8	37	47	27	35
32	1-1/4	7/16	47	61	35	45
38	1-1/2	1/2	62	79	46	58
51	2	1/2	75	88	55	65
64	2-1/2	1/2	107	123	79	91
76	3	5/8	187	203	138	150
89	3-1/2	5/8	142	136	105	115

(*) - Inside diameter of hydraulic tube or hose fitting. This number is cast into flange halves.

TORQUE VALUES FOR HOSE CLAMPS

The following chart provides the tightening torques for hose clamps used in various applications, such as air cleaner.

Clamp Type	Torque In. Lb.		Torque N-m	
	Min.	Max.	Min.	Max.
"T" Bolt	55	65	6,2	7,3
Worm Drive - 44 mm (1-3/4 in.) Open Diameter & Under	20	30	2,2	3,3
Worm Drive - Over 44 mm (1-3/4 in.) Open Diameter	40	50	4,5	5,6

TORQUE VALUES FOR TUBE NUTS WITH INVERTED FLARED FITTINGS

Tubing O.D.		Thread Size	Torque			
			Foot Pounds		Newton Meters	
in.	mm		Min.	Max.	Min.	Max.
1/8	3.2	5/16-18	3.5	4	4.5	5.5
3/16	4.7	3/8-24	7	9	10	12
1/4	6.4	7/16-24	9	12	12	16
5/16	7.9	1/2-20	12	15	16	20
3/8	9.5	5/8-18	21	24	29	33
1/2	12.7	3/4-18	35	40	47	54
5/8	15.9	7/8-18	53	58	72	79
3/4	19.1	1-1/16-16	77	82	104	111

Above Torque Figures are recommended for brass or steel inverted flare fittings, dry or wet installations.

TORQUE VALUE FOR TUBE NUTS

Tubing O.D.		Torque			
		Foot Pounds		Newton Meters	
in.	mm	Min.	Max.	Min.	Max.
1/4	6.4	9	12	12	16
5/16	7.9	12	15	16	20
3/8	9.5	21	24	29	33
1/2	12.7	35	40	47	54
5/8	15.9	53	58	72	79
3/4	19.1	77	82	104	111
7/8	22.2	90	100	122	136
1	25.4	110	120	149	163
1-1/4	31.8	140	150	190	204
1-1/2	38.1	162	175	217	237
2	50.8	225	240	305	325

TORQUE VALUE FOR O-RING BOSS PLUGS AND CONNECTORS, ADJUSTABLE FITTING LOCK NUTS AND SWIVEL DEGREE SEATS

Tubing O.D.			
in.	mm	Torque Ft. Lbs.	Newton Meters
1/4	6.4	6-10	8.1-13.6
5/16	7.9	10-15	13.6-20.3
3/8	9.5	15-20	20.3-27.1
1/2	12.7	25-30	33.9-40.7
5/8	15.9	35-40	47.5-54.3
3/4	19.1	60-70	81.4-94.9
7/8	22.7	70-80	94.9-108.5
1	25.4	80-90	108.5-122.1
1-1/4	31.8	95-115	128.9-156
1-1/2	38.1	120-140	162.8-190
2	50.8	250-300	339.1-407

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

DESCRIPTION

The chassis components are divided into four groups to simplify maintenance and provide a better understanding of each group. The groups are as follows: Main Frame, Superstructure, Operator's Compartment, and Boom and Bucket.

The forward portion of the articulated frame provides a mount for the operator's compartment. Seated on the forward portion, the operator is always in line with the bucket, allowing a greater degree of control and operating accuracy. The rear section of the main frame provides a platform to mount the engine, converter, transmission and grille.

In addition to their center hinge pins, the frame sections are linked together by a pair of steering cylinders. The bases of the cylinders are anchored in the forward frame section with the rod ends pinned to the rear section. As one cylinder extends, the opposite contracts, pivoting the frame sections on the hinge pins and steering the tractor. This type of articulated steering has definite advantages; it eliminates the need of a steering axle with its additional parts, eliminates the drag link and tie rod, and allows the rear wheels to track in the path of the front wheels. This latter item insures a much shorter turning radius than that afforded by the more conventional rigid frame and steering axle type.

The front axle is fastened directly to the forward frame section. The rear axle is connected to a bolster which in turn is fastened by two pins to the rear axle frame section. This allows the rear axle to oscillate on uneven terrain.

MAIN FRAME

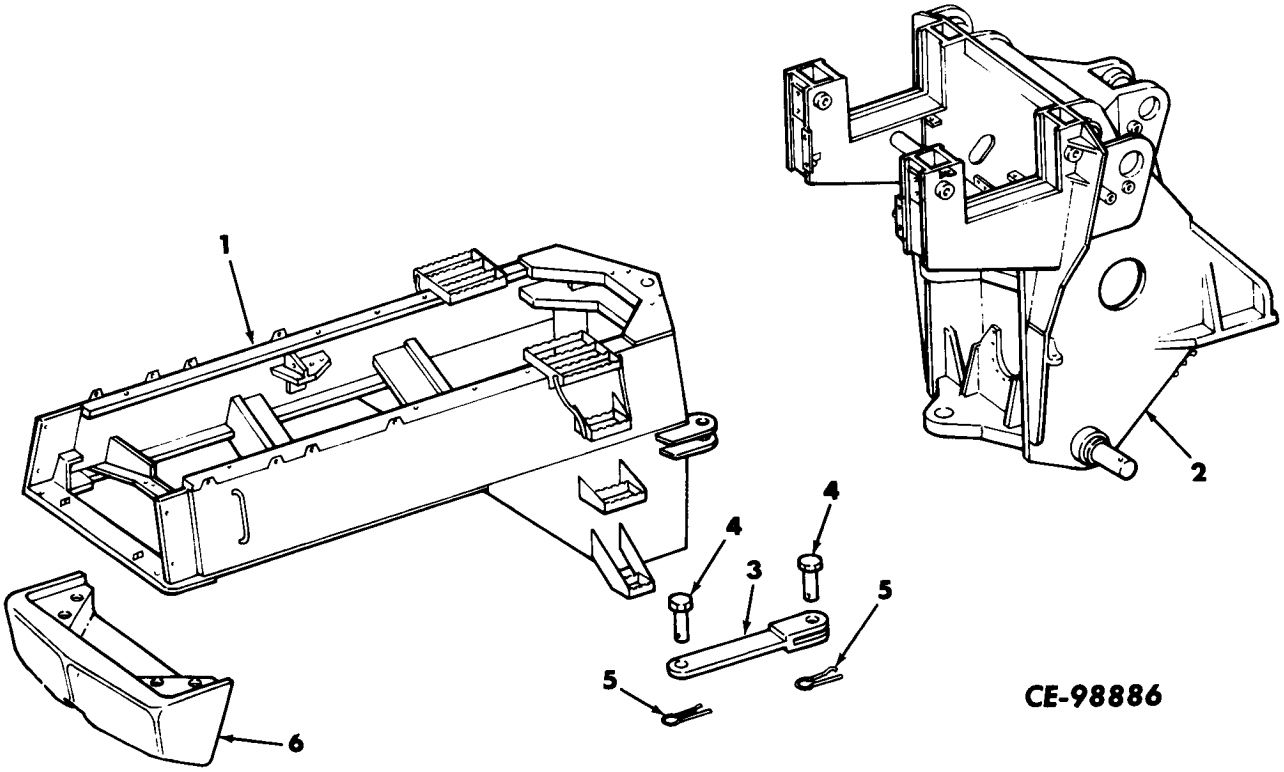


Figure 1-1
Main Frame Assembly (Early Style).

1. Main frame-rear section.
2. Main frame-front section.
3. Pivot locking bar.
4. Pivot locking bar pin.
5. Clinch pin.
6. Counterweight.

MAIN FRAME

DESCRIPTION

Each main frame component is composed of many smaller items welded together to form a single rigid assembly. Bushings are pressed into bores at pivot points and the counterweight is bolted to the rear of the rear frame section. The two frame sections are connected at their hinge points by a pin and bearing assembly. The rear axle bolster is connected to the rear main frame by pin and bushing arrangement.

Early Style

The frame locking bar is pinned and locked to the side of the rear frame section in its rest position. The bar and pins are used to lock the two tractor halves when the tractor is serviced or transported.

To lock the tractor halves in the straight position, the rear pin and clinch pin are removed, the bar swung forward and aligned with hole in forward section and pins replaced. (Fig. 1-3.)

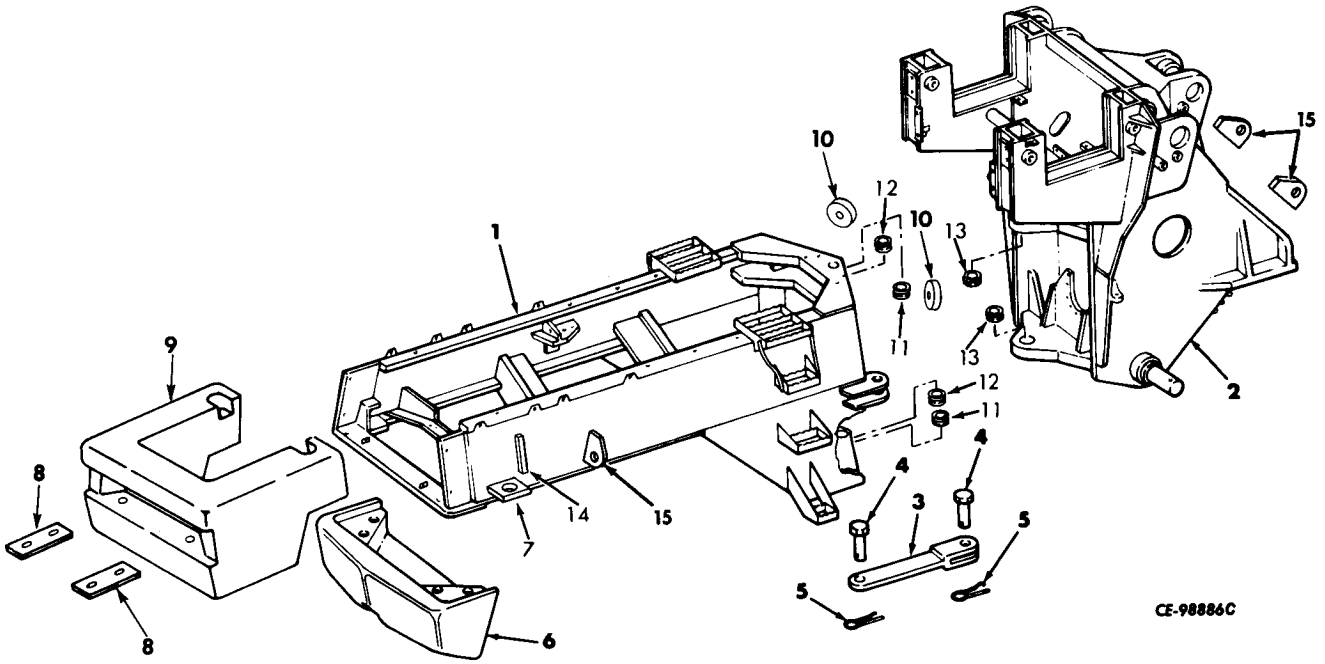


Figure 1-2
Main Frame Assembly (Late Style).

1. Rear frame.
2. Front frame.
3. Frame locking bar.
4. Frame locking bar pin.
5. Clinch pin.
6. Counterweight (2460 lbs.)
*7. Bar.
*8. Bar.
*9. Counterweight (3600 lbs.).
10. Steering bumper.
11. Bushing.
12. Bushing.
13. Bushing.
14. Bar.

* Part of Counterweight Kit. (OPTIONAL).

MAIN FRAME

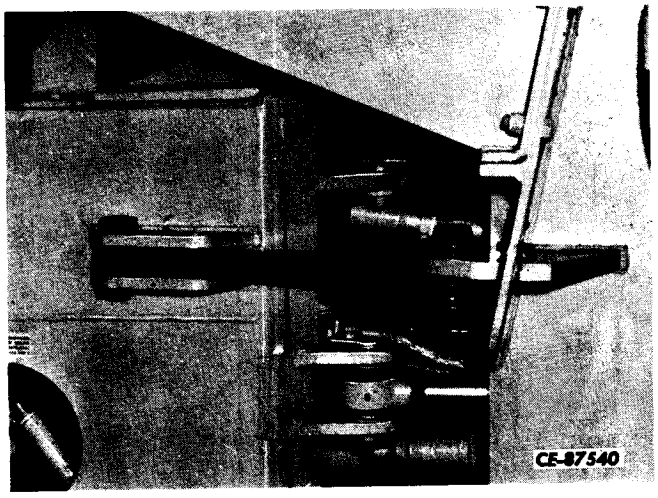


Figure 1-3
Frame Locking Bar and Pin in Straight Lock Position.

Be sure to install bar, pins and clinch pins in storage position when tractor operation is resumed. (Fig. 1-4.)

Late Styles

A bar and two pins (Fig. 1-5) are provided on the left side of the tractor. These should be used to lock the two tractor halves when the tractor is serviced or transported.

(Continued on next page)

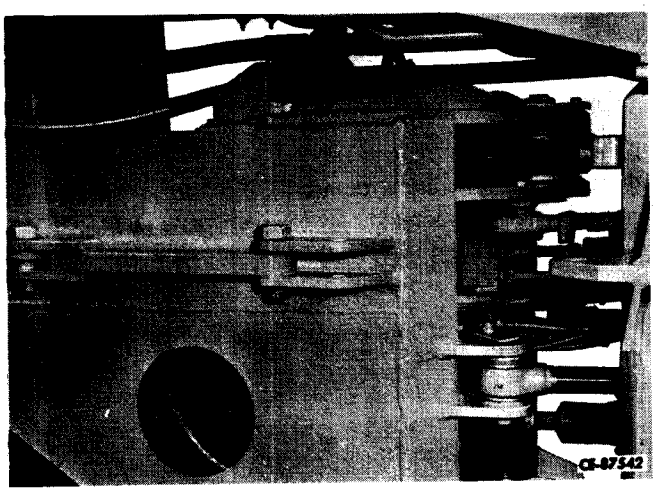


Figure 1-4
Frame Locking Bar and Pins (Stowed Position).

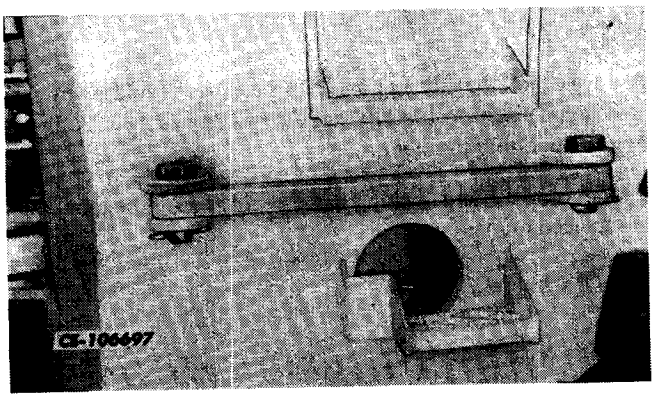


Figure 1-5
Frame Locking Bar and Pins Stowed.

MAIN FRAME

DESCRIPTION - Continued

Late Style - Continued

To lock the tractor halves in straight position, the bar and two pins are used as shown in Fig. 1-6.

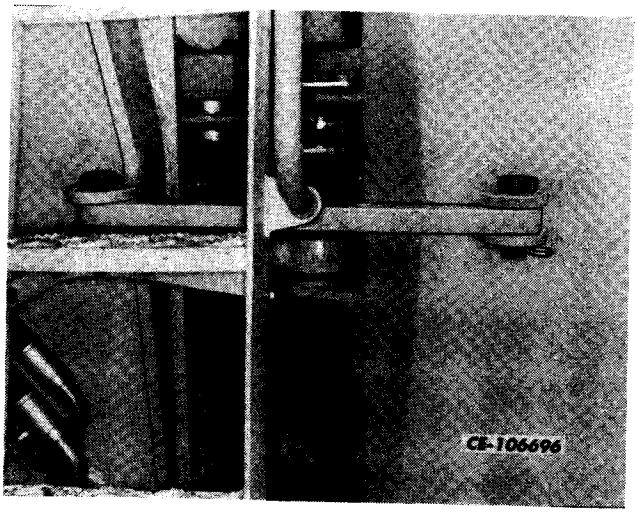


Figure 1-6
Frame Locking Bar in Straight Lock Position.

To lock the machine in a full left turn, the safety bar and both pins are used. Turn the machine to its full left turn position and install the frame locking bar and pins as shown in Fig. 1-7.

Always check that the bar and pins have been replaced in storage position on the left side of the tractor (Fig. 1-5) before operating the tractor.

Broken or lost frame locking bar and pins should be repaired or replaced immediately.

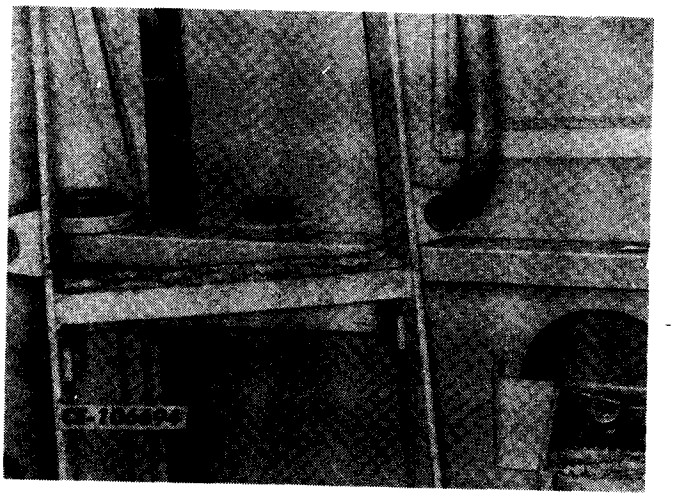


Figure 1-7
Frame Locking Bar and Pins Installed in Full Left Turn Lock Position.

ADJUSTMENT

NOTE: Both upper and lower center hinge assemblies use loctite to retain the bushings.

Center Hinge Bushing

Place linkage in "FLOAT" position so that weight of bucket is on ground. If machine is without bucket, rest boom ends on blocks.

Adjust hinge spacing using top nut (3, Fig. 1-9) so that frame tongues (7, 18) are centered between rear frame ears (5, 16). Bottom nut (20) must be off during spacing adjustment.

(Continued on page 7)

MAIN FRAME

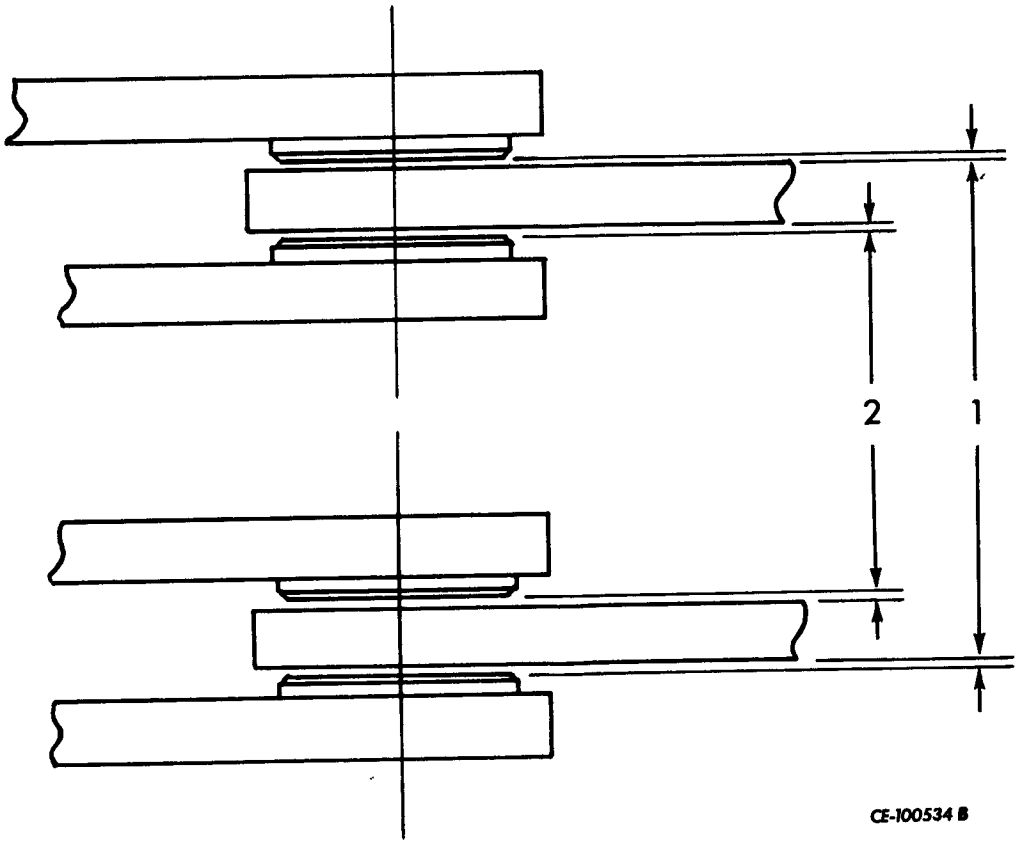


Figure 1-8
Center Hinge Alignment.

Dim. 1 — To be equal and assembled so that no portion of the rear frame ear's surface comes in contact with any portion of the surface of the front frame tongue.

Dim. 2 — To be spaced so that no portion of the rear frame ear's surface comes in contact with any portion of the surface of the front frame tongue.

NOTE: The 1 dimensions must be the same. The 1 dimension will not be the same as the 2 dimension. The bottom nut must be off during adjustment.

MAIN FRAME

ADJUSTMENT - Continued

Center Hinge Bushing - Continued

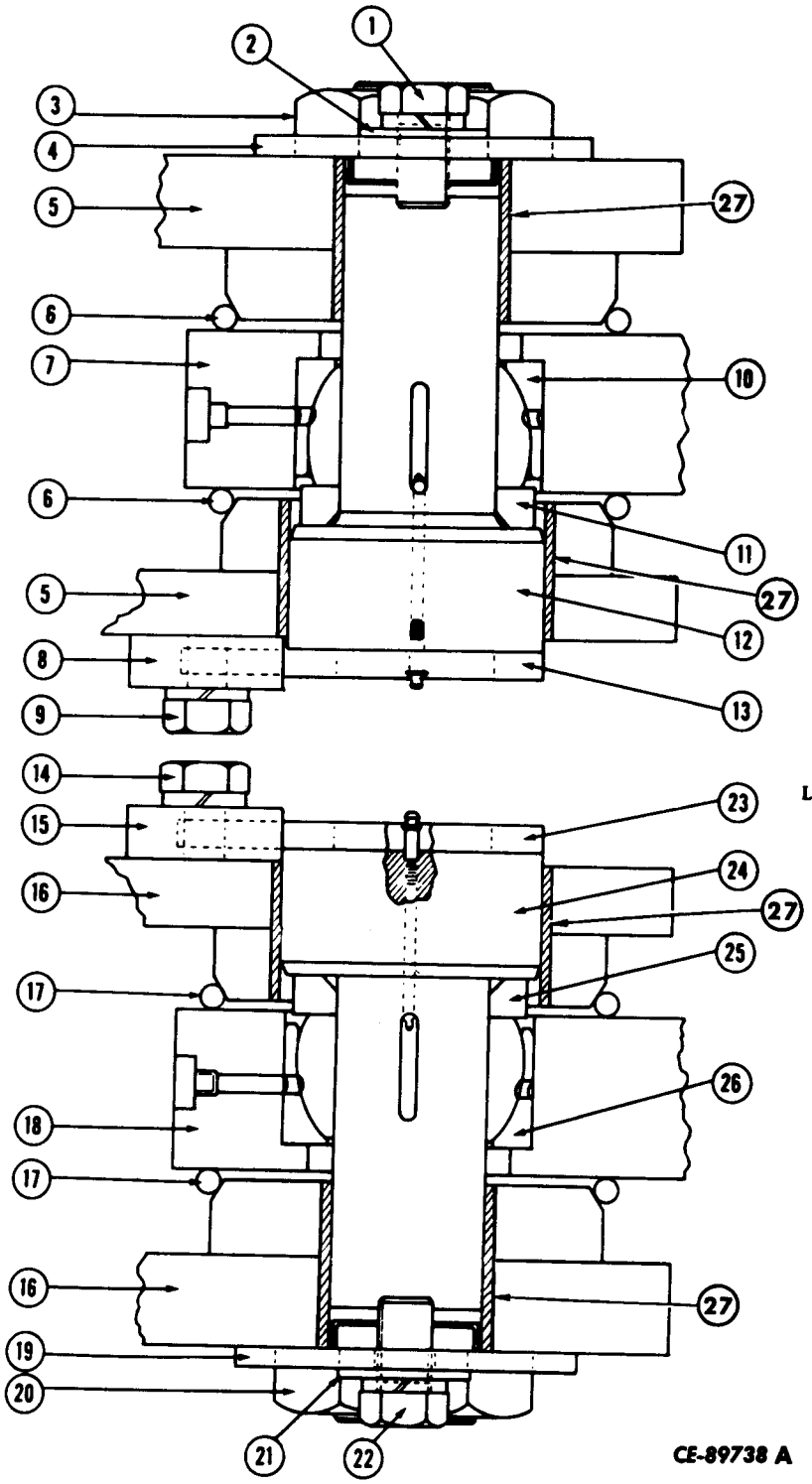


Figure 1-9
Center Hinge Bushing Arrangement.

MAIN FRAME

Legend for Figure 1-9

UPPER HINGE

1. Cap screw and lock washer.
2. Flat washer.
3. Hex nut.
4. Retainer plate.
5. Rear main frame ear.
6. Cord ring.
7. Front main frame tongue.
8. Cam.
9. Cap screw and lock washer.
10. Ball bushing.
11. Bushing.
12. Hinge pin.
13. Pin lock plate.

LOWER HINGE

14. Cap screw and lock washer.
15. Cam.
16. Rear main frame ear.
17. Cord ring.
18. Front main frame tongue.
19. Retainer plate.
10. Hex nut.
21. Flat washer.
22. Cap screw and lock washer.
23. Pin lock plate.
24. Hinge pin.
25. Bushing.
26. Ball bushing.
27. Sleeve.

If front frame tongues are too high, loosen top nut (3) until they are centered.

If front frame tongues are too low, tighten top nut (3) until they are centered.

Install retainer plate (4). Note that two retainer plate positions are available by turning the plate over. If holes in retainer plate do not line up with tapped holes in ear, loosen or tighten nut until plate can be installed. Do not rotate nut more than 30° in either direction.

Bring the upper pin lock (13, Fig. 1-9) in contact with block. Rotate cam (8) clockwise to contact pin lock and tighten cam bolt.

Lubricate all grease fittings.

Install and tighten bottom nut (20) with an air impact wrench to torque shown in "Special Torques".

Tap pin (12) solidly while tightening nut (20).

Check to be sure pin lock plate (13) is not in contact with rear frame.

Loosen bottom nut (20).

Tighten bottom nut (20) using retainer plate (19) as a wrench. Hinge should be just snug at this point; do not over tighten.

If holes in retainer plate (19) line up with tapped holes in frame, install plate. Note that two positions are available by turning retainer plate over. Tighten plate retaining cap screws.

If holes in retainer plate (19) do not line up with tapped holes in frame (in either retainer plate position), loosen nut (20) until plate holes line up with frame holes. Because two retainer plate positions are available, the amount of nut loosening required will always be less than 30°.

Install retainer plate (19).

To adjust pin lock:

Bring pin lock plate (13, 23) into contact with block (7, Fig. 1-11).

Rotate cam (8, 15, Fig. 1-9) clockwise to contact pin lock plate (13, 23).

Tighten cam cap screws (9, 14).

Position a dial indicator with its base on front frame and indicator on rear frame. Start engine and power boom until front tires are raised from ground. Read dial indicator and record reading.

Raise boom to maximum height and read and record dial reading. Lower boom until bucket rests squarely on ground (or boom ends on blocks). Total vertical movement on dial indicator must not exceed 254 mm (.010 in.) If total vertical movement exceeds 254 mm (.010 in.), readjust center hinge and recheck with dial indicator.

ADJUSTMENT - Continued

Center Hinge Bushing - Continued

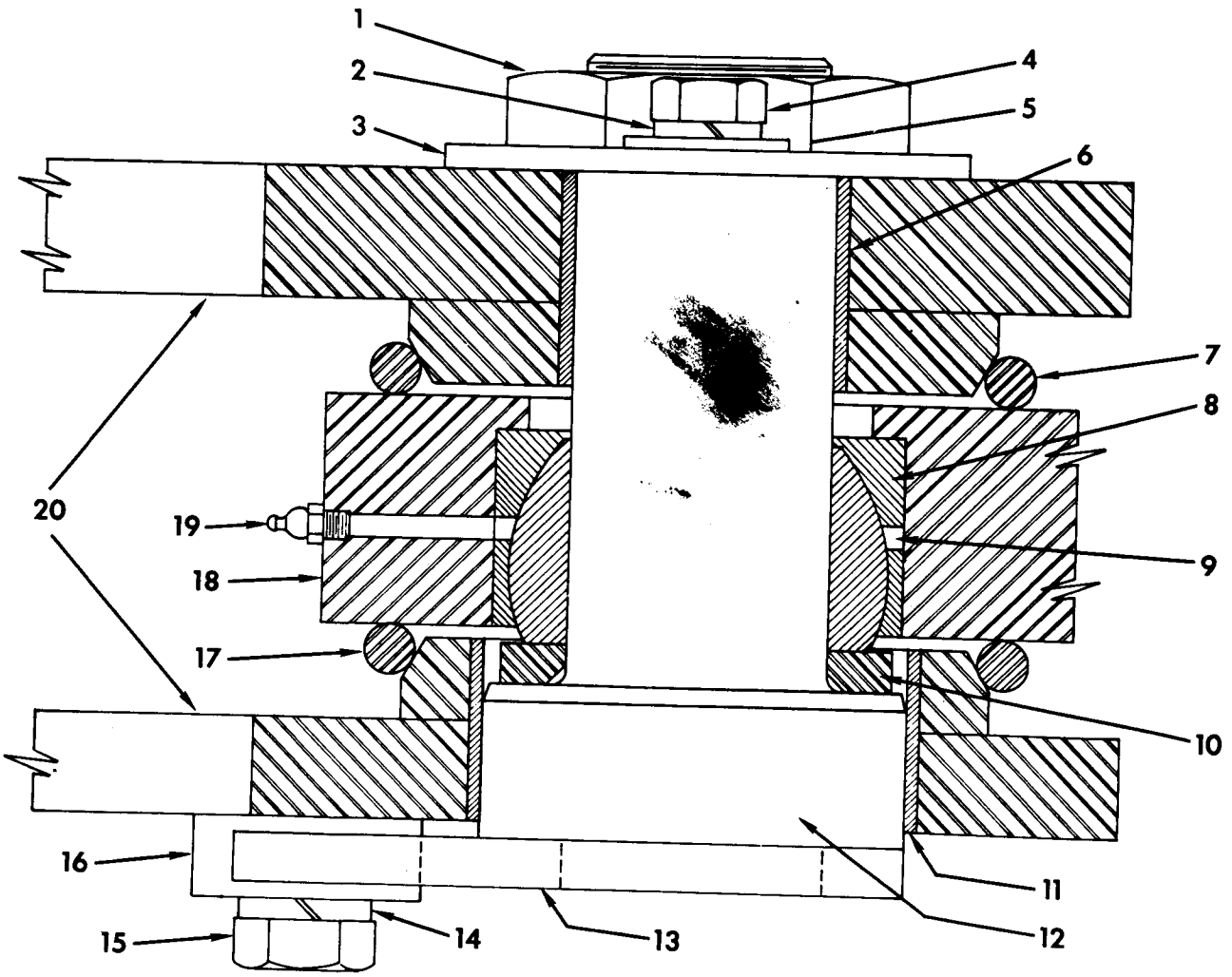


Figure 1-10
Close-up Cross Section of Upper Hinge Pin.

1. Nut.
2. Lock washer.
3. Retainer plate.
4. Cap screw.
5. Flat washer.
6. Bushing.
7. Cord ring.
8. Ball bushing.
9. Lubricant groove.
10. Spacer.
11. Bushing.
12. Shaft (includes item 13).
13. Lock plate.
14. Lock washer.
15. Cap screw.
16. Lock plate cam.
17. Cord ring.
18. Front main frame tongue.
19. Lube fitting.
20. Rear main frame ears.

Bolster Pivot Pin

Tighten nut (18, Fig. 1-11) with an air gun to torque shown in "Special Torques". This initial tightening will seat the mating parts in the pivot assembly.

(Continued on Page 10)

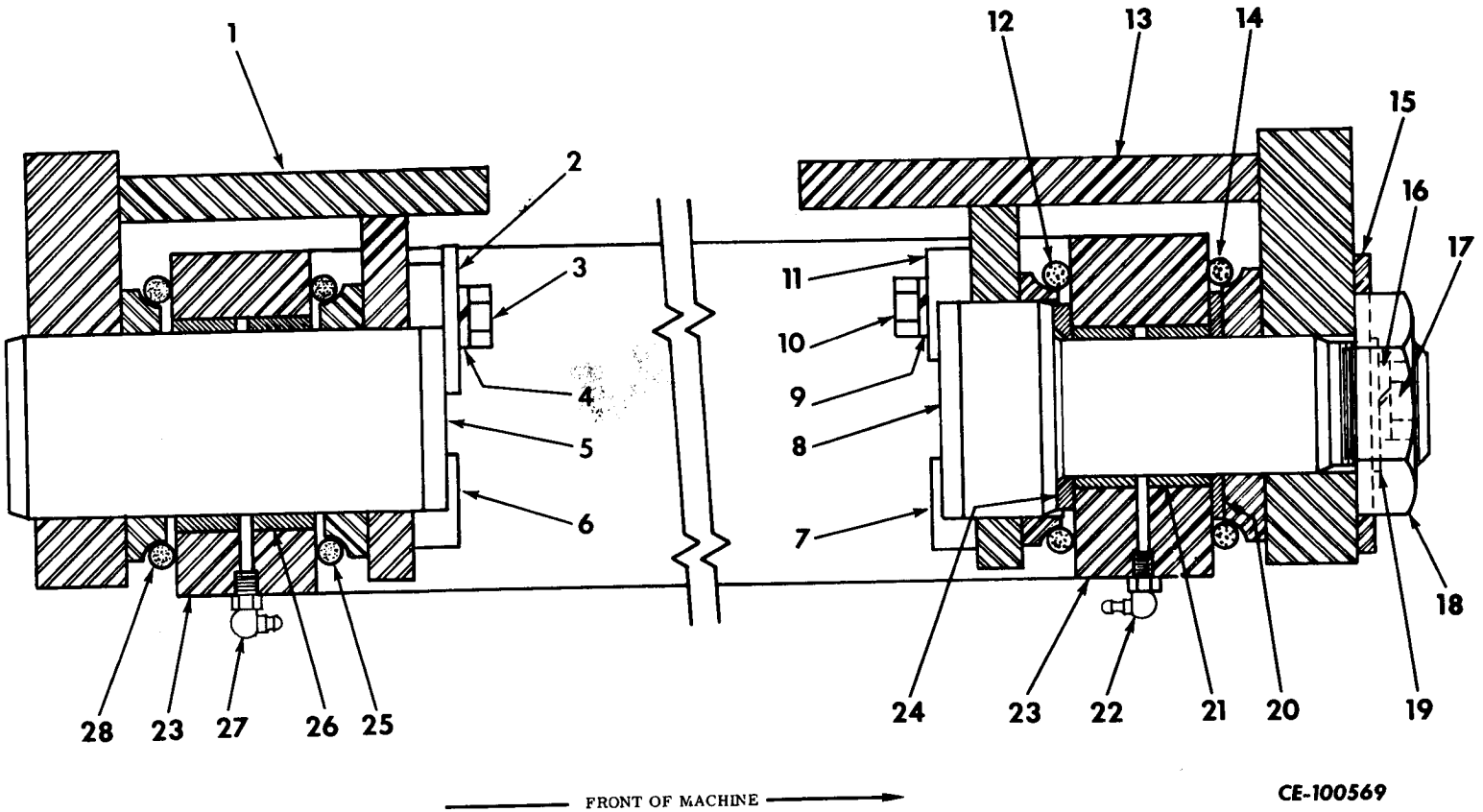


Figure 1-11
Bolster Pivot.

1. Tractor main frame.
2. Cam.
3. Bolt.
4. Lock washer.
5. Shaft and lock plate assembly.
6. Stop block.
7. Stop block.
8. Shaft and lock plate assembly.
9. Lock washer.
10. Bolt.
11. Cam.
12. Cord ring.
13. Tractor main frame.
14. Cord ring.
15. Retainer plate.
16. Lock washer.
17. Bolt.
18. Nut.
19. Flat washer.
20. Washer.
21. Bushing.
22. Lube fitting.
23. Bolster.
24. Bushing.
25. Cord ring.
26. Bushing.
27. Lube fitting.
28. Cord ring.

MAIN FRAME

ADJUSTMENT - Continued

Bolster Pivot Pin - Continued

Loosen nut (18).

Tighten nut (18) using retainer plate (15) as a wrench. Pivot should be just snug at this point; do not over tighten.

If holes in retainer plate line up with tapped holes in frame, install retainer plate with bolts (17), lock washers (16) and flat washers (19).

Note that two retainer plate positions are available by turning plate over. If holes in plate do not line up with holes in frame in either plate position, loosen nut (18) until plate holes line up with frame holes. Because of two plate positions, nut need never be loosened more than 30°.

With retainer plate torqued down, lubricate pivot bushings (21, 26, Fig. 1-11).

Rotate cam (11, Fig. 1-11) clockwise to contact pin lock. Tighten cam bolt.

Be sure cam (11, Fig. 1-11) and pin lock bolt (3) on rear pivot are secured in a like manner.

SUPERSTRUCTURE

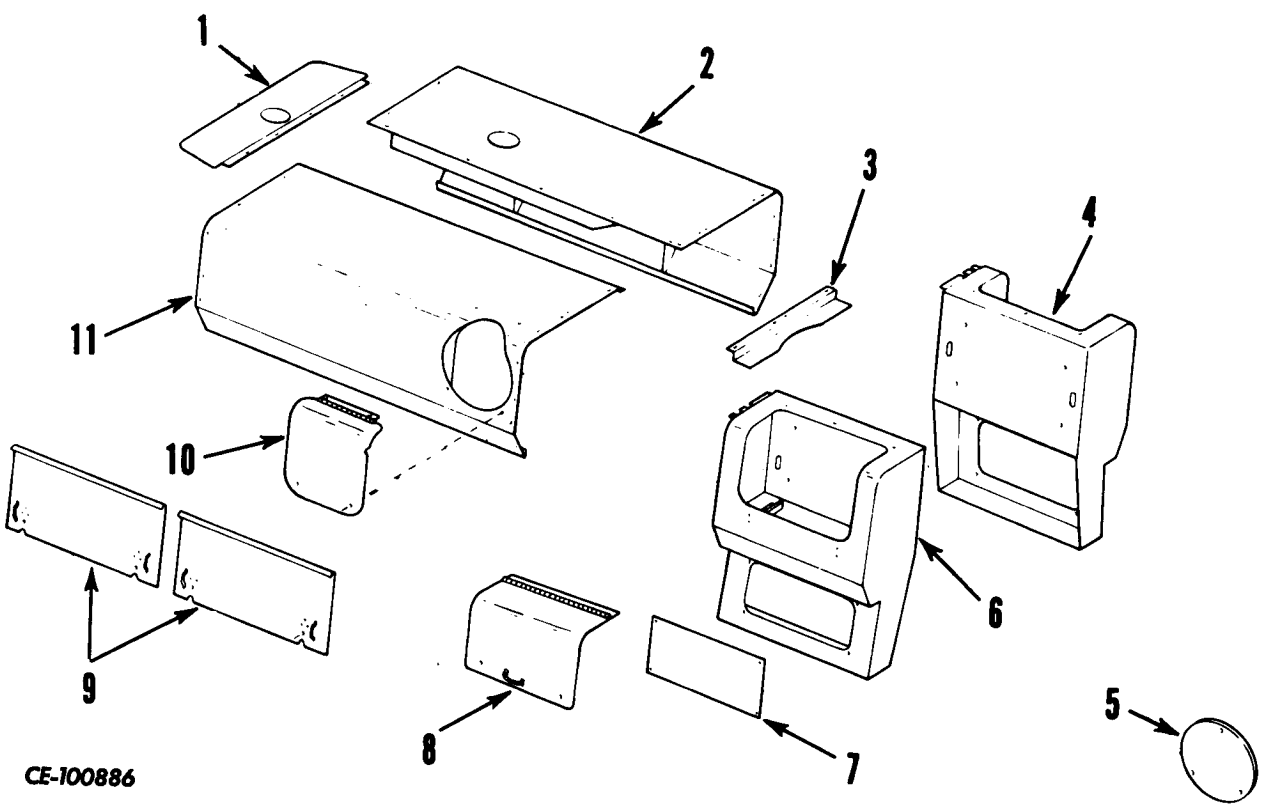


Figure 1-12
Superstructure.

1. Rear panel.
2. LH hood.
3. Support.
4. LH frame.
5. Access hole cover.
6. RH frame.
7. Frame cover plate.
8. Battery box cover.
9. Hood side panels.
10. Air cleaner cover.
11. RH hood.

SUPERSTRUCTURE

DESCRIPTION

The superstructure, as in the case of the main frame, is made primarily by joining various weldments. The hood (2, 9, Fig. 1-12), supported by the rear panel (1) and support (3), provides the suspension member for the hood side panels (11).

The battery boxes (4, 7) are weldments that bolt to the rear main frame weldment (1, Fig. 1-1).

To these boxes the cover assemblies (6, 8, Fig. 1-12) are added. The access hole covers (5) cover the service access holes in the sides of the front main frame (2, Fig. 1-1).

OPERATOR'S COMPARTMENT

DESCRIPTION

The operator's compartment is composed of the compartment enclosure, the instrument panel and box assembly, cab assembly, seat assembly and floor boards.

The seat has three control levers for adjusting the position of the seat. The forward and back motion is controlled by the lever on the front portion of the seat frame. Pushing the lever toward the right side will unlock the seat base and permit the seat to slide forward and back. Release the lever to lock in place.

The lever on the left side of the seat is for tilt control. Do not sit in seat while making this adjustment. Release the bracket, tilt the seat to desired position, lock in place. For height adjustment, remove the cap screws from post and move seat pedestal up or down as desired and replace cap screws.

The loader control levers are mounted to the right of the operator's seat on a console. The instrument panel and box assembly are mounted in front and to the right of the steering wheel. Transmission controls and hand throttle are ahead and to the left of the steering wheel.

Two brake pedals and an accelerator pedal are mounted on the front floor board.

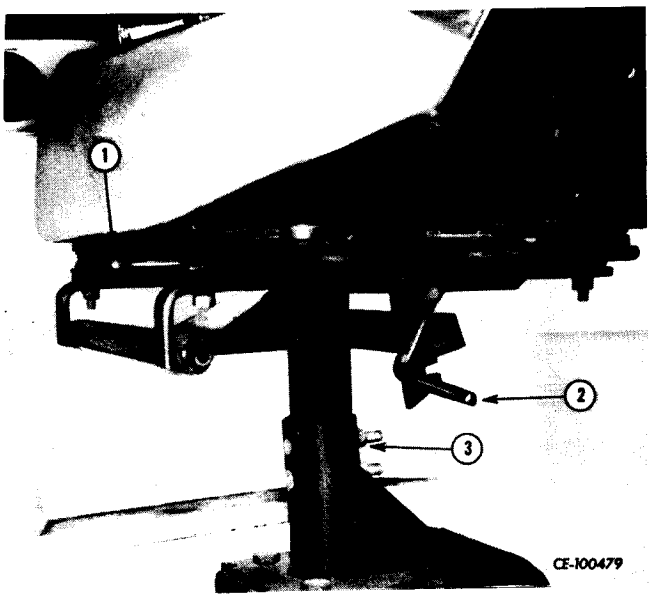


Figure 1-13
Seat Adjustments.

1. Forward and back.
2. Tilt.
3. Height.

BOOM AND BUCKET

DESCRIPTION

The loader linkage and bucket transform the energy produced by the tractor hydraulics into a visible working force. The hydraulic lift cylinders raise and lower the boom and the bucket cylinder actuates the bucket through the bellcrank and bucket link. The bucket may be moved from the fully retracted to the fully dumped position in a few seconds.

The boom (1, Fig. 1-14) is of welded steel construction. The bellcrank (2), joining the boom arms at its pivot point, is a one piece casting. The heavy bucket link transfers the stroke of the bucket cylinder rod, multiplied by the bellcrank, to the bucket. The bucket is heavily ribbed for added strength. Locking pins retain the bucket to the boom and dump link. The bucket is equipped with a replaceable, weld on, cutting edge.

(Continued on next page)

BOOM AND BUCKET

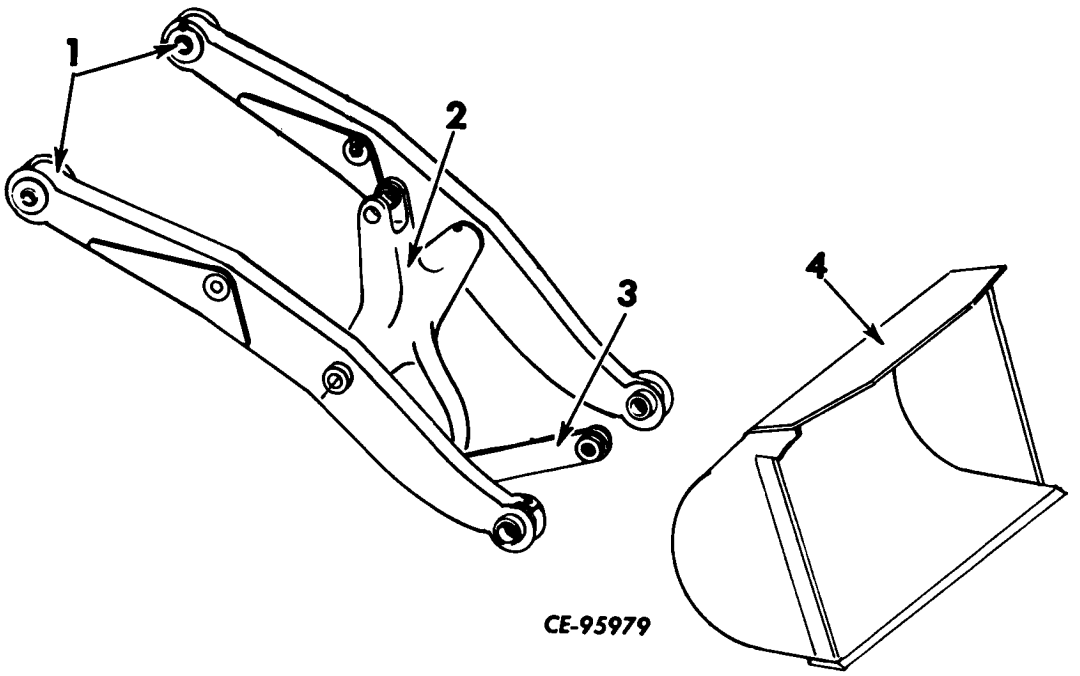


Figure 1-14
Boom and Bucket.

1. Boom.
2. Bellcrank.
3. Bucket link.
4. Bucket.

SERVICE

Bucket Removal

Place bucket on ground, bottom sheet parallel to ground. Place loader controls in neutral ("HOLD") position. Securely block rear of bucket to prevent it from rolling back when bucket is separated from linkage assembly.

Remove the pin locking cap screws (2, Fig. 1-15) with lock washers and flat washers. Remove the pin (1) that attaches the bucket link to the bucket.

> CAUTION: SUPPORT BUCKET LINK DURING PIN REMOVAL. AFTER REMOVING PIN, CAREFULLY LOWER LINK TO GROUND.

Retain cord rings.

Installing Cord Rings and Shims

To determine the shims needed when assembling the piston rod of either a boom, bucket or steering cylinder, to its' mounting location, use the following procedure:

Install the piston rod in its' location minus the cord rings.

Use a pry bar and crowd the piston rod fully to one side and using a feeler gauge, measure the gap between the piston rod head and the mounting surface.

If the clearance is less than 4.318 mm (.17 in.) of an inch, do not use any shims.

If the clearance is 4.572 mm (.18 in.) of an inch to 7.874 mm (.31 in.) of an inch, add 2 shims, one on each side of the piston rod head.

If the clearance is 7.874 mm (.31 in.) of an inch or larger, add 2 shims on each side of the piston rod head.

After you have selected the amount of shims to be used, remove the locking pin and install the shims, cord rings and then secure the piston rod with the locking pin and hardware.

Using a heavy gauge wire, wire the bucket link to the top of the bellcrank as shown in Fig. 1-16.

Remove cap screws (4, Fig. 1-15) with lock washers and flat washers. Remove pins (3) that secure the boom arms to the

BOOM AND BUCKET

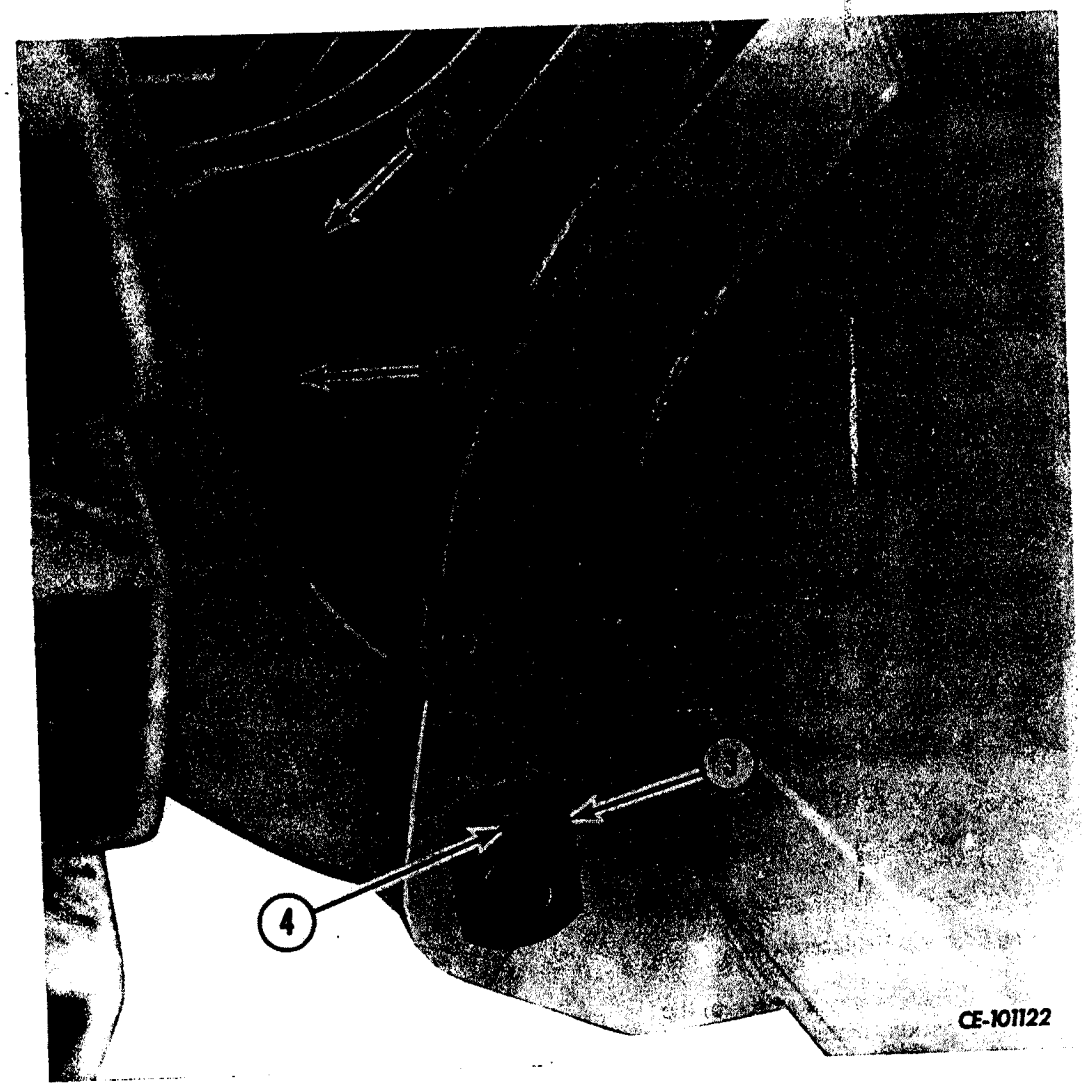


Figure 1-15
Typical Bucket Removal.

1. Pin assembly.
2. Cap screw.
3. Pin assembly.
4. Cap screw.

bucket. Place the boom control lever in "FLOAT" position allowing the boom arms to drop away from the bucket. Retain cord rings. Back tractor away from bucket.

To prevent loss of parts, install pins (1, 3, Fig. 1-15) in their respective bucket bores, looping cord rings over pins as they are installed. Thread locking cap screws (2, 4) with lock washer and flat washers through pin lock and into respective bores. Coat all pin shanks with a heavy, waterproof grease to prevent rusting.

To install bucket, reverse procedure, being sure to install cord rings.

(Continued on next page)

BOOM AND BUCKET

SERVICE - Continued

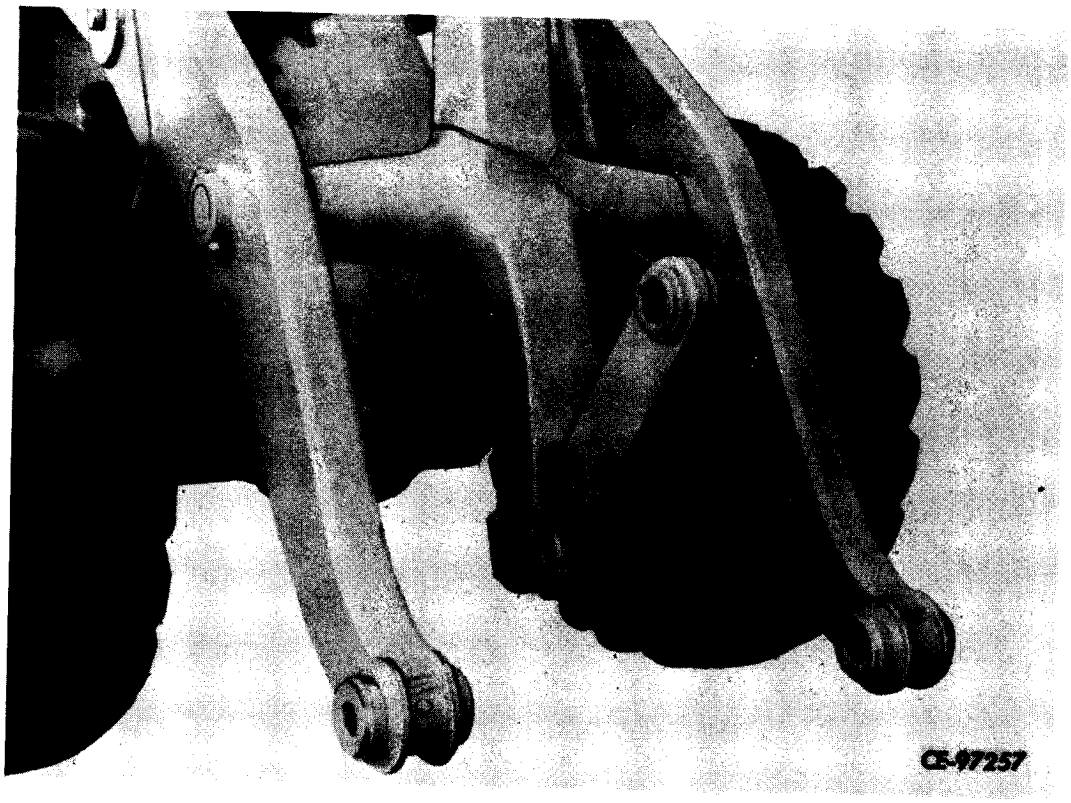


Figure 1-16
Method of Wiring Bucket Link.

Cutting Edge Tip Replacement

Replace the cutting edge tip before it wears back to the weld joining the tip and its backing plate. Use a carbon-graphite electrode to remove weld at rear of tip. Attach replacement tip to backing plate using a dry, low hydrogen E-7018 (AWS) electrode.

Replace tip as follows:

Prior to removing worn tip, straighten any bow that may be in cutting edge.

Tack weld a brace in the center of the bucket to hold straightened cutting edge (Fig. 1-17).

(Continued on next page)

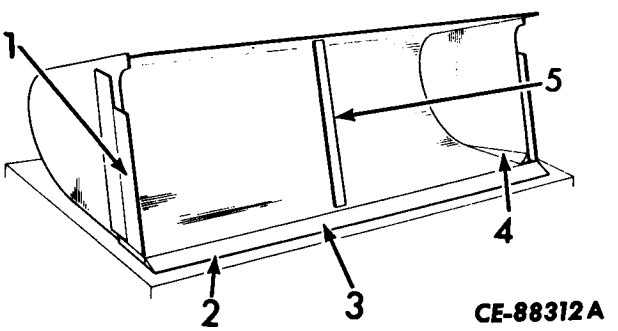


Figure 1-17

1. Side cutting edge.
2. Cutting edge.
3. Backing plate.
4. Corner stiffner.
5. Brace.

BOOM AND BUCKET

Clamp a stout piece of stock, having a straight edge, along the weld joining the tip and backing plate. Cut off front of tip at upper weld with cutting torch. Use clamped straight edge as guide for torch (Fig. 1-18).

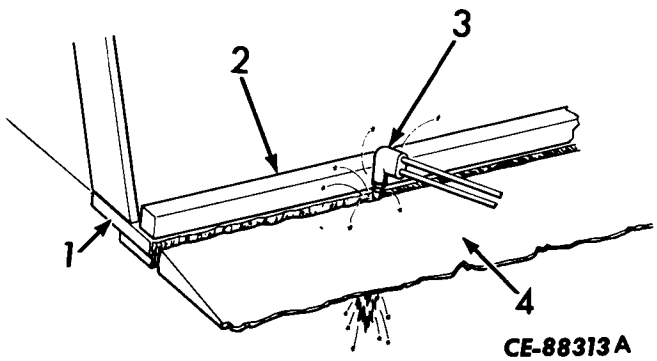


Figure 1-18

1. Backing plate.
2. Guide bar.
3. Torch.
4. Tip.

Remove weld at rear of cutting edge tip and on bottom of backing plate (Fig. 1-19). Use air carbon arc process. Keep heat penetration (heat build-up) in backing plate to a minimum to control plate warpage.

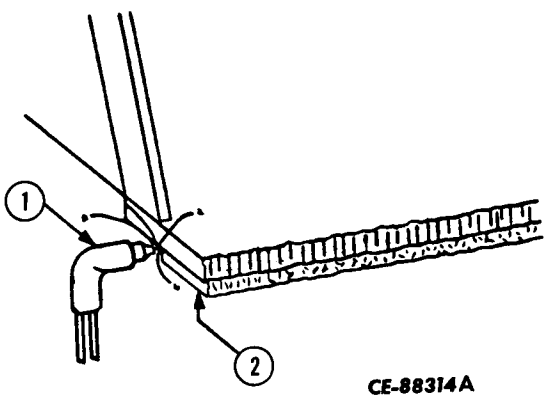


Figure 1-19

1. Torch.
2. Smooth surface.

Dress backing plate along forward face and lower surface to receive replacement tip (Fig. 1-20).

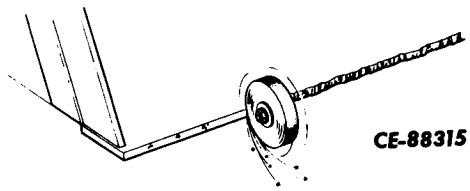


Figure 1-20

Position new cutting edge tip on backing plate. Tack weld top to backing plate at front of plate and along back of tip (Fig. 1-21). Start tacks at center of tip and work alternately between front edge of plate and rear of tip toward both ends. Fix tip ends with firm welds.

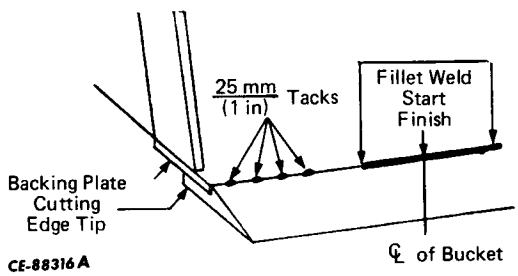


Figure 1-21

Best results will be obtained by preheating the tip and backing plate to 93 - 149°C (200°F to 300°F). Use a 8 mm (5/16 in.) fillet weld to join the rear of tip to bottom of backing plate. Start a weld 152 mm (6 in.) on either side of tip center and work alternately toward the center. Skip 152 mm (6 in.) from previous welds and work back. Continue to backstep welds alternately on either side of tip center until weld is completed at bucket side plates. Join front tip to front of backing plate in same manner. Remove tack welded brace.

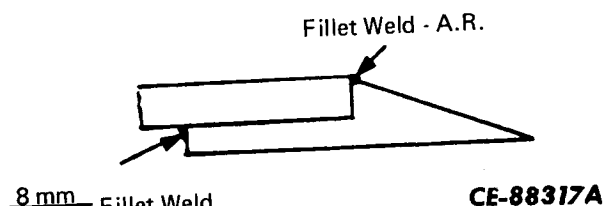


Figure 1-22

1. 8 mm (5/16 in.) fillet weld.
2. Fillet weld.

AUTOMATIC BOOM KICK-OUT VALVE

DESCRIPTION

The boom kick-out control is located at the left hand boom arm pivot. The control is an air operated valve that will stop the boom's upward motion when the boom arm reaches a predetermined level.

A lever arm (5, Fig. 1-23) is actuated by contact between its follower (4) and adjuster (3) on the nail (2). When actuated, the lever arm depresses the air valve (1) plunger. Air under pressure, released by the air valve actuates a piston in the main hydraulic control valve that kicks the "RAISE, LOWER" plunger into "NEUTRAL" stopping the boom lift.

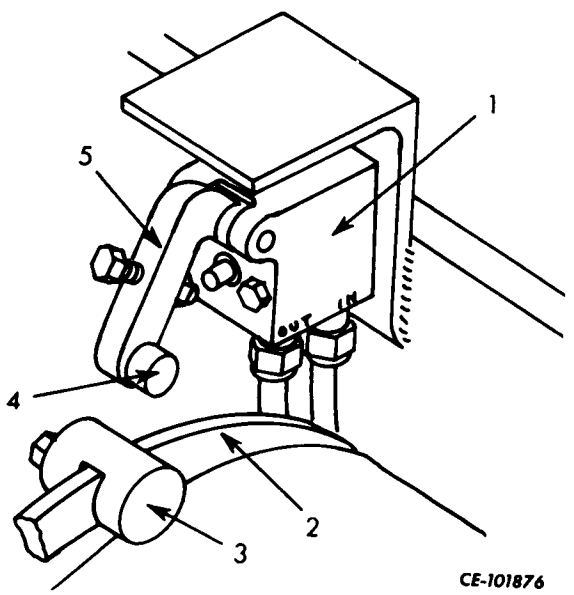


Figure 1-23
Automatic Boom Kick-out Control.

1. Air valve.
2. Rail.
3. Adjuster
4. Follower.
5. Lever arm.

DISASSEMBLY

After removing the air valve, cap the air lines to prevent the entrance of dirt.

Legend for Figure 1-24

1. Retaining ring.
2. Washer.
3. "O" ring.
4. Plunger guide.
5. "O" ring.
6. Valve plunger.
7. Exhaust valve spring.
8. Inlet valve seat.
9. "O" ring.
10. Supply valve assembly.
11. Valve spacer.
12. Inlet valve.
13. Valve spring.
14. Retaining ring.
15. Pipe plug.
16. Strainer.
17. Valve body.

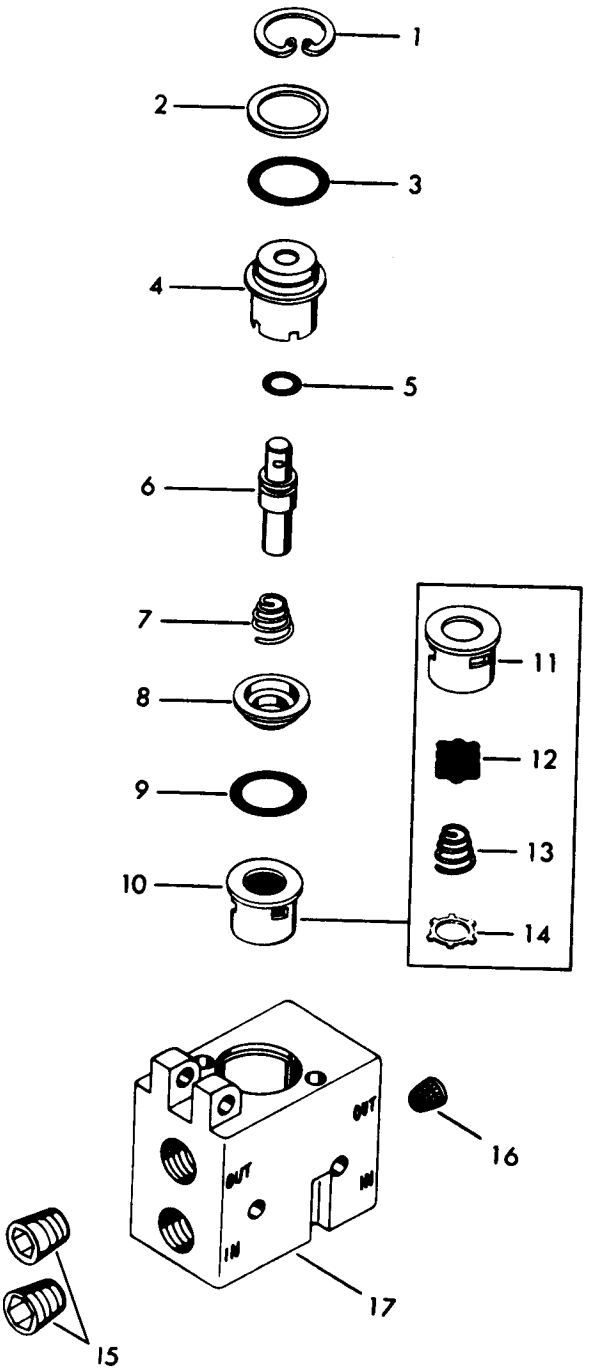


Figure 1-24
Air Valve - Exploded View.

Remove the retaining ring (1, Fig. 1-24) in the valve plunger bore. Remove the washer (2). Pull the plunger guide (4) from the bore and remove and discard the "O" ring (3).

AUTOMATIC BOOM KICK-OUT VALVE

Separate the plunger (6, Fig. 1-24) and guide (4). Remove and discard "O" ring (5). Remove spring (7) and inlet valve seat (8) from valve bore. Remove and discard "O" ring (9).

Remove supply valve assembly (10, Fig. 1-24) from valve. Remove the retainer (14). Withdraw the spring (13) and inlet (12) from the valve spacer (11). Discard inlet valve (12).

Remove pipe plugs (15, Fig. 1-24) from valve body (17).

NOTE: Do not remove strainer unless replacement is necessary. Strainers are easily damaged.

CLEANING AND INSPECTION

Clean the body with strainers intact, and all other metal parts with a nonflammable solvent.

If for some reason rubber parts cannot be replaced, wash them with soap and water.

Rinse parts thoroughly and blow them dry with a low pressure air jet.

Inspect all parts and replace any that are worn, damaged or in doubt.

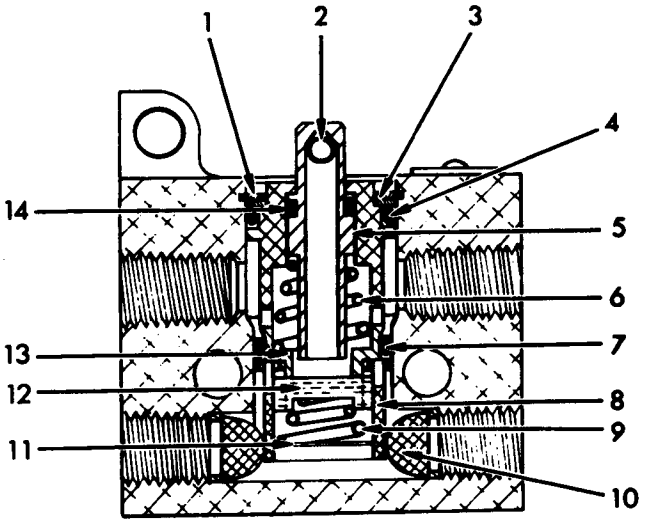
ASSEMBLY

NOTE: Lubricate all metal-to-metal contact surfaces with Number 107 Lubriplate.

Lubricate all rubber parts with Dow Corning No. 55 Pneumatic Grease.

Position new inlet valve (12, Fig. 1-24) in valve spacer (11) being sure that spring pocket in valve faces spring. Install spring (13) and secure assembly with retainer (14).

Install supply valve assembly (10, Fig. 1-24) in its bore in valve housing (17) followed by a new "O" ring (9) and inlet valve seat (8). Position spring (7) in valve seat.



CE-101873

Figure 1-25
Air Valve - Cross Section.

1. Retaining ring.
2. Port to atmosphere.
3. Washer.
4. "O" ring.
5. Valve plunger.
6. Exhaust valve spring.
7. "O" ring.
8. Valve spacer.
9. Inlet valve spring.
10. Strainer.
11. Retainer.
12. Inlet valve.
13. Inlet valve seat.
14. "O" ring.

Install a new "O" ring (5, Fig. 1-24) on valve plunger (6). Install new "O" ring (3) on plunger guide (4) and install plunger assembly in guide assembly. Install plunger and guide assembly in housing bore centering plunger stem in exhaust valve spring (7). Install washer (2). Depress assembly in housing bore and install retaining ring (1). Be sure ring bottoms in its groove about its entire circumference.

(Continued on next page)

SPECIAL TORQUES

Boom arm to frame pinlock	271 N·m (200 ft. lb.)
Boom arm to bucket pinlock	271 N·m (200 ft. lb.)
Boom arm to cylinders pinlock	271 N·m (200 ft. lb.)
Bucket cylinder to frame pinlock	271 N·m (200 ft. lb.)
Bucket cylinder to bellcrank pinlock	271 N·m (200 ft. lb.)
Bellcrank to bucket link pinlock	271 N·m (200 ft. lb.)
Bucket link to bucket pinlock	271 N·m (200 ft. lb.)
Steering cylinder to frame pinlock	271 N·m (200 ft. lb.)
Bolster to frame pinlock	271 N·m (200 ft. lb.)
Grill mounting	271 N·m (200 ft. lb.)
Counterweight mounting	380 N·m (280 ft. lb.)
Batter box mounting	1763 N·m (1300 ft. lb.)
Bulkhead mounting	217 N·m (160 ft. lb.)
Fuel tank mounting	217 N·m (160 ft. lb.)
Ladder mountng	217 N·m (160 ft. lb.)
	108 N·m (80 ft. lb.)

Initial tightening of nut on bottom	
Center hinge	488 - 542 N·m (360 - 400 ft. lb.)
Bolster pin nut	407 - 542 N·m (300 - 400 ft. lb.)

PRINTED IN UNITED STATES OF AMERICA

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

ENGINE REMOVAL AND INSTALLATION (EARLY I.H.)

REMOVAL

Position tractor under an overhead crane or portable hoist. Lower bucket to ground, apply parking brake and turn main switch to "OFF" position. If possible, steam clean engine and torque converter before removal.

Lock frame halves in a straight-ahead attitude with frame locking bar.

Remove side panels from both sides of engine compartment. Remove clamps that secure exhaust stack to turbocharger exhaust elbow and remove stack. Loosen clamps at air cleaner hose connections and remove hose from air cleaner. Air cleaner removal is not necessary.

Remove hardware securing hood to grille and to reservoir-battery box bulkhead. Remove hardware securing hood halves and remove both halves. Disconnect battery cables (ground cable first) from batteries and pull cables out of battery boxes. Remove batteries.

Drain reservoir by removing plug from drain valve and opening valve. Direct draining oil through a funnel and length of hose to containers of sufficient capacity. Use clean, resealable containers if hydraulic oil is to be reused.

Loosen and remove connections from reservoir to pumps and split spool valve. Remove hardware securing alcohol injector and transmission filter to left side of bulkhead and lay units, with lines connected, out of the way inside tractor.

Attach hoist to bulkhead. Remove all hardware attaching bulkhead to frame and carefully raise and swing unit away from tractor. Check carefully while removing bulkhead for any overlooked connections.

Radiator drain (1, Fig. 2-1) is located on left rear side of tractor, on fuel tank wall.

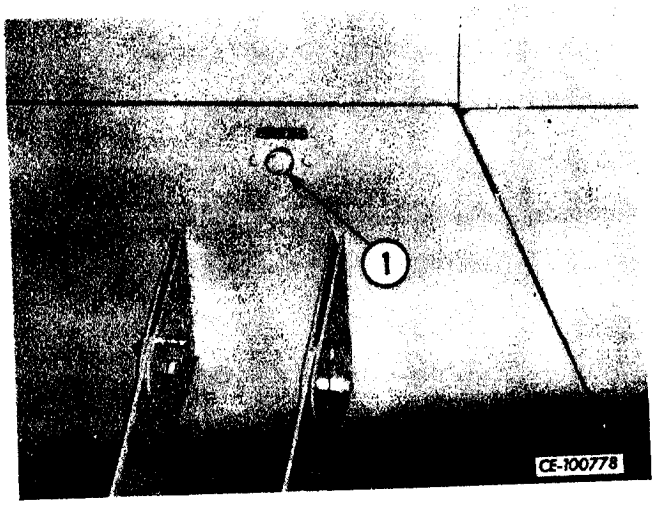


Figure 2-1
Radiator Drain.

Remove drain plug and drain coolant into clean, resealable containers if it is to be reused.

Hasten draining by removing radiator cap. Replace cap after draining. Remove hardware securing radiator drain to fuel tank and pull drain and attached hose from fuel tank mounting into engine compartment.

Attach hoist to grille. Remove all hardware securing grille to frame, remove grille and carefully lower to floor.

Disconnect oil cooler lines from connectors at bottom of radiator-oil cooler unit. Detach lower and upper (1, Fig. 2-2) radiator hoses, deaeration hose (2) and water pump hose (3).

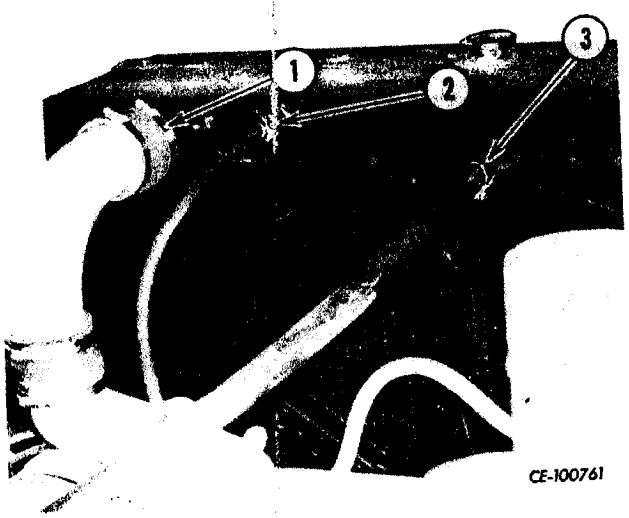


Figure 2-2
Upper Radiator Connections.

Remove support brackets (1, Fig. 2-3) from each side of radiator-oil cooler unit.

Attach hoist to radiator. Remove hardware from mountings (Fig. 2-7) and carefully remove unit from tractor. Be careful not to damage fan or radiator shroud during removal.

Tag and disconnect lines at hydraulic pumps and torque converter. Note that some lines are common to engine and converter and need not be removed. Plug and cap all openings. Disconnect converter to transmission drive shaft.

Tag and disconnect wires and cables at starting motor and engine sending units. Dismount solenoid just above starter with connections intact. Remove hose connections (1, Fig. 2-4) from compressor. Disconnect tubes (2) from compressor to governor. Remove governor and its mounting bracket, as a

(Continued on next page)

ENGINE REMOVAL AND INSTALLATION (EARLY I.H.)

REMOVAL - Continued

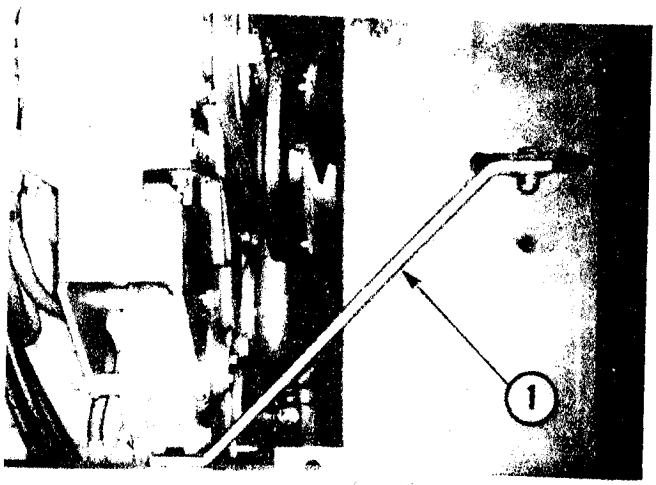


Figure 2-3
Radiator Supports.

unit, from engine and lay governor and attached line out of the way in engine compartment.

Engine may be removed without draining crankcase. Remove hardware attaching crankcase drain to right side of fuel tank wall and pull drain and attached hose into engine compartment. Tie or wire drain and hose to engine.

Disconnect fuel line (1, Fig. 2-5) at fuel filter. Remove filter bracket mounting hardware (2) and lay filter with attached bracket and fuel supply line out of the way in engine compartment. Disconnect fuel return line, accelerator cable and engine shut-down cable from engine.

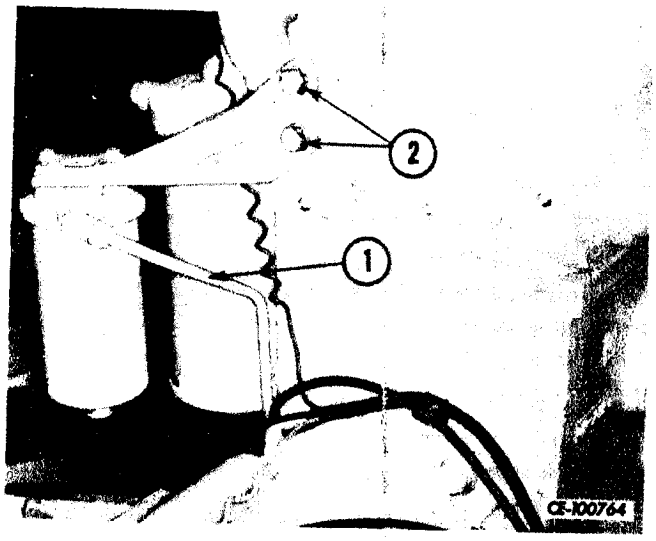


Figure 2-5
Converter End of Engine.

Securely attach engine lifting tool (refer to "SPECIAL TOOLS") to "flat" from which fuel filter was removed. Securely fasten second lifting tool (refer to "SPECIAL TOOLS::) to "flat" (1, Fig. 2-6) on fan end of engine.

Attach a spreader bar to hoist and spreader bar hooks to engine lifting tools. Remove engine mounting hardware that secures front and rear mounting brackets to frame. Carefully raise engine from frame, meanwhile checking for any overlooked connections. Set engine in a properly supported engine stand.

Refer to Service Manual, Form Number ISS-1519 for engine overhaul.

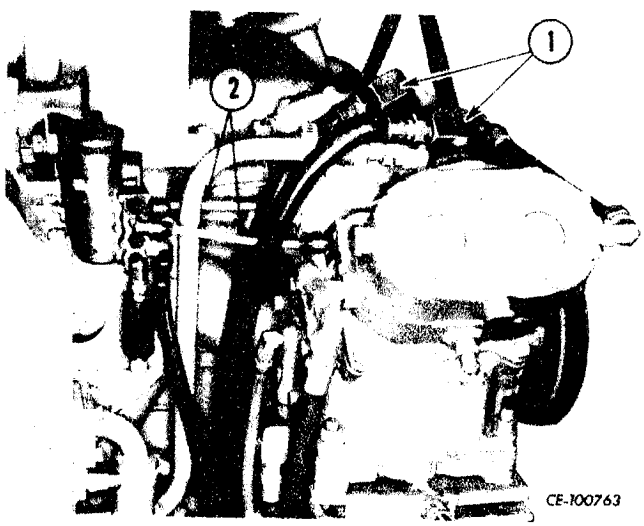


Figure 2-4
Compressor Connections

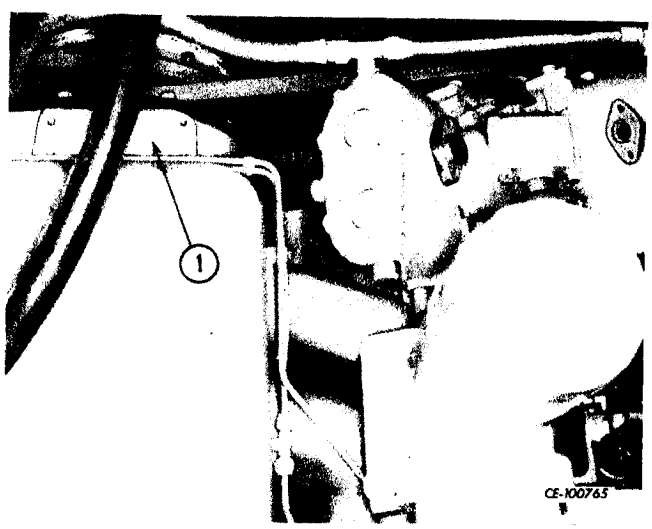


Figure 2-6
Fan End of Engine.

ENGINE REMOVAL AND INSTALLATION (EARLY I.H.)

INSTALLATION

Steam clean engine compartment and check for wear and damage to wires, hoses or tubes. Repair or replace as necessary. Using special lifting tools and spreader bar used in removing engine, raise engine from stand and position it over engine compartment. Carefully lower engine into compartment, positioning engine mounting brackets onto supports in frame. Line up mounting holes with a drift and install mounting bolts and washers. Use new nuts on all mounting bolts. Tighten mounting bolts to recommended torque (refer to "SPECIAL TORQUES").

Engine mounting bolt torque
Flywheel end _____
Fan end _____

Remove hoist, spreader bar and lifting tools. Remove caps and plugs from hoses, tubes and converter and pump ports. Connect all tagged lines to their proper ports. Use new "O" rings. Be sure all split flange clamps are properly seated before tightening cap screws. Connect fuel return line, accelerator and engine shutdown cables to engine. Mount fuel filter with attached bracket and supply line to its previous position on engine (Fig. 2-5). Connect fuel line (1). Position engine oil drain in cutout in fuel tank wall and secure with proper hardware.

Mount governor and bracket in original position on engine and connect nylon tubes between governor and compressor. Connect air lines (Fig. 2-4) to compressor. Connect previously tagged wires to sending units and cranking motor. Mount solenoid to engine bracket just above cranking motor. Install drive shaft from converter to transmission. Attach hoist to radiator-oil cooler unit and raise into position. Be careful not to damage fan, radiator shroud or radiator. Line up radiator and frame mounting brackets (Fig. 2-7) and install mounting hardware but do not tighten.

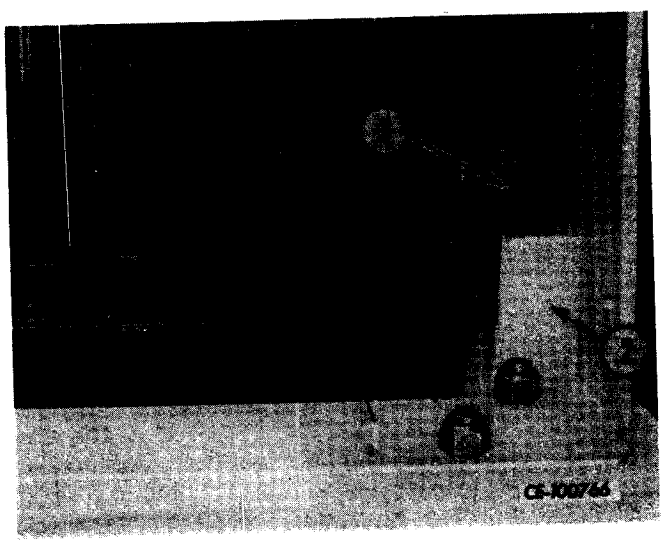


Figure 2-7
Radiator Mounting.

Install radiator support brackets (1, 2, Fig. 2-3) on each side of radiator. Tighten radiator mounting hardware previously left loose, then tighten bracket hardware. Use new nuts.

Connect oil cooler lines and lower radiator hose. Make upper radiator connections (Fig. 2-2). Mount radiator drain in sidewall of fuel tank and secure with proper hardware.

Attach hoist to grille and position it on frame. Install mounting bolts and new nuts and tighten securely. Attach hoist to reservoir-battery box bulkhead and position it on frame. Install, but do not tighten mounting hardware. Make reservoir connections to pumps and split spool valve. Mount alcohol injector and transmission filter to side of bulkhead. Connect air cleaner to engine, being sure connections are tight.

Raise left hood half into position and install, but do not tighten mounting hardware. Position remaining half of hood in same manner, also installing hardware that ties hood halves together. Now tighten bulkhead mounting hardware, then hood hardware. Feed battery cables into battery compartments, install batteries and make cable connections, ground cable last.

Fill radiator with fresh, clean coolant or previously drained coolant if it is clean and has retained its rust-inhibiting and anti-freeze qualities.

Insert exhaust stack through hood, position on turbocharger exhaust and clamp securely. Be sure hydraulic reservoir drain valve is closed and drain plugs are in place and tight. Fill reservoir to full mark on dipstick. Use a fine screen to filter hydraulic oil as it is added to reservoir. Refer to Section 9, "HYDRAULIC SYSTEM," for recommended lubricant and reservoir capacity.

Check fluid levels of engine crankcase and transmission and add fluid as needed. Reposition frame locking bar from "straight lock" to its normal carry position.

Start engine and check carefully for leaks. Operate hydraulic controls through several cycles to purge system of air. With engine running, again check transmission fluid level and add makeup fluid as needed.

Shut down engine when it has reached normal operating temperature and repeat fluid level checks of radiator, hydraulic reservoir and engine crankcase. Add fluid as required.

RADIATOR AND OIL COOLER (EARLY I.H.)

GENERAL

Prepare the tractor for radiator and oil cooler removal by locking the frame in a straight-ahead attitude, lower bucket to ground, apply parking brake and turn main switch to "OFF." Provide a hoist or portable crane of one ton minimum capacity. Disconnect and tag battery cable.

REMOVAL

Remove all side panels. Remove hardware securing hood to grille and reservoir bulkhead. Separate hood halves by removing attaching hardware. Remove hood from tractor.

Attach hoist to grille, leaving only a little slack. Remove grille mounting hardware and grille. If coolant is to be reused, drain radiator into clean resealable containers by removing drain plug (Fig. 2-1) from left side of fuel tank wall. Hasten draining by removing radiator cap. Replace cap when radiator has drained.

Loosen clamp at lower radiator hose connection and disconnect hose. Loosen clamps and disconnect upper radiator hoses (Fig. 2-3). Attach hoist to radiator-oil cooler unit, leaving a little slack. Remove mounting hardware (Fig. 2-7) from radiator-to-frame brackets. Raise unit carefully to avoid damage to fan and shroud.

INSTALLATION

Using a hoist, position radiator-oil cooler unit on tractor frame. Carefully work unit into its mounting position, with radiator shroud around fan blades. Line up radiator mounting brackets with frame brackets and install, but do not tighten mounting hardware. Remove hoist. Install side supports, leaving hardware a little loose. Use new nuts for all mounting and support bolts. Tighten mounting hardware at frame brackets, then at side supports.

Connect oil cooler lines. Position radiator drain in wall of fuel tank and secure with proper hardware. Connect lower and upper radiator hoses and tighten clamps securely. Attach hoist to grille and position it on tractor. Using new nuts, install mounting hardware, but do not tighten until after hood is installed. Raise hood sections into place and install all securing hardware, but do not tighten. Tighten grille mounting bolts, then hood hardware.

Fill radiator to proper level. Start engine and check fluid level of transmission. Add makeup fluid as needed. Operate engine until normal operating temperature is reached. Check for leaks and correct if any are found. Shut down engine and repeat fluid level check of radiator. Replace side panels and restore frame locking bar to its stored position.

RADIATOR AND OIL COOLER (LATE I.H.)

REMOVAL

NOTE: Tag all lines and plug all openings.

The oil cooler for the hydraulic circuit and the radiator are one unit and the two should be removed as a unit.

Position the machine so a hoist or other lifting device can be used to remove heavy items.

Lock frame halves in a straight-ahead attitude with frame locking bar.

Turn the electrical switch off. Disconnect and tag the battery ground cable.

Drain the radiator and oil cooler. Refer to the Operator's Manual.

Remove the engine side panels (1, Fig. 2-8) from each side.

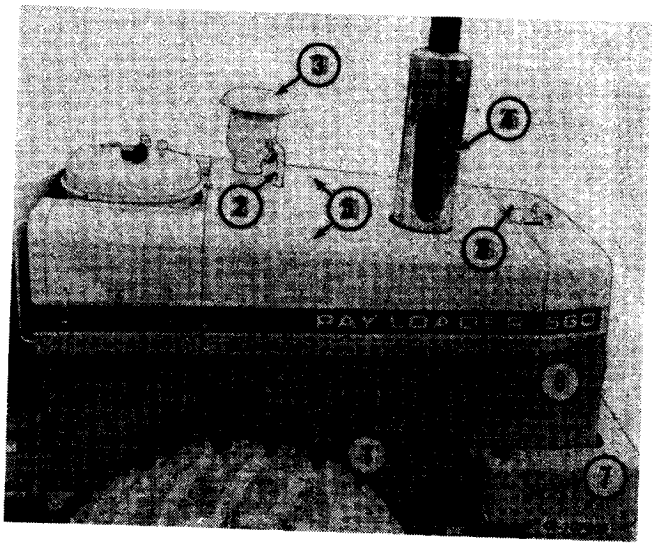


Figure 2-8
Remove Radiator.

RADIATOR AND OIL COOLER (LATE I.H.)

Disconnect the aspirator tube (2) from the precleaner (3) and the muffler (4). Remove it from the machine.

Remove the muffler and precleaner.

Remove the hood halves (5) and the radiator cover (6).

Remove counterweight (7).

Attach a hoist to the grille and remove mounting bolts (8).

If equipped, disconnect turn signal light wires at lights and wire from sender on radiator top.

Remove grille from machine.

Disconnect oil cooler lines from connectors at bottom of radiator-oil cooler unit. Detach lower and upper (1, Fig. 2-9) radiator hoses, deaeration hose (2) and water pump hose (3).

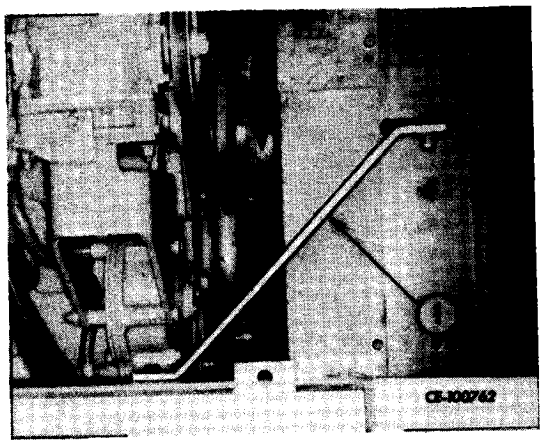


Figure 2-10
Radiator Supports.

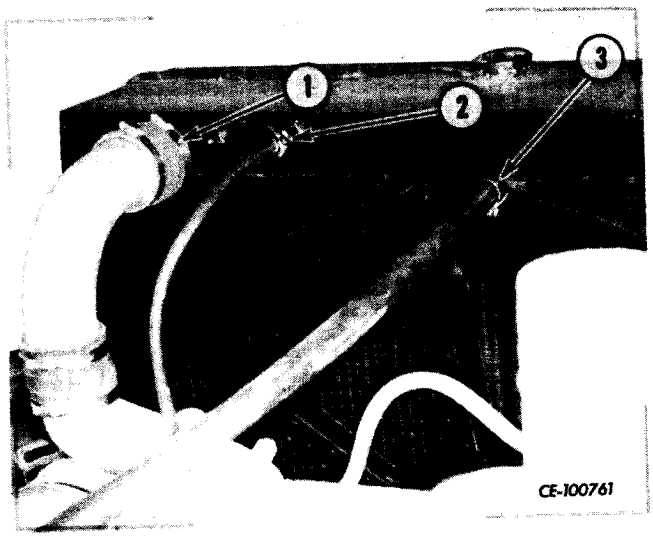


Figure 2-9
Upper Radiator Connections.

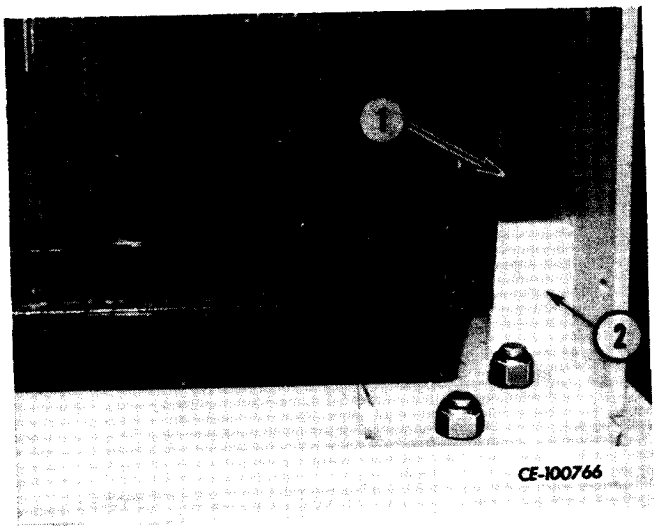


Figure 2-11
Radiator Mounting.

Unbolt the finger guard from the shroud.

Disconnect the radiator drain line.

Remove support brackets (1, Fig. 2-10) from each side of radiator-oil cooler unit.

Remove the hardware securing the radiator mount (1, Fig. 2-11) to the bracket (2).

Remove radiator from machine.

INSTALLATION

Using a hoist, position radiator-oil cooler unit on tractor frame. Carefully work unit into its mounting position, with radiator shroud around fan blades. Line up radiator mounting brackets with frame brackets and install, but do not tighten mounting hardware. Remove hoist. Install side supports, leaving hardware a little loose. Use new nuts for all mounting and support bolts. Tighten mounting hardware at frame brackets, then at side supports.

(Continued on next page)

RADIATOR AND OIL COOLER (LATE I.H.)

INSTALLATION - Continued

Connect oil cooler lines. Connect radiator drain. Connect lower and upper radiator hoses, deareation hose and water pump hose.

Install fan guard to shroud.

Attach hoist to grille and position it on tractor. Using new nuts, install mounting hardware, but do not tighten until after hood is installed. Raise hood sections into place and install all securing hardware, but do not tighten. Tighten grille mounting bolts, then hood hardware.

Install radiator cover.

If equipped, connect turn signal wires and radiator sender wire.

Install counterweight.

Install muffler, precleaner and aspirator tube.

Install ride panels and store frame locking bar.

Fill cooling system and cooler circuit. Refer to the Operator's Manual.

ENGINE REMOVAL AND INSTALLATION (LATE I.H.)

REMOVAL

Engine removal involves lifting of very heavy components. Be certain that lifting equipment has a sufficient capacity to safely handle loads imposed on it. A hoist with a minimum capacity of three tons is recommended.

Lock the frame halves in a straight-ahead attitude with the frame locking bar and turn the electrical switch off.

Disconnect the battery cables from the batteries, ground cables first and tag them to alert personnel you are working on the machine.

Drain the engine coolant.

Disconnect the engine fuel drain line from the fuel tank.

Remove the hood panels, side and top.

Disconnect the ether injection line (1, Fig. 2-12).

Disconnect the wire lead (2) if equipped, at frame.

Disconnect the governor line (3) at frame.

Disconnect the compressor lines (4) at frame.

Disconnect the air cleaner indicator line from the air cleaner outlet tube.

Disconnect the 3 electrical cables (1, Fig. 2-13) from the starter and solenoid.

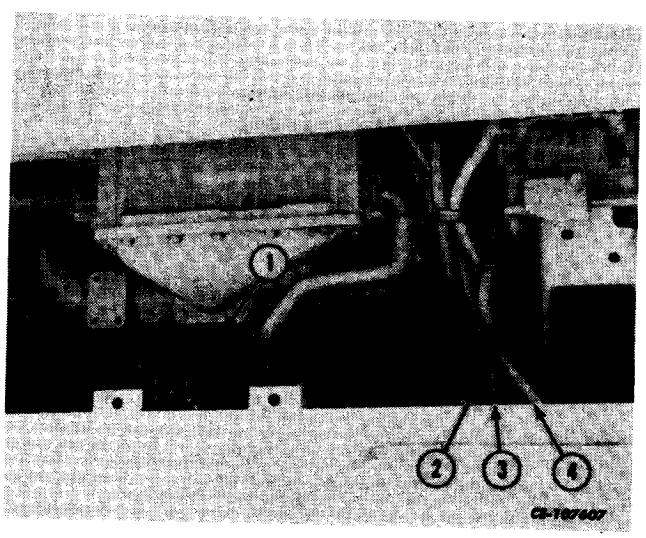


Figure 2-12
Engine Left Side Disconnects.

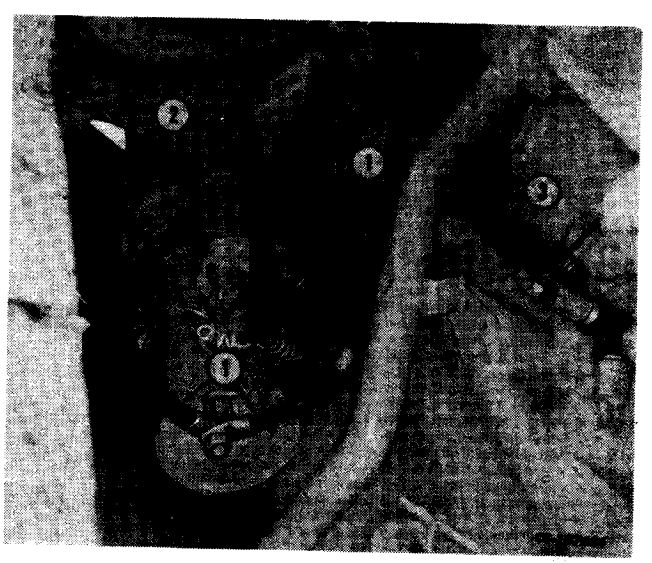


Figure 2-13
Starter Disconnects.

ENGINE REMOVAL AND INSTALLATION (LATE I.H.)

Disconnect the engine wiring harness (2) at the frame.

Disconnect the heater hose (3) from the engine.

Disconnect the lines from the engine to the radiator.

Disconnect the accelerator cable (1, Fig. 2-14) from the injection pump and the mounting bracket.

Disconnect the ether injection sender line (2).

Disconnect the ether injection line.

Disconnect the shutdown cable from the injection pump.

Disconnect the fuel return line (3).

Disconnect the fuel supply line (4).

If equipped, disconnect the freon compressor hoses.

Disconnect the alternator wire (5).

Remove the air cleaner outlet tube (6).

Disconnect the wires from the sender (7).

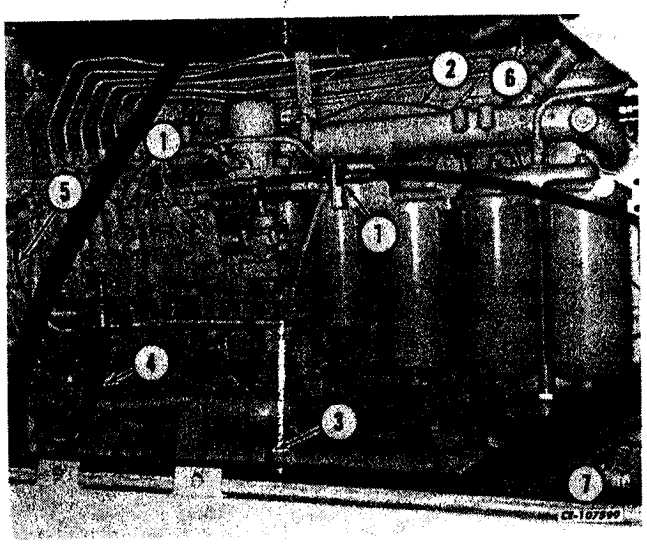


Figure 2-14
Engine Right Side Disconnects.

Disconnect the heater hose from the engine.

Disconnect the hoses from the drive circuit oil cooler.

Attach the lifting tool, (refer to "SPECIAL TOOLS") to the "flat" on the fan end of the end, just in front of the valve cover. (Refer to Fig. 2-15).

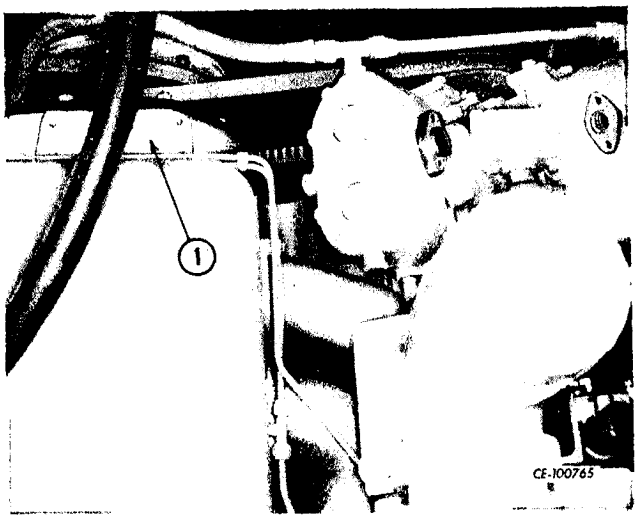


Figure 2-15
Front Lifting Tool Location.

Attach a hoist to this tool and to the hole in the air cleaner mounting bracket and take up the slack.

Disconnect the wire from the torque converter sender.

Chain the converter in place so it will not move when the mounting bolts are removed.

Remove the torque converter mounting bolts.

Loosen the fan belts and remove the fan drive housing from the engine block. Move the fan and fan drive forward with the fan belts and let them rest on the fan guard.

Remove the front and rear engine mounting bolts.

Remove the engine.

Refer to Service Manual ISS-1519 for engine overhaul.

INSTALLATION

Position the engine in the frame and secure to the torque converter, then to the frame. Refer to Special Torques.

Torque: _____

Install the fan, fan drive and fan drive belts to the engine. Adjust the drive belts. Refer to the Operator's Manual.

Install the wire to the torque converter sender.

(Continued on next page)

ENGINE REMOVAL AND INSTALLATION (LATE I.H.)

INSTALLATION - Continued

Remove the hoist and install the air cleaner outlet tube.

Install the radiator lines to the radiator.

Install the oil cooler lines to the cooler on the engine and the heater hose to the coolant inlet housing.

Install the sender wires near the oil filters.

Install the alternator wire, fuel return line, fuel supply line, shutdown cable, accelerator cable and if so equipped, install the ether injection and sender lines, and the freon compressor lines.

Install the heater hose to the engine block.

Reconnect the wiring harness.

Install the electrical cables to the starter and solenoid.

Install the air cleaner indicator line to the outlet tube.

Install the air compressor lines, governor line, ether injection line, freon compressor wire and the battery cables, ground cable last.

Install the hood, top and side panels and engine drain line.

Refill the cooling system. Refer to Operator's Manual.

ENGINE REMOVAL AND INSTALLATION - CUMMINS

REMOVAL

Remove the grill and radiator. Refer to "Radiator and Oil Cooler - Cummins" removal in this section.

Disconnect the oil line for the engine oil pan (drain line from the frame) and disconnect and cap the return line from the bypass filter.

Disconnect line (1, Fig. 2-16) from injection pump.

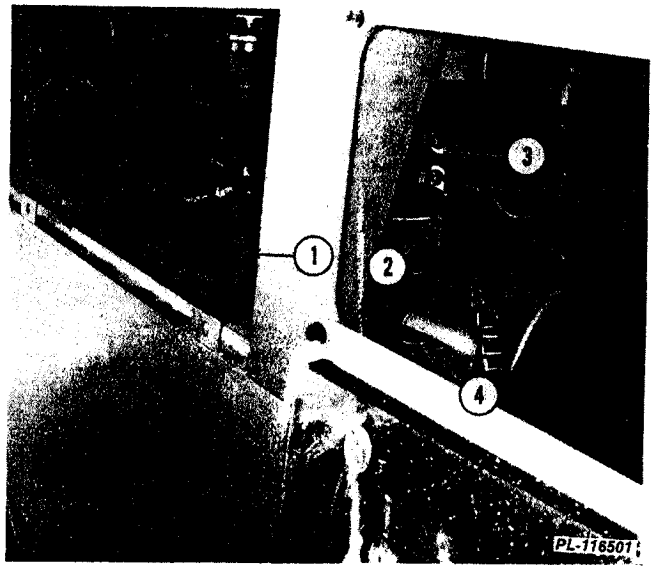


Figure 2-16
Right Side Disconnects

1. Line - filter to injection pump.
2. Line - filter to filter.
3. Support bracket.

Disconnect the line (2, Fig. 2-16) from filter.

Disconnect the accelerator cable (1, Fig. 2-16) from the bracket and the pump.

Disconnect the shut down cable (2, Fig. 2-16) from the injection pump.

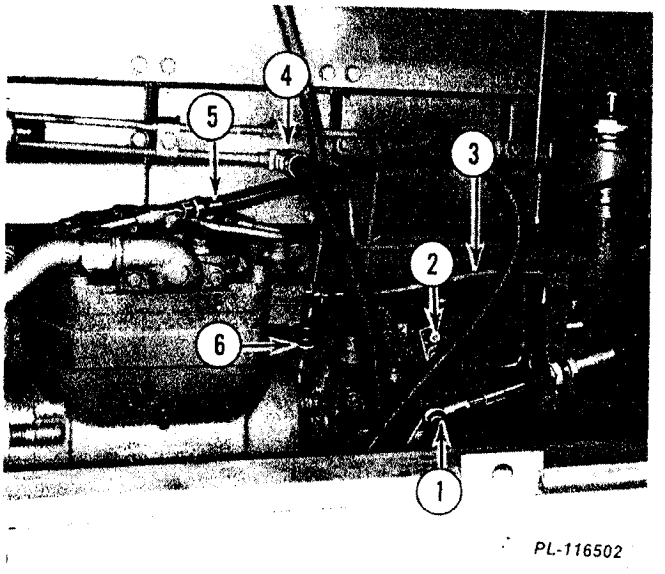


Figure 2-17
Injection Pump Disconnects.

1. Accelerator cable.
2. Shut down cable.
3. Air supply line.
4. Fuel return line.
5. Governor air line.
6. Tach drive

Disconnect the air supply line (3, Fig. 2-17).

ENGINE REMOVAL AND INSTALLATION - CUMMINS

REMOVAL - Continued

Disconnect the fuel return line (4, Fig. 2-17).

Disconnect the governor air line (5, Fig. 2-17).

Disconnect the tack drive cable (6, Fig. 2-17) from the injection pump and other mounting spots. Make sure the support bracket (3, Fig. 2-16) is removed from the engine.

Disconnect the air cleaner indicator line (Fig. 2-18) from the air cleaner.

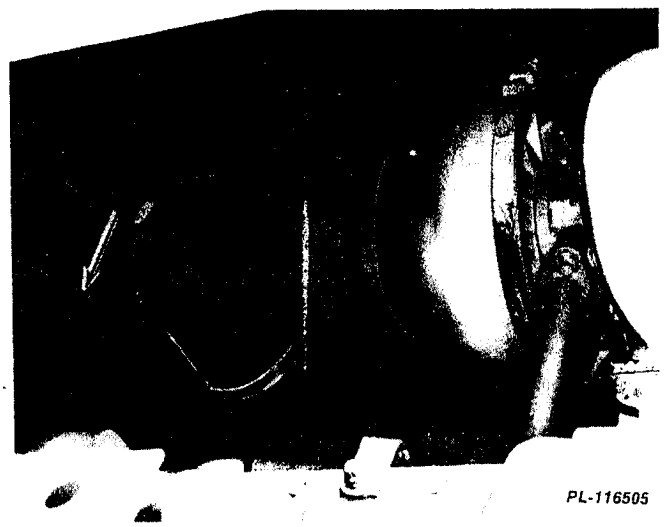


Figure 2-18
Air Cleaner Indicator Line.

Figure 2-19
Rear Disconnects.

1. Heater line. 2. Finger guard.

Disconnect the heater line (1, Fig. 2-19).

Disconnect cooler lines (1 & 2, Fig. 2-20).

Disconnect heater line (3, Fig. 2-20).

Disconnect wiring harness (4, Fig. 2-20) at connector.

Disconnect battery cable (5, Fig. 2-20) from starter solenoid.

Disconnect starter ground cable (6, Fig. 2-20) from frame.

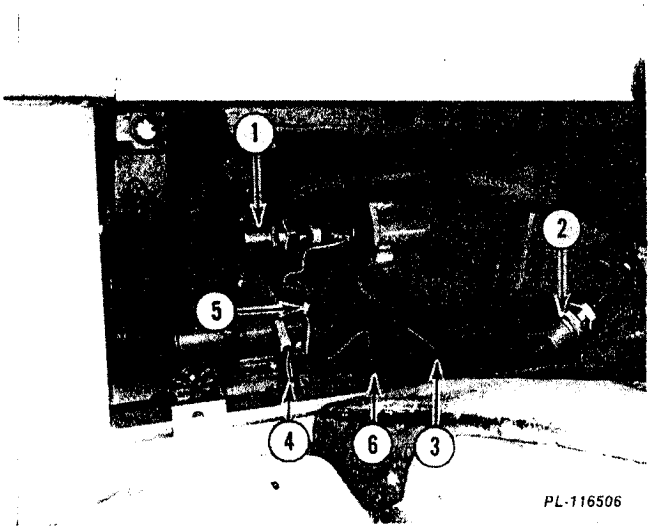


Figure 2-20
Left Hand Disconnects.

1. Cooler line.
2. Cooler line.
3. Heater line.
4. Wiring harness.
5. Battery cable.
6. Ground cable.

Remove muffler and aspirator tube.

Remove air cleaner and mount (Fig. 2-21).

(Continued on next page)

ENGINE REMOVAL AND INSTALLATION - CUMMINS

REMOVAL - Continued

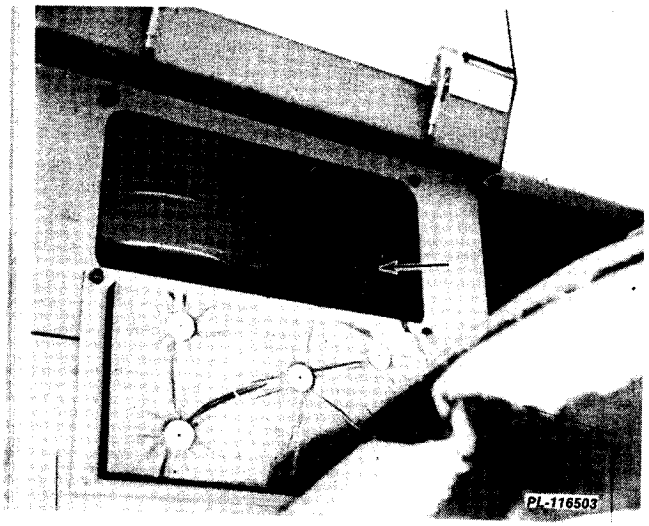


Figure 2-21
Air Cleaner Mount.

Leave the hydraulic lines connected to the hydraulic pumps and just remove the pump mounting hardware securing them to the converter housing.

Disconnect the breather line from the converter.

Disconnect the converter to transmission drive shaft.

Disconnect the drain line from the bottom of the converter housing.

Determine what size caps you will need to cap the hoses leading to the converter housing and if possible, connect a vacuum source to the system to prevent oil loss during the disconnecting of the lines and the capping of same. Then disconnect the lines and cap.

Attach your lifting eyes and chains to the engine.

Remove the trunnion caps (4, Fig. 2-16) from the engine mounts.

Remove the hardware securing the engine to the frame at the fan end.

Lift the engine and converter from the frame.

Remove the converter from the engine.

Refer to Cummins representative in your area for service on the engine.

INSTALLATION - CUMMINS

If removed, install the drive ring to the flywheel. Refer to "Special Torques" for the drive ring mounting.

Install converter on engine.

Install engine into frame and align hydraulic pumps to converter drive splines at same time.

Secure engine to front and rear mounts. Refer to "Special Torques" for engine mounting.

Uncap and install the lines to the converter.

Install the hydraulic pumps on the converter. Refer to "Special Torques" for charging pump mounting.

Install the driveshaft. Refer to "Special Torques" for driveshaft mounting.

Install the breather line to the converter.

Install the accelerator bracket to the flywheel end of engine (if removed).

Install the drain line to the converter housing.

Install the engine oil drain line to the frame.

Install the drain line from the bypass filter to engine oil pan.

Install the air cleaner and mount.

Install the air cleaner indicator line.

Install the ground cable to the starter.

Install the battery cable to the starter solenoid.

Install the heater lines.

Install the cooler lines to the engine cooler.

Connect the wiring harnesses together.

Install the tach drive cable.

Install the governor air line.

Install the air system supply line.

Install the fuel return line.

Install the shut down cable to injection pump.

ENGINE REMOVAL AND INSTALLATION - CUMMINS

Install the accelerator cable to injection pump.

Install the line between the fuel filters.

Install the line from injection pump to bypass filter.

Install the muffler and aspirator tube.

Install the radiator and oil cooler. Refer to "Radiator and Oil Cooler - Cummins".

RADIATOR AND OIL COOLER - CUMMINS

REMOVAL

Position the machine in a straight ahead attitude and lock the frames with the frame locking bar.

Remove the ground cable from the battery and tag it so personnel will be aware you are working on the machine.

Drain the cooling system and the converter/cooler system. Refer to the Operator's Manual for the proper procedure.

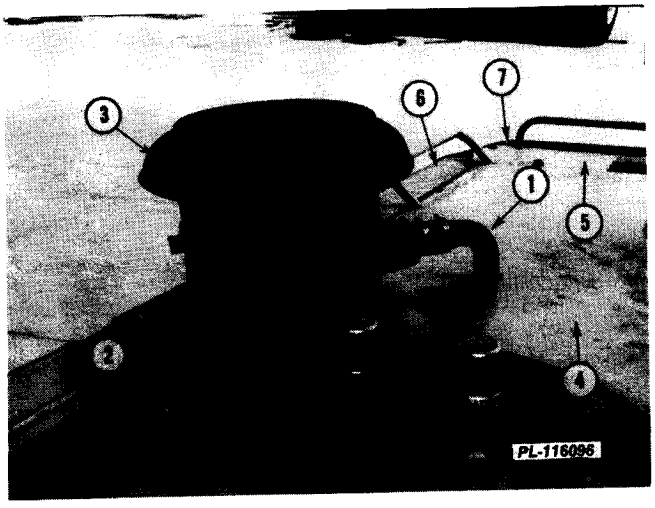


Figure 2-22
Hood and Pre-Cleaner.

1. Aspirator line.
2. Pre-cleaner clamp.
3. Pre-cleaner.
4. Hood.
5. Rear cover.
6. Side hood.
7. Grill.

Remove engine side panels.

Remove aspirator tube (1, Fig. 2-22).

Remove pre-cleaner clamp (2, Fig. 2-22).

Remove pre-cleaner (3, Fig. 2-22).

Remove muffler.

Remove hood (4, Fig. 2-22).

Remove rear cover (5, Fig. 2-22).

Remove side hoods (6, Fig. 2-22).

Remove grill (7, Fig. 2-22).

Disconnect wires to rear lights and sender on radiator (top).

Remove shrouding around radiator sides.

Remove finger guard.

Disconnect the lines from the oil cooler.

Disconnect the lower tube from the radiator.

Disconnect the upper hoses from the radiator.

Attach hoist to radiator.

Remove side braces to radiator.

Remove radiator mounting bolts and lift off radiator and cooler.

INSTALLATION

Position radiator on mounts and secure in place.

Install side braces to radiator.

Install lower radiator tube and oil cooler lines.

Install upper lines to radiator.

Install wire to radiator sender.

Install finger guard.

Install shrouding to sides of radiator but do not tighten.

Install wiring to rear lights.

Install grill. Refer to "Special Torques" for grill mounting. Position side shrouds out against grill and tighten.

(Continued on next page)

RADIATOR AND OIL COOLER - CUMMINS

INSTALLATION - Continued

Install top and side hoods.

Install rear cover.

Install muffler, pre-cleaner and aspirator tube.

Fill cooling system and oil cooler system with proper fluids. Refer to the Operator's Manual for the proper procedure.

Reconnect battery cables.

SERVICE INFORMATION

SPECIAL TORQUES

Grill mounting . . . . . 380 N·m (280 ft. lb.)
Drive shaft mounting . . . . . 108 N·m (80 ft. lb.)
Charging pump mounting . . . . . 45 - 50 N·m (33 - 37 ft. lb.)
Bracket to frame flywheel end (Cummins only) . . . . . 610 N·m (450 ft. lb.)
Front mounting brackets-to-flywheel housing, cap screws . . . . . 210 - 214 N·m (155 - 165 ft. lbs.)
Front mounting brackets-to-tractor frame, cap screws . . . . . 610 N·m (450 ft. lbs.)
Fan end mounting cap screws (adapter to frame) . . . . . 380 N·m (280 ft. lbs.)
(for adapter to engine - refer to Engine Service Manual)
Isolation mount (units so equipped) . . . . . 434 N·m (320 ft. lb.)
Drive ring to flywheel mounting . . . . . 42 - 50 N·m (31 - 37 ft. lb.)

NORMAL GAUGE READINGS

SYSTEM	GAUGE	INTERNATIONAL HARVESTER	
		Min.	Max.
ENGINE	Water Temperature	82.2°C (180°F)	90.6°C (195°F)
	Oil Pressure	379 kpa (55 PSI)	517 kpa (75 PSI)
TACHOMETER	Low Idle (RPM)	800	900
	High Idle (RPM)	2300	2450
	Governed Speed (RPM)	2200	
	Converter Stall (RPM)	2225	2350
	Hydraulic Stall (RPM)	2200	2350
	Full Stall (RPM)	1750	1900

SERVICE INFORMATION

NORMAL GAUGE READINGS

SYSTEM	GAUGE	CUMMINS	
		Min.	Max.
TACHOMETER	Low Idle (RPM)	700	800
	High Idle (RPM)	2240	2390
	Governed Speed (RPM)	2200	
	Converter Stall (RPM)	2110	2260
	Hydraulic Stall (RPM)	2130	2280
	Full Stall (RPM)	1590	1730

PRINTED IN UNITED STATES OF AMERICA

SERVICE INFORMATION

SPECIAL TOOLS

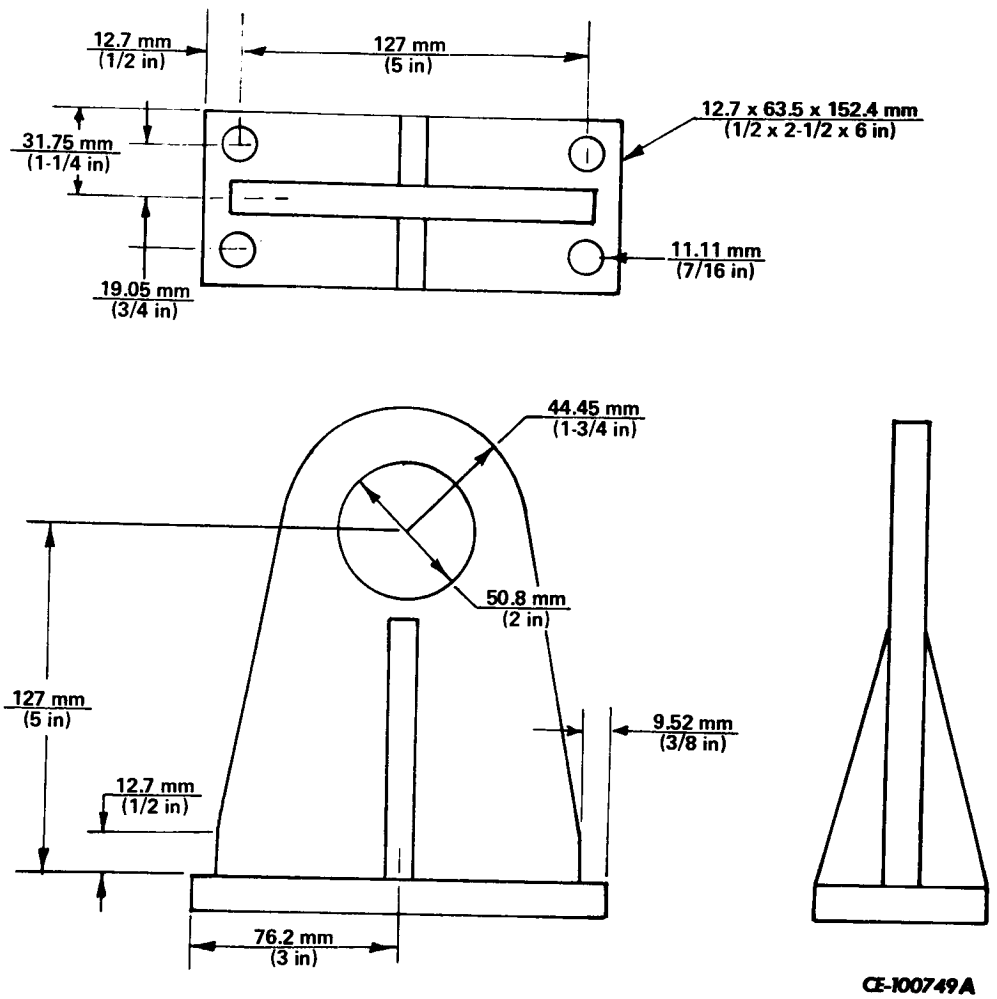


Figure 2-16
Engine Lifting Tool - Fan End (I.H.).

SERVICE INFORMATION

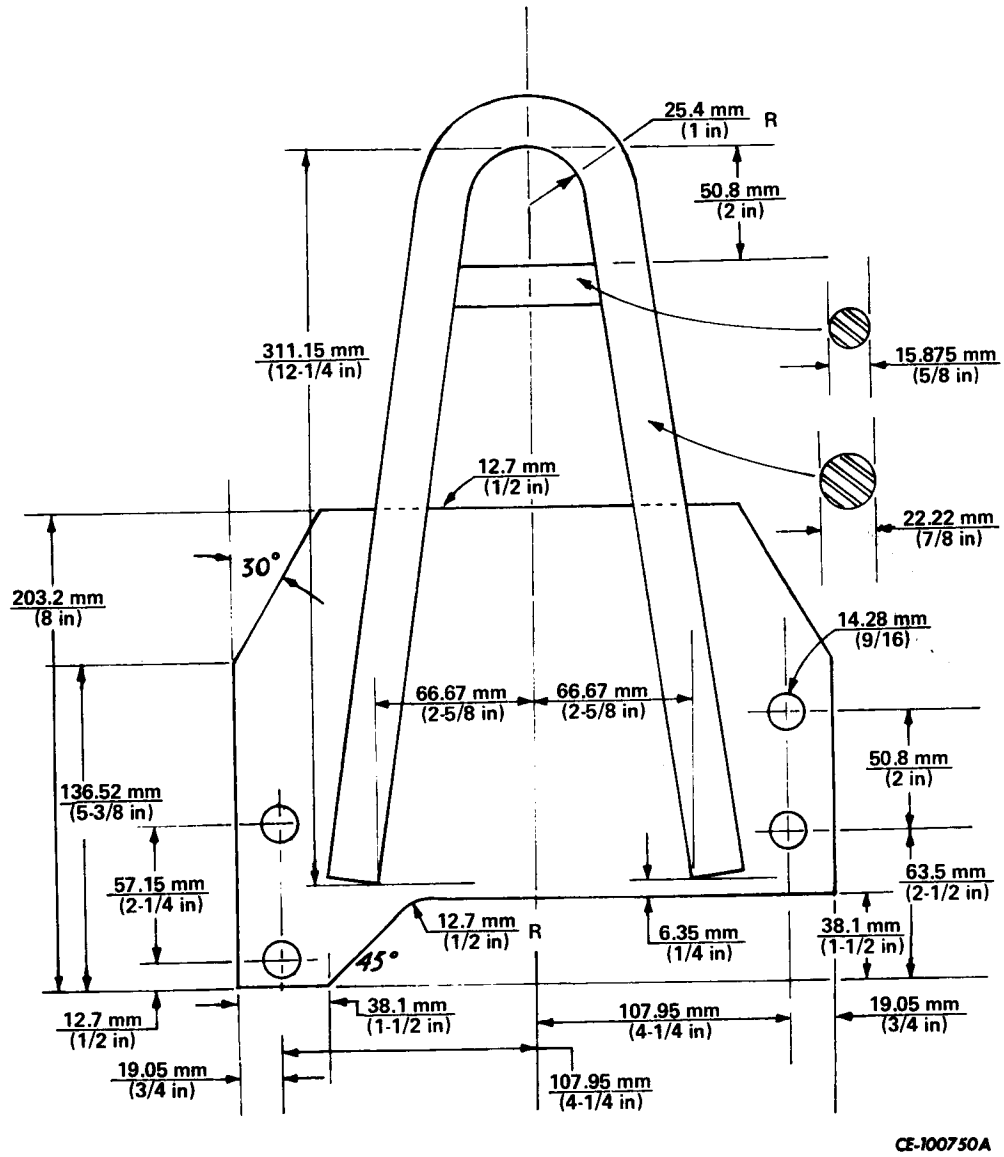


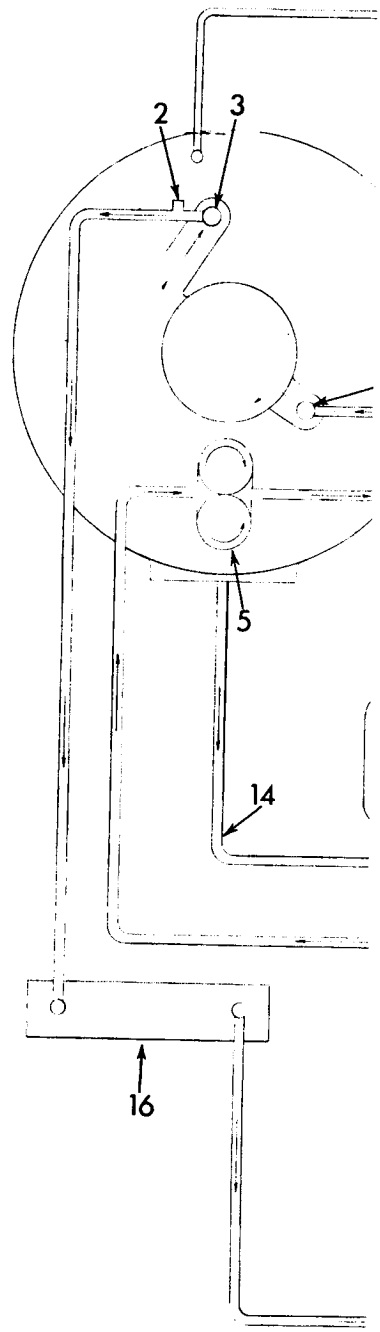
Figure 2-17
Engine Lifting Tool - Flywheel End (I.H.).

Later units have lifting eye on air cleaner mounting bracket.

Contents Page

PRINTED IN UNITED STATES OF AMERICA

1. Torque converter.
2. Converter oil temperature check point.
3. Converter oil "out" port.
4. Converter oil "in" port.
5. Charging pump.
6. System filters w/172 ± 34 kpa (25 ± 5 PSI) bypass valves.
7. Breather.
8. Input/directional clutch pack shaft.
9. Forward clutch pack.
10. Reverse clutch pack.
11. First clutch pack.
12. Third clutch pack.
13. Second clutch pack.
14. Drain to transmission sump.
15. Transmission sump filter w/172 kpa ± 10% (2.5 PSI ± 10%) differential.
16. Oil cooler.
17. Transmission control valve - lower portion.
18. Lube valve - 69 kpa (10 PSI).
19. Converter valve - 552 kpa (80 PSI).
20. Clutch valve - 1379 kpa (200 PSI).
21. Converter pressure check point.
22. Transmission disconnect from brake pedal.
23. Transmission control valve - upper portion.
24. Neutral safety switch.
25. Lube pressure check point.
26. Range plunger.
27. Directional plunger.
28. Clutch pressure check point.
29. Pressure apply oil.
30. Lube oil.



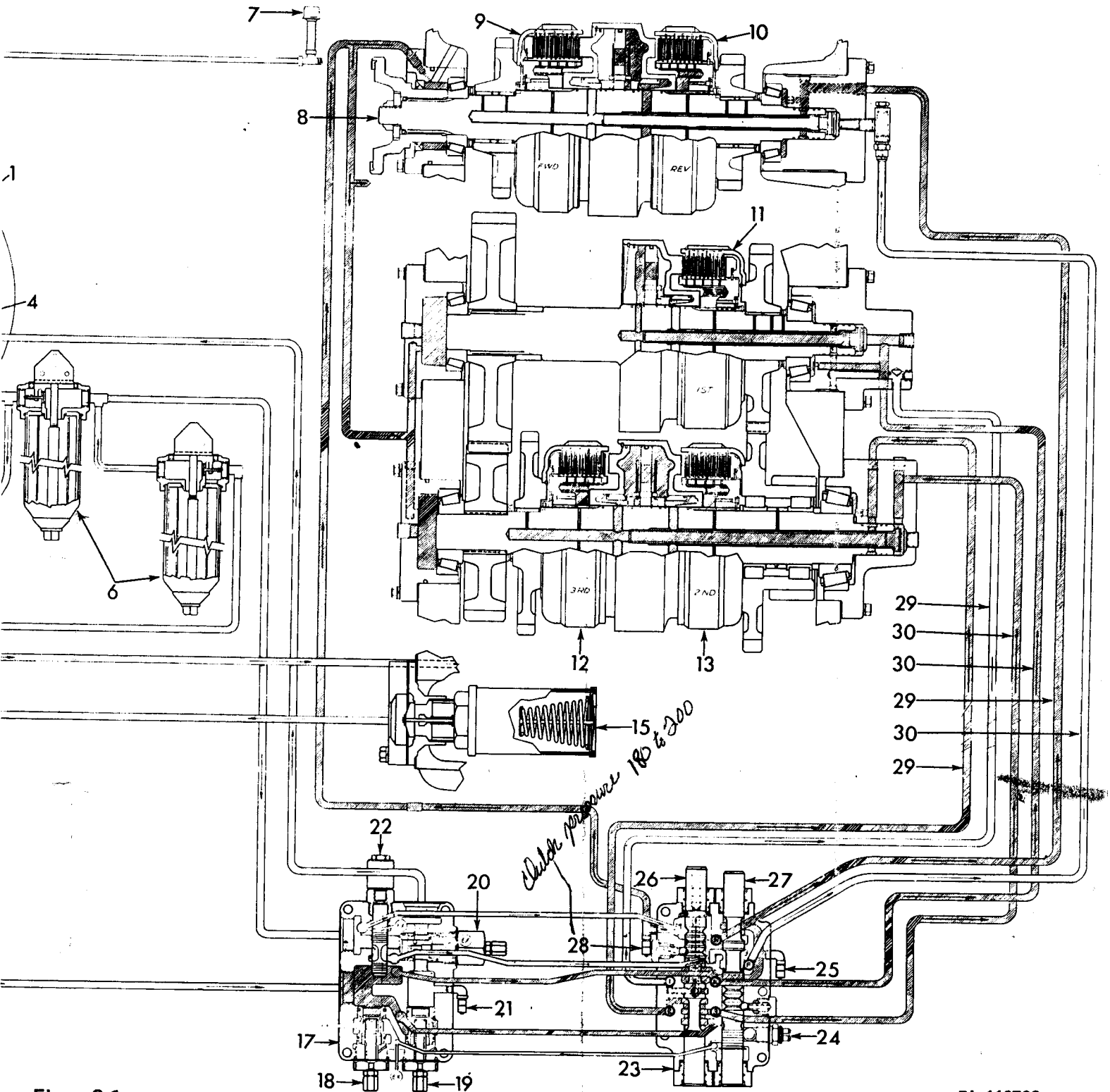


Figure 3-1
ion and Torque Converter
Flow Diagram

PL-116762

GENERAL INFORMATION

DESCRIPTION

The transmission is located at the front of the rear frame, connected to the rear axle by a drive shaft, connected to the front axle via a transfer case located at the raar of the front frame, and connected to the torque converter via a drive shaft. The torque converter is mounted to the engine flywheel housing, the engine being mounted in the rear frame (fan end toward rear of machine).

Oil is drawn from the transmission sump, through the strainer in the transmission into the circuit pump mounted on the torque converter and routed to the two in line filters mounted in front of the transmission. The two filters have cold oil bypass check valves in the filter heads to permit oil bypass when the oil is cold. This insures an adequate oil supply at all times for the actuation of the clutch packs. After the oil leaves the filters it proceeds to the regulating valve mounted on the front of the transmission which establishes and maintains the pressure needed for the clutch apply circuits, the torque converter and the transmission lubricating circuit. Mounted on the face of the regulating valve is the transmission control valve. When the plunger in the control valve is moved it connects a port for the transmission clutch pack desired with the high pressure oil present at the valve and oil proceeds to activate the clutch pack. When the plunger is moved to the opposite position, the pressurized oil is cut off from the previously used pack and routed to the transmission sump to be used again.

The regulating valve sees to it that the clutch apply circuit has the necessary pressure and then supplies oil to the torque

(Continued on page 5)

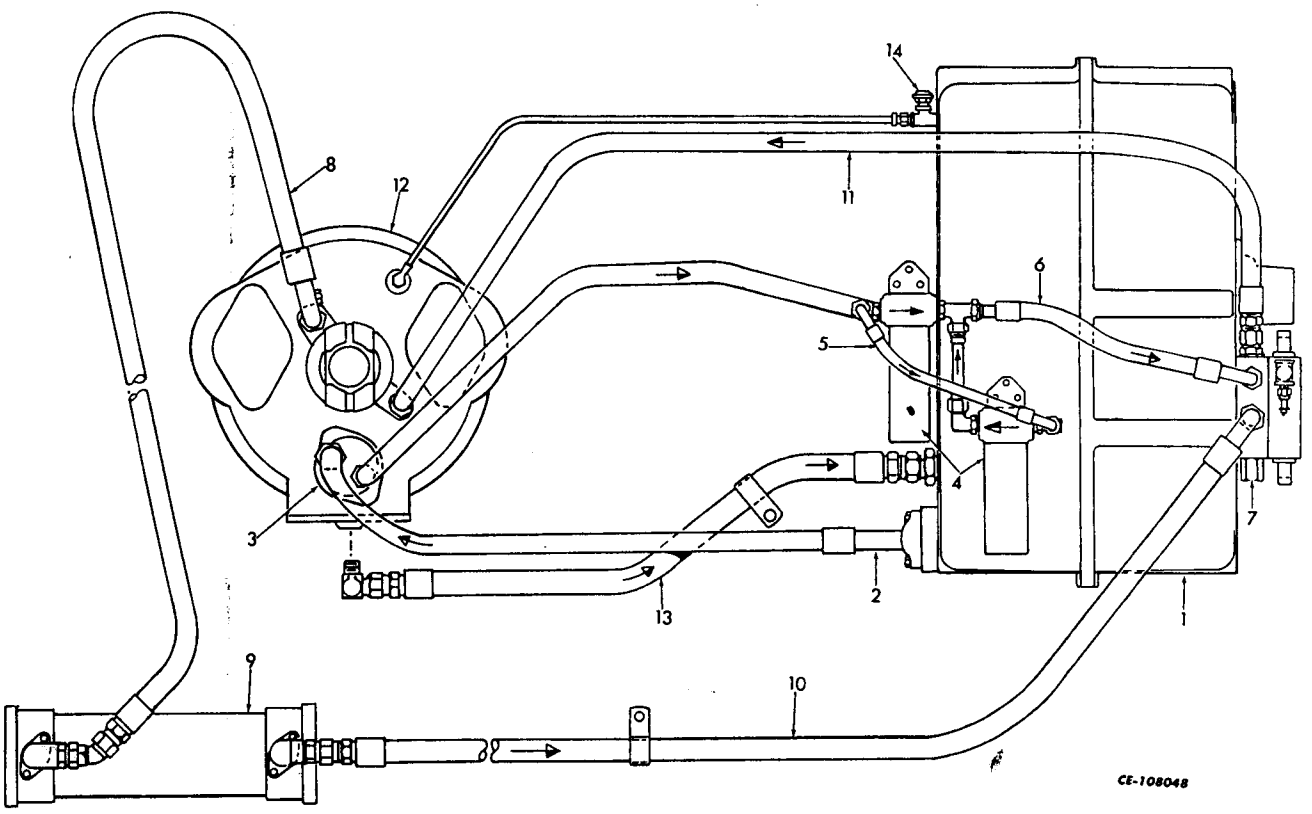


Figure 3-2
Transmission and Torque Converter Circuit.

1. Transmission.
2. Suction line.
3. Circuit pump.
4. Filters.
5. Line to secondary filters.
6. Line - filter to transmission.
7. Regulating valve.
8. Line - torque converter to oil cooler.
9. Oil cooler.
10. Line - oil cooler to regulating valve.
11. Line - regulating valve to torque converter.
12. Torque converter.
13. Torque converter sump to transmission.
14. Breather.

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

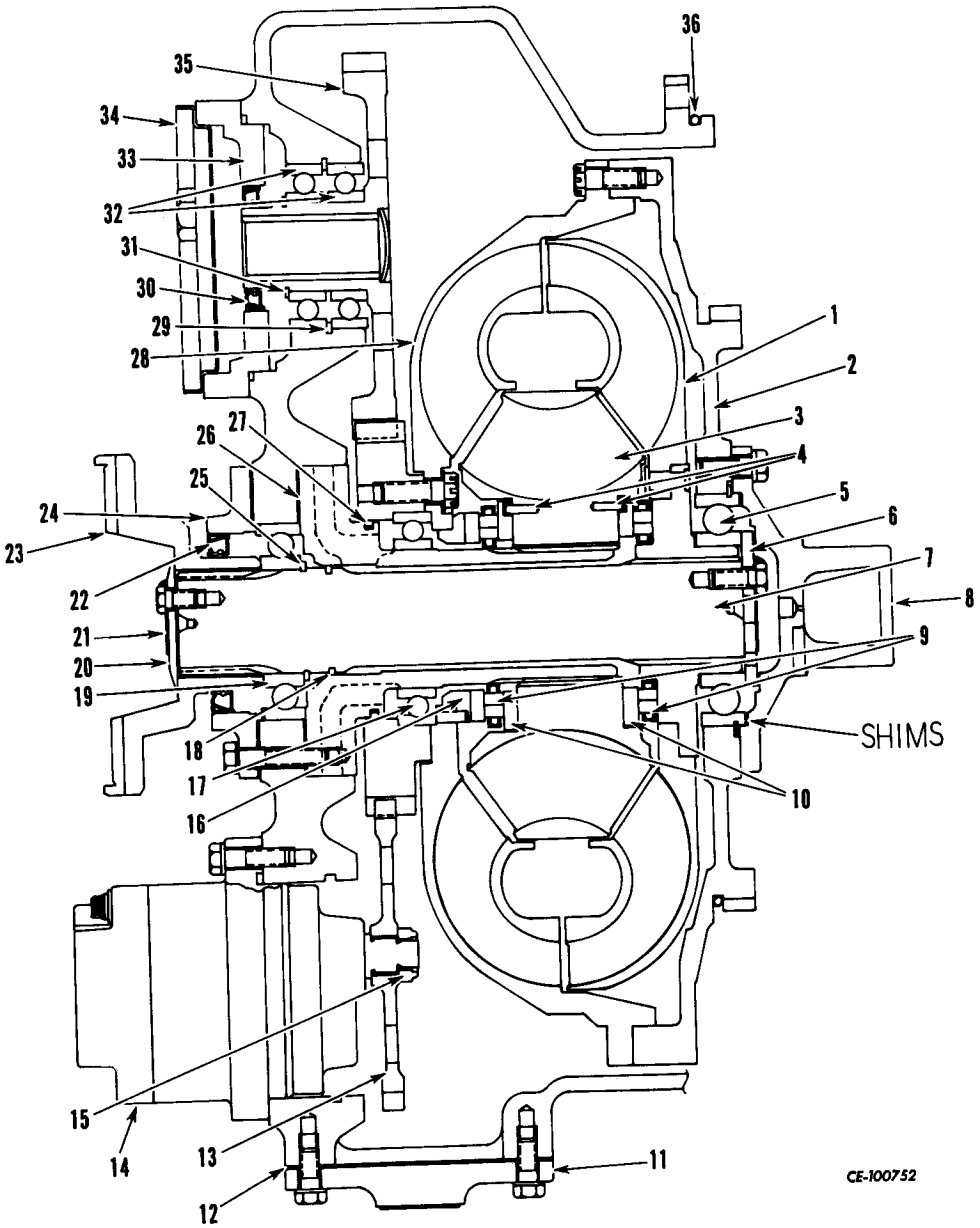


Figure 3-3
Torque Converter - Cross Section (Early Style).

1. Turbine.
2. Drive housing.
3. Stator.
4. Pin.
5. Bearing.
6. Washer.
7. Output shaft.
8. Input hub. *
9. Thrust bearing.
10. Thrust race.
11. Input cover.
12. Gasket.
13. Pump drive gear.
14. Pump.
15. Nut.
16. Spacer.
17. Bearing assembly.
18. Snap ring.
19. Bearing assembly.
20. Retainer washer.
21. Locking plate.
22. Seal.
23. Output flange.
24. Bearing retainer.
25. Snap ring.
26. Gasket.
27. Seal ring.
28. Impeller.
29. Snap ring.
30. Seal.
31. Snap ring.
32. Bearing assembly.
33. Adapter.
34. Cover.
35. Gear.
36. "O" ring.

* Later hubs do not have the extended sleeves on them.

GENERAL INFORMATION

DESCRIPTION - Continued

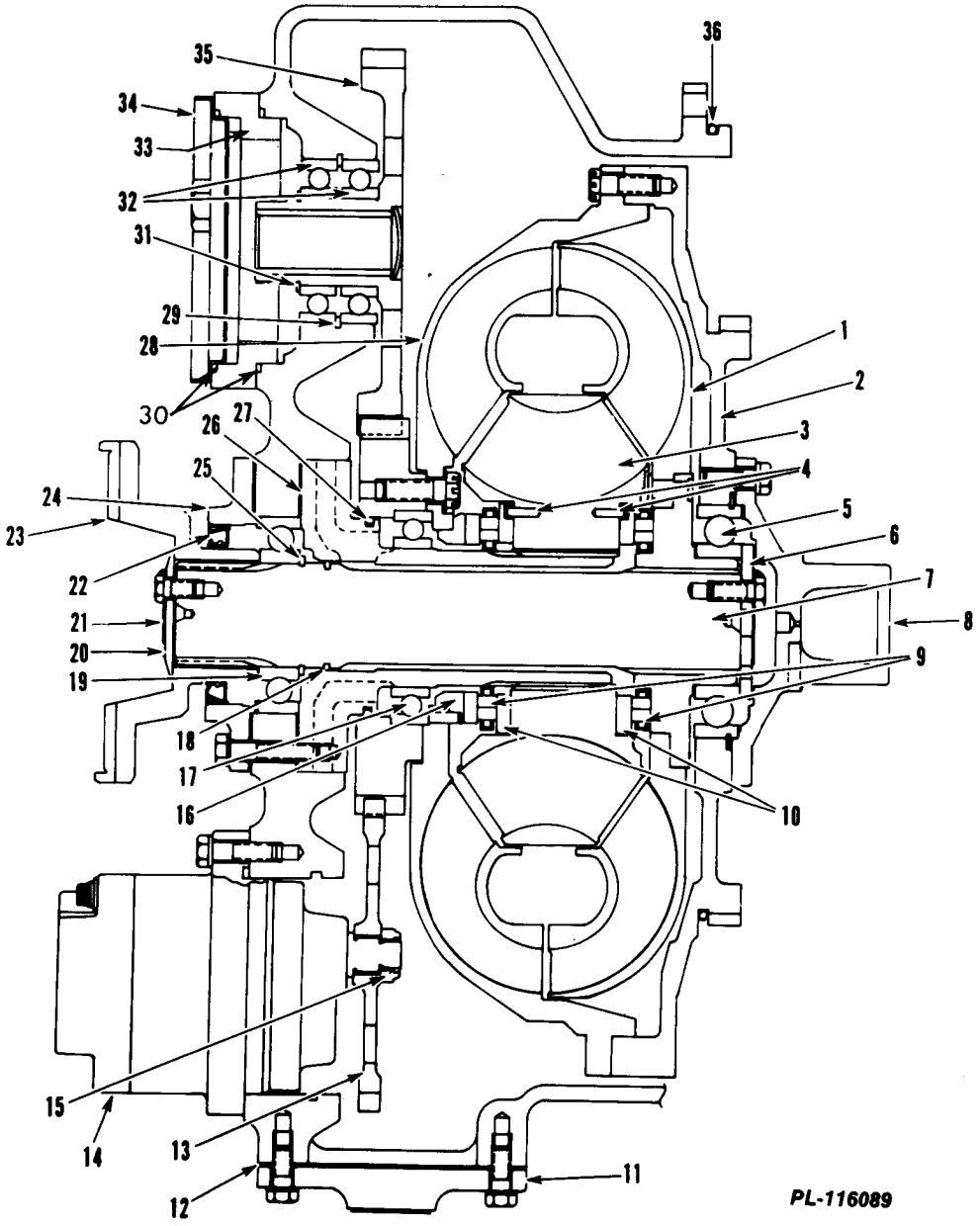


Figure 3-4
Torque Converter (Late Style).

1. Turbine.
2. Drive housing.
3. Stator.
4. Pin.
5. Bearing.
6. Washer.
7. Output shaft.
8. Input hub.*
9. Thrust bearing.
10. Thrust race.
11. Input cover.
12. Gasket.
13. Pump drive gear.
14. Pump.
15. Nut.
16. Spacer.
17. Bearing assembly.
18. Snap ring.
19. Bearing assembly.
20. Retainer washer.
21. Locking plate.
22. Seal.
23. Output flange.
24. Bearing retainer.
25. Snap ring.
26. Gasket.
27. Seal ring.
28. Impeller.
29. Snap ring.
30. "O" ring.
31. Snap ring.
32. Bearing assembly.
33. Adapter.
34. Cover.
35. Gear.
36. "O" ring.

* Later hubs do not have the extended sleeves on them.

GENERAL INFORMATION

converter at a given pressure. The torque converter uses the oil in its function and then directs the oil to the cooler. Here it is cooled and directed back to the regulating valve where the oil is maintained at a constant pressure for the lube system of the transmission.

After the transmission has been lubricated, the oil drains to the sump via various passages.

CONVERTER STALL CHECK

A full power stall check is made to determine whether or not the engine has rated power and if converter and transmission are operating correctly.

NOTE: Before making a stall check, accelerate the engine to 1000 rpm with transmission in neutral. At 1000 rpm, clutch pressure should equal recommended minimum (refer to "SPECIFICATIONS" in Section 4). If this minimum pressure is not obtained DO NOT MAKE THE STALL CHECK. If clutch pressure is below minimum, clutches will slip and burn at full stall.

If you use the parking brake to perform stall test, you must disconnect the air lines from the transmission disconnect valve (31, Fig. 13-4) and plug the openings before performing the stall test. After test is complete, reconnect air lines.

The alternative is to use the R.H. brake treadle instead to hold the machine.

A stall check is accomplished by:

1. Engine, converter and transmission operating at proper temperature.

2. Apply parking brake or R.H. treadle valve.

3. Run the engine to be sure it will operate at high idle (refer to Section 2, "ENGINE" under "SERVICE INFORMATION - NORMAL GAUGE READINGS").

4. Shift transmission to either forward or reverse direction and 3rd range.

5. Depress the accelerator to its maximum position and record the engine RPM. Refer to "SPECIFICATIONS" for stall speed limitations.

DISASSEMBLY, INSPECTION AND ASSEMBLY

REMOVAL (ALL MODELS)

Position machine under a suitable hoist, apply parking brake, position bucket on ground and turn off the electrical switch.

Drain the hydraulic reservoir. Refer to the Operator's Manual. Disconnect the battery cables, ground cables first, and tag so personnel are aware you are working on it.

> NOTE: Whenever lines are disconnected, both open ends should be capped immediately to prevent the entrance of dirt. Open valve or pump ports should be plugged. Serious damage to system components may result due to the entrance of tiny particles of foreign material in the fluid.

REMOVAL (EARLY MODELS ONLY)

Disconnect filters (1, 5, Fig. 3-5) from left hand battery box frame. Disconnect lines (2) to hydraulic pumps at pumps. Disconnect temperature sender (4) wire. Disconnect breather line (3).

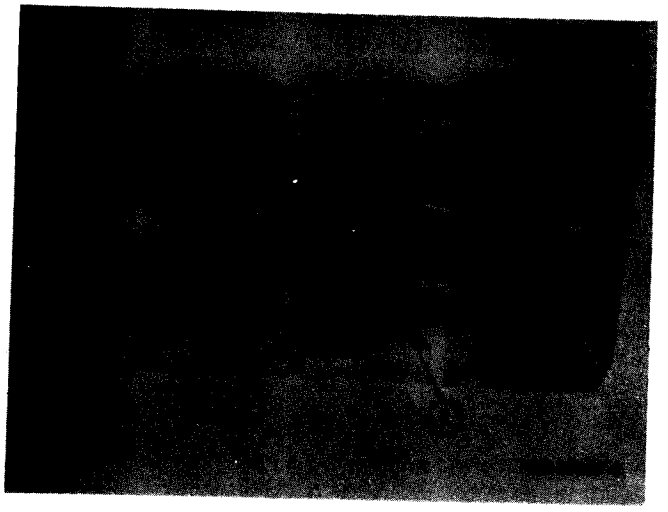


Figure 3-5
Reservoir Disconnects.

Disconnect any other lines (1, Fig. 3-6) leading to reservoir or torque converter.

Remove drive shaft (1, Fig. 3-7) between converter and transmission. Wire up bearing caps to avoid loss.

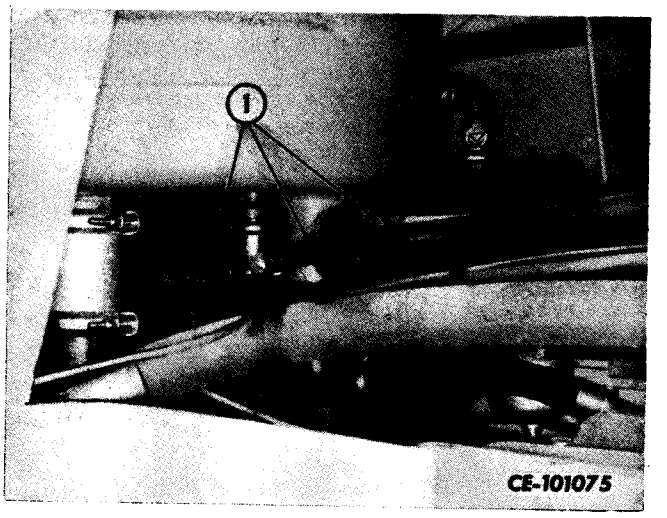


Figure 3-6
Reservoir Disconnects.

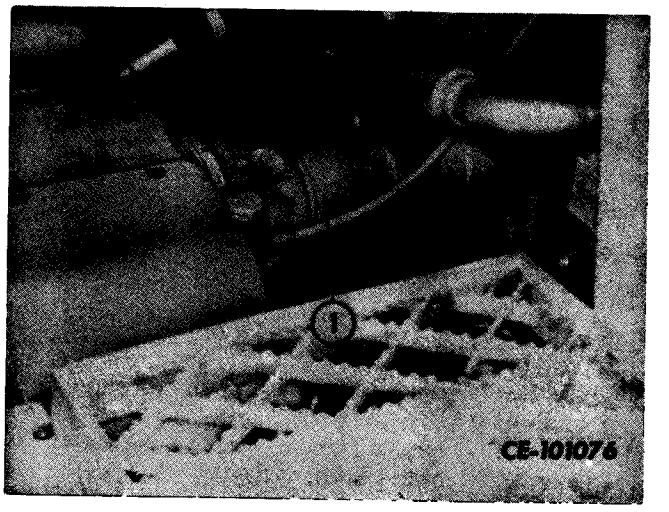


Figure 3-7
Drive Shaft.

Remove hood panels (2, Fig. 3-8). Remove exhaust stack. Remove hood retaining cap screws and with a suitable sling and hoist, remove hood (1).

Using a suitable sling, secure the battery box and reservoir assembly to a hoist. Remove cap screws, nuts and lock washers that secure assembly to rear main frame. Remove battery box/reservoir assembly from tractor.

DISASSEMBLY, INSPECTION AND ASSEMBLY

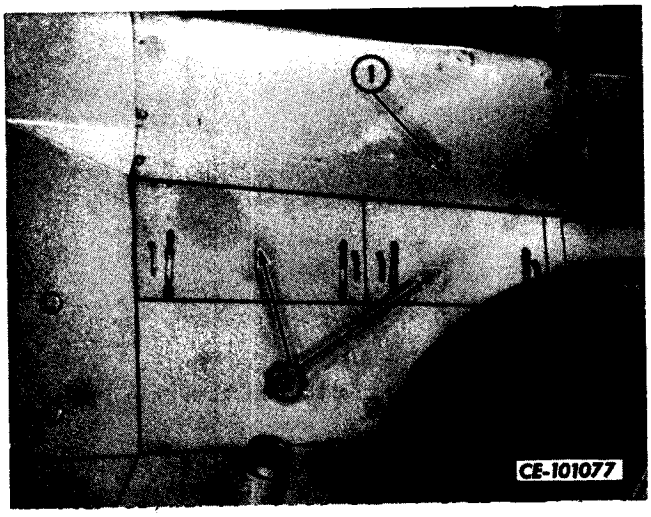


Figure 3-8
Remove Engine Panels.

> NOTE: As assembly is lifted from tractor, be sure all wires, hoses and tubes have been disconnected.

Secure converter in a suitable sling attached to hoist. Remove slack from hoist.

Remove cap screws and lock washers that secure converter to engine flywheel housing. Carefully remove converter being sure all wires, hoses and tubes have been disconnected.

REMOVAL (LATE MODELS ONLY)

Disconnect the reservoir supply lines (1 and 2, Fig. 3-9).

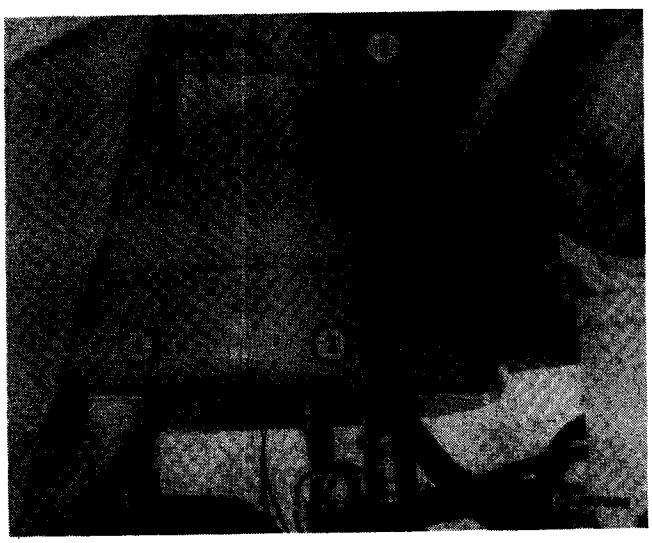


Figure 3-9
Reservoir Disconnects.

Disconnect the electrical cables (3) from the starter.

Disconnect the reservoir return lines (1, 2 and 3, Fig. 3-10) and line (1, Fig. 3-11).

(Continued on next page)

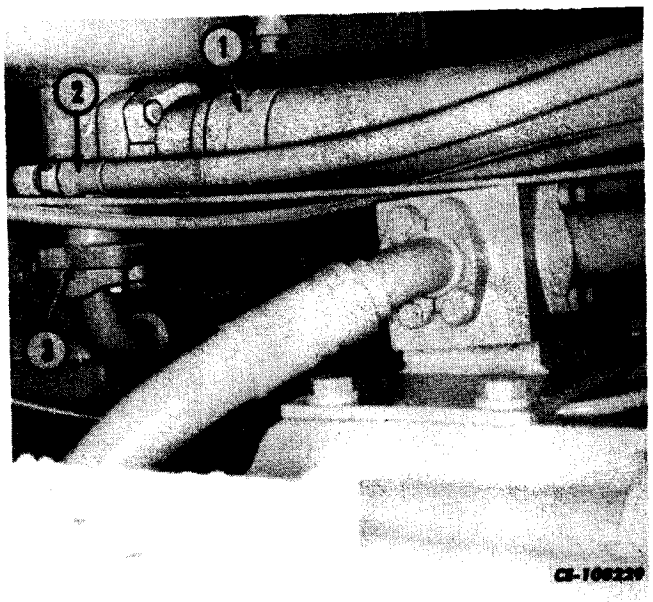


Figure 3-10
Reservoir Disconnects.

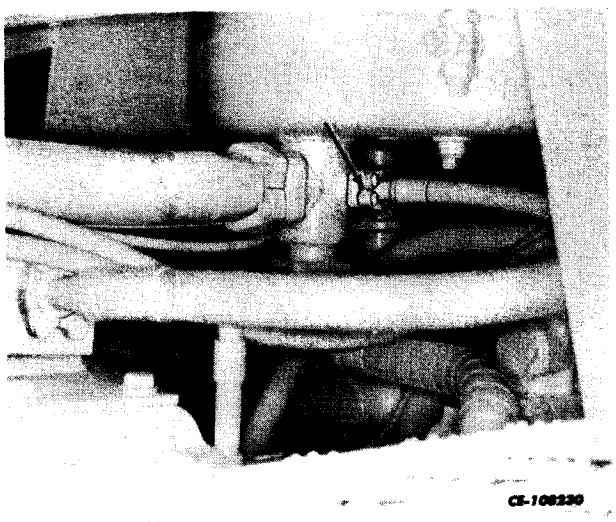


Figure 3-11
Reservoir Disconnects.

DISASSEMBLY, INSPECTION AND ASSEMBLY

REMOVAL (LATE MODELS ONLY) - Continued

Disconnect transmission control valve to torque converter line (1, Fig. 3-12).

Disconnect torque converter to filter line (2).

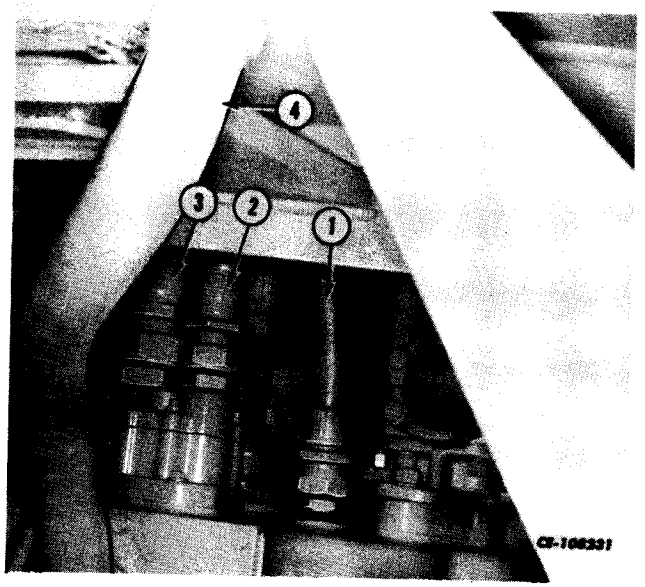


Figure 3-12
Torque Converter Lower Disconnects.

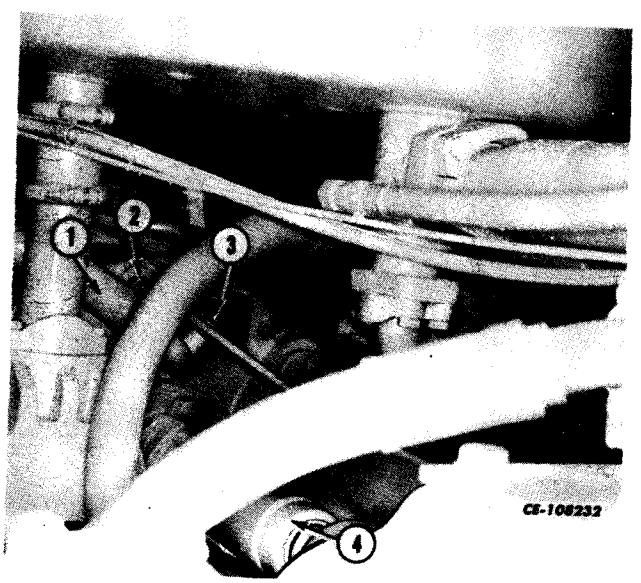


Figure 3-13
Upper Disconnects.

Disconnect transmission sump to torque converter line (3).

Disconnect the torque converter drain line (4).

Disconnect the torque converter to oil cooler line (1, Fig. 3-13).

Disconnect the breather line (2).

Disconnect the sender wire (3).

Disconnect the drive shaft (4).

Remove hydraulic pumps from the torque converter and secure out of the way.

Disconnect the air cleaner indicator line from the outlet tube.

Remove the baffle between the reservoir and hood.

If equipped, disconnect the ether injection lines and tag them for reassembly.

Attach a hoist to the bulkhead assembly, remove the mounting bolts and remove the reservoir, batteries and bulkhead together.

Attach a hoist to the torque converter and remove the torque converter mounting bolts.

Insert three of the mounting bolts into the jack screw holes in the converter flange and turn them in evenly until the housing is separated from the engine.

Remove the torque converter.

DISASSEMBLY

Position converter (1, Fig. 3-14) on a bench with output yoke facing down. Block housing so yoke will clear bench.

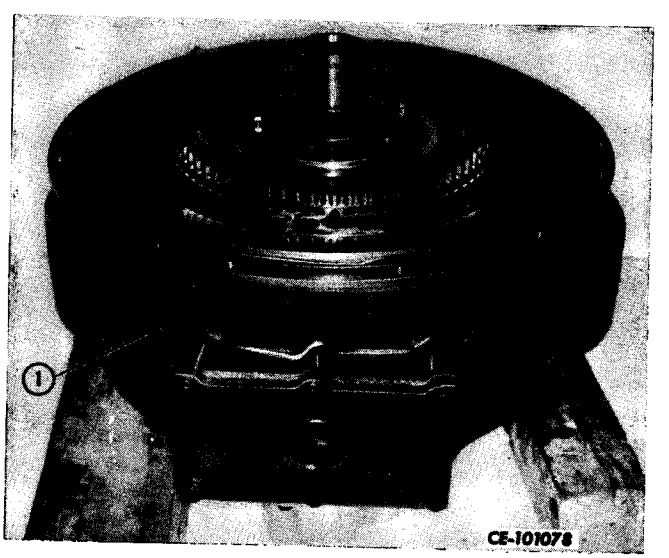


Figure 3-14
Position Converter.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Remove seal ring (1, Fig. 3-15) from drive housing (2). Discard seal ring.

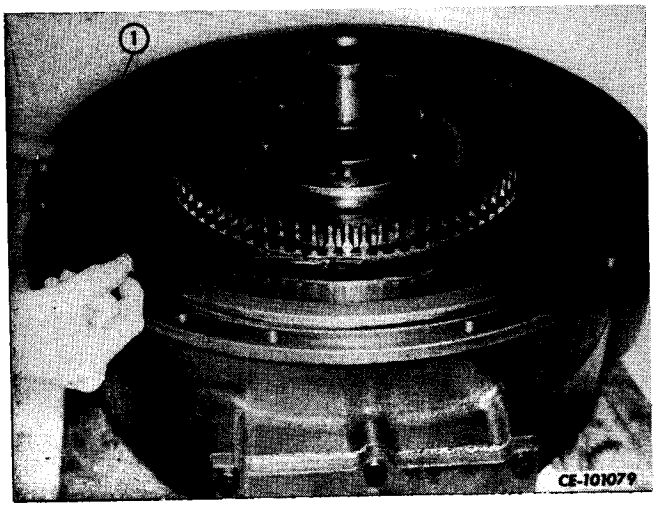


Figure 3-15
Remove Seal Ring.

Remove cap screws and lock washers (1, Fig. 3-16) that secure pump inspection cover (3) and gasket (2). Discard gasket.

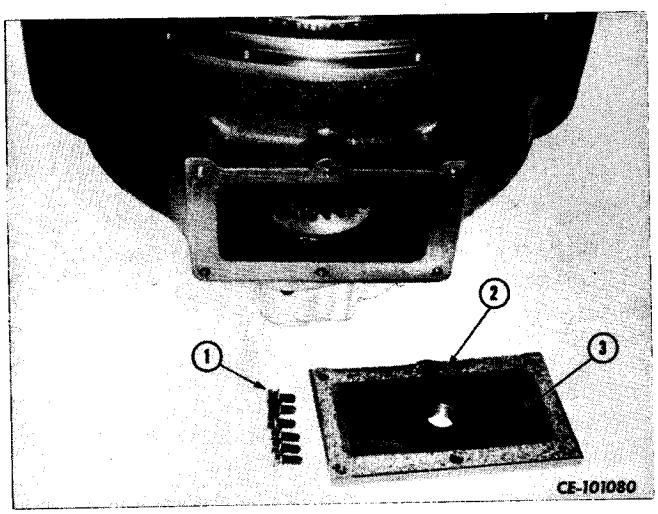


Figure 3-16
Remove Inspection Cover.

Remove cap screws and lock washers (3, Fig. 3-17) that secure hub (1) to drive housing (4). Remove hub and shims (2). Tie shims together to facilitate assembly. Old style hub shown in Figures 3-12 and 3-13.

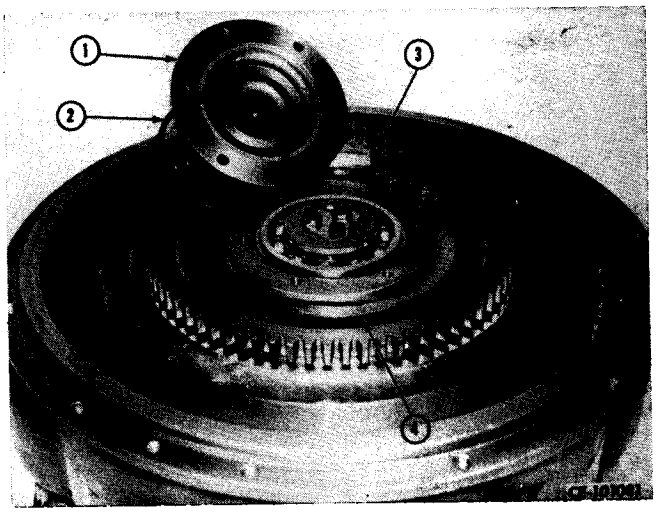


Figure 3-17
Remove Hub.

Remove cap screws (1, Fig. 3-18) and lock plate (2) that secure retaining washer (3) to output shaft. Remove retaining washer. Discard lock plate.

(Continued on next page)

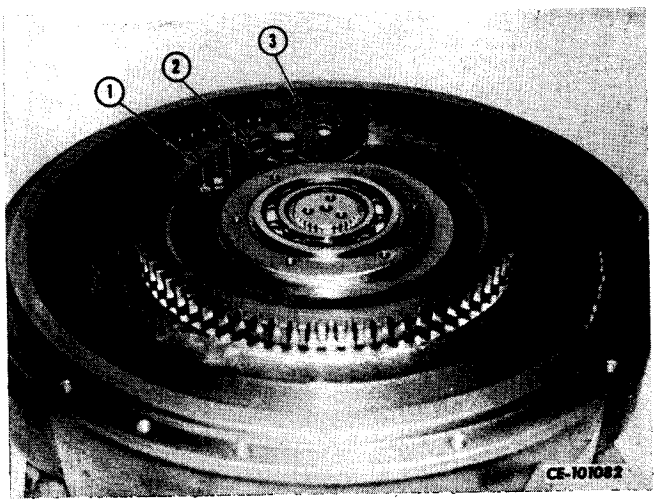


Figure 3-18
Remove Lock Plate.

DISASSEMBLY, INSPECTION AND ASSEMBLY

DISASSEMBLY - Continued

Using a suitable hoist, lift converter assembly (1, Fig. 3-19) from converter housing (2).

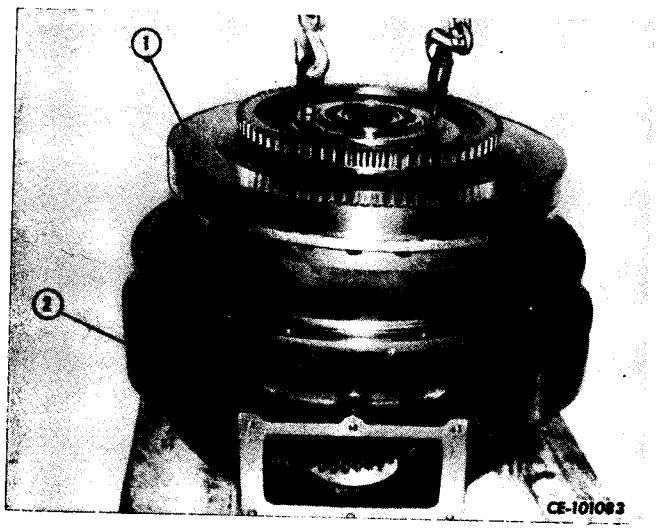


Figure 3-19
Remove Converter Assembly.

Place converter assembly on bench, drive housing (1, Fig. 3-20) up. Block impeller high enough to allow accessory drive gear to clear bench.

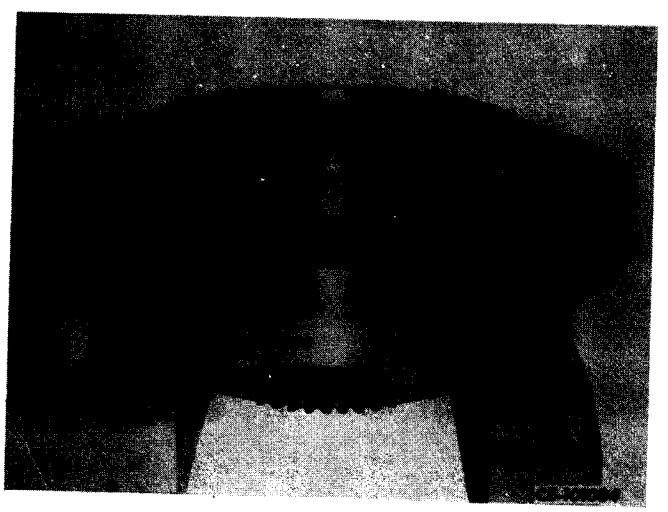


Figure 3-20
Converter Assembly.

Remove cap screws (3, Fig. 3-21) that secure impeller (2) to drive housing (1).

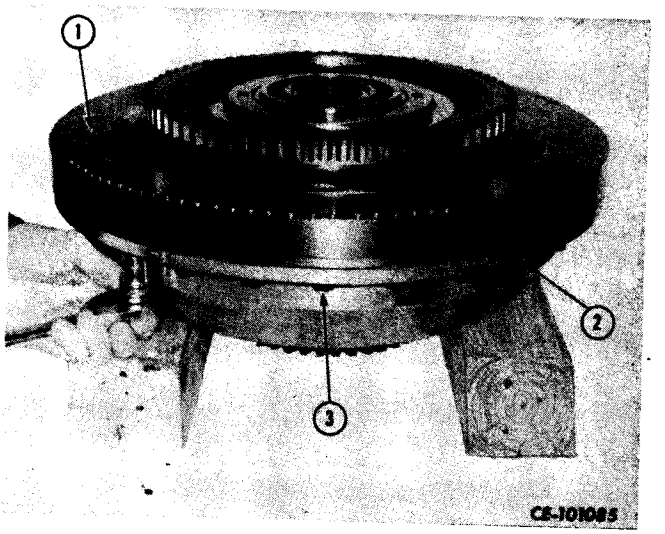


Figure 3-21
Disconnect Impeller.

Using a suitable hoist, lift drive housing (1, Fig. 3-22) and attached turbine from converter assembly.

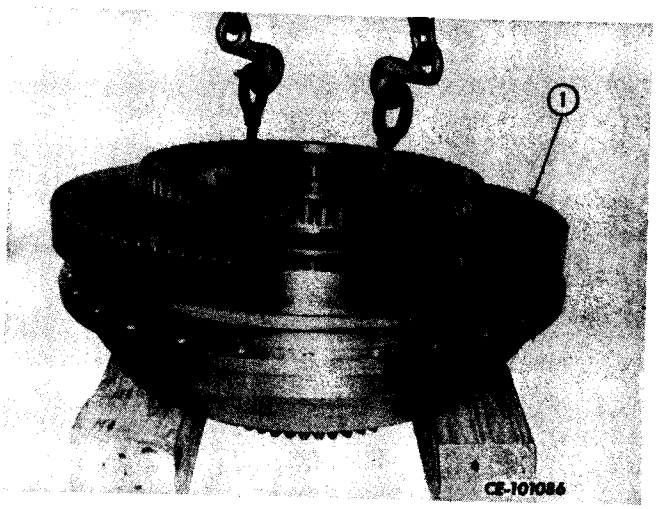


Figure 3-22
Remove Drive Housing.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Invert drive housing (2, Fig. 3-23) and pull turbine assembly (1) from housing.

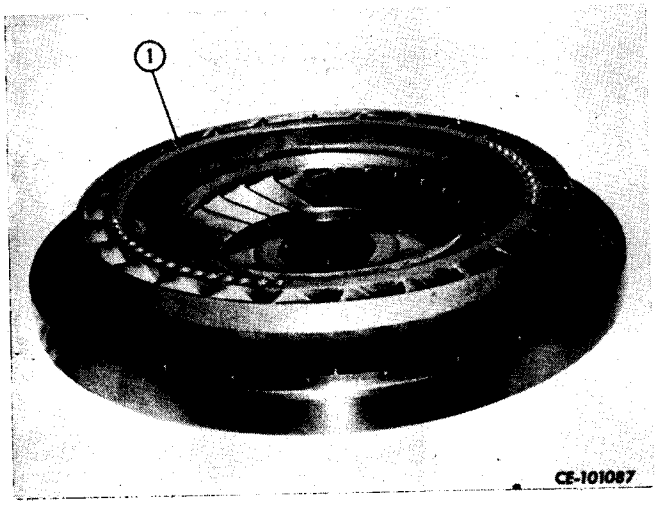


Figure 3-23
Drive Housing.

To remove bearing (2, Fig. 3-24), use a suitable driver (1) on outer bearing race and drive bearing from drive housing.

Figure 3-24
Remove Bearing.

Remove thrust bearing (1, Fig. 3-25) and thrust race (2) from dowel (3) in stator (4).

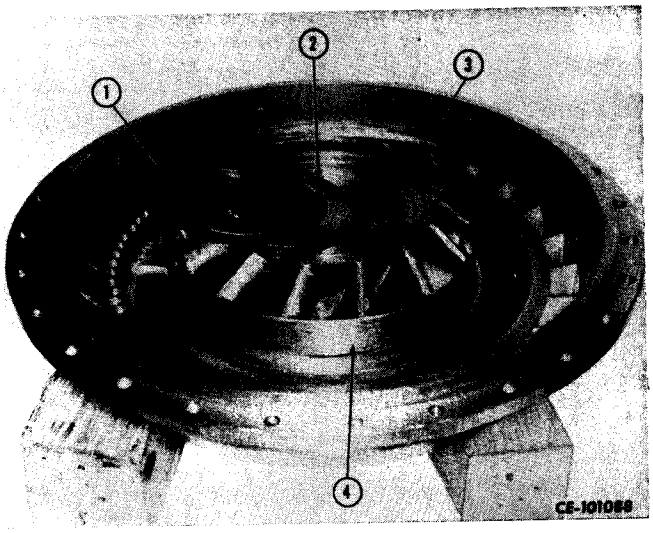


Figure 3-25
Remove Thrust Bearing.

Remove stator (1, Fig. 3-26), thrust race (2), thrust bearing (3) and converter spacer (4) from impeller.

(Continued on next page)

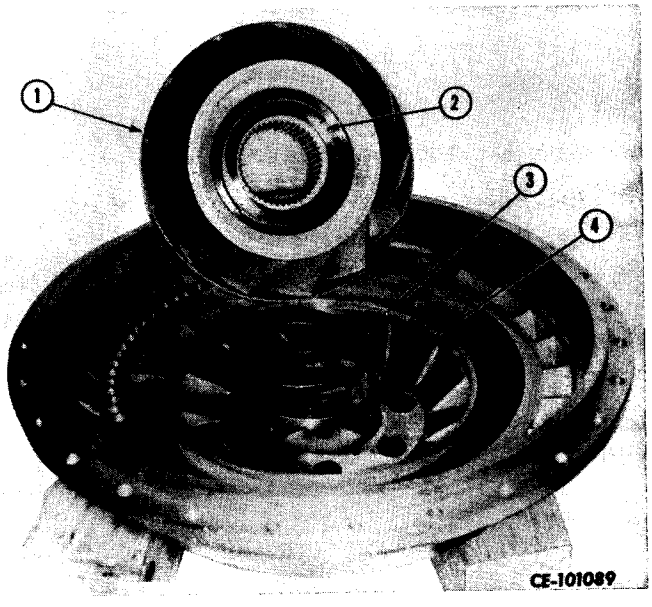


Figure 3-26
Remove Stator.

DISASSEMBLY, INSPECTION AND ASSEMBLY

DISASSEMBLY - Continued

Remove cap screws (1, Fig. 3-27) that retain accessory drive gear to impeller (2). Tap hub bearing and gear from impeller.

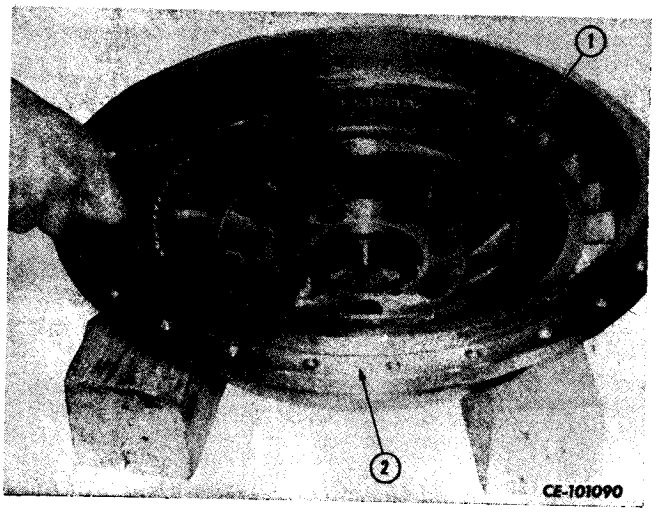


Figure 3-27
Remove Drive Gear.

Position converter housing (3, Fig. 3-28) on its side and remove nut (2) and pump drive gear (1) from pump shaft.

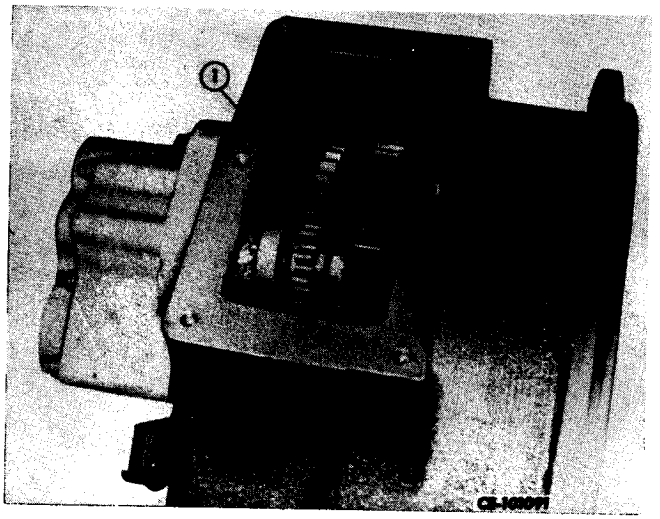


Figure 3-28
Pump Drive Gear.

Remove cap screws (1, Fig. 3-29) that retain pump (3) to converter housing (2). Remove pump. Discard "O" ring (4).

Figure 3-29
Remove Pump.

Position converter housing (5, Fig. 3-30) with output yoke (4) facing up. Remove cap screws (2) and lock plate (1) that secures retaining washer (3) to output shaft. Remove retaining washer and output yoke.

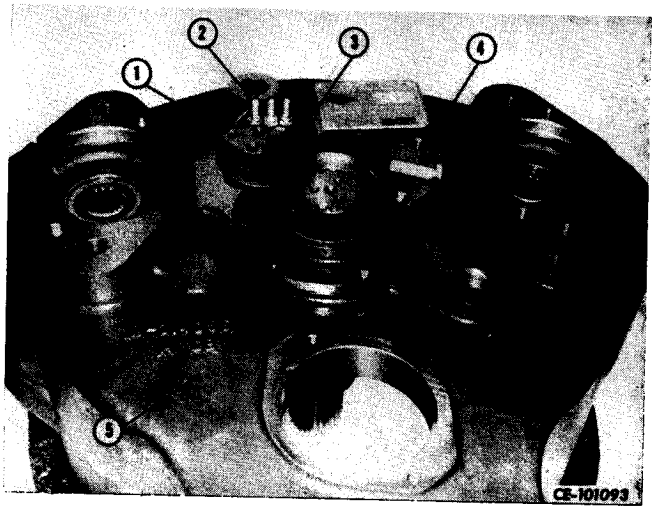


Figure 3-30
Disconnect Output Shaft.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Remove cap screws and lock washers (3, Fig. 3-31) that secure bearing retainer (1) and ground sleeve hub to converter housing (4). Remove bearing retainer with seal assembly and shims (5). Drive seal (6) out of retainer. Discard seal and gasket (2).

Tie shims to bearing retainer to prevent loss.

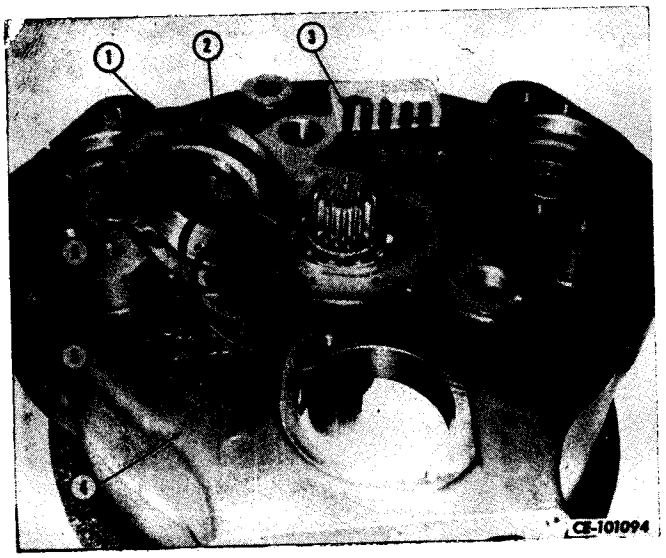


Figure 3-31
Remove Bearing Retainer
(Early Style Only)

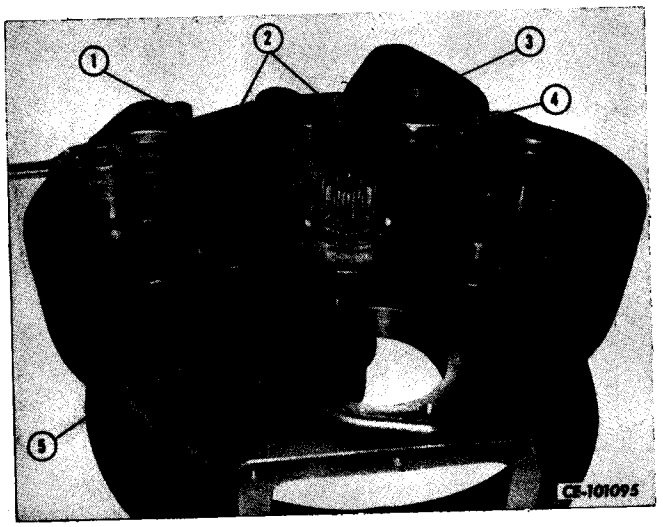


Figure 3-32
Remove Pump Adapter.
(Early Style Shown)

Remove cap screws securing pump adapter plates (2, Fig. 3-32) to converter housing (5) and use as jack screws (1) to remove plates. Drive seals (3) from plates. Discard seals and "O" rings (4).

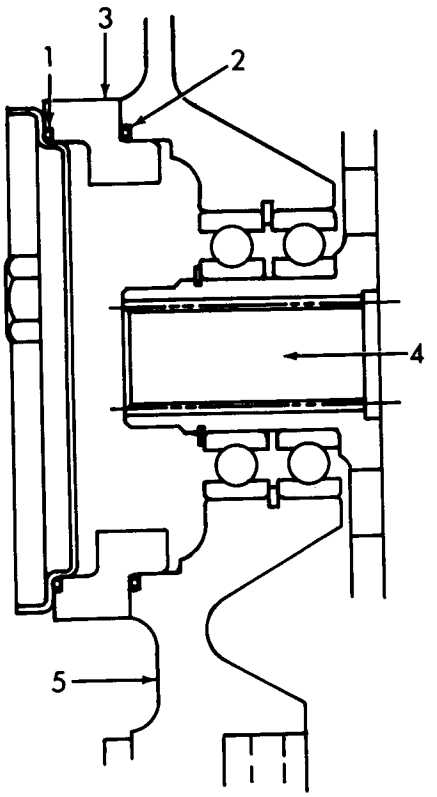


Fig. 3-33
Late Style Pump Adapter

1. "O" ring.
2. "O" ring.
3. Pump adapter.
4. Gear.
5. Housing.

The late style pump adapter uses no internal shaft seal. Otherwise adapters are very similar.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

DISASSEMBLY - Continued

Stand converter housing on inspection cover opening and tap gently on output shaft (1, Fig. 3-34) with a soft mallet until shaft is free of housing.

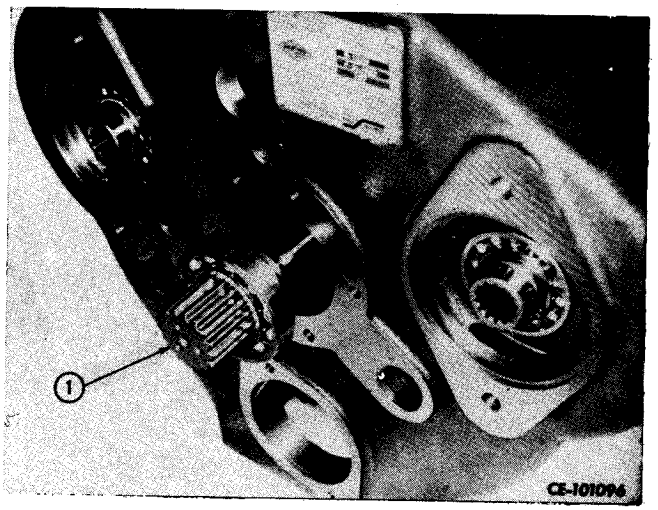


Figure 3-34

Remove Output Shaft.

Remove snap rings (1, Fig. 3-35) from gear shafts (2). Using a soft mallet drive gear from bearings.

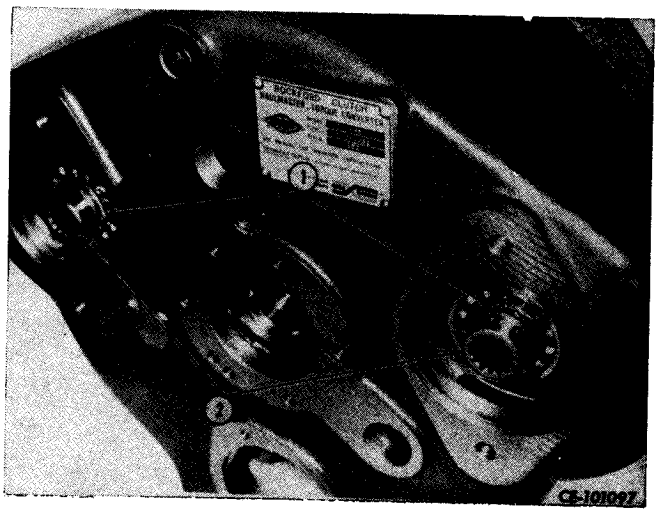


Figure 3-35

Remove Snap Rings.

DISASSEMBLY, INSPECTION AND ASSEMBLY

To remove bearings, tap inner bearing out of rear of housing and outer bearing (1, Fig. 3-36) out toward front of housing. Do not remove snap ring (2) unless it is chipped, cracked or broken.

NOTE: Repeat above procedures for remaining pump gear assembly.

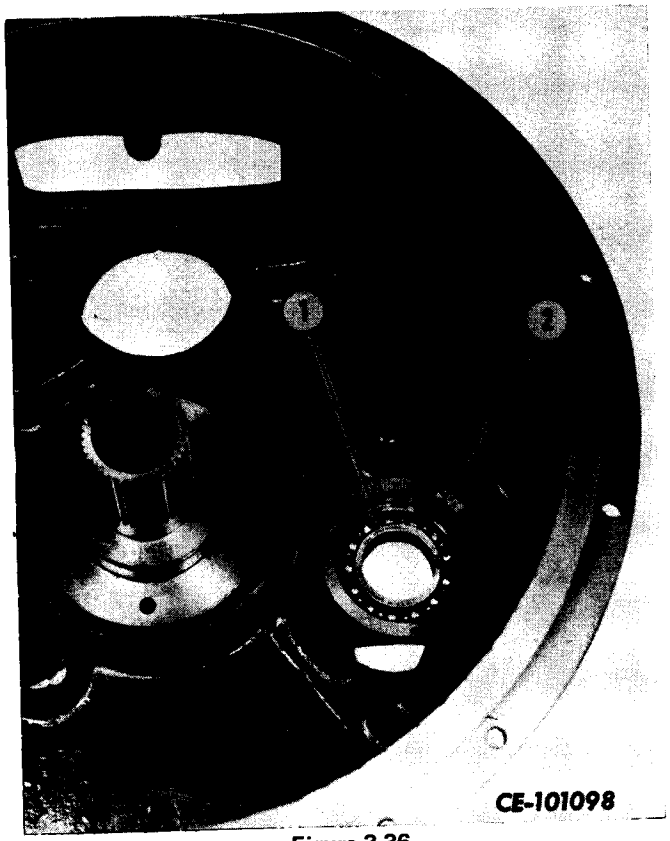


Figure 3-36
Remove Bearing.

To remove ground sleeve hub (3, Fig. 3-37), remove seal ring (5) from hub. Place converter housing (2) in a press with splined end hub down. Support center of housing with a steel sleeve (4) 165 mm I.D. x 228.6 mm long (6-1/2 in. I.D. x 9 in. long) with 6,35 mm (1/4 in.) wall thickness. Sleeve must not contact hub. Place a steel disc (1) 95,25 x 19,05 mm (3-3/4 x 3/4 in.) in center of hub and press out hub. Discard hub gasket.

NOTE: Do not attempt to drive ground sleeve from converter housing as serious damage may be incurred by both housing and ground sleeve.

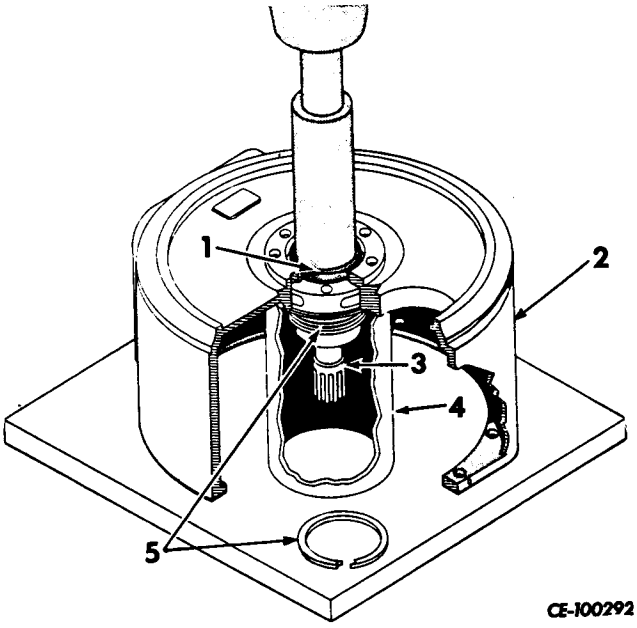


Figure 3-37
Remove Sleeve Hub.

Remove hook-type seal ring (1, Fig. 3-38) and snap ring (2) from output shaft.

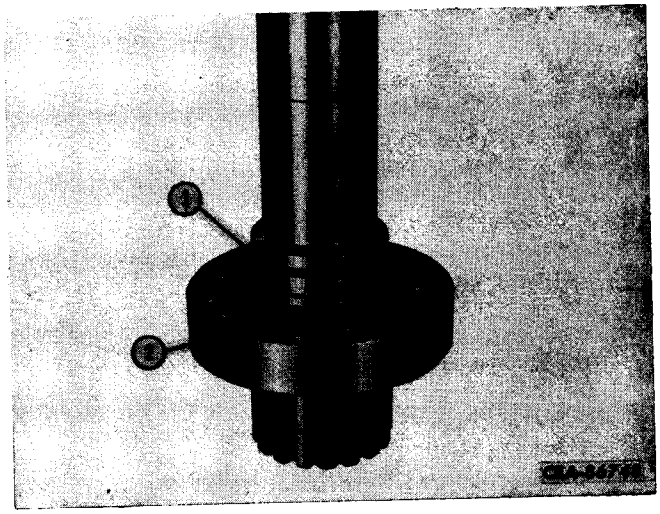


Figure 3-38
Remove Snap Ring.

Install output shaft in press and press shaft out of bearing (1, Fig. 3-39).

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

DISASSEMBLY - Continued

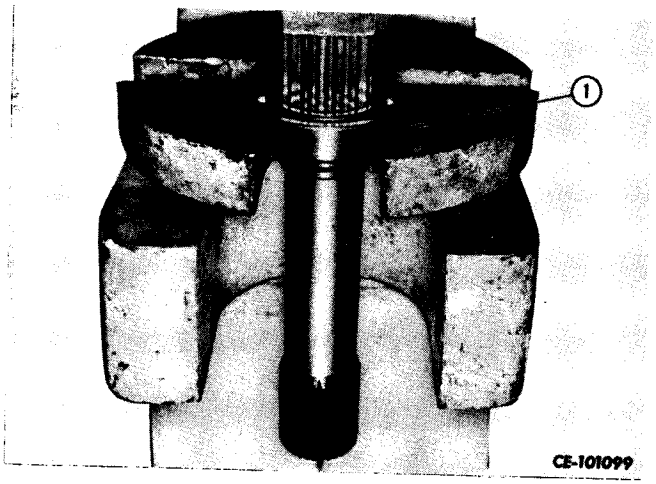


Figure 3-39
Remove Bearing.

CLEANING AND INSPECTION

Cleaning

Clean all metal parts in cleaning solvent and dry with compressed air. Lubricate all machined surfaces with clean oil. During cleaning operation, give particular attention to oil passages, bearing assemblies, bearing bores, snap and seal ring grooves and screw threads.

Inspection

Inspect all parts for wear or damage. Check converter and rotating housing for cracks. Inspect bearing bores and mounting faces for wear, grooves or scratches. Remove burrs and scratches with a crocus cloth. Inspect all splined parts for worn, twisted, chipped or burred splines. Remove burrs with a soft stone. Check turbine, impeller and guide wheel for cracks or other damage. Replace any parts that are in doubt or cannot be repaired.

Discard all old oil seals, "O" rings and gaskets. Reusing old gaskets and seals is false economy.

NOTE: Special Torque, Pressure, etc. recommendations are listed under "SERVICE INFORMATION." This simplifies revision when necessary. To eliminate constant referral, black spaces are provided at points where special information is required. These may be filled in by the manual holder, in pencil, and revised when necessary.

ASSEMBLY

NOTE: The ground sleeve hub must be packed in dry ice or chilled to a temperature of -13°C (-25°F) for at least 30 minutes prior to assembly.

Place converter housing in a press with output side down. Position a new gasket in housing.

Insert two headless guide screws (1, Fig. 3-40) (3/8" x 3" N.C.) in chilled ground sleeve hub (2) and position hub in converter housing aligning oil passages (3) and bolt holes. Press hub into converter housing.

> NOTE: Care must be taken to be sure ground sleeve is fully seated.

Remove guide screws (1).

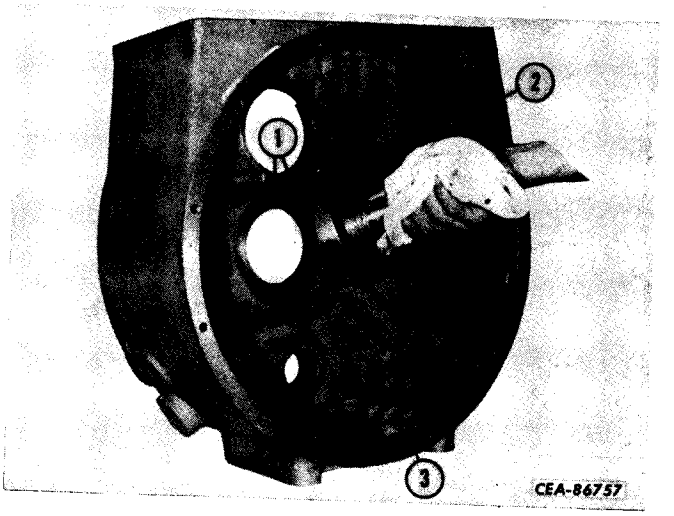


Figure 3-40
Install Sleeve Hub.

Install a new seal ring (2, Fig. 3-41) on hub (1). Be sure to hook ring. Coat ring lightly with heavy grease.

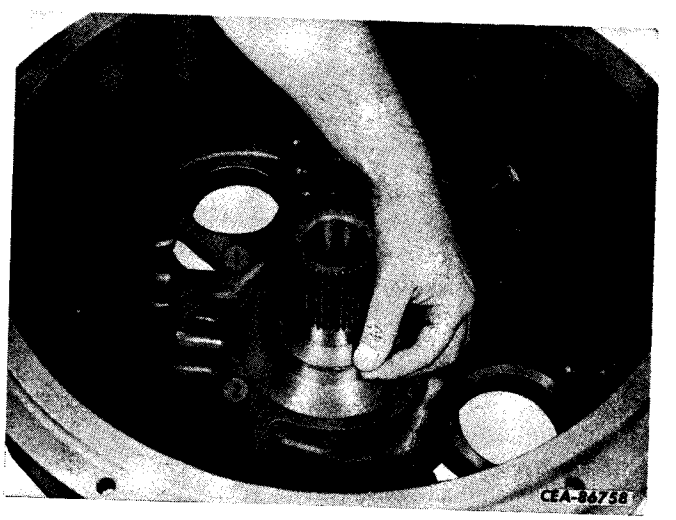


Figure 3-41
Install Seal Ring.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Install snap rings (if removed) in housing bores. Drive inner pump drive gear bearings into housing until they bottom on their respective snap rings.

Invert housing and drive in outer bearings (1, Fig. 3-42) until they bottom on snap rings.

> NOTE: Sleeve should contact outer bearing races only when driving in bearings.

Figures 3-42
Install Bearings.

Invert converter housing and drive accessory driven gear (1, Fig. 3-43) into bearings until snap ring groove near end of shaft is exposed and gear shoulder is bottomed on inner race of inner bearing. Repeat operation for remaining accessory driven gear.

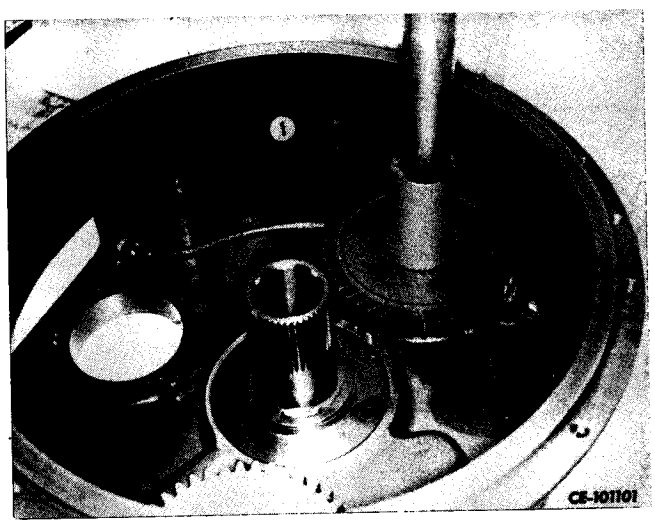


Figure 3-43
Install Driven Gear.

Turn converter housing over and install snap rings (1, Fig. 3-35).

Install a new "O" ring (4, Fig. 3-29) on input pump (3). Install pump in housing (2) and retain with cap screws and lock washers (1). Tighten cap screws to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Invert converter and install input drive gear (1, Fig. 3-44) on pump shaft. Install retaining nut and tighten to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

NOTE: Use a bar to keep gear from rotating.

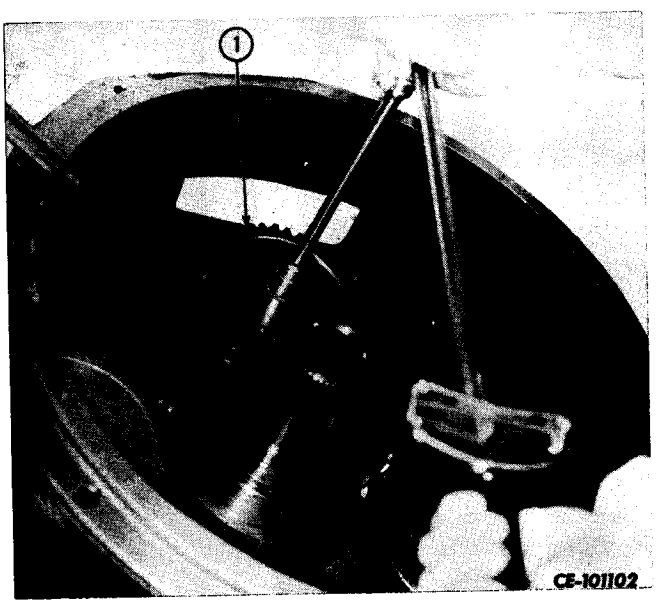


Figure 3-44
Install Drive Gear.

Install snap ring (2, Fig. 3-45) and a new hook-type seal ring (1) in their grooves in output shaft (4). Press shaft into bearing (3) with output end of shaft entering bearing and seating bearing against snap ring.

Install output shaft in housing with output end facing up. Using a suitable sleeve, drive outer race of bearing (1, Fig. 3-46) until shaft and bearing assembly bottom on ground sleeve hub.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

ASSEMBLY - Continued

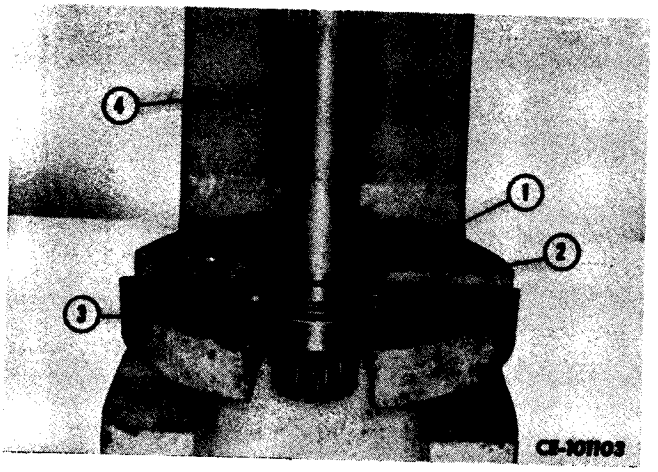


Figure 3-45
Install Bearing.

Figure 3-46
Install Outer Race.

NOTE: Extreme care must be exercised to prevent breaking seal ring on shaft.

Coat the O.D. of a new output shaft seal (2, Fig. 3-47) with sealant. Using a suitable sleeve (1) between the press ram and the seal, press seal into bore of retainer.

NOTE: Large lip of seal should face down toward the large flange end of the bearing retainer.

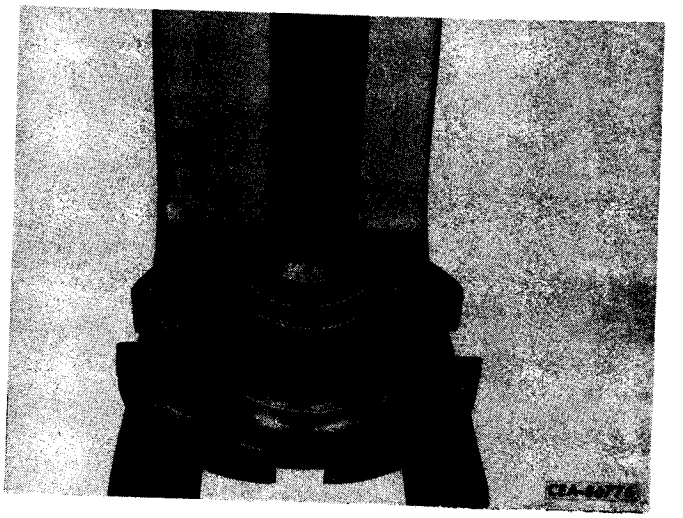


Figure 3-47
Install Seal.

Install pump adapter plates (2, Fig. 3-48) using new seals (3, Fig. 3-32) and "O" rings (4), on housing and secure with cap screws (3, Fig. 3-48). Tighten cap screws evenly to properly seat seals (1).

Be sure output shaft bearing (2, Fig. 3-50) is flush against ground sleeve hub (3). Using a depth micrometer, measure distance between machined surface of housing (4) and top of bearing race (Dimension 5). Now, measure height of lip on bearing retainer (1) (Dimension 6). Subtract height of lip from depth of bearing (Dimension 5 minus Dimension 6).

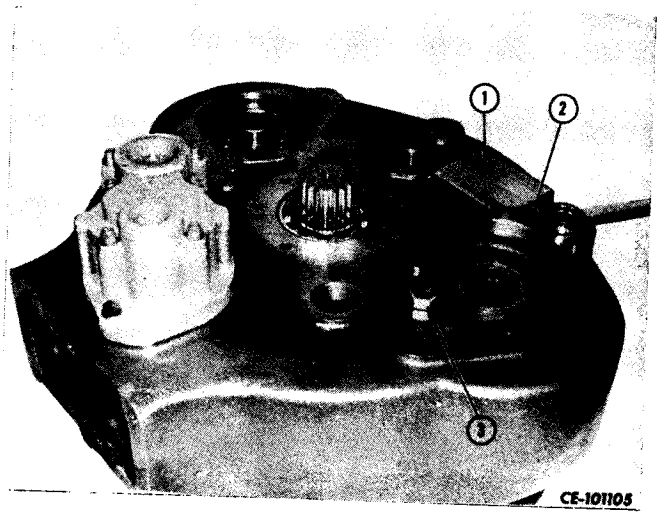


Figure 3-48
Install Adapter Plates.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Remainder, plus measured thickness of retainer-to-housing gasket equals thickness of the shim pack to be used (refer to "TOLERANCES").

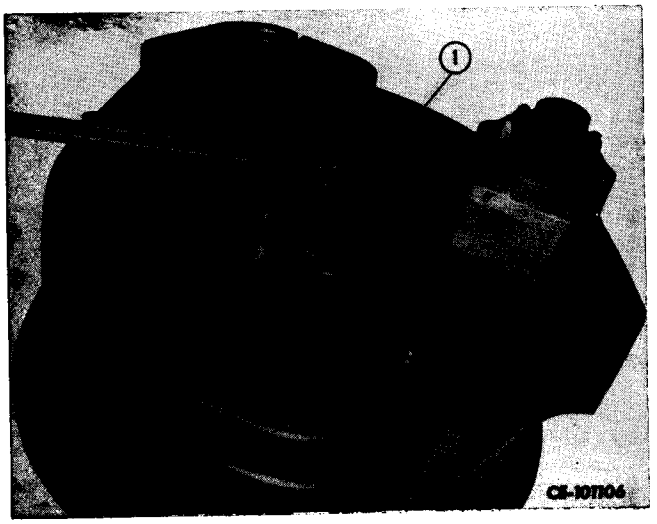


Figure 3-49
Install Bearing Retainer.

Center a new gasket on converter housing and install shim pack and bearing retainer (1, Fig. 3-49) with cap screws and lock washers. Tighten cap screws to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Place output yoke (1, Fig. 3-51) over splines of output shaft. Install retaining washer (2) and locking plate on output shaft and secure with cap screws. Tighten cap screws to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Bend up tabs of locking plate to prevent cap screws from loosening.

Block outer flange of impeller (4, Fig. 3-52) with blades down. Using a suitable sleeve (1), drive impeller bearing (2) into bore until snap ring (3) bottoms in its groove in impeller.

(Continued on next page)

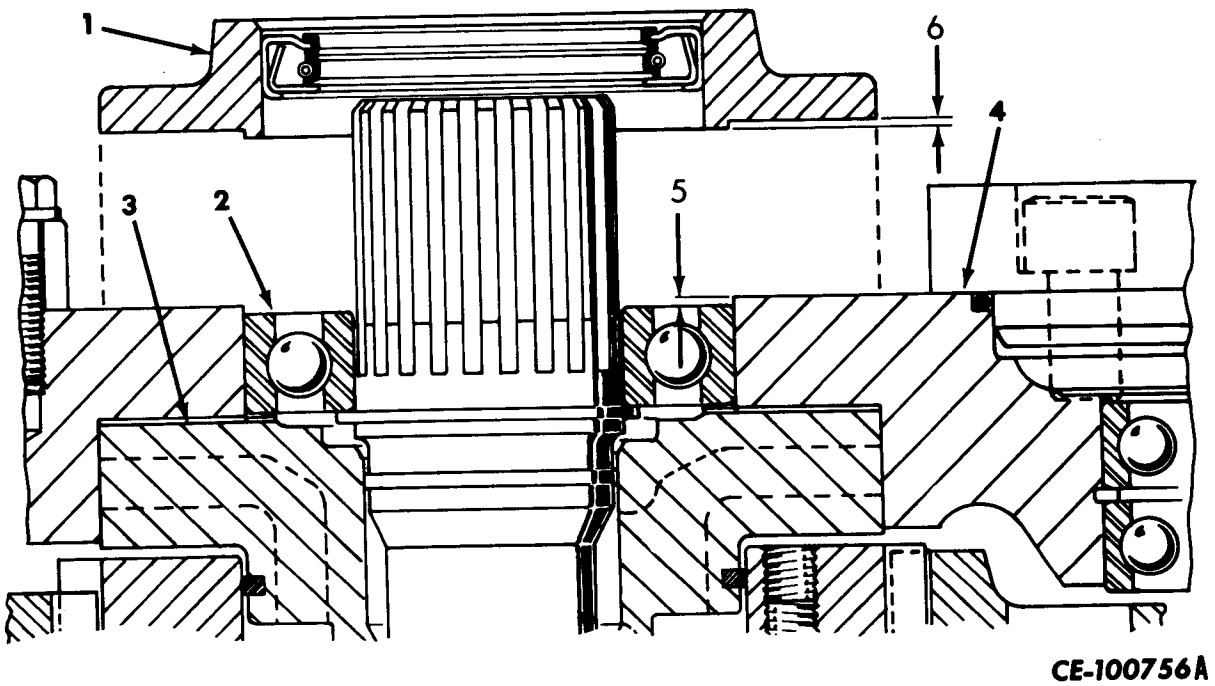


Figure 3-50
Shim Pack Dimension.

DISASSEMBLY, INSPECTION AND ASSEMBLY

ASSEMBLY - Continued

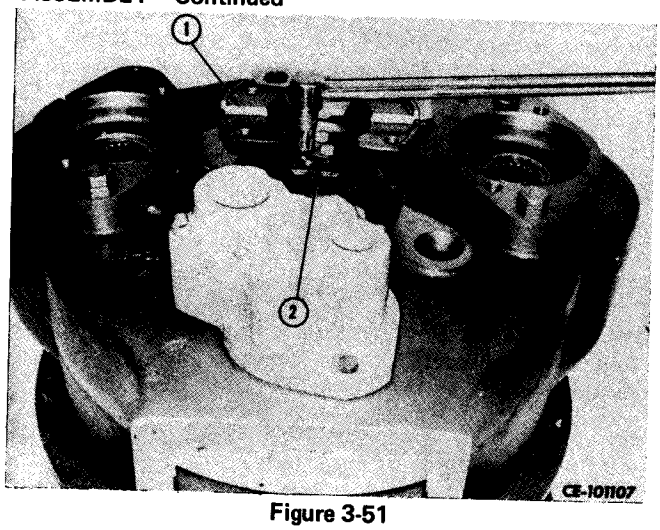


Figure 3-51
Install Output Yoke.

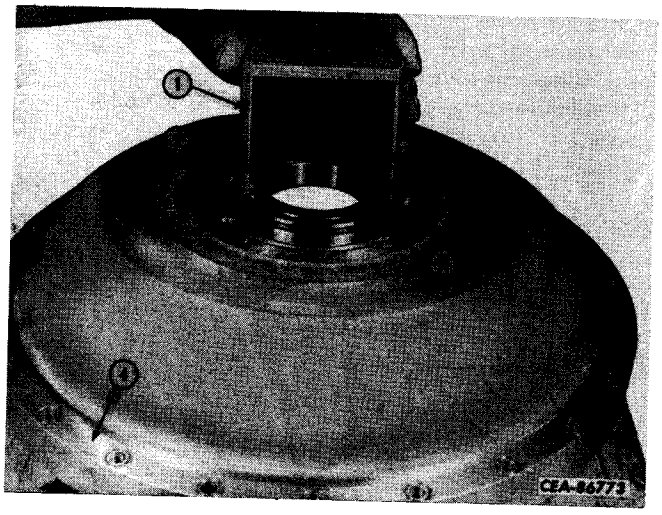


Figure 3-52
Install Bearing.

Align holes in accessory drive gear (2, Fig. 3-53) with those of impeller, and tap gear with a mallet until it bottoms in recess of impeller. Install retaining cap screws (1) and tighten to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

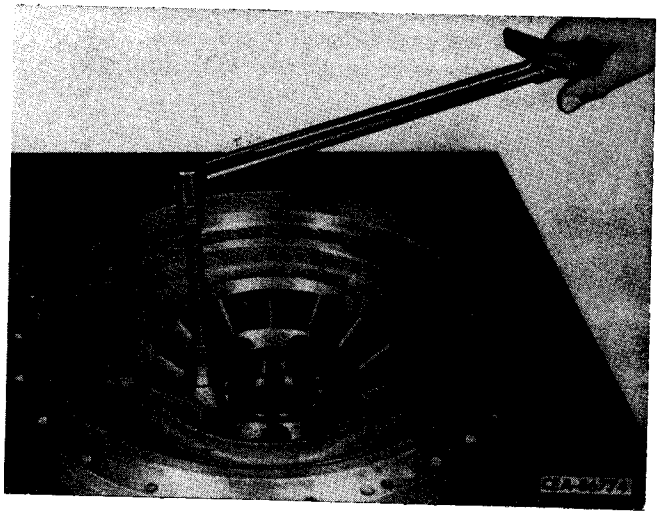


Figure 3-53
Install Drive Gear.

Place drive housing (1, Fig. 3-54) in press with gear teeth up. Press turbine hub bearing into drive housing until snap ring (3) is bottomed.

Use suitable sleeve (2) and press on bearing outer race only.

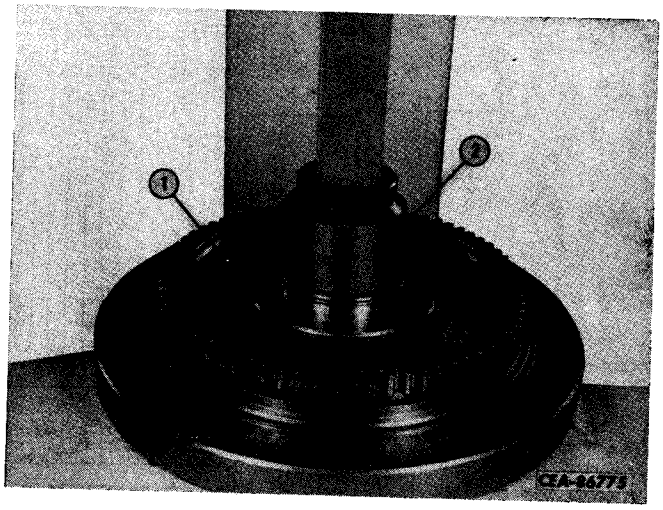


Figure 3-54
Install Hub Bearing.

DISASSEMBLY, INSPECTION AND ASSEMBLY

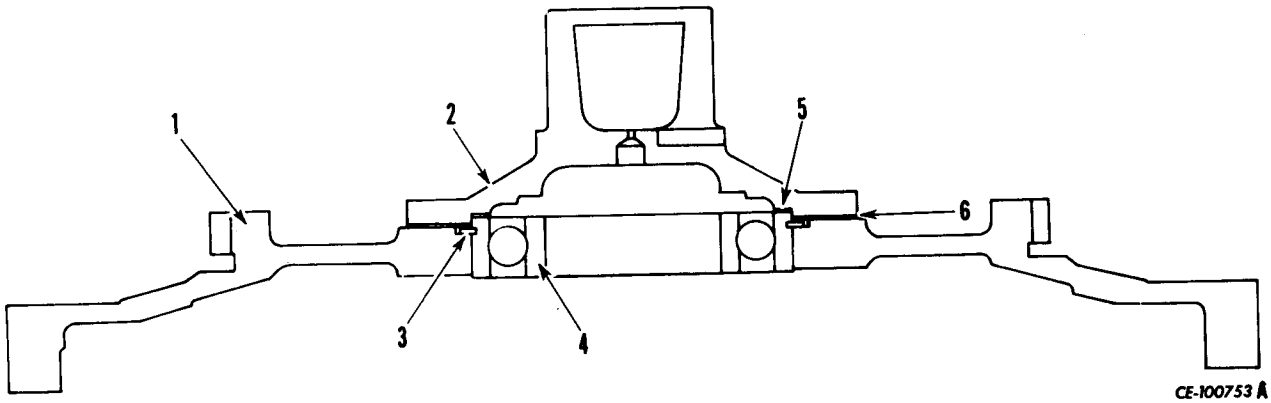


Figure 3-55
Shim Dimension.

1. Drive housing.
2. Input hub.
3. Snap ring.
4. Bearing.
5. Shim location.
6. Clearance dimension.

Place drive housing (1, Fig. 3-55) on bench with gear teeth up. Snap ring (3) on bearing (4) must be bottomed in drive housing (1) groove. Place original shim pack in position (5) on outer race of bearing. Place input hub (2) (old style shown), in position over shims and bearing. Apply a firm hand pressure to top of hub and using a shim (or shims) (2, Fig. 3-56) or feeler gauge, check clearance at "6" between hub and drive housing flange surfaces (Fig. 3-55).

Add or subtract shims under hub until recommended tolerance is reached (refer to "TOLERANCES"). Remove hub and shims. Tie shim pack to hub and set aside.

Block drive housing (2, Fig. 3-23) on bench with gear teeth down. Support outer hub bearing race from beneath. Install turbine (1) in drive housing. Be sure shoulder of turbine hub bottoms on inner race of hub bearing.

Align thrust bearing (3, Fig. 3-57) on turbine (4). Align pin (1) in stator with pin bore (2) in thrust race and install stator and race in turbine.

Align bore of thrust race (2, Fig. 3-58) with pin (3) of stator (4). Center thrust bearing (1) on race.

(Continued on next page)

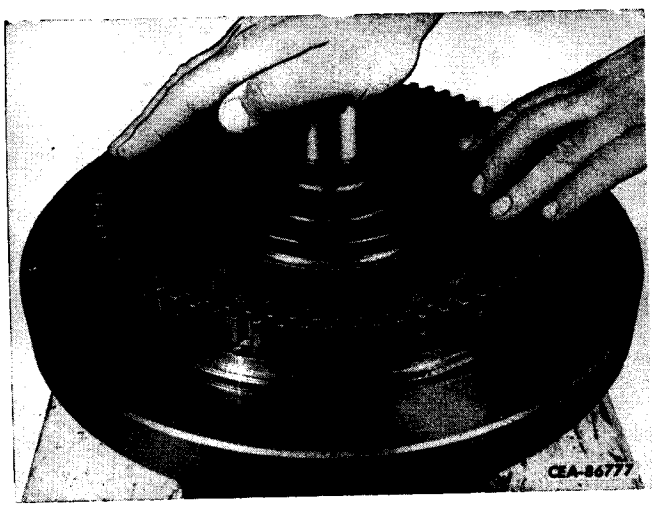


Figure 3-56
Check Clearance.

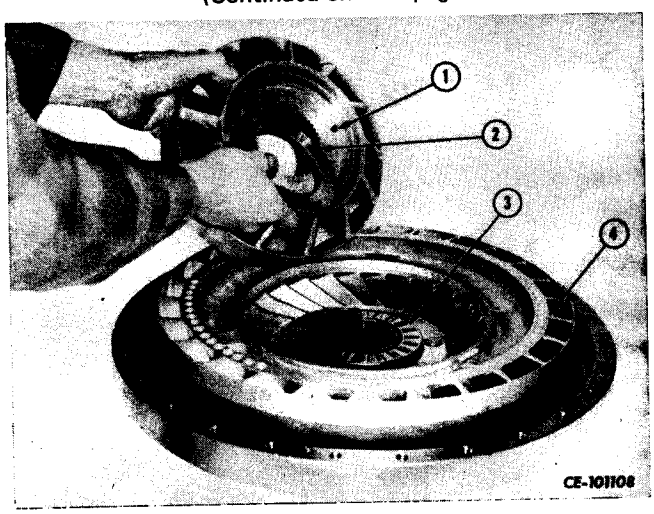


Figure 3-57
Install Stator.

DISASSEMBLY, INSPECTION AND ASSEMBLY

ASSEMBLY - Continued

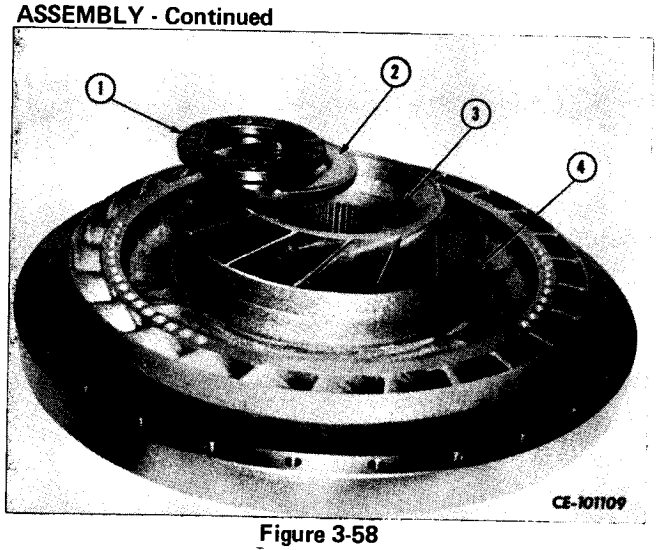


Figure 3-58
Install Thrust Bearing.

Install converter spacer (1, Fig. 3-59) on stator. When installing impeller be sure to align small slot (2) in spacer with pin in impeller.

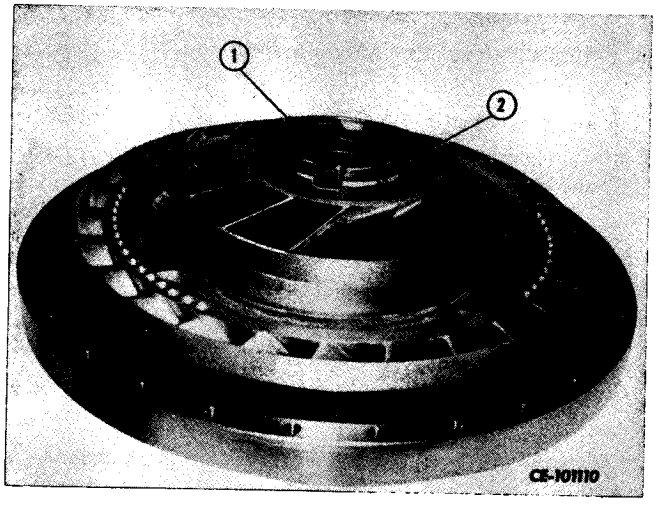


Figure 3-59
Align Spacer.

Place impeller (1, Fig. 3-60) on drive housing (4) with accessory gear (2) up. Secure assembly with cap screws (3). Tighten cap screws to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

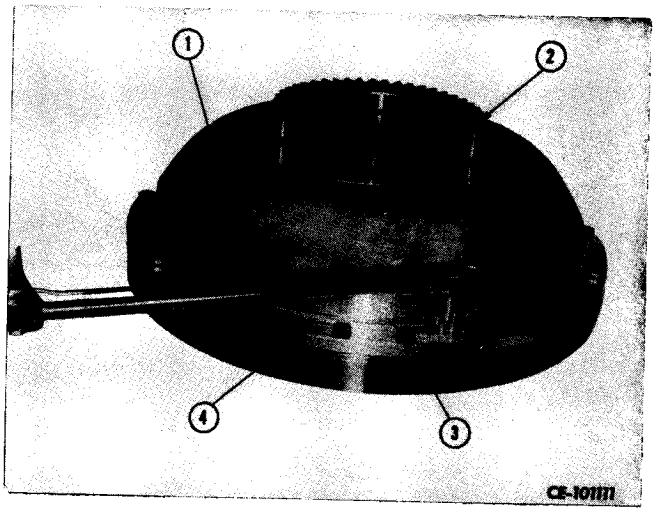


Figure 3-60
Install Impeller.

Invert assembly, accessory drive gear down and attach a hoist to input drive hub mounting holes. Lower assembly (1, Fig 3-19) into converter housing (2).

While lowering converter assembly into housing, check the following:

a. Stator and ground sleeve hub must spline together.

b. Accessory drive gear must mesh with accessory driven gears and input pump driven gear.

c. Accessory drive gear must also fit over seal ring on ground sleeve hub.

d. Output shaft must spline into turbine hub.

Install retaining washer (3, Fig. 3-18) and a new locking plate (2). Tighten cap screws (1) to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Bend up tabs on locking plate.

Place previously selected shim pack (1, fig. 3-61) on outer race of drive housing bearing (2).

DISASSEMBLY, INSPECTION AND ASSEMBLY

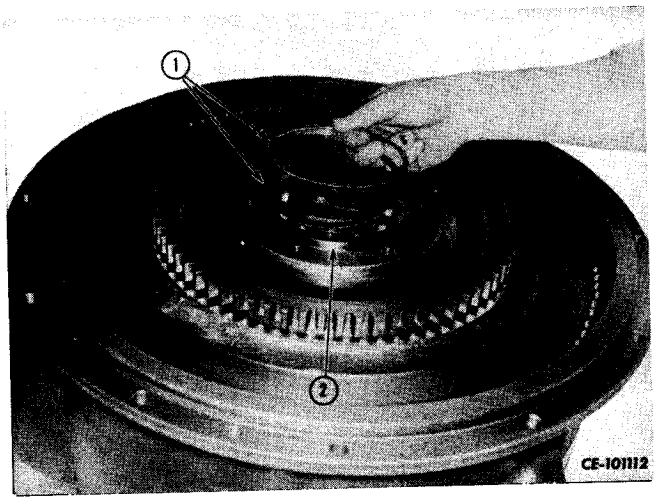


Figure 3-61
Install Shim Pack.

Install input hub (1, Fig. 3-62) and secure with cap screws (2) and lock washers. Tighten cap screws to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

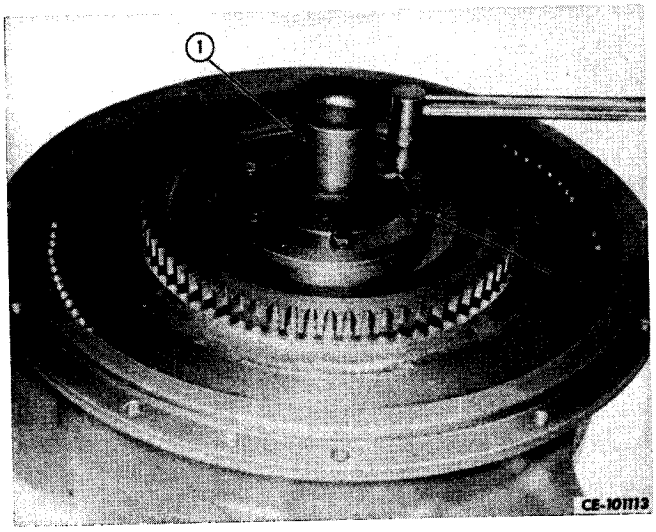


Figure 3-62
Install Hub.

Center a new gasket (2, Fig. 3-16) on pump inspection cover opening. Install inspection cover (3) and retain with cap screws and lock washers (1). Tighten cap screws to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Install new "O" ring (1, Fig. 3-15) in groove of converter housing (2).

INSTALLATION (EARLY MODELS ONLY)

Attach a suitable sling to converter and hoist converter into tractor. Align converter on engine flywheel housing and secure with cap screws and lock washers.

Secure battery box/reservoir assembly to a hoist with a sling. Raise assembly and position on tractor. Secure with cap screws, lock washers and nuts. Tighten nuts securely.

Position hood on tractor and secure with fasteners. Tighten securely.

Install exhaust stack.

Install all hood sides.

Connect all lines leading to reservoir and torque converter.

Install drive shaft between converter and transmission. Refer to "SERVICE INFORMATION" (Section 5) for special torques.

Mount filters (4, Fig. 3-2) on left hand battery box frame. Connect lines (2) to hydraulic pumps. Connect wire to temperature sender (4). Connect breather line (3).

Install battery cable clamps. Connect battery cables, ground cable last.

Fill hydraulic reservoir (refer to Operator's Manual).

INSTALLATION (LATE MODELS ONLY)

Attach a sling to the torque converter, position on flywheel housing and secure in place.

Mount the hoses (Fig. 3-12) to the torque converter.

Install the hydraulic pumps.

Install the drive shaft. (Refer to "SPECIAL TORQUES," Section 5.)

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

INSTALLATION (LATE MODELS ONLY) - Continued

Install the sender wire, breather line and oil cooler line (Fig. 3-13).

Install reservoir, attach air cleaner indicator, and hood.

Install the lines from reservoir to pumps.

Install the return lines to the reservoir.

NOTE: For all split flange mounting, refer to "SPECIAL TORQUES."

Install the electrical cables to the reservoir.

Fill the reservoir with proper oil. Refer to Operator's Manual.

Install the battery cables, ground cables last.

CHARGING PUMP

General

Do not remove or disassemble pump unless it is known to be in need of repair. Eliminate first all other possibilities of transmission system malfunction as outlined in the "TROUBLE SHOOTING" section.

Before disassembly, have correct pump repair parts on hand.

NOTE: For correct repair parts, refer to current "PARTS MANUAL."

Disassembly

Remove cap screws and washers (4, Fig. 3-63) that secure cover (3) to pump body (1). Pry cover carefully and evenly from body. Care must be taken not to damage casting. Remove and discard "O" ring (2). Do not lose dowel pins.

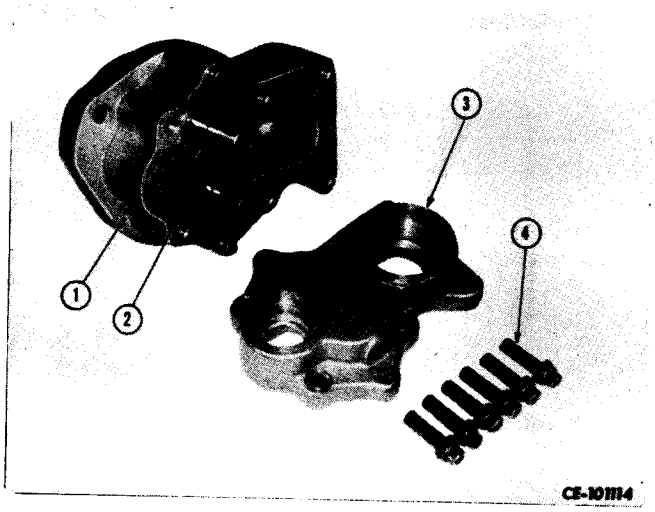


Figure 3-63
Remove Cover.

Remove input drive gear (3, Fig. 3-64) and driven gear (2) from pump body (1). If gears are to be reused mark them with match marks before removal.

Remove wear plate (6), pressure loading seal (5) and seal (4) from pump body.

Figure 3-64
Remove Gears.

Pull bushings (1, Fig. 3-65) from cover (3) and pump body (2) if worn or damaged.

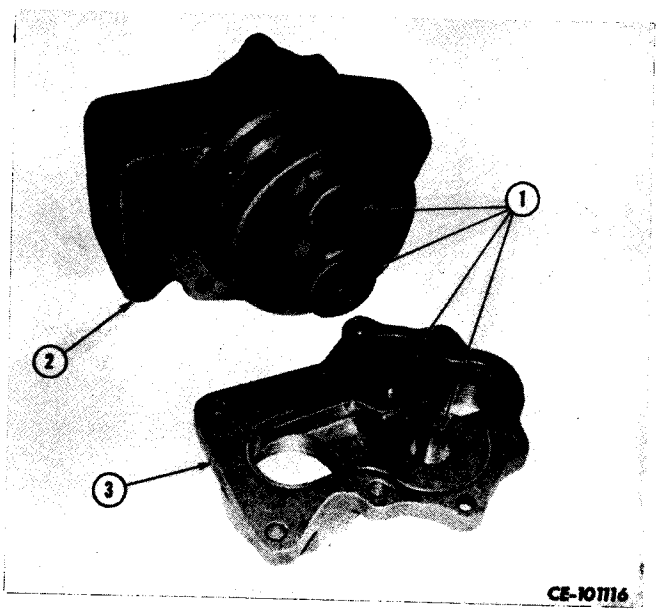


Figure 3-65
Remove Bushings.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Clean and dry all parts.

Remove nicks and burrs from all parts with emery cloth.

Inspect drive gear shaft for damaged splines.

Inspect both drive gear and driven gear shafts at bushing points for rough surfaces and excessive wear. Inspect gear faces and wear plate for scoring and excessive wear.

If edges of gear teeth are sharp, carefully break edge with emery cloth.

Assembly

Press new bushings (1, Fig. 3-65) into cover (3) and pump body (2) if they were removed.

Install new seal (4, Fig. 3-64), pressure loading seal (5) and wear plate (6) in pump body bore.

Install drive gear (3, Fig. 3-58) and driven gear (2) in pump body (1). If old gears are used align match marks on teeth.

Install new "O" ring (2. Fig. 3-63) in pump cover (3). Install cover (3) on body and secure with cap screws ano washers (4). Tighten cap screws evenly and to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

TROUBLE SHOOTING

Refer to Section 4, "TRANSMISSION TROUBLE SHOOTING."

SERVICE INFORMATION

SPECIFICATIONS

Charging pressure (at high idle)	414 - 552 kpa (60 - 80 psi)
Oil temperature	121,1°C (250°F) Max.
Converter stall speed	2225-2350 RPM

SPECIAL TORQUES

Drive Shaft mounting	108 N·m (80 ft. lb.)
Charging pump mounting cap screws	45 - 50 N·m (33 - 37 ft. lb.)
Charging pump drive gear retaining nut	61 - 75 N·m (45 - 55 ft. lb.)
Output shaft bearing retainer cap screws	35 - 43 N·m (26 - 32 ft. lb.)
Output yoke retainer washer cap screws	35 - 43 N·m (26 - 32 ft. lb.)
Accessory drive gear to impeller cap screws	95 - 108 N·m (70 - 80 ft. lb.)
Drive housing to impeller	49 - 58 N·m (36 - 43 ft. lb.)
Retaining washer - output shaft to input drive bearing	35 - 43 N·m (26 - 32 ft. lb.)
Input hub retaining cap screws	35 - 43 N·m (26 - 32 ft. lb.)
Inspection cover retaining cap screws	35 - 43 N·m (26 - 32 ft. lb.)
Charging pump cover cap screws	38 - 43 N·m (28 - 32 ft. lb.)
Converter drive ring to flywheel	42 - 50 N·m (31 - 37 ft. lb.)

TOLERANCES

Input hub-to-drive housing clearance	127 - 381 mm (.005 - .015 in.)

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

DESCRIPTION

The full power shift transmission is designed to increase the useful range of the torque converter. A countershaft design with hydraulically actuated clutches is employed. First range increases power for starting and as the demand on the converter diminishes the transmission may be progressively shifted into higher ranges.

The transmission has three speeds forward and three speeds reverse and provides full power shifting in all ranges.

The countershaft type of design employs shafts positioned parallel to, and driven by, the input shaft for transfer of power to the output shaft. Gears mounted on the parallel shafts run free unless "clutched" to the shaft thereby transmitting power in the power train.

(Continued on next page)

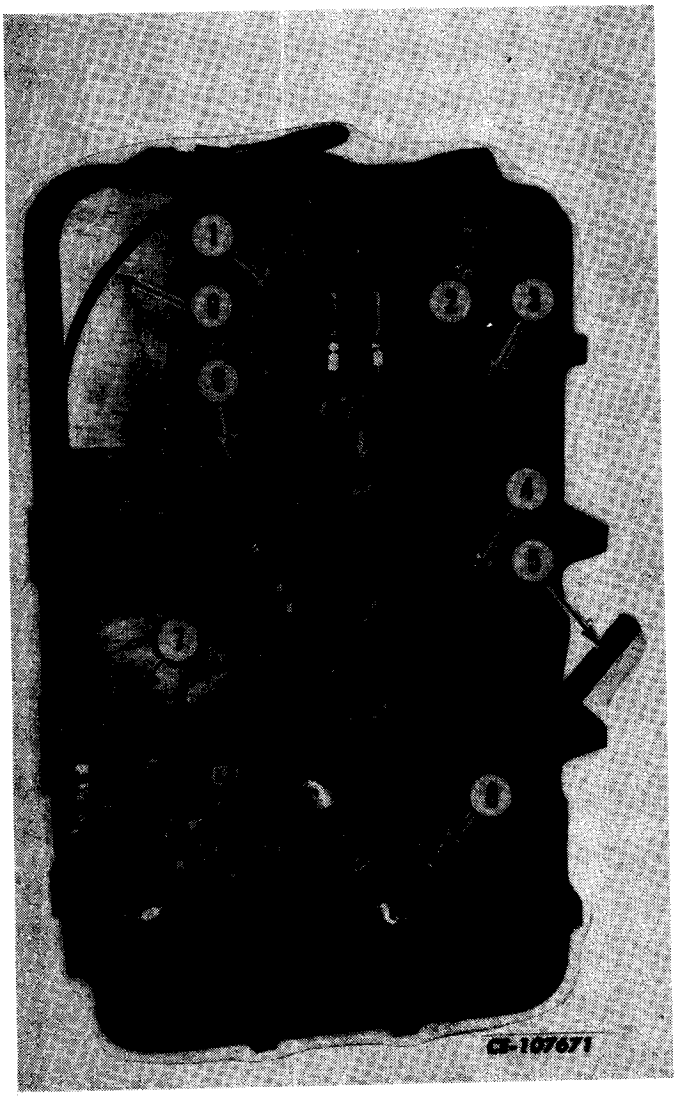


Figure 4-1
Front of Transmission.

1. Forward and reverse oil supply cap.
2. Name plate.
3. Idler shaft bearing cap.
4. 2nd and 3rd range oil supply cap.
5. Oil filler tube.
6. Front output yoke.
7. Transmission control valve.
8. 1st range oil supply cap.
9. Lube line.

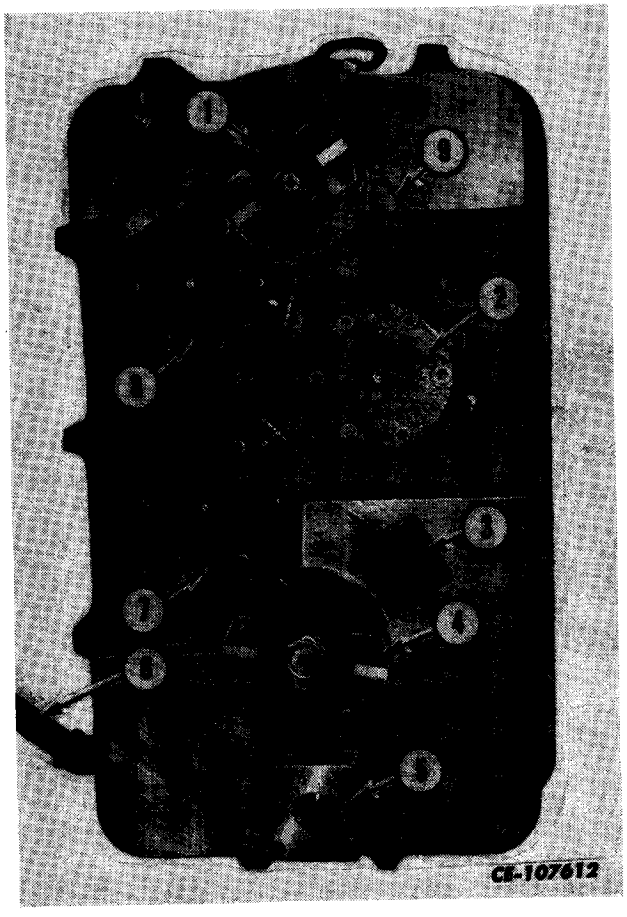


Figure 4-2
Rear of Transmission.

1. Input yoke.
2. 1st range bearing cap.
3. Magnetic pickup location (early).
4. Output yoke.
5. Sump oil screen.
6. Oil filler tube.
7. 2nd and 3rd range bearing cap.
8. Idler shaft bearing cap.
9. Lube lines.

GENERAL INFORMATION

DESCRIPTION - Continued

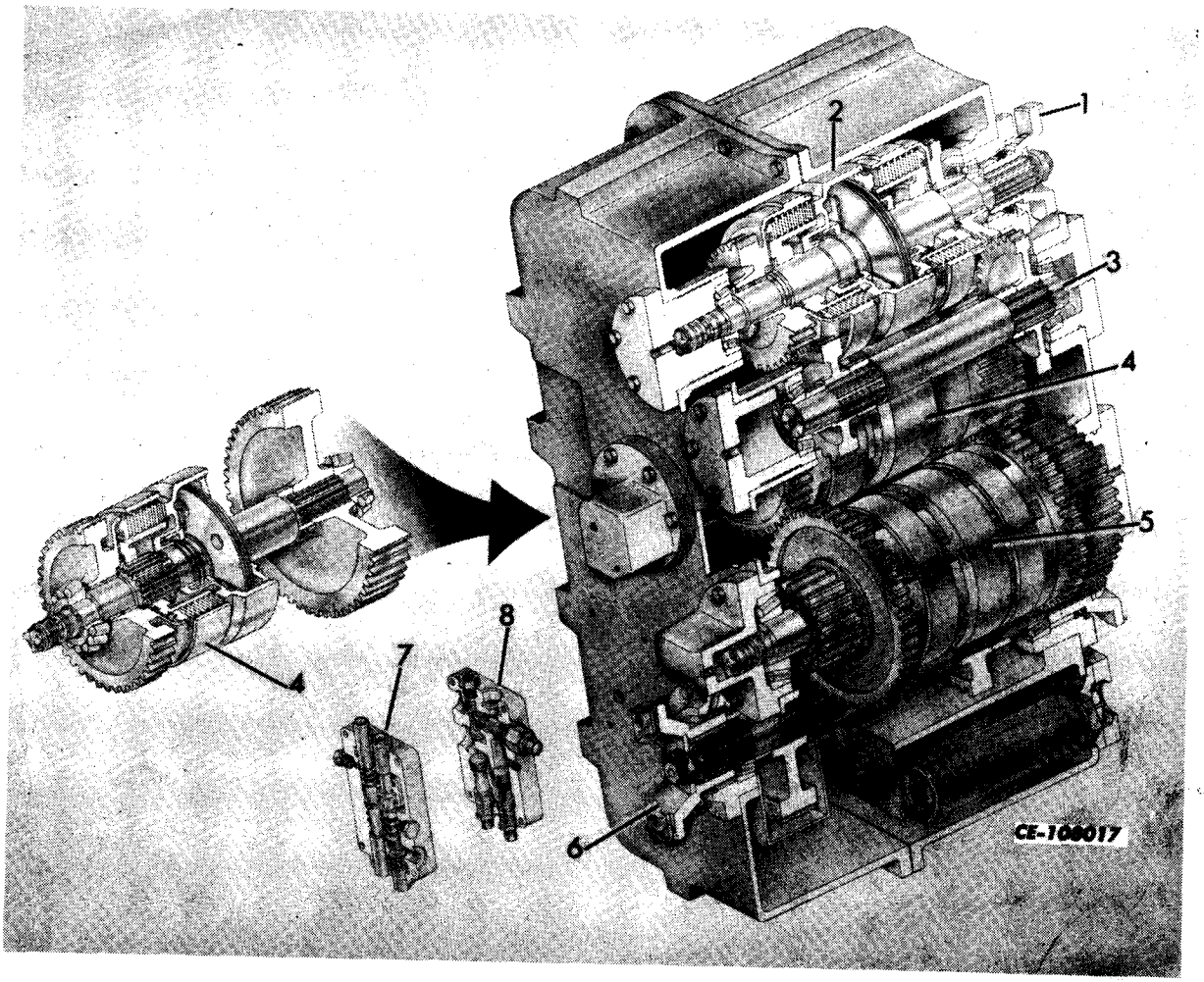


Figure 4-3
Transmission.

1. Input shaft.
2. Directional clutch pack.
3. Reverse idler shaft.
4. First speed clutch pack.
5. 2nd and 3rd speed clutch pack.
6. Output shaft.
7. Control valve (plunger section).
8. Control valve (relief section).

To assure smooth, high speed shifts, all clutches, except 1st gear, are mounted in pairs. Pairing the clutches affords compactness in design and hydraulic balance. The clutch design allows the transfer of oil from the disengaged clutch into the cavity created by the engaging clutch. Thus, a low volume of high pressure oil actuates the clutch for high speed shifting.

First Gear

The input shaft is coupled to the torque converter and revolves whenever the engine is running. The input shaft is splined to the sintered clutch discs in both directional clutch packs only. The steel clutch plates are splined to the gear and housing of each clutch pack. When the clutch discs are pressed together via hydraulic oil against the clutch piston, the gear on the clutch housing is set in motion energizing forward clutch pack. The forward pack gear is meshed directly with the gear splined to the 1st speed clutch pack shaft. Now we have the shaft in the 1st speed clutch pack turning. We now energize the 1st speed clutch pack which locks the shaft with the gear on the clutch housing and causes it to revolve. This gear is meshed with the 2nd speed clutch pack gear which is free wheeling on the shaft of the 2nd and 3rd speed clutch pack.

GENERAL INFORMATION

The 2nd speed clutch pack gear is meshed with the gear on the output shaft and now causes it to revolve.

Second and Third

Second and third gear are attained in a similar manner except the 2nd and 3rd speed clutch pack shaft is turned via the gear splined to the end of the shaft and meshed with the gear on the 1st speed shaft. When the range desired is energized, the corresponding gear on the clutch housing is locked to the shaft, revolves and in turn, moves the gear on the output shaft.

Reverse

When the reverse clutch pack is energized, it locks the clutch housing gear with the gear on the reverse idler shaft, which drives the gear on the opposite end of the shaft meshed with the gear on the 1st speed shaft. This extra gear in the power flow reverses the direction of rotation for the 1st speed shaft which affects the rotation of the output shaft. The range selections are basically the same operations as mentioned previously.

OPERATING PRESSURES

Pressure checks should be made with engine and transmission at normal operating temperature. Pressure checks should be made at full power stall.

Clutch Pressure at Stall

a. Refer to "SPECIFICATIONS" for clutch pressure limitations.

b. Service gauge may be attached to cartridge valve at quick disconnect fitting (3, Fig. 4-4).

c. If clutch pressure is not reached within thirty seconds after engine is started, shut down engine and determine reason.

Converter Charging Pressure (High Idle)

a. Refer to "SPECIFICATIONS" for converter charging pressure limitations.

b. Service gauge may be attached to cartridge valve at quick disconnect fitting.

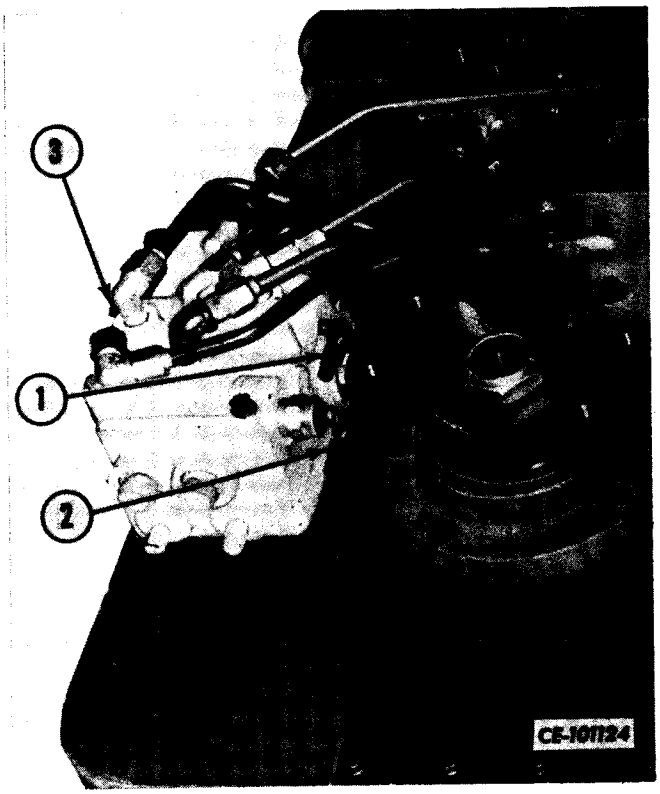


Figure 4-4
Quick Disconnect Fittings.

Lube Pressure (High Idle)

a. Refer to "SPECIFICATIONS" for lube pressure limitations.

b. Service gauge may be attached to cartridge valve at quick disconnect fitting.

CONVERTER STALL CHECK

Refer to Section 3, "TORQUE CONVERTER" for stall check procedure.

DISASSEMBLY, INSPECTION AND ASSEMBLY

DISASSEMBLY PREPARATION

The following should be made available for removal and disassembly of the transmission:

Provisions for steam cleaning the transmission. Do not use caustic soda.

Prepare a dirt-free work area at least 12 ft. square.

A suitable hoist.

The following tools:

a. Low bench for disassembly.

b. Mechanical gear and bearing puller set.

c. Standard set of mechanics tools.

d. Special tools (see "SPECIAL TOOLS").

e. Shop press.

REMOVAL

Drain transmission fluid.

Remove mounting hardware securing cab (1, Fig. 4-5) to operator's compartment (2). Attach a sling to cab and remove cab from tractor.

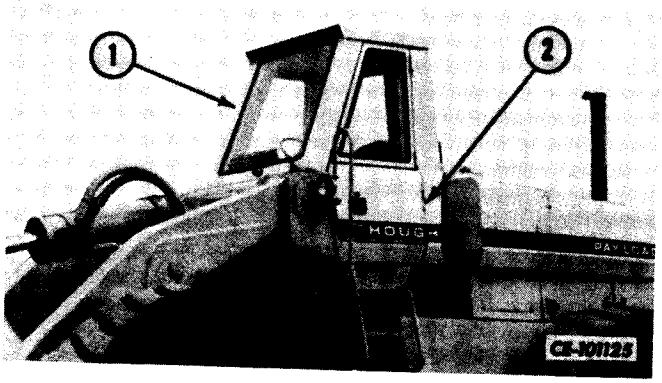


Figure 4-5
Remove Cab.

A hole must be cut in the rear of the operator's compartment so a chain hoist can be inserted to remove transmission. (Fig. 4-6.)

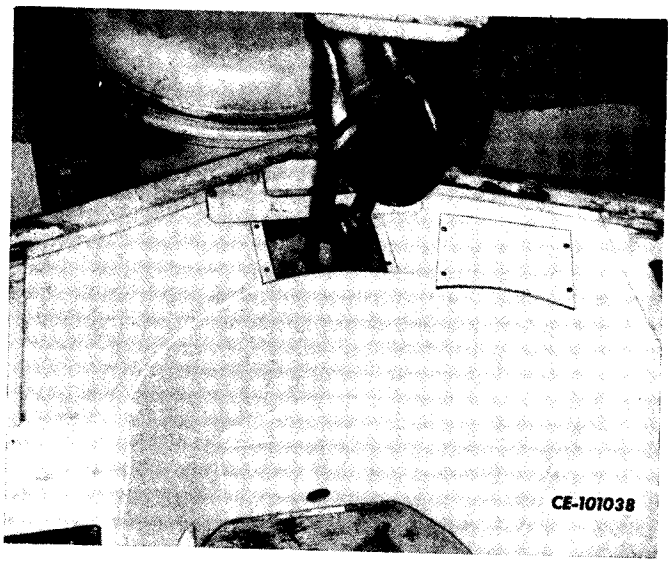


Figure 4-6
Access Hole.

Block front wheels securely and jack up rear of tractor 7 to 8 inches off the ground, or in the field a hole may be dug and the transmission lowered into it. Be sure adequate blocking is installed under raised rear wheels.

Disconnect transmission to parking brake drive shaft (1, Fig. 4-7) from transmission (2).

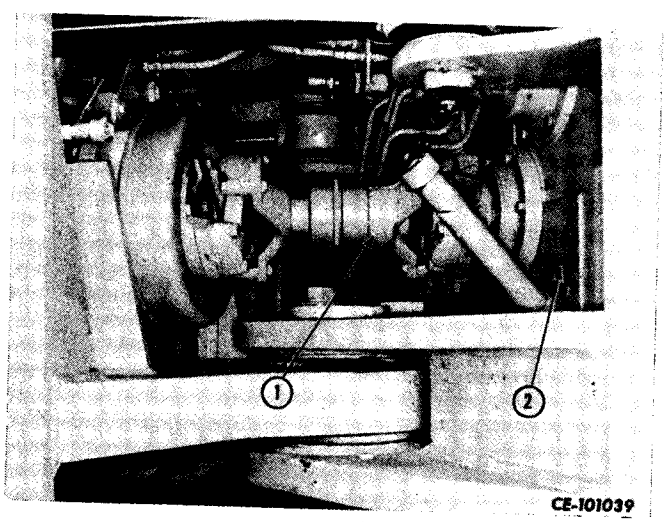


Figure 4-7
Remove Drive Shaft (Early).

Disconnect transmission shift linkage (1, Fig. 4-8) from bracket and valve (2). Disconnect all hoses (3) leading to valve.

DISASSEMBLY, INSPECTION AND ASSEMBLY

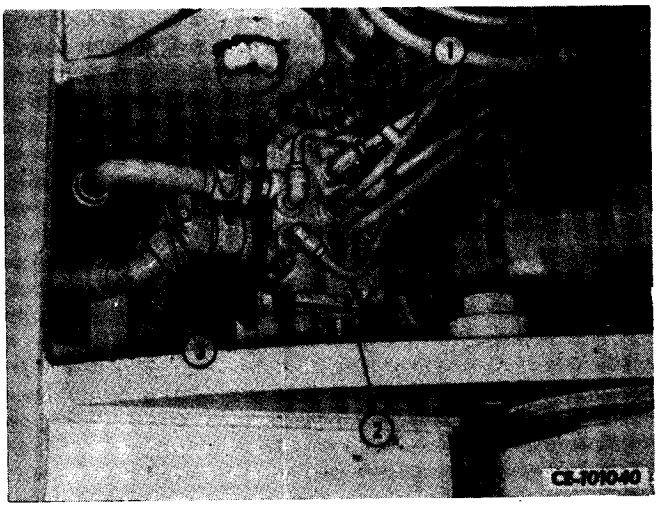


Figure 4-8
Disconnect Lines.

Remove transmission to rear axle drive shaft (1, Fig. 4-9) from tractor. Disconnect converter drain hose (3) and suction line hose (2).

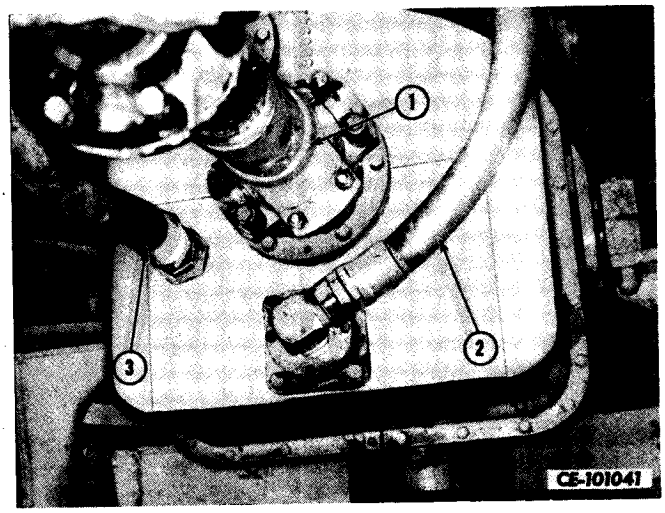


Figure 4-9
Remove Drive Shaft.

Remove cap screws (1, Fig. 4-10) that secure pin support caps (2) to the pin supports (3). Remove caps. Block transmission securely to prevent tipping.

Disconnect the transmission-to-torque converter drive shaft (1, Fig. 4-11) from transmission. Disconnect line (3) from breather (2).

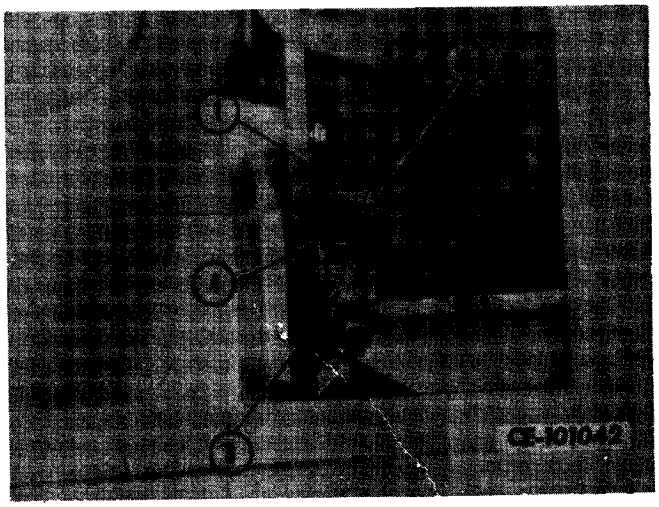


Figure 4-10
Transmission Mount.

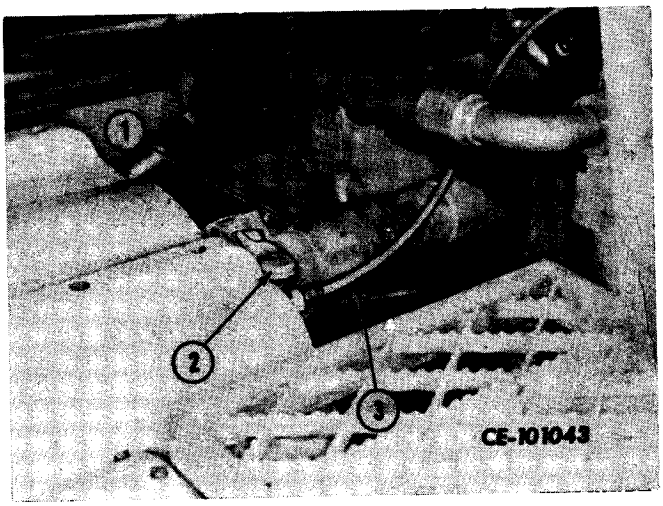


Figure 4-11
Disconnect Drive Shaft.

Remove mounting hardware securing hose pad (1, Fig. 4-13) to transmission and tie hose support and hoses out of the way. Remove hardware securing supports (2) to transmission. Remove supports and install special lifting eyes (refer to "SPECIAL TOOLS") in tapped holes on top of transmission.

On later models, disconnect the manifold block and the wiring harness from the transmission. Refer to Fig. 4-12.

Attach chain hoist to lifting eyes and raise transmission until pins on mounting plates (4, Fig. 4-11) clear pin supports. Remove bolts and lock washers that secure mounting plates to transmission and remove plates.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

REMOVAL - Continued

Remove blocking and lower transmission from tractor. Move transmission to disassembly area.

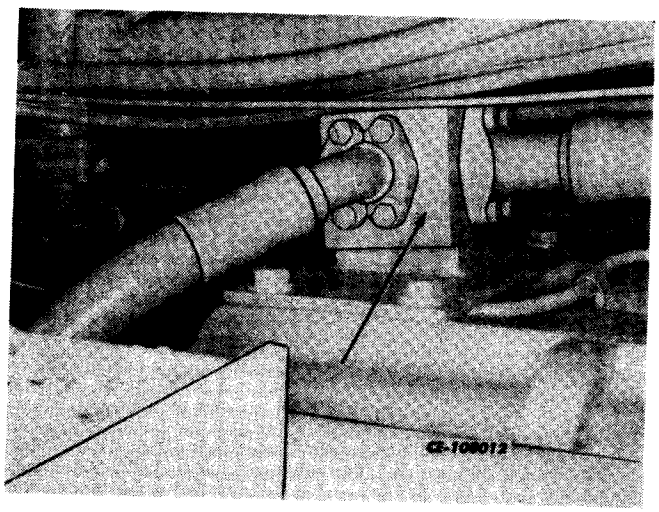


Figure 4-12
Hydraulic Block.

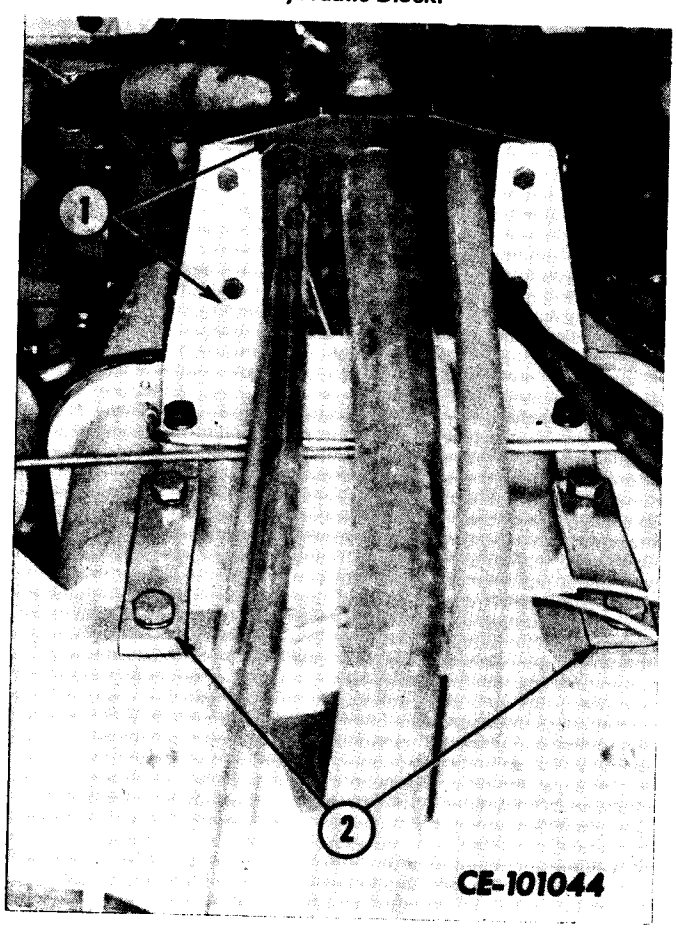


Figure 4-13
Disconnect Hose Pad.

DISASSEMBLY

Clean exterior of transmission thoroughly with plain steam (no caustic soda). Provide a clean work area. Cleanliness is extremely important during transmission overhaul.

Be sure transmission is thoroughly drained.

Remove nut (1, Fig. 4-14), spacer (2), "O" ring (3) and input yoke (4) from directional clutch shaft (12). Remove input shaft bearing retainer (6) by removing cap screws. Remove idler shaft bearing cap (74), 1st range bearing cap (73) and 2nd and 3rd range bearing cap (71) from near

(Continued on page 8)

Legend for Figure 4-14

1. Lock nut.
2. Spacer.
3. "O" ring.
4. Input yoke.
5. Seal.
6. Input shaft bearing retainer.
7. Shims.
8. "O" ring.
9. Bearing cup.
10. Rear housing.
11. Dowel.
12. Directional clutch pack.
13. Bearing cone.
14. Bearing cup.
15. Gasket.
16. Bearing cup.
17. Front housing.
18. Seal rings.
19. Plug.
20. Gasket.
21. Plug.
22. Directional oil supply cap.
23. Plug.
24. Idler shaft bearing oil supply cap.
25. 1st range oil supply cap.
26. 2nd and 3rd range oil supply cap.
27. Plug.
28. Plug.
29. Gasket.
30. Plug.
31. Output shaft front bearing retainer.
32. Ferry cap screw.
33. Plate (early).
34. Gasket (early).
35. Seal.
36. Front output yoke.
37. "O" ring.
38. Spacer.
39. Lock nut.
40. Bearing cone.
41. Spacer.
42. Roller bearing.
43. Spacer.
44. 2nd and 3rd clutch pack.
45. Bearing cone.
46. Gear.
47. Oil baffle.
48. Bearing cup.
49. Output shaft.
50. Bearing cup.
51. Bearing cone.
52. Gear.
53. Spacer.
54. 1st range clutch pack.
55. Bearing cone.
56. Reverse idler shaft.
57. Plate.
58. Plug.
59. Output shaft rear bearing retainer.
60. Seal.
61. Shims.
62. "O" ring.
63. Strainer.
64. Gasket.
65. Check valve.
66. Adapter.
67. Rear output yoke.
68. "O" ring.
69. Spacer.
70. Lock nut.
71. 2nd and 3rd range bearing cap.
72. Plug.
73. 1st range bearing cap.
74. Idler shaft bearing cap.

DISASSEMBLY, INSPECTION AND ASSEMBLY

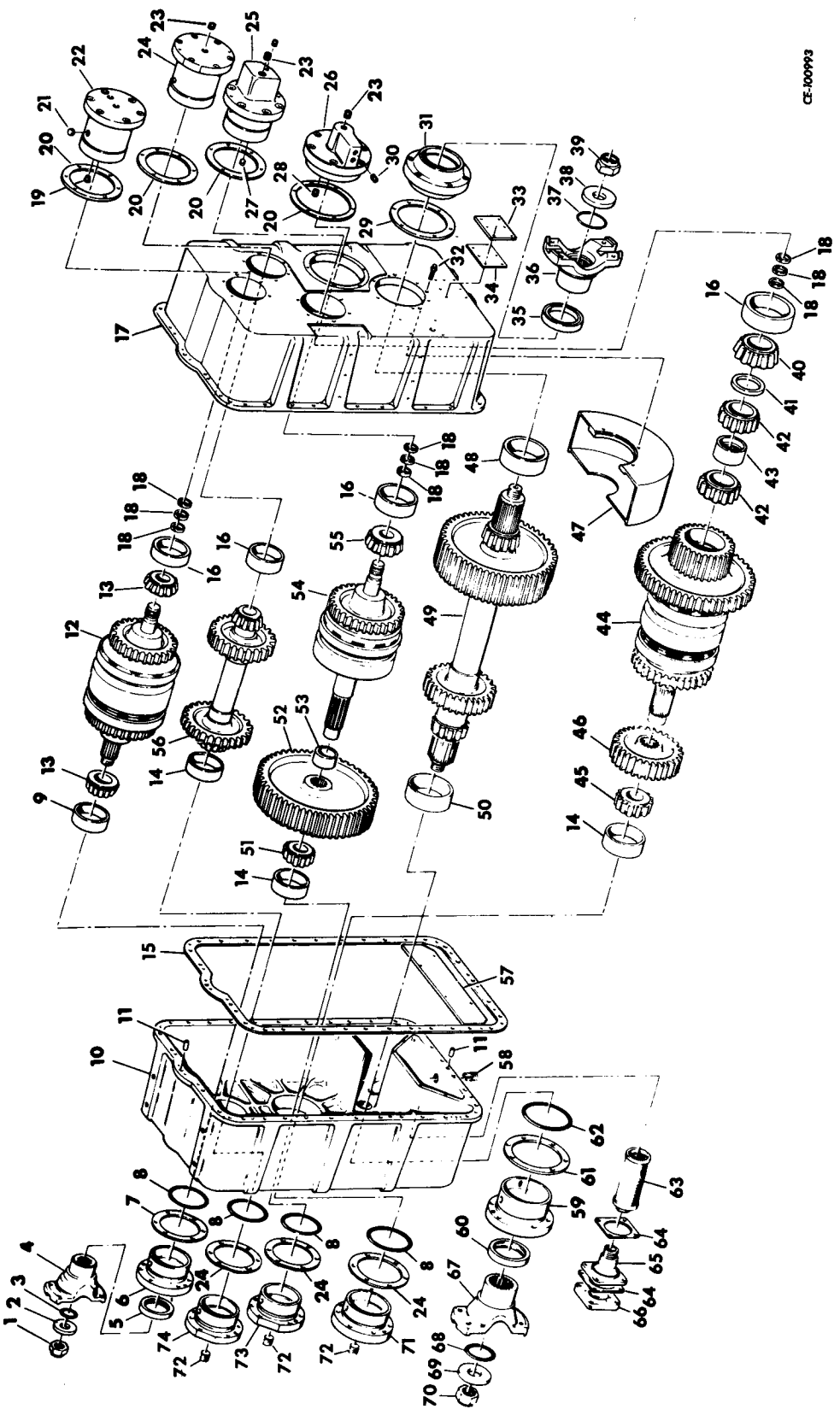


Figure 4-14
Exploded View of Transmission.

DISASSEMBLY, INSPECTION AND ASSEMBLY

DISASSEMBLY - Continued

housing (10) by removing their retaining cap screws. Remove nut (70), spacer (69), "O" ring (68) and rear output yoke (67) from output shaft (49). Remove strainer (63) from rear housing by removing cap screws. Discard gaskets (64).

Remove and discard seals (5, 60) from output and input shaft bearing retainers (6, 59). After inspection, bearing cups (9, 50) may be removed if replacement is required.

NOTE: If replacement is required, bearing cup and cone must be replaced as a set.

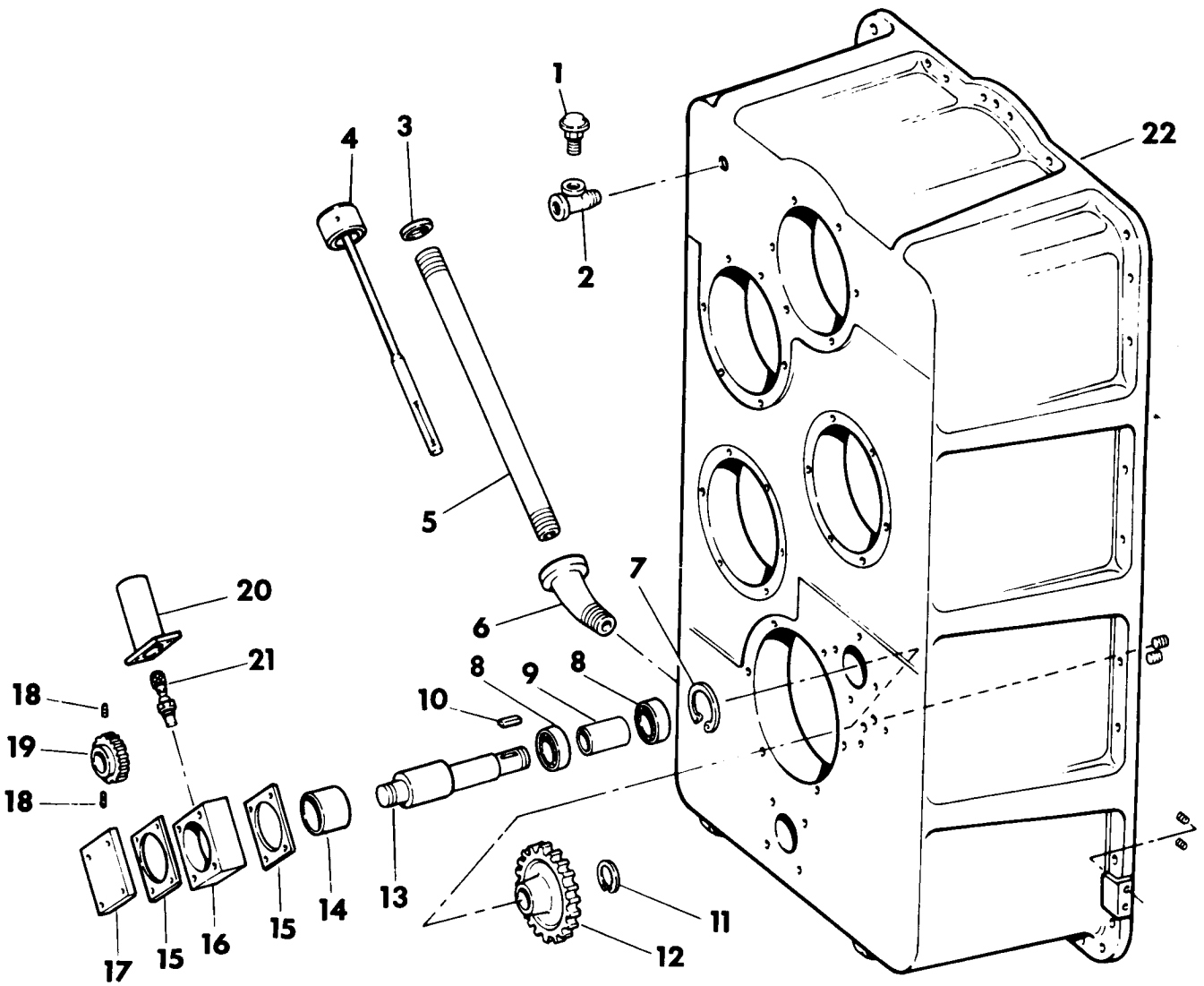


Figure 4-15
Magnetic Pickup (Early Models).

1. Breather.
2. Tee.
3. Seal ring.
4. Dipstick.
5. Tube.
6. Elbow.
7. Snap ring.
8. Bearings.
9. Spacer.
10. Key.
11. Snap ring.
12. Gear.
13. Sensor shaft.
14. Spacer.
15. Gaskets.
16. Housing.
17. Cover.
18. Set screws.
19. Gear.
20. Tube.
21. Magnetic pickup.
22. Rear housing.

DISASSEMBLY, INSPECTION AND ASSEMBLY

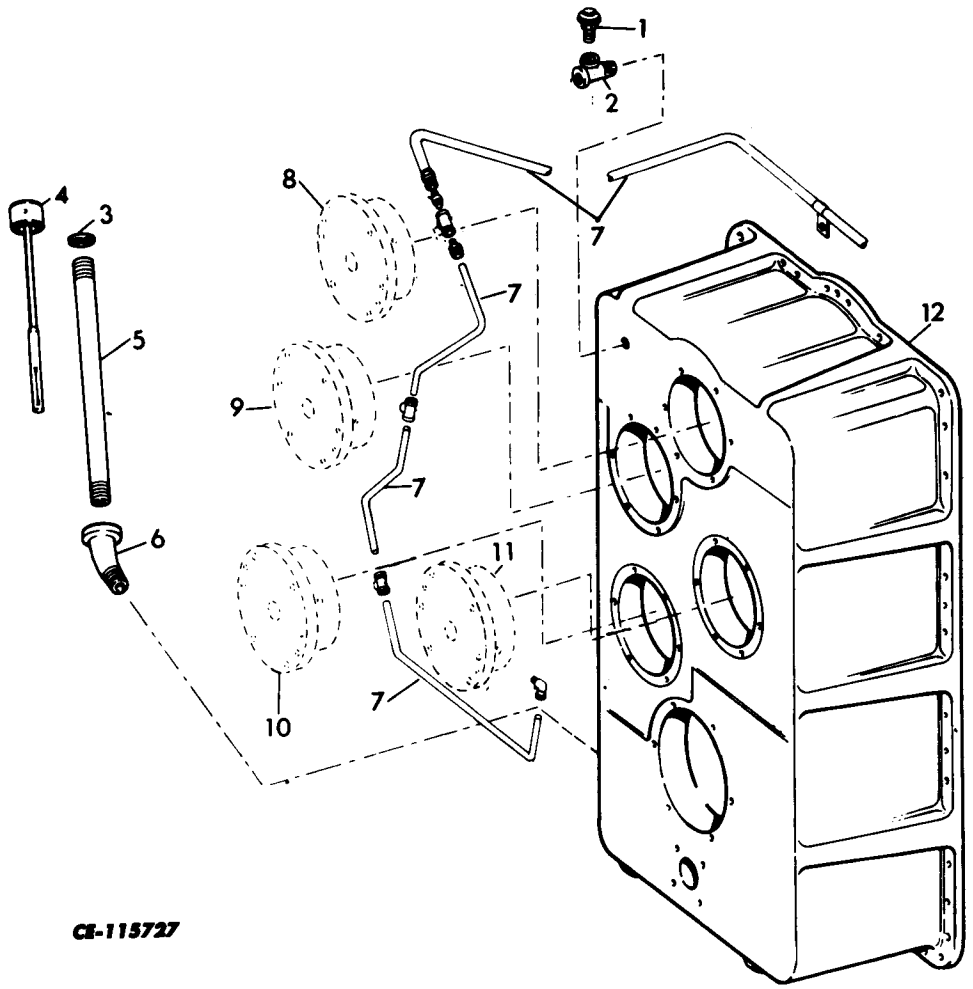


Fig. 4-15A
Housing and Lube Lines (Late Models).

1. Breather.
2. Tee.
3. Seal ring.
4. Dipstick.
5. Tube.
6. Elbow.
7. Lube lines.
8. Directional clutch cap.
9. Idler shaft cap.
10. 2nd and 3rd clutch cap.
11. 1st clutch cap.
12. Rear transmission housing.

DISASSEMBLY, INSPECTION AND ASSEMBLY

DISASSEMBLY - Continued

After inspection, bearing cups (14) may be removed from remaining bearing caps (71, 73, 74) if replacement is required.

> NOTE: If replacement is required, bearing cup and cone must be replaced as a set.

Remove rear housing (10) and discard gasket (15). Remove forward and reverse clutch pack. For overhaul procedures refer to "CLUTCH PACKS."

Remove reverse idler shaft (56) from front housing (17). Remove 1st range clutch pack (54). For overhual procedures refer to "CLUTCH PACKS."

Remove 2nd and 3rd range clutch pack (44) from front housing (17). For overhual procedures refer to "CLUTCH PACKS." Remove nut (39), spacer (38), "O" ring (37) and front output yoke (36). Remove output shaft (49) from oil baffle (47) and front housing.

Remove output shaft front bearing retainer (31) by removing cap screws. Remove and discard seal (35). After inspection, bearing cup (48) may be removed if replacement is required.

Disconnect oil tubes from oil supply caps and transmission valve. Remove remaining oil supply caps (22, 24, 25, 26) from front housing. Remove bearing cups only if repair is indicated. Remove transmission valve from front housing. Remove plate (57) from rear housing (10).

(Early Models Only)

Remove snap ring (11, Fig. 4-15) securing gear (12) to shaft (13). Remove gear. Remove snap ring (7) and key (10). Remove cap screws securing cover (17) and housing (16) to rear housing (22). Carefully drive out shaft assembly from inside of rear housing. Pull bearings (8) and spacer (9) from shaft (13). Remove shaft from housing (16). Loosen set screws (18) on gear (19) and slide gear off shaft. Remove cap screws securing tube (20) to sensor housing. Remove tube and magnetic pickup (21). Remove breather (1) and tee (2) from rear housing. Remove dipstick (4), tube (5) and elbow (6) from rear housing. Remove and discard seal ring (3).

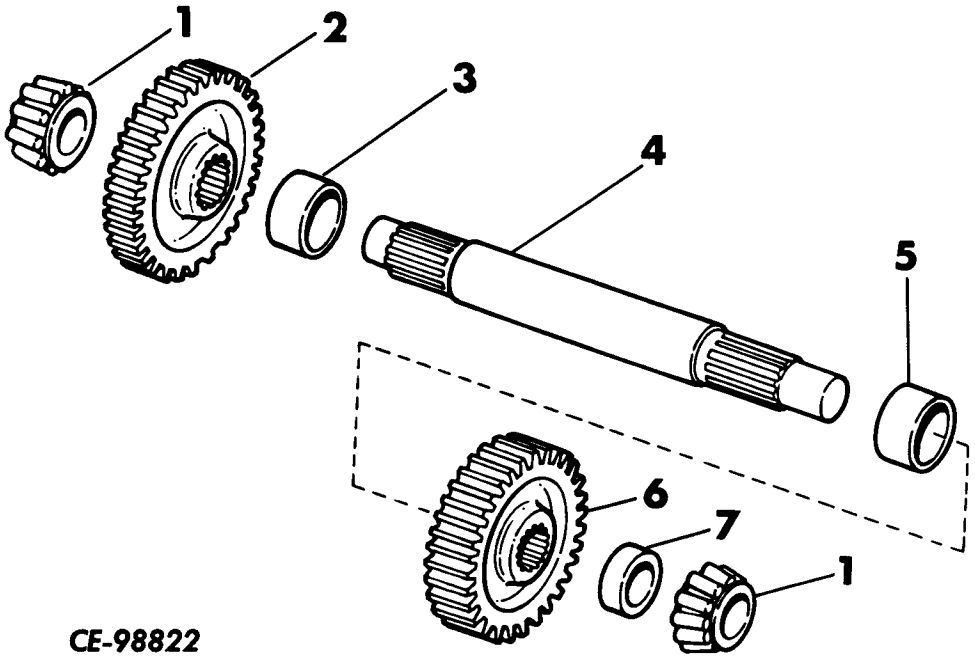


Figure 4-16
Reverse Idler Shaft.

1. Bearing cones.
2. Gear.
3. Spacer.
4. Shaft.
5. Spacer.
6. Gear.
7. Spacer.

DISASSEMBLY, INSPECTION AND ASSEMBLY

(All Models)

Unscrew strainer filter (63, Fig. 4-14) from check valve (65).

Pull bearing cones (1, Fig. 4-16) from reverse idler shaft (4), using a suitable puller. Remove spacer (7), gear (6), spacer (5), gear (2) and spacer (3) from shaft.

Pull bearing cones (1, Fig. 4-17) from output shaft (5) using a suitable puller. Remove gear (6), spacer (2), gear (3) and spacers (4) from shaft.

CLEANING AND INSPECTION

Cleaning and inspection of the transmission in preparation for assembly should include the following:

a. Cleaning all parts thoroughly in solvent or plain steam. (Do not use caustic soda.) Use compressed air to dry parts. If steam is used to clean parts, oil immediately thereafter. Carefully inspect all parts for excessive wear, cracks and for breakage.

b. Inspecting all bearings for pits and spalled areas. Replace all damaged parts.

(Continued on next page)

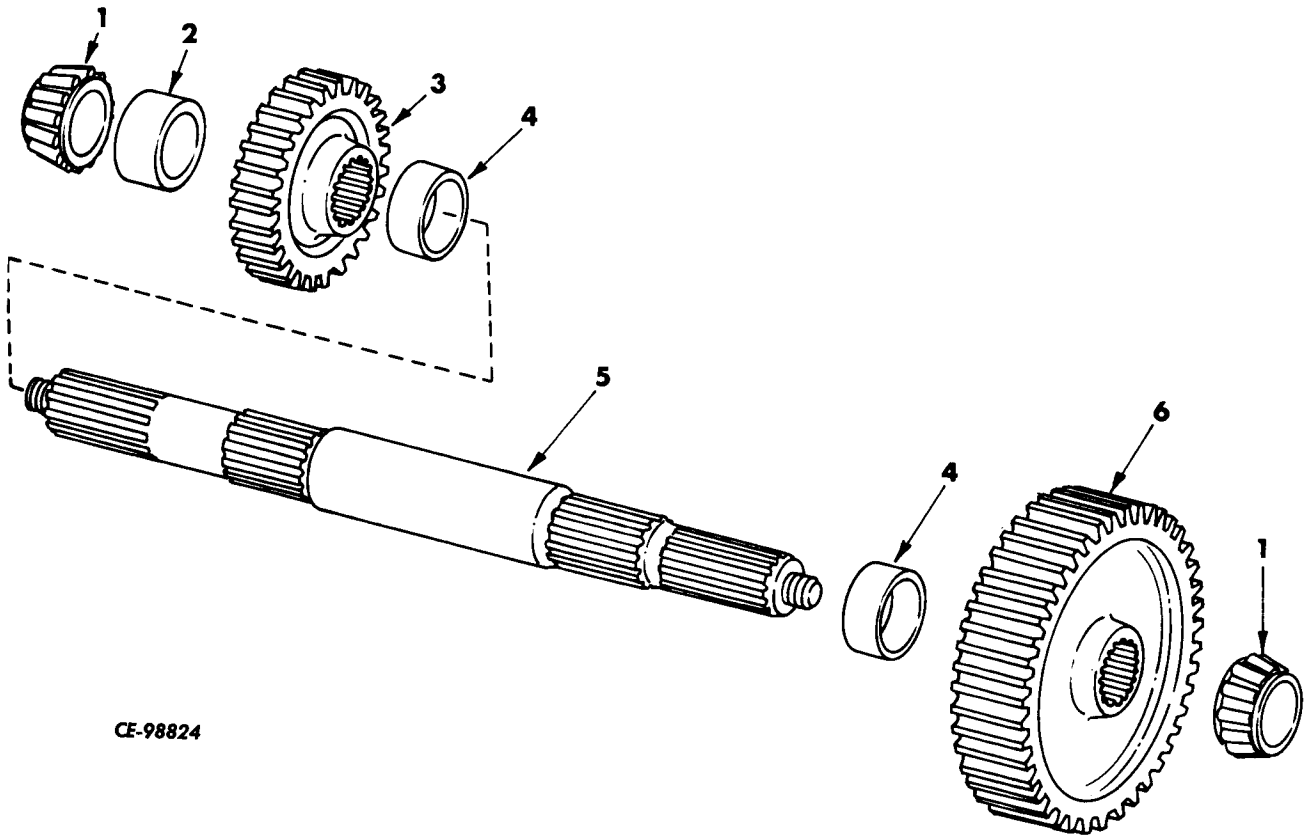


Figure 4-17
Output Shaft.

1. Bearing cones.
2. Spacer.
3. Gear.
4. Spacer.
5. Shaft.
6. Gear.

DISASSEMBLY, INSPECTION AND ASSEMBLY

CLEANING AND INSPECTION - Continued

c. Replacing all seals, hook type seal rings, gaskets, "O" rings and snap rings.

d. Inspecting all sealing surfaces for wear and for grooving.

e. Inspecting housing for dirt particles, and flushing all passageways thoroughly.

f. Inspecting splines on all shafts and drive gears for wear.

g. Provisions should be made for heating bearings in oil or an oven.

h. Clean and flush oil supply tubes.

NOTE: Special Torque, Pressure, etc. recommendations are listed under "SERVICE INFORMATION." This simplifies revision when necessary. To eliminate constant referral, blank spaces are provided at points where special information is required. These may be filled in by the manual holder, in pencil, and revised when necessary.

ASSEMBLY

Install spacers (4, Fig. 4-17), gears (3, 6) and spacer (2) on output shaft (5). Using a suitable press and sleeves, press bearing cones (1) on shaft.

Install spacers (3, 5, Fig. 4-16), gears (2, 6) and spacer (7) on reverse idler shaft (4). Using a suitable press and sleeves, press bearing cones (1) on shaft.

Install front oil supply caps (22, 24, 25, 26, Fig. 4-14) with new gaskets (20) on front housing (17). Secure with cap screws and lock washers.

Install transmission valve with new gasket and front housing and secure with cap screws and lock washers.

Connect all oil lines to valve and caps. Refer to Fig. 4-18) for proper installation.

Turn front housing over and position output shaft assembly (49, Fig. 4-14) in its bore in housing. Position oil baffle (47) around shaft gear and secure with cap screws (32).

Install a new oil seal (35, Fig. 4-14) in output shaft front bearing retainer. Spring loaded lip of seal must face in toward output shaft gear. Install retainer with new gasket (29) on housing and secure with cap screws and lock washers.

Install 2nd and 3rd clutch pack (44, Fig. 4-14), 1st range clutch pack (54), reverse idler shaft (56) and directional clutch pack (12) in front housing (17). Be sure gears are properly meshed. To install clutch shaft assemblies install lifting eyes in holes in web of gears (52, 46) and use a suitable sling and hoist to lower clutch shaft assemblies into position. Lubricate cast iron seal rings on end of clutch shafts as well as their respective cap bores with clean new transmission fluid. Be extremely careful when installing clutch shafts in cap bores to prevent seal ring breakage.

Screw strainer filter (63), onto check valve (65). Install strainer assembly with new gaskets (64) on rear housing (10).

(Early Models Only)

Using a suitable press, press bearings (8, Fig. 4-15) and spacers (9, 14) on sensor shaft (13). Install internal snap ring (7) in bore of rear housing (22). Carefully drive shaft into bore from outside-in. Install magnetic pick-up (21) in sensor housing (16). Install tube (20) on housing and secure with cap screws and lock washers. Using new gasket (15), position sensor housing (16) on transmission housing (22) over shaft (13). Install gear (19) on shaft and secure with setscrews (18). Install new gasket (15) and cover (17). Secure assembly with cap screws and lock washers. Install large gear (12) on other end of sensor shaft inside transmission housing (22). Secure with snap ring (11). Install elbow (6), tube (5) and dipstick (4) on housing. Install breather (1) and tee (2).

Istall plate (57, Fig. 4-14) on inside of rear housing (10). Secure with cap screws and lock washers. Position new gasket (15) on front housing (17), holding it in place with a small amount of gasket adhesive. Hoist rear housing in place on front housing and secure with cap screws and lock washers.

(All Models)

Install retainers 6, 74, 73, 71 and 59 with their bearing cups into the rear cover using only 2 cap screws per retainer at 180° apart; finger tight.

NOTE: Do not install seals, shims or "O" rings on the retainers at this time.

Roll the directional clutch shaft and the output shaft while you exert pressure on them toward the front cover. This will seat the bearing assembly firmly in the cap.

NOTE: To roll the countershaft assembly, 1st speed assembly or 2nd and 3rd speed assembly, apply air to the clutch port for the clutch pack shaft you wish to revolve and then turn the attached input or output shaft which is meshed with it.

(Continued on page 14)

DISASSEMBLY, INSPECTION AND ASSEMBLY

180 to 200 PSI
Clutch apply pressure

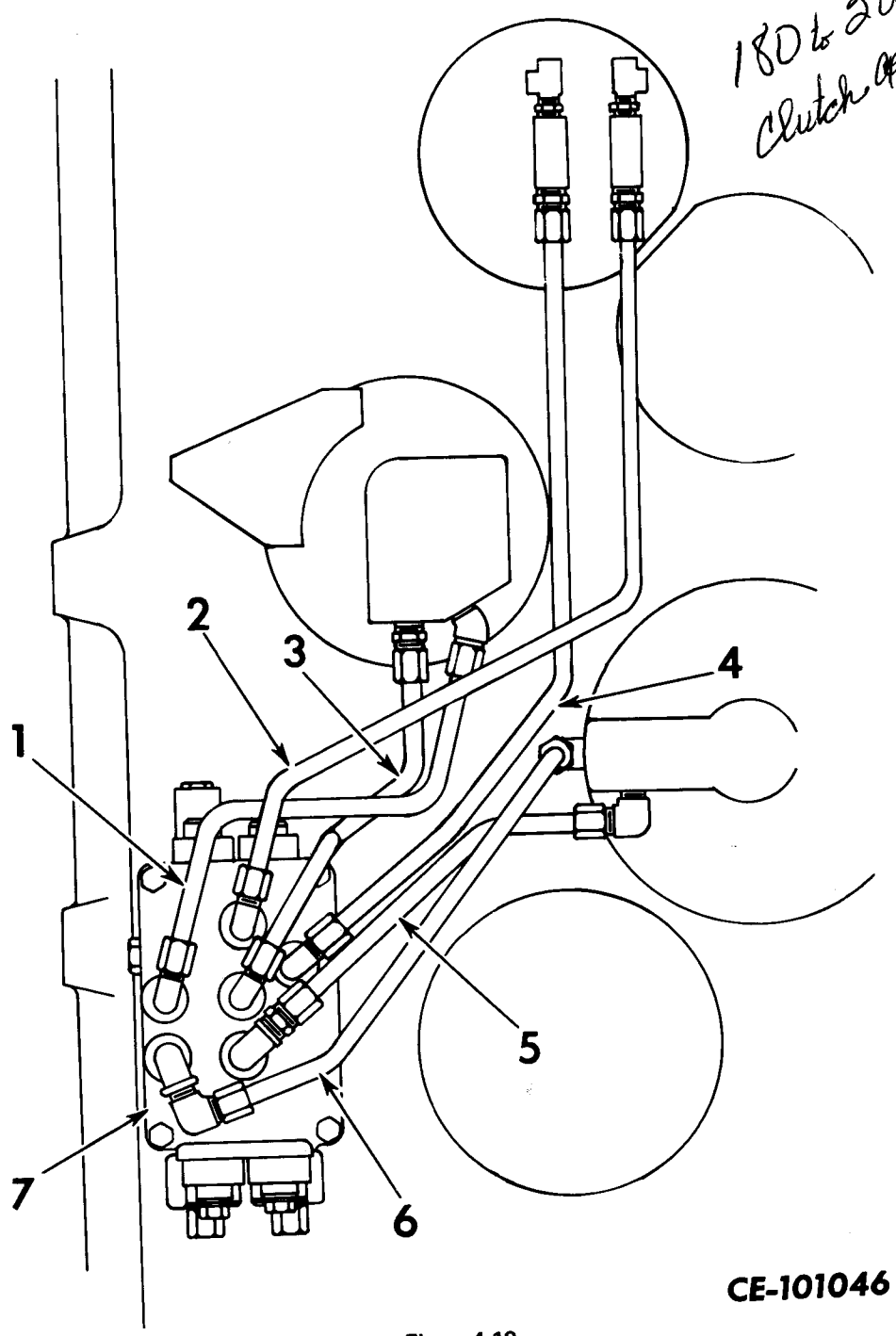


Figure 4-18
Oil Tubes.

1. 1st clutch tube.
2. Reverse clutch tube.
3. 1st lube tube.
4. Forward clutch tube.
5. 3rd clutch tube.
6. 2nd clutch tube.
7. Transmission valve.

DISASSEMBLY, INSPECTION AND ASSEMBLY

ASSEMBLY - Continued

(All Models) - Continued

Torque the cap screws alternately on each retainer to 18 N·m (160 in-lb) in increments of 5 N·m (40 in-lb). Continue to roll the shafts as you torque them.

Using a feeler gauge, measure the gap between the transmission housing and each cap. Measure at each cap screw. If the readings are not equal, add the two dimensions and divide by two.

An alternate method for seating the shaft assemblies is as follows:

With shaft assembly and cover in place, install bearing retainer, tightening the bolts evenly and tapping the retainer with a plastic hammer as you do so. Continue to tap the retainer and tighten the bolts until you reach the standard torque required for the bolts. Then loosen the bolts and retighten finger tight only. Measure the distance between the retainer and the transmission housing.

This is the measured shim gap. Refer to the "Shim Chart" for the other dimensions needed for the shim pack formula.

Leave a space about 6.35 mm (1/4 in) between shaft and jack.

Install a dial indicator on the transmission housing and indicate the opposite end of the output shaft. Using a pry bar, exert pressure on the shaft and note the reading on the dial indicator. This distance should be within that recommended on the chart. Adjust the shim pack accordingly to obtain correct tolerance.

For the other shaft assemblies, check the end play as follows:

Remove the plugs from both bearing retainers at each end of the shaft assembly.

Install a dial indicator on the transmission housing with the needle inserted through the plug hole, indicating the end of the shaft.

Charge the opposite end of the shaft with compressed air and note the reading. This distance should fall within that recommended on chart. Adjust shim pack accordingly to obtain correct tolerance.

SHIM CHART

Shaft	Deflection Constant		Mean End Play		Measured Shim Gap		Required Shim Pack		Measured End Play	
	mm	in	mm	in	mm	in	mm	in	mm	in
First	.305	.012	.229	.009					.178/.279	.007/.011
Second and Third	.305	.012	.229	.009					.178/.279	.007/.011
Output	.381	.015	.305	.012					.254/.356	.010/.014
Input	.305	.012	.229	.009					.178/.279	.007/.011
Reverse Idler	.254	.010	.229	.009					.178/.279	.007/.011

Enter your measured shim gap dimension on the chart under the same heading.

Add the measured shim gap dimension to the deflection constant and the mean end play from the shim chart for the shaft involved. The resulting dimension is the required shim pack.

Enter these dimensions on your chart for future reference.

Remove the bearing retainers, insert new seals, "O" rings and shim packs. Install on transmission. Continue to roll the shafts while tightening the retainers.

Place a jack under the output shaft (Do not contact shaft).

If reading is not within recommended limitations, adjust shim pack as required.

Lubricate output yokes sealing surfaces and lips of seals with grease.

Install output shaft yokes (36, 67, Fig. 4-14) and new "O" rings (37, 68) on output shaft (49). Install spacers (38, 69) and lock nuts (39, 70). Tighten lock nuts to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

DISASSEMBLY, INSPECTION AND ASSEMBLY

Lubricate input yoke sealing surface and lips of seal with grease.

Install input shaft yoke (4) and new "O" ring (3) on directional clutch shaft (12). Install spacer (2) and retaining nut (1). Tighten nut to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

INSTALLATION

Position transmission (2, Fig. 4-19) under tractor. Attach chain hoist (1) to lifting eyes and raise transmission into tractor. Attach mounting plates (4, Fig. 4-10) with bolts and lock washers. Tighten bolts to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Position transmission on pin supports (3, Fig. 4-10). Install pin support caps (2) and secure with bolts (1) and nuts. Snug up nuts but do not torque at this time.

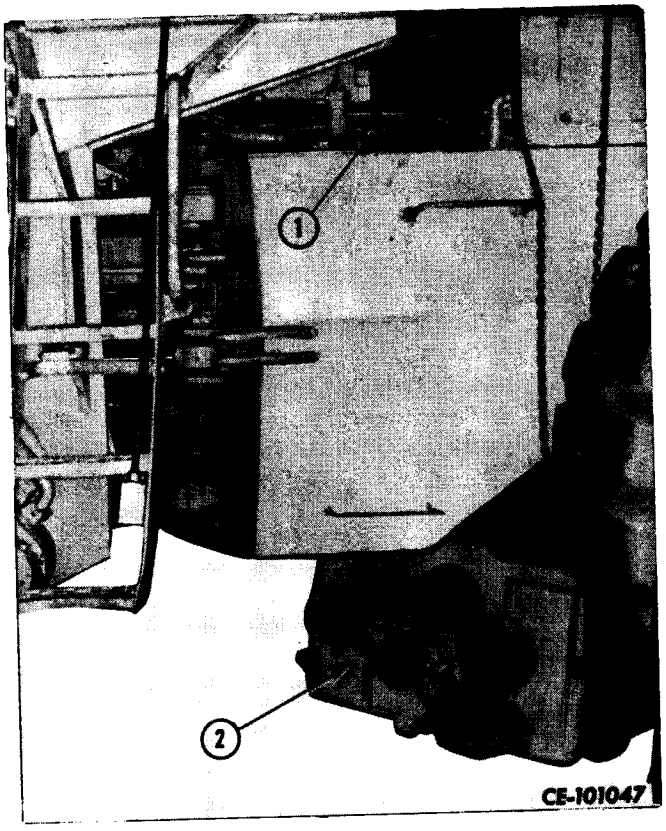


Figure 4-19
Install Transmission.

Block securely under transmission and remove chain and lifting eyes.

Install transmission supports (2, Fig. 4-13) and secure with cap screws and lock washers. Tighten cap screws to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Position hose pad (1, Fig. 4-13) and secure with cap screws. Tighten to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Tighten pin support cap bolts to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Remove transmission blocking.

Connect transmission-to-torque converter drive shaft (1, Fig. 4-11) to transmission. Connect line (3) to breather (2).

Install transmission-to-rear axle drive shaft (1, Fig. 4-9). Connect converter drain hose (3) and suction line hose (2) to transmission.

Connect transmission shift linkage (1, Fig. 4-8) to bracket and valve (2). Connect all hoses (3) leading to valve.

Connect transmission to parking brake drive shaft (1, Fig. 4-7) to transmission (2).

Remove blocks from rear of tractor.

Attach a sling to cab (1, Fig. 4-5) and install cab on operator's compartment (2). Secure with mounting hardware.

Fill transmission with correct fluid (refer to Operator's Manual).

CLUTCH PACKS

Disassembly

Using a suitable puller, pull bearing cones (1, Fig. 4-20) from shaft of forward and reverse clutch pack. Remove thrust washers (2) and needle thrust bearings (6). Pull gear and drum assembly (8) from both ends of shaft. With assemblies removed, pull roller bearings (3) and spacers (7) from shaft.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

CLUTCH PACKS - Continued

Disassembly - Continued

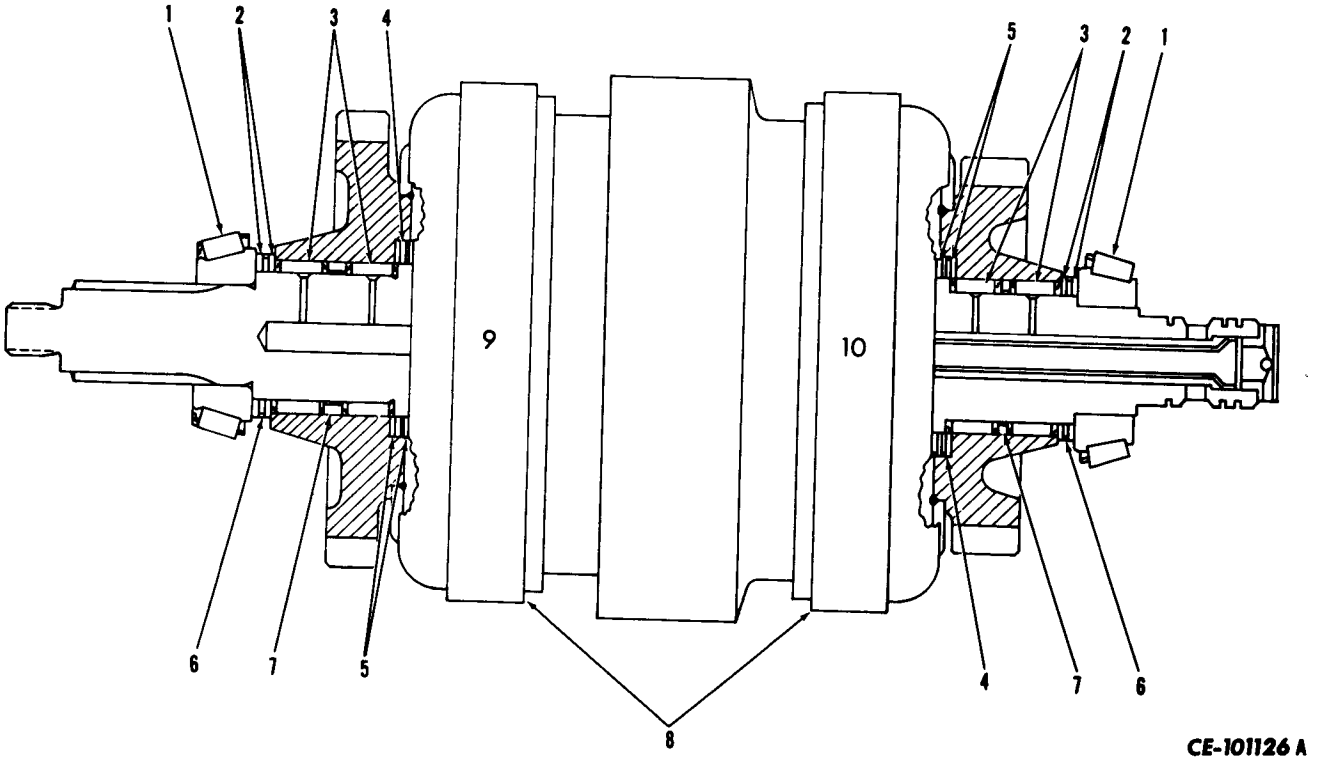


Figure 4-20
Directional Clutch Pack.

1. Bearing cones.
2. Thrust washers.
3. Roller bearings.
4. Needle thrust bearings.
5. Thrust washers.
6. Needle thrust bearings.
7. Spacers.
8. Gear and drum assemblies.
9. Forward clutch.
10. Reverse clutch.

Using a suitable puller, pull bearing cones (1, Fig. 4-21) from clutch shaft. Remove gear (2), thrust washers (3), needle thrust bearing (11) and spacer (8) from shaft. Pull gear and drum assemblies (6) from shaft. Pull roller bearings (4, 9) and spacer (7) from shaft. Remove thrust washers (10) and needle thrust bearing (5).

Using a suitable puller, pull bearing cones (1, Fig. 4-22) from clutch shaft. Remove gear (2), spacer (3), thrust washers (6) and needle thrust bearing (7) from shaft. Pull gear and drum (5) from shaft. Pull bearings (8) and remove thrust washers (4) and needle thrust bearing (9) from shaft.

NOTE: Mark thrust washers (4, Fig. 4-22) in the order in which they were removed. They must be assembled in their original positions.

DISASSEMBLY, INSPECTION AND ASSEMBLY

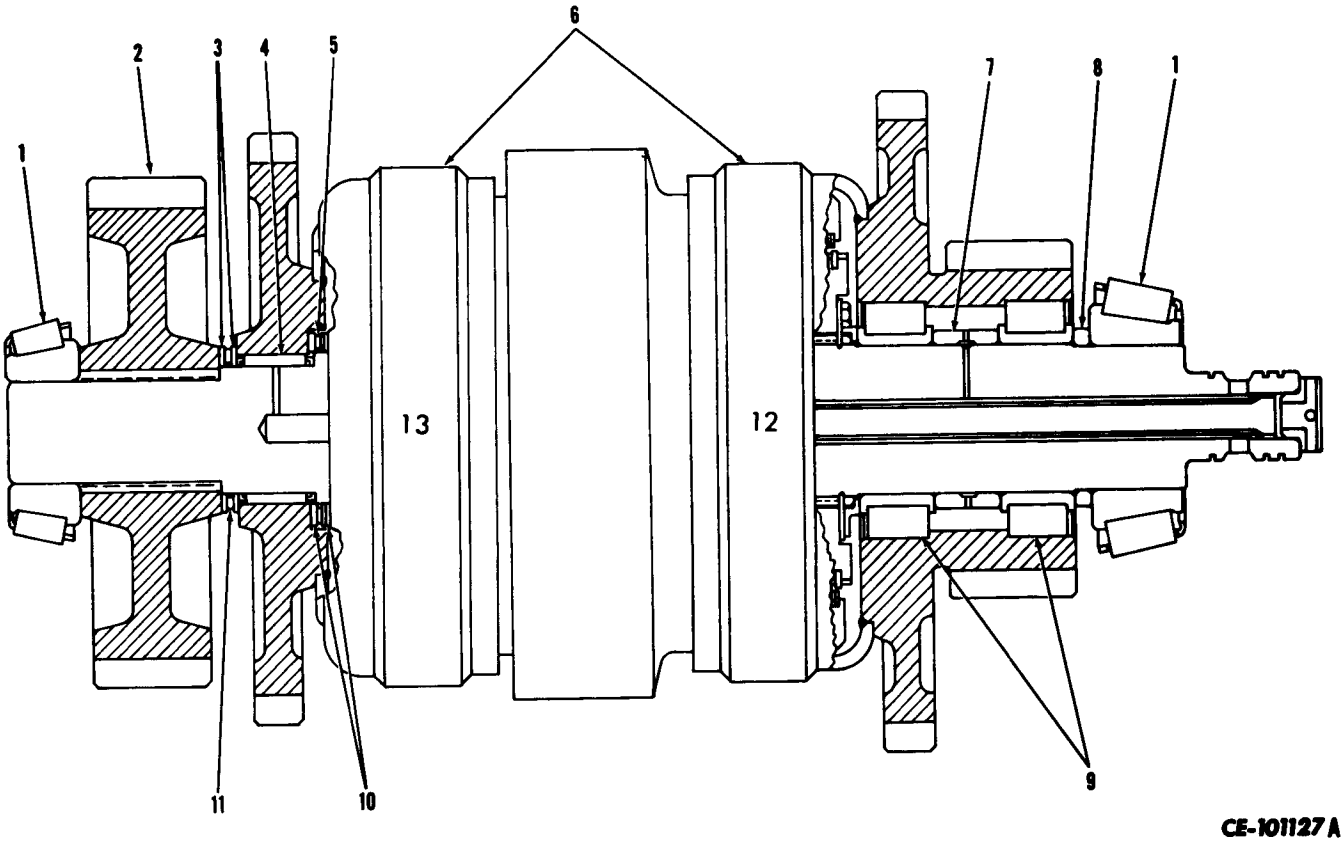


Figure 4-21
2nd and 3rd Clutch Pack.

1. Bearing cones.
2. Gear.
3. Thrust washers.
4. Roller bearing.
5. Needle thrust bearing.
6. Gear and drum assemblies.
7. Spacer.
8. Spacer.
9. Roller bearings.
10. Thrust washers.
11. Needle thrust bearing.
12. Second clutch.
13. Third clutch.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

CLUTCH PACKS - Continued

Disassembly - Continued

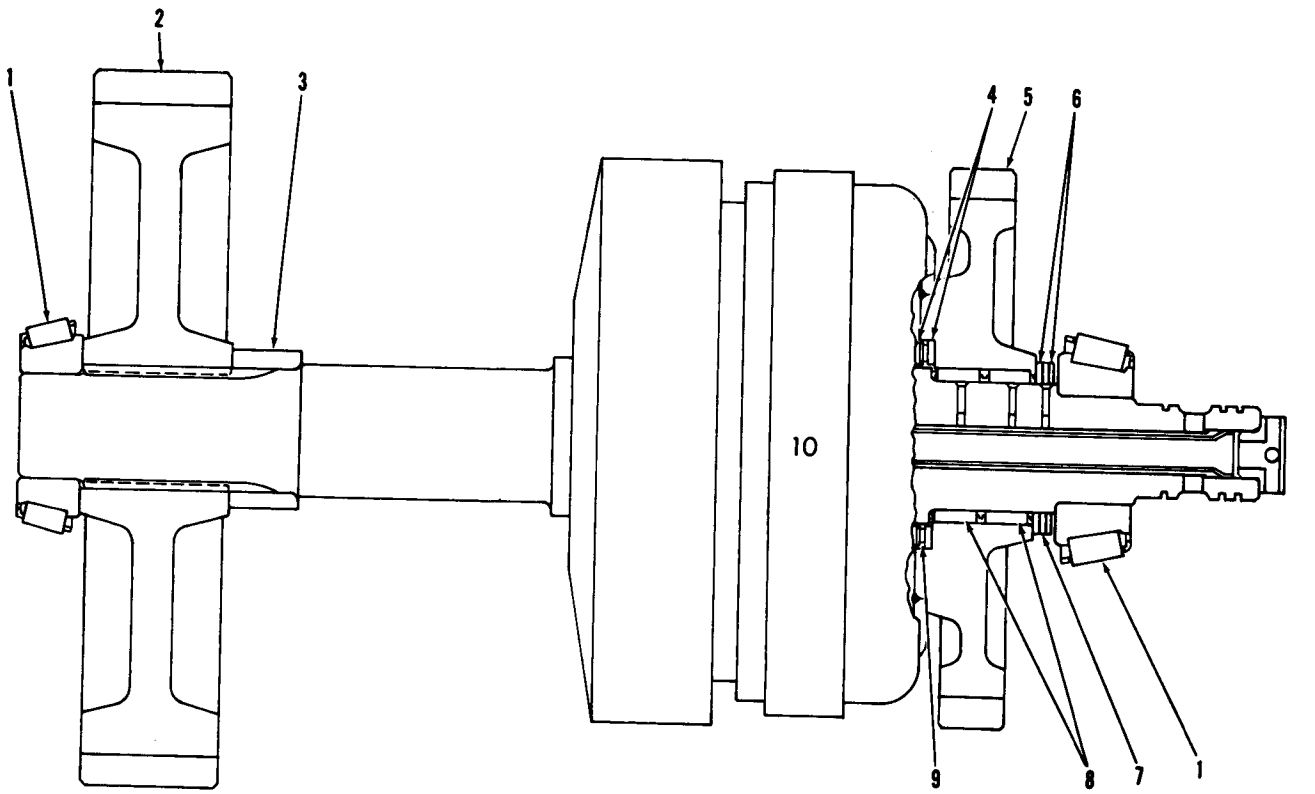


Figure 4-22
1st Gear Clutch Pack.

1. Bearing cones.
2. Gear.
3. Spacer.
4. Thrust washers.
5. Gear and drum assembly.
6. Thrust washers.
7. Needle thrust bearing.
8. Roller bearings.
9. Needle thrust bearing.
10. First clutch.

NOTE: Service instructions are given below for 2nd and 3rd speed clutch assembly. The forward and reverse pack is serviced in a similar manner. The 1st speed pack is serviced similarly to half of the 2nd and 3rd speed pack.

Remove notched clutch spacer (1, Fig. 4-23) from shaft (2).

Remove cap screws (3) that secure the clutch hub retainers (4). Remove retainers. Lift the hub and plate assembly (5) from the shaft.

Remove Spir-O-Lox retaining ring (1, Fig. 4-24) from the hub and plate assembly (2).

DISASSEMBLY, INSPECTION AND ASSEMBLY

Figure 4-23
Remove Spacer.

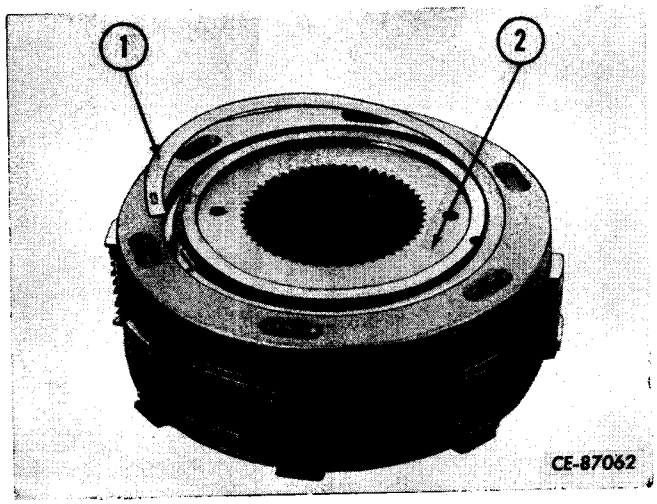


Figure 4-24
Remove Retaining Ring.

Remove snap ring (1, Fig. 4-25) from the hub and plate assembly.

Figure 4-25
Remove Snap Ring.

Remove backing plate (1, Fig. 4-26) from hub and plate assembly (2).

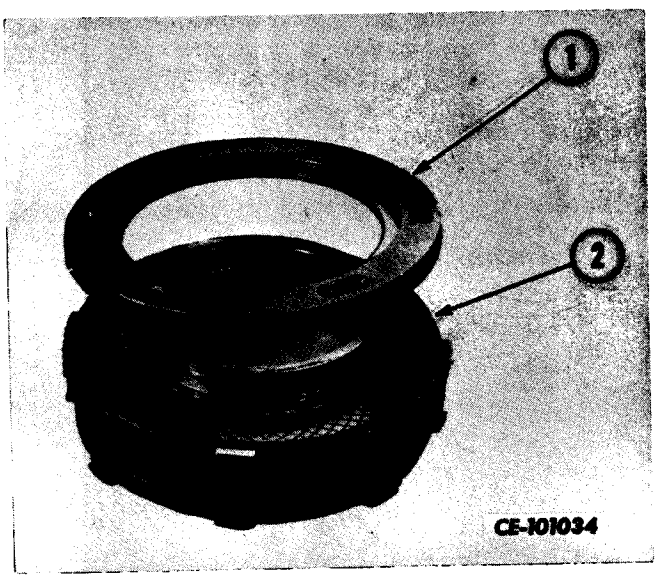


Figure 4-26
Remove Backing Plate.

Clutch plates, bronze (1, Fig. 4-27) and steel (2), may be lifted from the clutch hub assembly (4).

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

CLUTCH PACKS - Continued

Disassembly - Continued

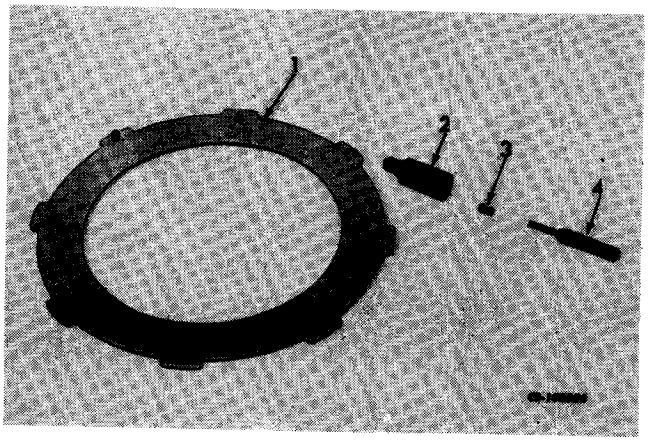


Figure 4-27
Separator Installing Tool.

1. Clutch plate.
2. Body.
3. Plug/separator.
4. Driver.

On the later directional and 2nd and 3rd speed clutch packs, the last sintered plate next to the piston is replaced with a special "organic" and sintered bronze clutch plate. The "organic" face goes toward the piston.

Inspect the rubber plugs (3, Fig. 4-27) on the steel plates. Damaged or worn plugs must be replaced.

A special tool is available for replacing these plugs. Refer to the 'Service Tools" in the "Introduction" section. The tool is used as follows:

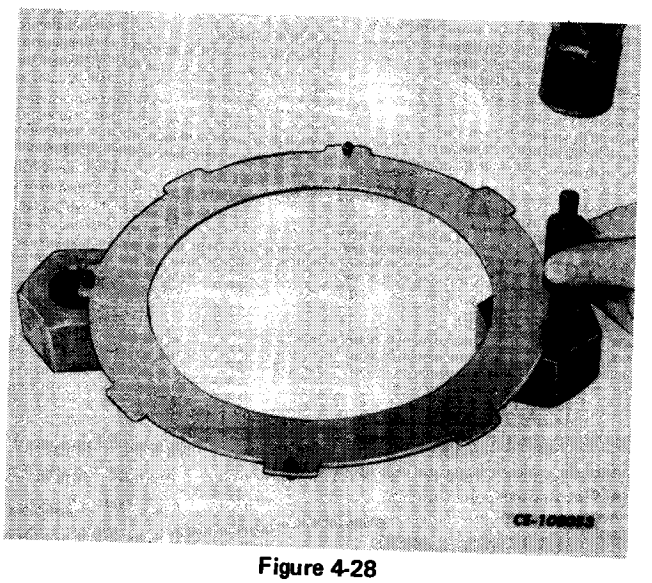


Figure 4-28
Installing Plug.

Figure 4-29
Clutch Plates.

Position the plate so the plug will not be restricted from coming through the hole.

Lubricate the plug with liquid soap and insert it into the large opening of the body (make sure the plug does not become wedged sideways). Refer to Fig. 4-28).

Position the tool tapered portion flush against and centered on the hole in the clutch plate.

Holding the tool against the plate tightly, strike the driver with a hammer so the plug enters the plate to the correct depth. The plug should be centered on the plate when finished.

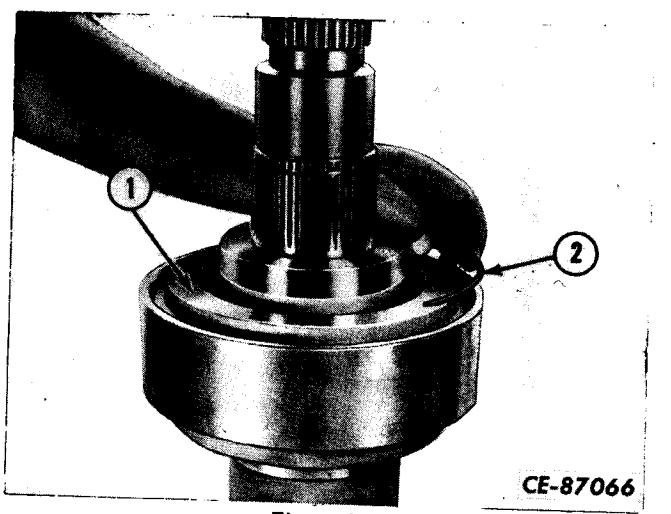


Figure 4-30
Remove Snap Ring.

DISASSEMBLY, INSPECTION AND ASSEMBLY

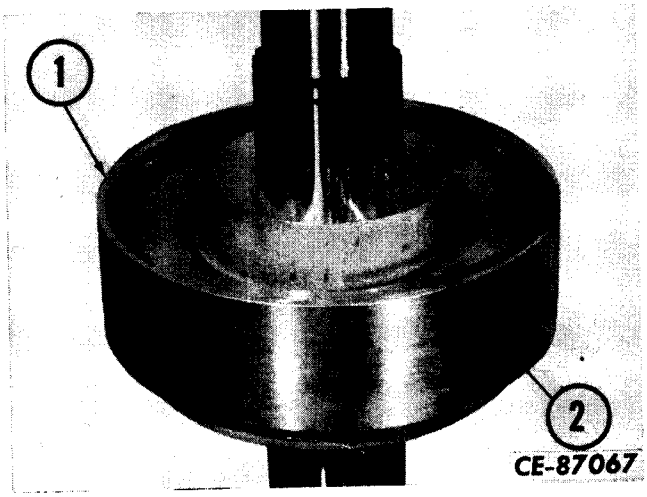


Figure 4-31
Install Groove Filler.

NOTE: The early clutch plates used separators that were not replaceable.

Using a plastic mallet, tap clutch piston (1, Fig. 4-30) down making snap ring (2) accessible. Remove snap ring.

Install special snap ring groove filler (2, Fig. 4-31) (refer to Section VI, "SPECIAL TOOLS") with bevel edge down in piston housing (1) snap ring groove.

Using a plastic mallet, tap around outer edge of piston housing (1, Fig. 4-32).

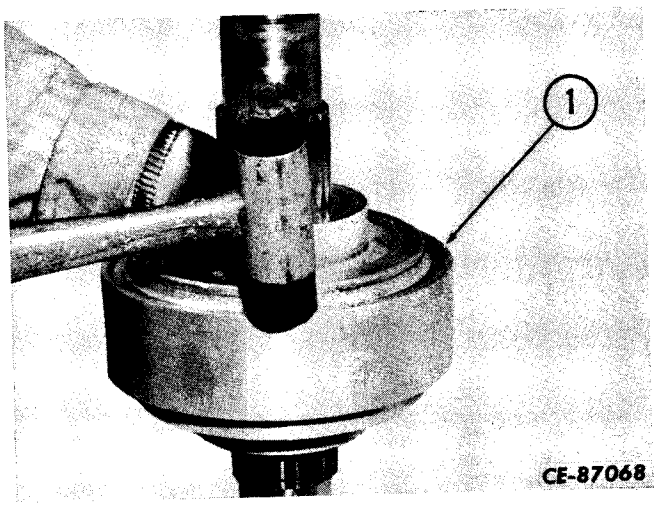


Figure 4-32
Remove Piston Housing.

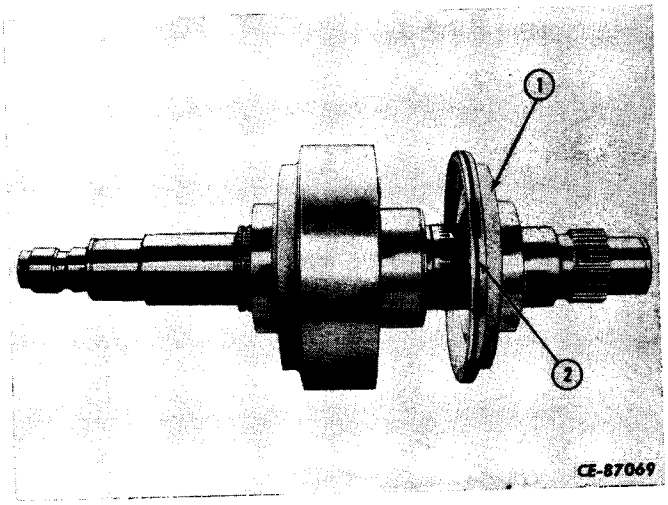


Figure 4-33
Remove Clutch Piston.

NOTE: Do not allow piston housing to fall on bench.

Remove clutch piston (1, Fig. 4-33) and rectangular seal ring (2). Remove special tool.

Remove piston housing (2, Fig. 4-34) and "O" ring (2) from shaft.

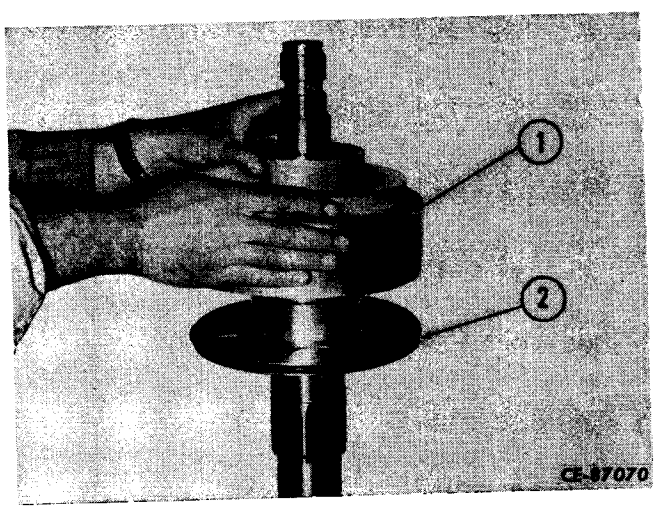


Figure 4-34
Remove Piston Housing.

Remove the hook type seal rings (1, Fig. 4-35) from the clutch shaft assembly.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

CLUTCH PACKS - Continued

Disassembly - Continued

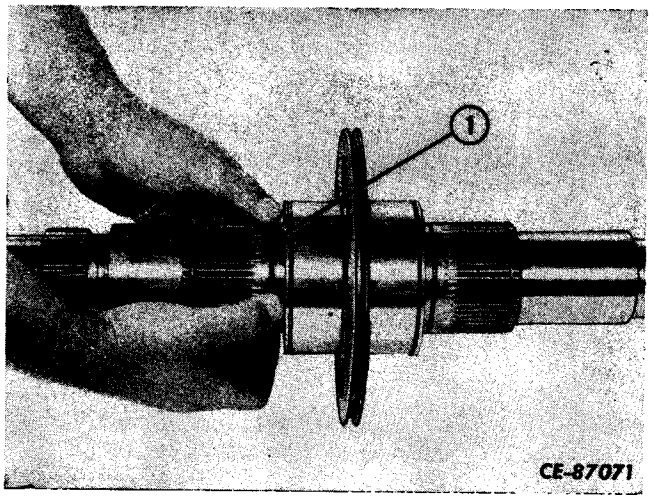


Figure 4-35
Remove Seal Rings.

Remove the accelerating pistons retaining snap rings (3, Fig. 4-36). Remove the accelerating pistons (1). Remove hook type seal rings (2) from pistons.

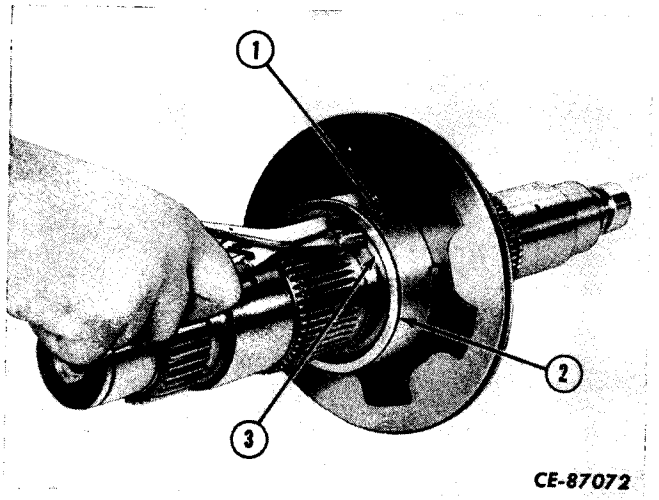


Figure 4-36
Remove Accelerator Pistons.

Remove disc valve (1, Fig. 4-37) reinforcing disc (2), hook type seal ring (3), dowel pins (4). Remove inner and outer compression springs (5) from 2nd range side of separator plate.

The following items are called out for identification: (Fig. 4-38)

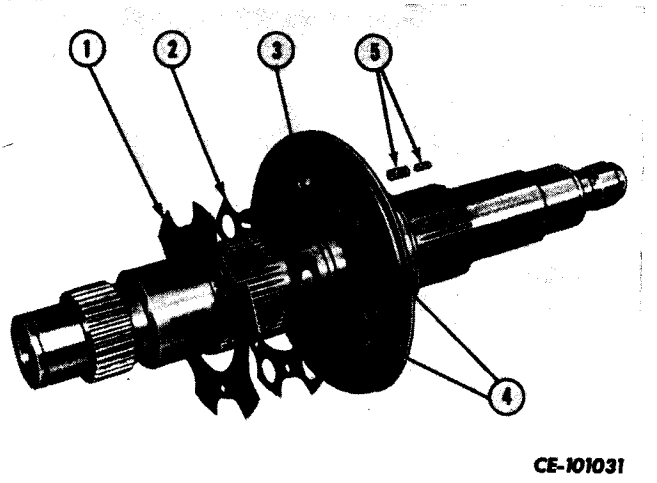


Figure 4-37
Remove Valve and Disc.

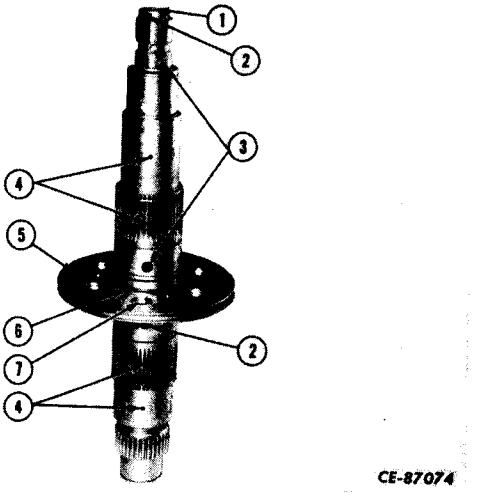


Figure 4-38

1. 3rd gear oil supply plug.
2. 3rd gear oil supply port.
3. 2nd gear oil supply port.
4. Lube oil holes.
5. Separator plate.

DISASSEMBLY, INSPECTION AND ASSEMBLY

6. Separator plate locating snap ring.

7. Oil transfer holes.

NOTE: Shaft is serviced as an assembly only. If locating snap rings, shaft or separator plate are damaged, entire assembly must be replaced.

Cleaning and Inspection

Cleaning and inspection of the clutch components in preparation for assembly should include the following:

a. Cleaning all parts in solvent or plain steam. (Do not use caustic soda.) Use compressed air to dry parts. If steam is used to clean parts, oil immediately thereafter.

b. Inspection of splines on all shafts and gears for excessive wear.

c. Inspection of all sealing surfaces for wear or grooving.

d. Inspection of bearing inner races for pits and spalled areas.

e. Inspection of sintered bronze and steel discs for wear, signs of burning and/or warping. Replace discs if any of these conditions exist.

f. Replacing all seals, hook type seal rings, "O" rings, and snap rings.

g. Inspect the relief orifice in the pistons to be certain they are open.

NOTE: Special Torque recommendations are listed on a single page in this section under "SPECIAL TORQUES." This simplifies revision when necessary. To eliminate constant referral, blank spaces are provided at points where special torques are required. These may be filled in by the manual holder, in pencil, and revised when necessary.

Assembly

Place shaft horizontally on bench. Install new hook type seal rings (2 and 3, Fig. 4-39) on inner shaft grooves.

NOTE: Use caution when installing hook type seal rings to avoid breaking rings.

Be sure roll pins (1, 4, Fig. 4-39) are in place and bores are clean.

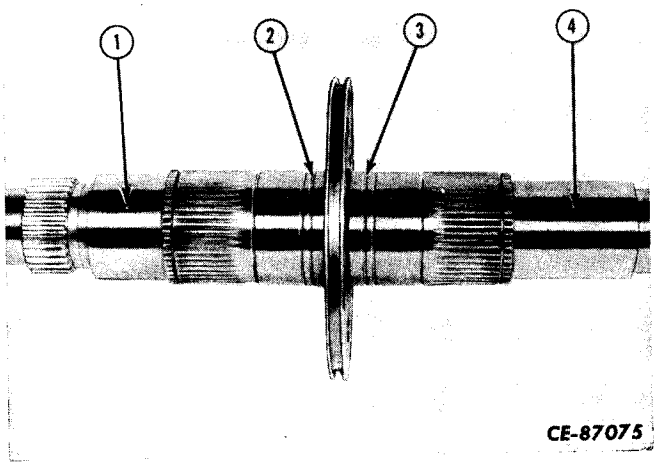


Figure 4-39
Install Seal Rings.

Install dowel pins (4, Fig. 4-37) in separator plate.

Install all required inner and outer compression springs (5) in their bores on the 2nd range side of separator plate.

Install a reinforcing disc (2, Fig. 4-37) and a disc valve (1) on each side of separator plate. Align reinforcing disc and disc valves on dowel pins.

Install a hook type seal ring (1, Fig. 4-40) on each accelerating piston.

(Continued on next page)

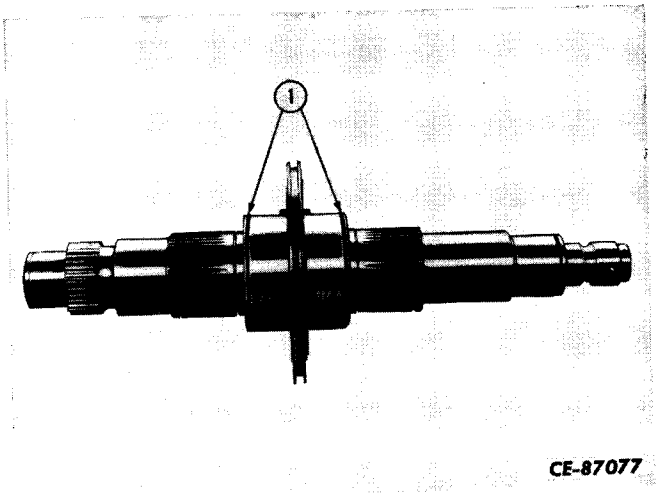


Figure 4-40
Install Seal Ring.

DISASSEMBLY, INSPECTION AND ASSEMBLY

CLUTCH PACKS - Continued

Assembly - Continued

Install pistons on shaft.

> NOTE: Use caution when installing pistons to prevent breaking hook type seal rings on shaft. Lubricate seal rings and inner bore of accelerating pistons liberally with clean transmission fluid or grease before assembling.

Install snap rings (3, Fig. 4-36) that retain accelerating pistons (1).

Place shaft in vertical position with reverse oil supply plug down. Install new hook type seal ring (1, Fig. 4-41) in groove on shaft.

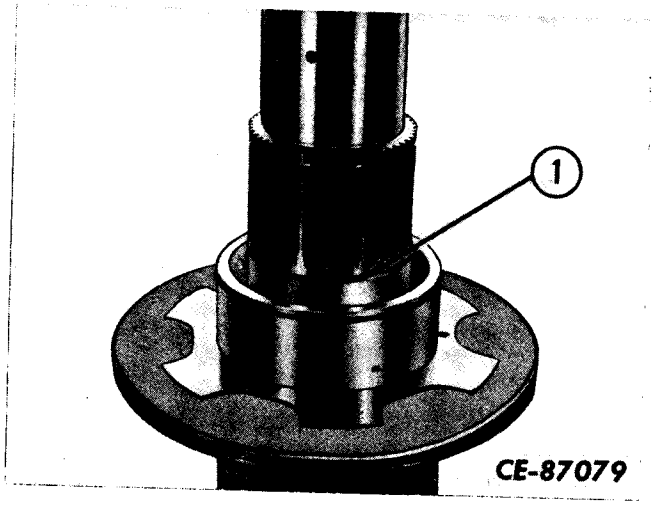


Figure 4-41
Install Seal Ring.

Install new rectangular seal ring (1, Fig. 4-42) on clutch piston outer diameter. Coat seal ring on shaft and accelerating piston and inner bore of clutch piston with grease or clean transmission fluid. Install clutch piston (2) on shaft assembly being careful not to damage hook type seal rings.

Invert shaft. Install new hook type seal ring (2, Fig. 4-43) in groove on shaft. Install new "O" ring (1) on outer diameter of separator plate. Coat both seals with heavy grease. Coat rectangular seal (3) on clutch piston with grease.

Install special snap ring groove filler (refer to "SPECIAL TOOLS"), bevel edge up in groove of piston housing. Lubricate groove area and mouth of piston housing with heavy grease.

Install piston housing (1, Fig. 4-44) on shaft assembly.

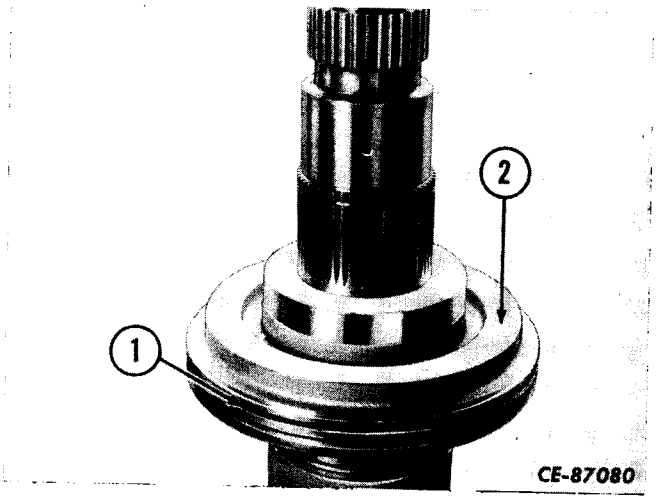


Figure 4-42
Install Seal Ring.

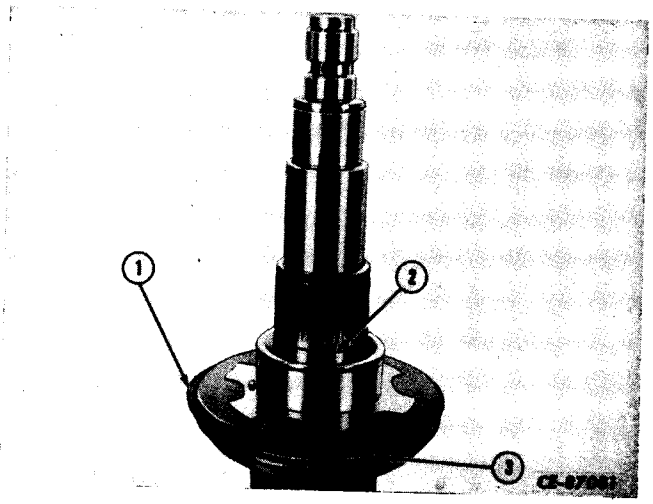


Figure 4-43
Install Seal Ring.

NOTE: The "O" ring (3) is larger in diameter than separator plate. This design allows inside diameter of piston housing (1) to compress seal ring to proper fit.

Carefully "feed in" "O" ring seal (3) while applying pressure to piston housing (1). Push piston housing over "O" ring seal and clutch piston (2).

> NOTE: Care must be taken during assembly to prevent cutting or otherwise damaging seal rings.

Invert shaft assembly. Depress clutch piston (1, Fig. 4-30) into piston housing. Remove special snap ring groove filler. Install snap ring (2).

DISASSEMBLY, INSPECTION AND ASSEMBLY

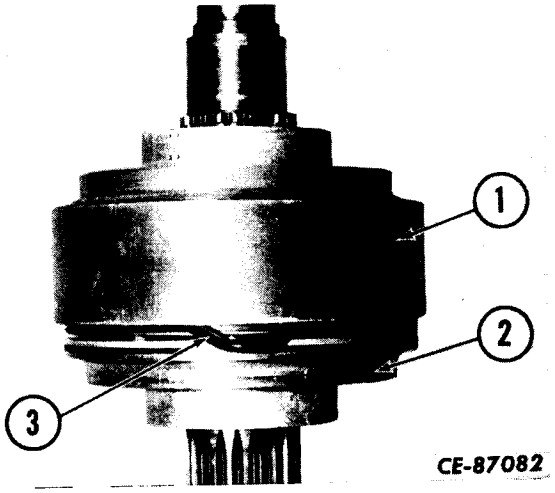


Figure 4-44
Install "O" Ring.

Apply air pressure to oil port holes to check operation of clutches. The clutch piston/piston housing assembly should move freely (Fig. 4-45).

◆ CAUTION: DO NOT exceed 689 kPa (100 psi) air pressure.

NOTE: The next five steps apply to both sides of clutch pack.

Install hub assembly (2, Fig. 4-46) and hub retainers (1). Tighten the retaining cap screws (3) to the recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

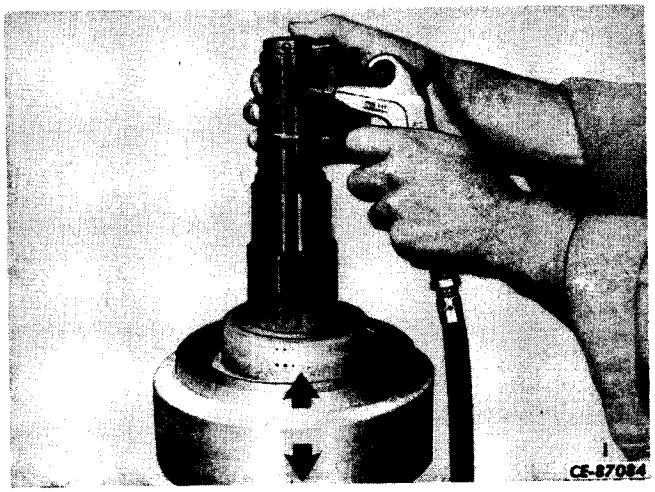


Figure 4-45
Check Clutch Operation.

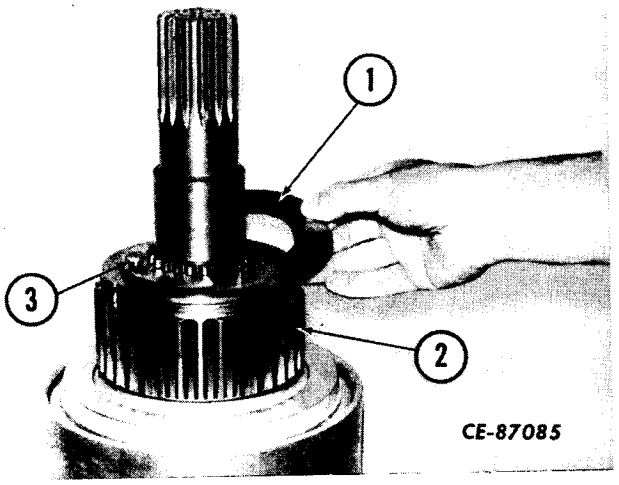


Figure 4-46
Install Hub and Retainer.

Install clutch spacer (3, Fig. 4-47) over retainer cap screws.

Install the clutch plate with the organic side facing toward the piston.

Install the correct number of steel and bronze plates (2, Fig. 4-47) (refer to "SERVICE INFORMATION" and current Parts Manual). Install the clutch backing plate (1).

(Continued on next page)

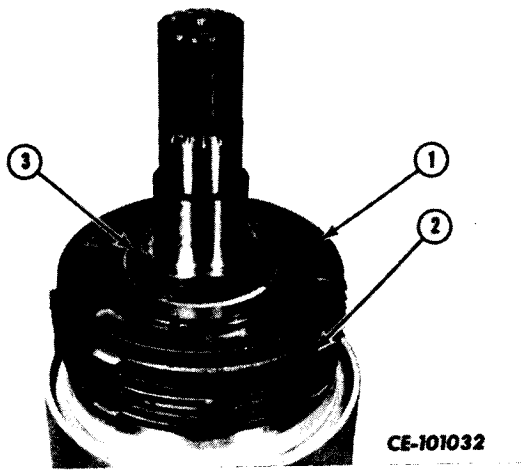


Figure 4-47
Install Clutch Plates.

DISASSEMBLY, INSPECTION AND ASSEMBLY

CLUTCH PACKS – Continued
ASSEMBLY - Continued

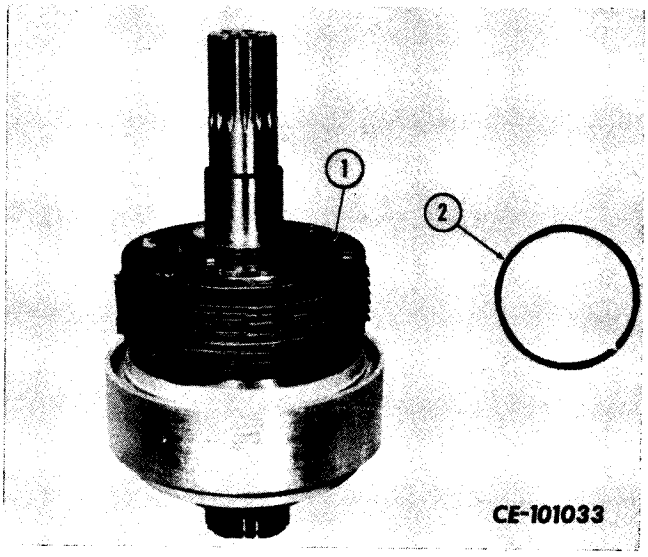


Figure 4-48
Install Snap Ring.

Install external snap ring (2, Fig. 4-48) in hub recess (1).

Install Spir-O-Lox retaining ring (1, Fig. 4-49) in backing plate (3). This locks in the external snap ring (2).

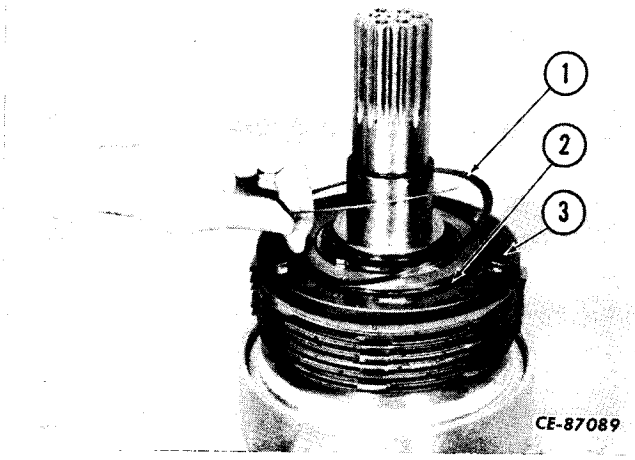


Figure 4-49
Install Retaining Ring.

Install thrust washers (4, Fig. 4-22), thin washer first, and needle thrust bearing (9) on 1st range clutch shaft. Install roller bearings (8) on shaft. Lubricate bearing surface of gear and drum assembly (5) with grease and install assembly on shaft. Install thrust washers (6) and needle thrust bearing (7) on shaft. Install spacer (3) and gear (2) on shaft. Press on bearing cones (1).

Install thrust washers (10, Fig. 4-21) and needle thrust bearing (5) on 2nd and 3rd clutch shaft. Install roller bearing (4). Install roller bearings (9) and install spacer (7) on shaft. Lubricate bearing surfaces of gear and drum assemblies (6) with grease and install on shaft. Install thrust washers (3), needle thrust bearing (11), gear (2) and spacer (8). Press bearing cones (1) on shaft.

Install thrust washers (5, Fig. 4-20) and needle thrust bearings (4) on directional clutch shaft. Install roller bearings (3) with spacers (7) on shaft. Lubricate bearing surfaces of gear and drum assemblies (8) with grease and install them on shaft. Install thrust washers (2) and needle thrust bearings (6). Press bearing cones (1) on shaft.

CONTROL VALVE

Removal

Follow the necessary steps described under "TRANSMISSION, DISASSEMBLY" in this section to remove control valve from transmission.

Disassembly

Remove cap screws (2, Fig. 4-50) that secure two halves of valve assembly (1) together.

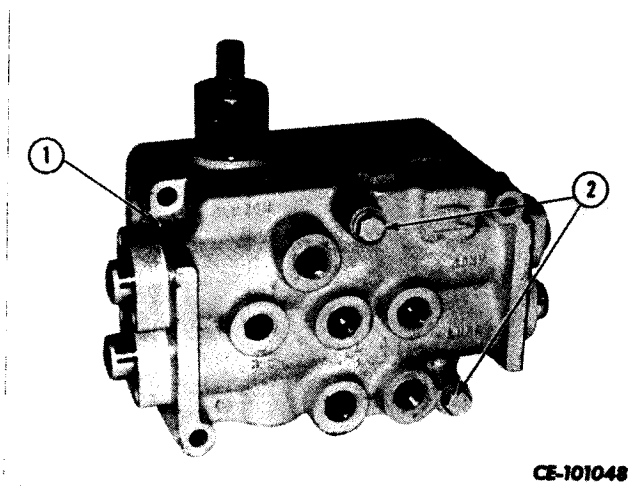


Figure 4-50
Separate Valve Sections.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Separate valve halves (2, Fig. 4-51) taking care not to damage finished surfaces of valves. Remove and discard "O" rings (1).

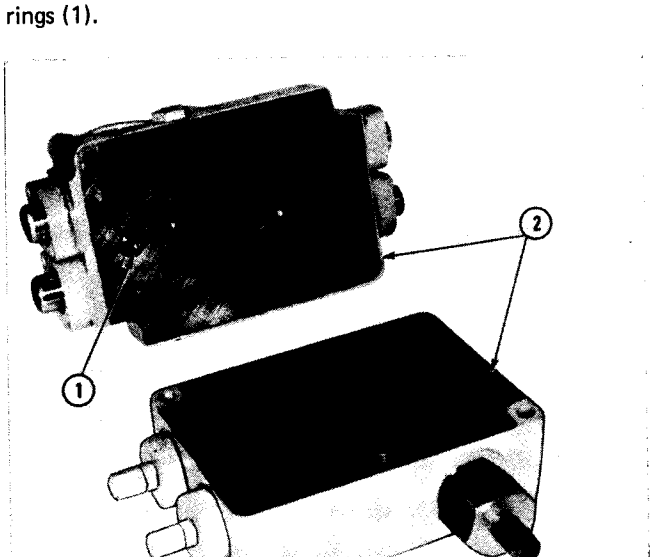


Figure 4-51
Remove "O" Rings.

Remove plug (2, Fig. 4-52), spring (3) and detent ball from valve (4). Remove and discard "O" ring (1). Remove end caps (5) from ends of top spool (6).

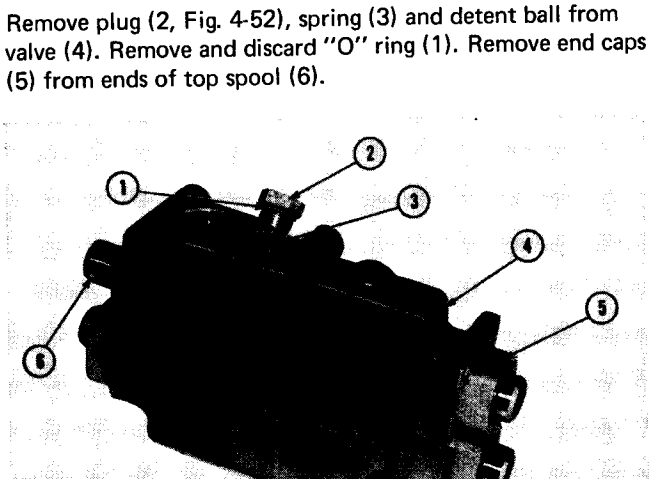


Figure 4-52
Remove Caps.

Remove neutral safety switch and detent ball from port just under plug (2, Fig. 4-52).

Remove and discard "O" rings (2, Fig. 4-53) and seals (1) from end caps (3).

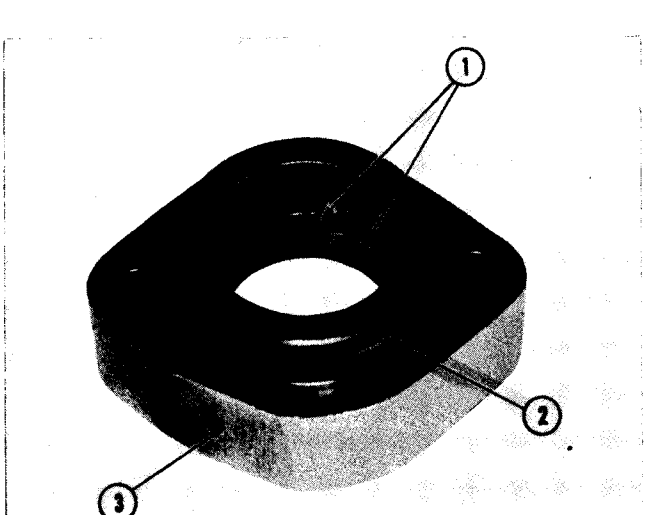


Figure 4-53
Remove "O" Ring and Seal.

Carefully slide spool (2, Fig. 4-54) out of valve body (1). Remove snap ring (3) from spool.

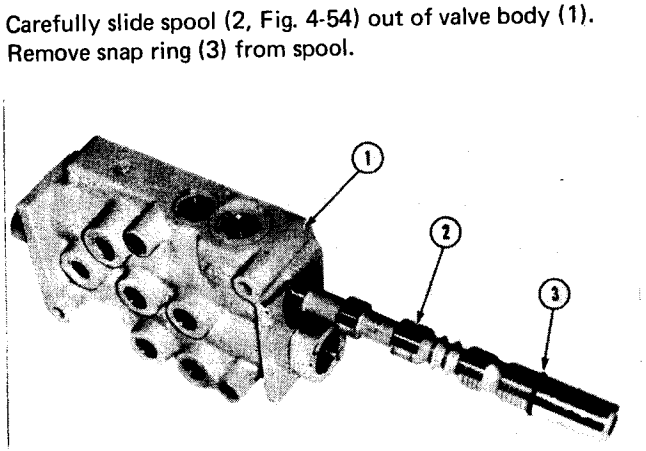


Figure 4-54
Remove Upper Spool.

Remove end caps from ends of bottom spool (1, Fig. 4-55). Carefully slide spool out of valve body (3). Remove snap ring (2) from spool.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

CONTROL VALVE - Continued

Disassembly - Continued

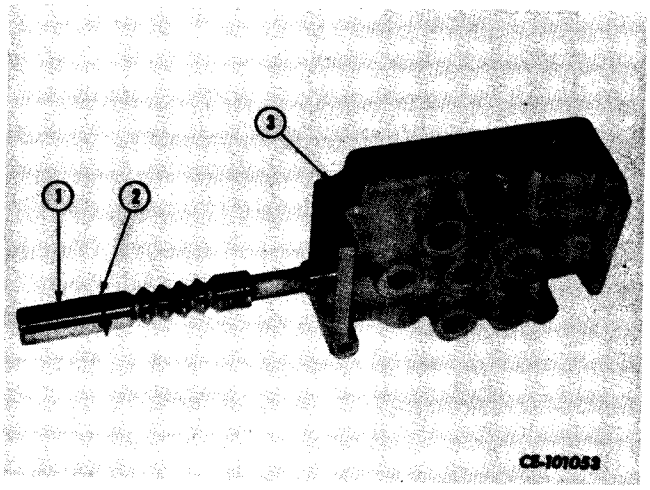


Figure 4-55
Remove Lower Spool.

Remove cartridge valves (1, Fig. 4-56) from other valve half (2).

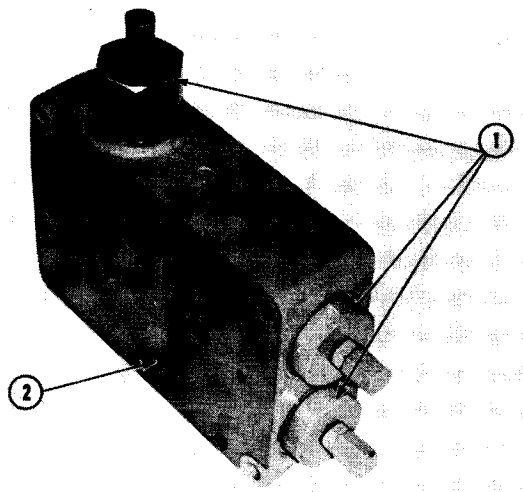


Figure 4-56
Remove Cartridge Valve.

Remove and discard "O" rings (1, Fig. 4-57) from cartridge valves (2).

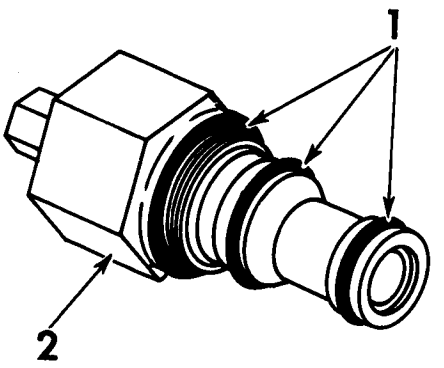


Figure 4-57
Remove "O" Rings.

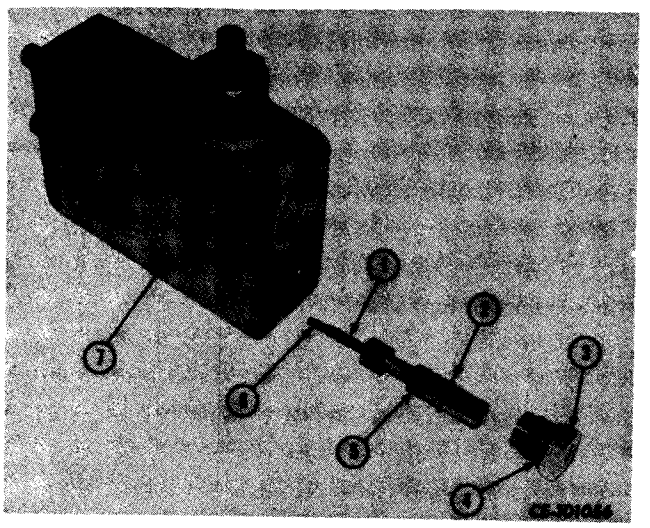


Figure 4-58
Remove Spool.

Remove plug (3, Fig. 4-58), disconnect spool (5), spring (1) and dowel (6) from valve body (7). Remove and discard "O" ring (4).

Cleaning and Inspection

Wash all parts in clean solvent and dry with compressed air. Flush valve bodies with clean solvent and compressed air. Inspect all valve plungers and bores for scoring and/or excessive wear. Replace all unserviceable parts. Replace all "O" rings. Use a liberal amount of clean, new transmission oil on plungers during assembly.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Assembly

Install new "O" ring (4, Fig. 4-58), lubricated with clean transmission fluid, on plug (3). Install snap ring (2) on disconnect spool (5). Insert spring (1) and dowel (6) into end of spool. Install spool and plug in valve body (7). Tighten plug.

Install new "O" rings (1, Fig. 4-57) on cartridge valves (2). Lubricate "O" rings thoroughly with clean transmission fluid.

Install cartridge valves (1, Fig. 4-56) in valve half (2).

Install new seals (1, Fig. 4-53) and "O" rings (2) on all end caps (3). Lubricate "O" rings and lips of seals with clean transmission fluid.

Install snap ring (2, Fig. 4-55) on bottom spool (1). Carefully slide spool, lubricated with clean transmission fluid, into valve body (3). Install end caps on both ends of spool and secure to valve body with socket head screws.

Install snap ring (3, Fig. 4-54) on upper spool (2). Carefully slide spool, lubricated with clean transmission fluid, into valve body (1). Install end caps on both ends of spool and secure to valve body with socket head screws.

Insert detent ball and spring (3, Fig. 4-52) into valve (4). Insert detent ball and neutral safety switch into port below plug (2, Fig. 4-52). Install new "O" ring (1), lubricated with clean transmission fluid, on plug (2) and secure plug in valve body.

Install new lubricated "O" rings (1, Fig. 4-51) in valve recesses. Place two valve halves (2) together and secure with cap screws (2, Fig. 4-50).

Installation

Follow the necessary steps described under "TRANSMISSION, ASSEMBLY" in this section to install control valve on transmission.

TROUBLE SHOOTING

Diagnostic Checks to be Made When Trouble Occurs:

(1) Transmission sump oil level.
(2) Cleanliness of oil and oil filter.
(3) Air flow through oil cooler.
(4) Condition of all oil lines and fittings.
(5) Condition of all wiring and connections.
(6) Engine-converter stall speed.
(7) Proper linkage positioning of all valves and levers.
(8) Converter and transmission oil pressures.
(9) All drive lines and mounting brackets for tightness.

COMPLAINT	CAUSE	REMEDY
High engine speed at converter stall.	1. Low transmission sump oil level. 2. Low converter charging pressure at stall. 3. Slipping clutch. 4. Foaming oil. 5. Disconnect spool sticking.	1. Add oil to proper level. 2. (a) Check external lines for leaks. (b) See low converter charging pressure. 3. (a) Cross check clutches by applying other clutches to varify slipping. (b) Observe movement in drive line between converter and transmission. 4. (a) Low oil level. (b) Water in oil. (c) Oil line suction leak. (d) Improper oil. 5. (a) Clean and inspect valve body bore. (b) Inspect valve spring.

(Continued on next page)

TROUBLE SHOOTING

COMPLAINT	CAUSE	REMEDY
Low engine speed at converter stall.	1. Low engine output. 2. Stator installed backwards. 3. Excessive oil in converter housing. 4. Plugged or restricted accessory drive and torque converter housing drain line.	1. Tune engine and check output. 2. Disassemble converter and check stator. 3. (a) Charging pump seal worn. (b) Charging pump seal failure. (c) Excessive charging pump wear. 4. Clean or replace drain line.
High oil temperature.	1. Low transmission sump oil level. 2. High transmission sump oil level. 3. Foamed oil. 4. Clogged oil cooler. 5. Low converter charging pressure. 6. Improper vehicle operation. 7. Stator assembled in converter backwards. 8. Low oil flow thru converter.	1. Add oil to proper level. 2. Drain oil to proper level. 3. (a) Check oil level. (b) Air leaks in suction lines. 4. Clean oil cooler. 5. See low converter charging pressure. 6. (a) Operate in correct range. (b) Downshift into lower range. (c) Remaining in stall too long. 7. (a) Check converter stall. (b) Disassemble converter and check stator. 8. Check charging pump for excessive wear.
Slow or erratic clutch engagement.	1. Low transmission sump oil level. 2. Clogged suction line screen. 3. Foamed oil. 4. Improper linkage adjustment. 5. Low clutch pressure. 6. Clutch pressure regulator valve stuck. 7. Disconnect valve sticking. 8. Internal oil leaks.	1. Add oil to proper level. 2. Remove and clean. 3. Eliminate air leak into pump suction line. 4. (a) Free linkage and adjust. (b) Check control valve positioning. 5. See low clutch pressure. 6. Clean and inspect valve. 7. (a) Clean and inspect valve body bore. (b) Inspect valve spring. 8. (a) Cross check clutches by applying other clutches. (b) Damaged or worn seals in clutch pack. (c) Damaged oil transfer tubes. (d) Damaged or worn shaft seals. (e) Overhaul transmission.
High clutch pressure.	1. Improper main pressure regulator valve operation. 2. Stuck converter regulator valve.	1. Clean and inspect. 2. Clean and inspect.
Low clutch pressure.	1. Low transmission sump oil level. 2. Clogged oil filter or transmission sump oil screen. 3. Foamed oil. 4. External oil leaks. 5. Improper clutch pressure regulator valve operation.	1. Add oil to proper level. 2. Clean and/or replace. 3. (a) Eliminate air leaks in suction line. (b) Tighten fittings. (c) Check oil level. 4. Check external oil lines. 5. (a) Clean and inspect. (b) Check valve body bore.

TROUBLE SHOOTING

COMPLAINT	CAUSE	REMEDY
Low clutch pressure. (Cont)	6. Worn charging pump. 7. Disconnect valve sticking. 8. Internal oil leaks.	6. Overhaul input oil pump. 7. (a) Clean and inspect valve. (b) Inspect valve spring. 8. (a) Watch for excessive pressure drop in a specific direction or range clutch. (b) Overhaul transmission.
High converter charging pressure.	1. Clogged oil cooler. 2. Stuck converter regulator valve. 3. Stuck lube pressure regulator valve.	1. Remove and clean. 2. (a) Clean and inspect valve body bore. (b) Inspect valve spring. 3. (a) Clean and inspect valve body bore. (b) Inspect valve spring.
Low converter charging pressure.	1. Low transmission sump oil level. 2. Low clutch pressure. 3. External oil leak. 4. Converter regulator valve sticking. 5. Internal oil leak.	1. Add oil to proper level. 2. See low clutch pressure. 3. Check external lines for leaks. 4. Clean and inspect valve. 5. Overhaul converter.
Low lube pressure.	1. Low oil level. 2. Worn charging pump. 3. Stuck lube pressure regulator valve. 4. Internal leaks.	1. Correct oil level. 2. Overhaul charging pump. 3. Clean and inspect valve. 4. Overhaul transmission.
High lube pressure.	1. Stuck lube pressure regulator valve.	1. Clean and inspect valve.
Loss of power.	1. Low engine output. 2. Stator assembled backward. 3. Low converter charging pressure. 4. Direction or range selector valves inoperative. 5. Improper vehicle operation. 6. Parking brake dragging. 7. Foaming oil. 8. Slipping clutches. 9. Vehicle brakes dragging.	1. See low engine speed at converter stall. 2. Disassemble converter and check stator. 3. See low converter charging pressure. 4. (a) Check linkage. (b) Disassemble valve bodies and inspect. 5. Operate in proper range for load and terrain. 6. (a) Adjust linkage to allow full release. (b) Release brake. 7. (a) Correct oil level. (b) Check for air leak in suction line. (c) Oil used not meeting specifications. 8. See low clutch pressure. 9. (a) Adjust brakes. (b) Check brake linkages.
Vehicle drives in one direction but stalls when shifted to the opposite direction.	1. Failed directional clutch.	1. Overhaul transmission.
Vehicle drives in one range but stalls when shifted to another range.	1. Failed range clutch.	1. Overhaul transmission.

(Continued on next page)

TROUBLE SHOOTING

COMPLAINT	CAUSE	REMEDY
All range pressures normal in one direction but all low in opposite direction.	1. Directional selector valve linkage out of adjustment. 2. Internal oil leaks in forward or reverse clutch.	1. Adjust linkage. 2. Overhaul transmission.
Low clutch pressure in one range clutch in either direction.	1. Linkage out of adjustment. 2. Internal oil leaks in clutch.	1. Adjust linkage. 2. Overhaul transmission.

SERVICE INFORMATION

OPERATING RANGES

Torque converter charging pressure	414-552 kPa (*60-80 psi)
Clutch apply pressure	1241-1378 kPa (*180-200 psi)
Lube pressure	69-345 kPa (*10-50 psi)
Transmission temperature range:	
Desired operating	82,2°C (180°F)
Maximum operating	121,1°C (250°F)

TOLERANCES

Forward and reverse shaft end play	.178-.279 mm (.007-.011 in)
Reverse idler shaft end play	.178-.279 mm (.007-.011 in)
1st gear clutch shaft end play	.178-.279 mm (.007-.011 in)
2nd and 3rd gear clutch shaft end play	.178-.279 mm (.007-.011 in)
Output shaft end play	.279-.356 mm (.010-.014 in)

SPECIAL TORQUES

Output yokes retaining nuts	813-1085 N·m (600-800 ft-lbs)
Input yoke retaining nut	271-407 N·m (200-300 ft-lbs)
Transmission mounting (Standard coated hardware):	
Mount to transmission housing	264-278 N·m (195-205 ft-lbs)
Trunnion to frame	427-441 N·m (315-325 ft-lbs)
Top support (both ends)	264-278 N·m (195-205 ft-lbs)
Transmission mounting (Phosphate-coated hardware):	
Mount to transmission housing	380 N·m (280 ft-lbs)
Trunnion to frame	610 N·m (450 ft-lbs)
Top support (Both ends)	380 N·m (280 ft-lbs)

PRINTED IN UNITED STATES OF AMERICA

SERVICE INFORMATION

SPECIAL TOOLS

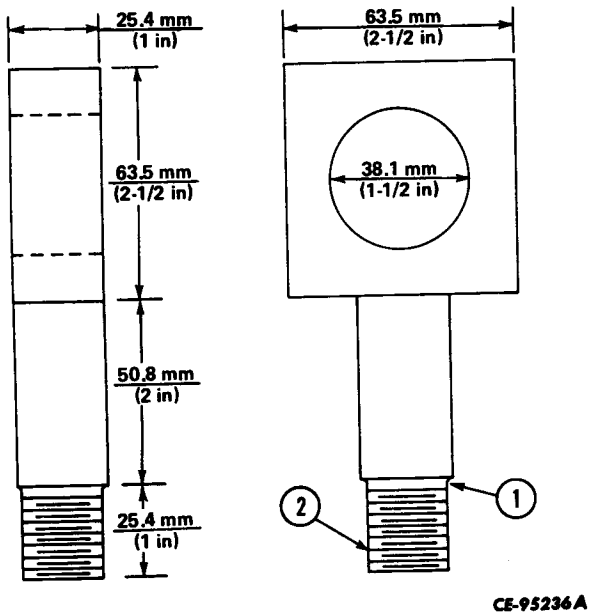


Figure 4-59
Lifting Eye.

1. 1,58 mm (1/16 in) Min.
2. 3/4NC thread.

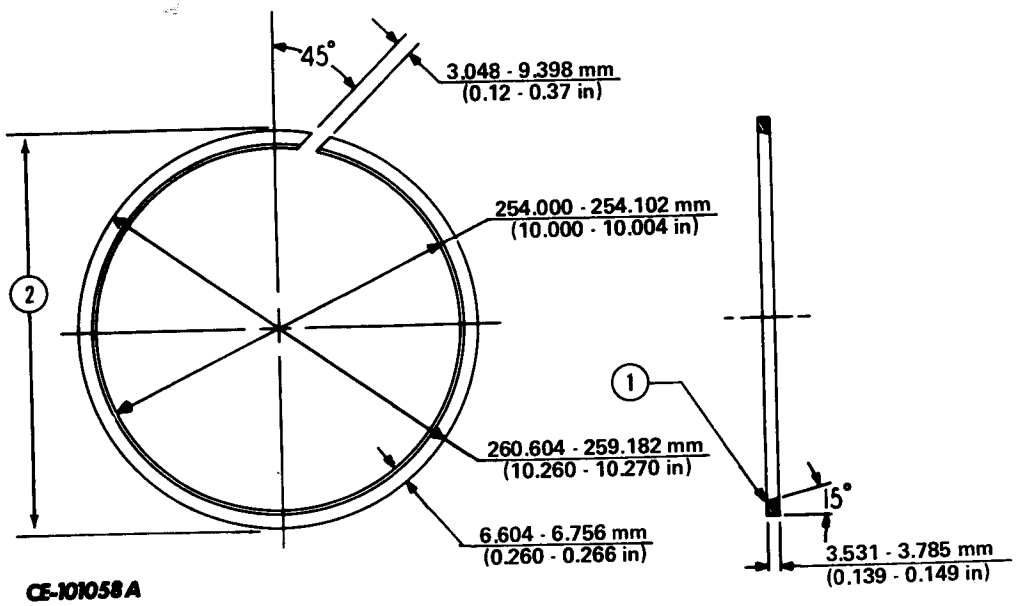


Figure 4-60
Snap Ring Groove Filler.

1. .254 mm (.01 in) radius max. — 4 corners
2. Ring must pass thru 254,0 - 254,102 mm (10,000 - 10,004 in) diameter.

SERVICE INFORMATION

SPECIAL TOOLS - Continued

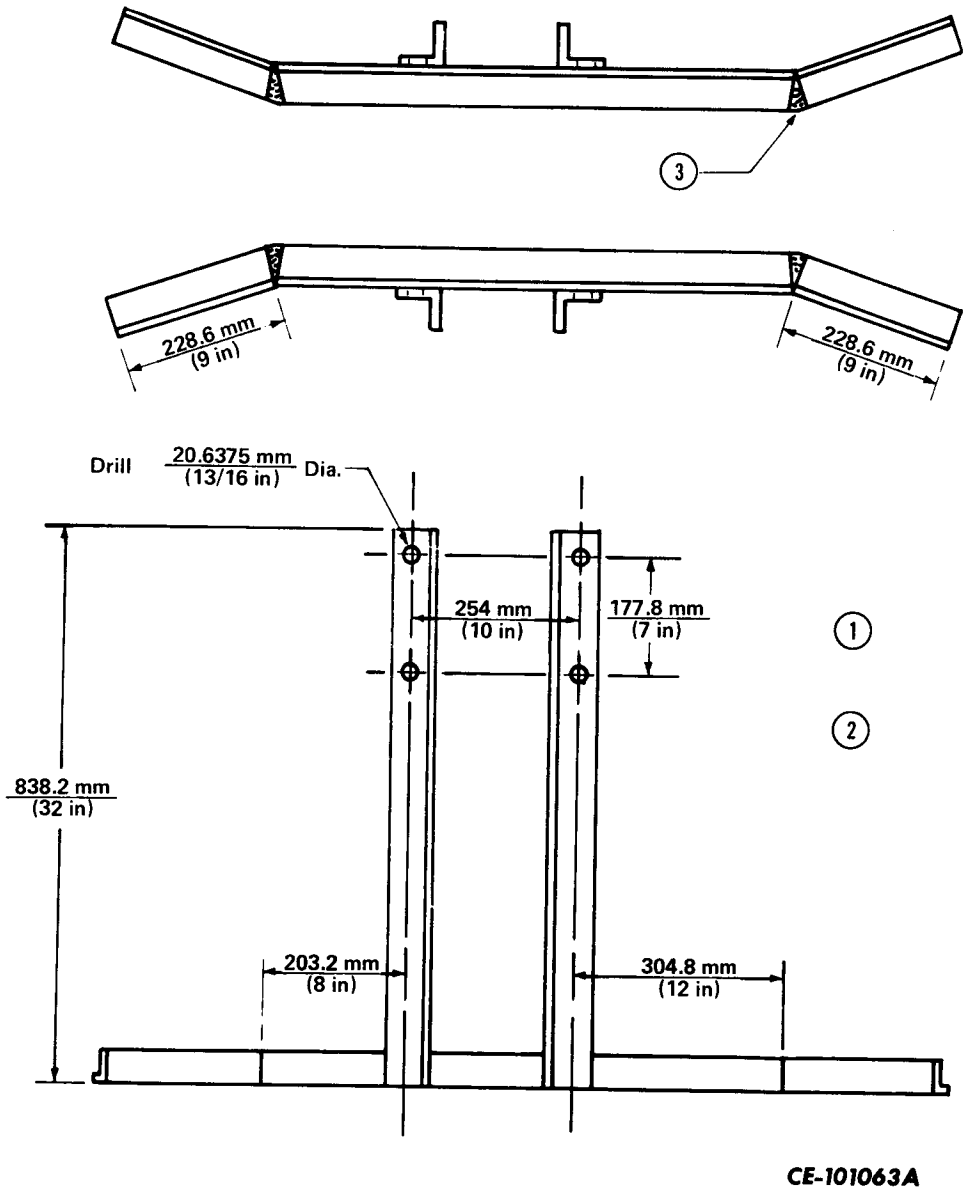


Figure 4-61
Transmission Stands.

1. Material – Angle iron – 50,8 x 50,8 mm (2 x 2 in)
2. Make 2 stands – right and left hand
3. Cut, bend 19,05 mm (3/4 in) and weld

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

DESCRIPTION

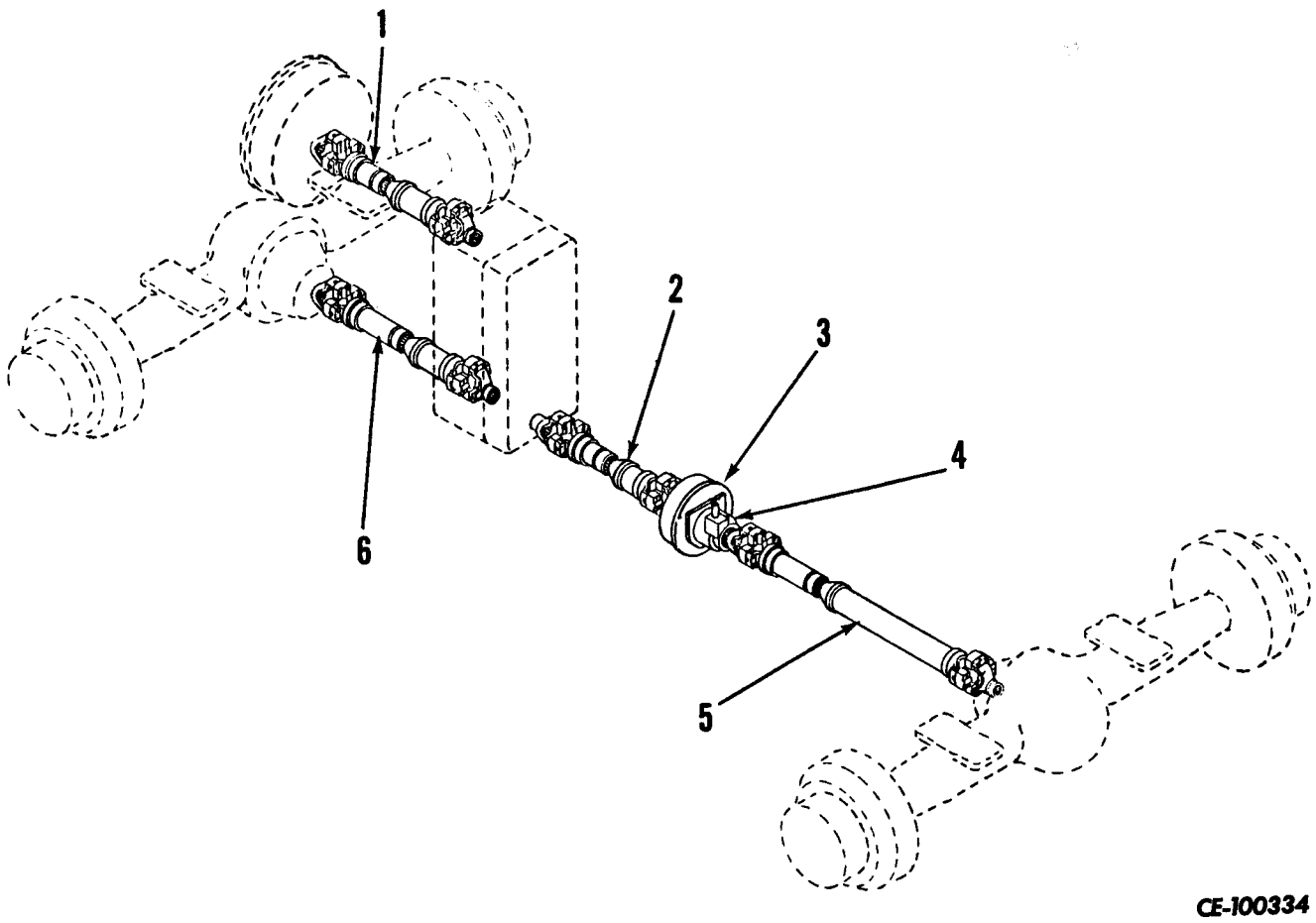


Figure 5-1
Drive Shafts.

1. Drive shaft, torque converter-to-transmission.
2. Drive shaft, transmission-to-transfer drive.
3. Parking brake assembly.
4. Transfer drive assembly.
5. Drive shaft, transfer drive-to-front differential.
6. Drive shaft, transmission-to-rear differential.

GENERAL INFORMATION

DESCRIPTION - Continued

Drive Shafts

The purpose of the drive shafts is to transmit power. All drive shafts on the tractor are similar in construction. (Fig. 5-2.) A universal joint located at each end of the shaft permits pivoting in all directions and accommodates any misalignment. A slip joint is provided, allowing the shaft to telescope, compensating for changes in distance between the connected components. During normal operation, the rear axle undergoes considerable vertical movement due to surface irregularities and varying axle loads. Each time these conditions are encountered, a proportional change in the overall length of the drive shaft occurs. The slip joint accommodates these variations by telescoping. This eliminates the forces of tension that would be present in a shaft not so equipped.

Transfer Drive

The transfer drive (Fig. 5-3) transmits power from the transmission to the front differential across the tractor articulation point. The transfer drive consists of a shaft supported by two roller bearing assemblies, held in a lubricant filled housing. A yoke is attached to each end of the shaft. The parking brake assembly is mounted on the rear of the transfer drive assembly.

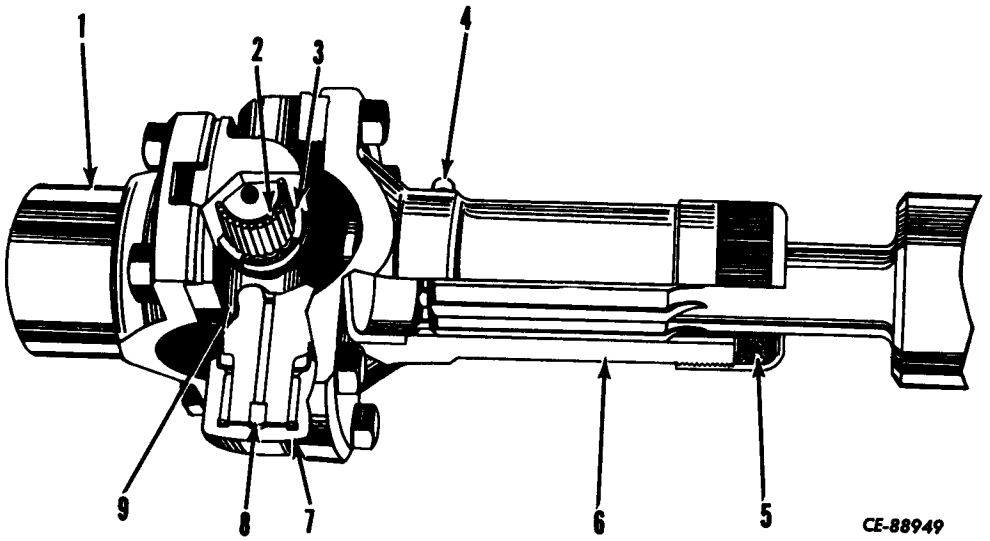


Figure 5-2
Universal Joint.

1. Yoke.
2. Roller bearing.
3. Grease seal.
4. Grease fitting.
5. Grease seal.
6. Slip yoke.
7. Bearing cap.
8. Lube channel.
9. Spider.

GENERAL INFORMATION

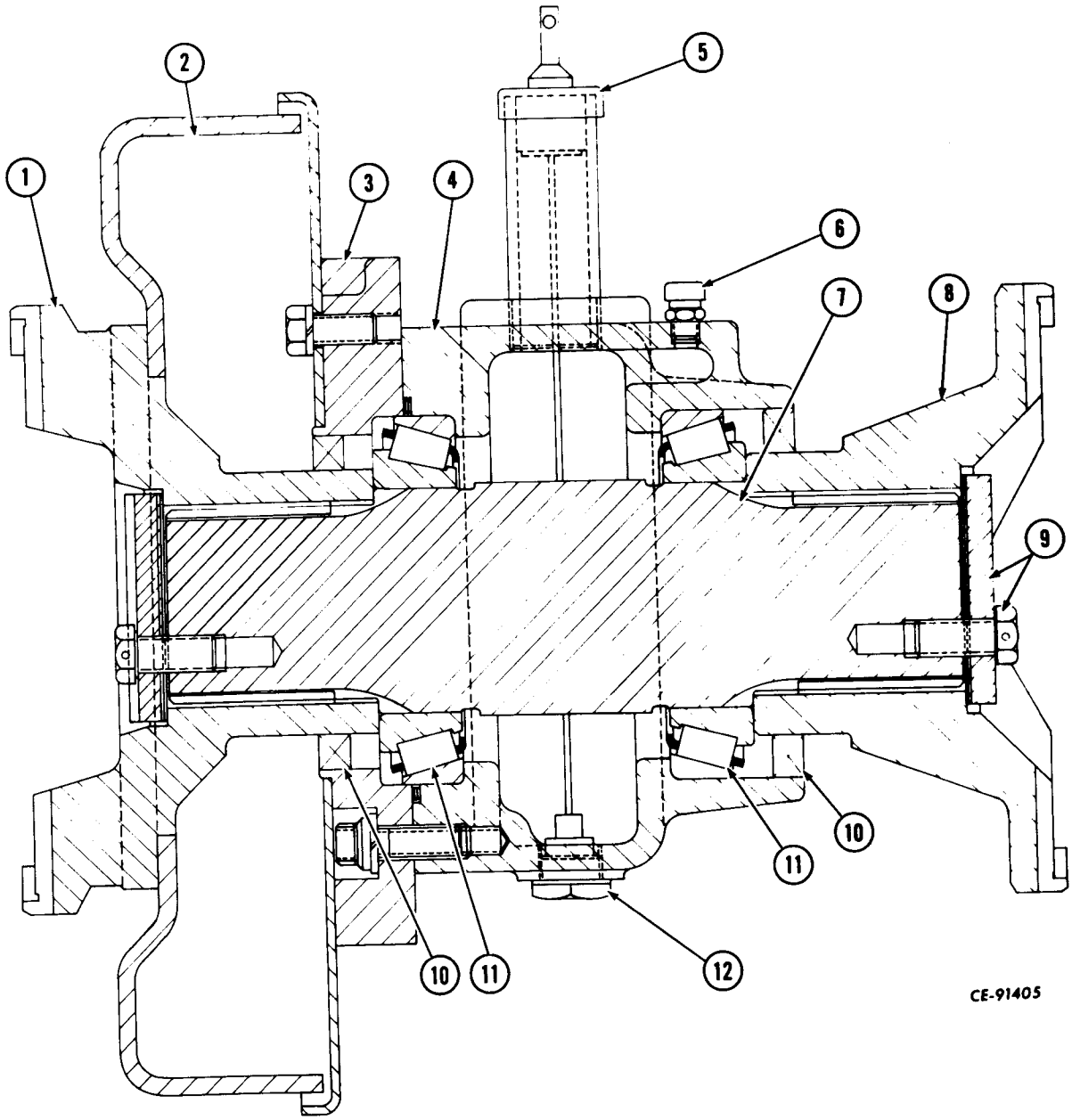


Figure 5-3
Transfer Drive.

1. Rear yoke.
2. Parking brake assembly.
3. Cover.
4. Housing.
5. Dipstick and filler tube.
6. Breather.
7. Shaft.
8. Front yoke.
9. Retainer and cap screws.
10. Seal.
11. Bearing.
12. Drain plug.

DISASSSEMBLY, INSPECTION AND ASSEMBLY

DRIVE SHAFTS

General

All drive shafts on the tractor are similar and are serviced in the same manner.

Prepare tractor for drive shaft removal as follows:

a. Park tractor on a level surface.

b. Lower bucket to ground level.

c. Securely block wheels to prevent tractor from rolling.

Removal

Remove cap screws and lock nuts from each end of drive shaft. Using a small pry bar, apply leverage to telescope slip yoke inward. Remove drive shaft from tractor.

Disassembly

Place drive shaft on a clean work bench.

Remove cap screws (1, Fig. 5-4) and lock nuts (2) that secure spider and bearing assembly (3) to yoke (4).

NOTE: The bearing caps (5) may stick in yoke grooves. Tap them at an angle with a soft hammer to unseat.

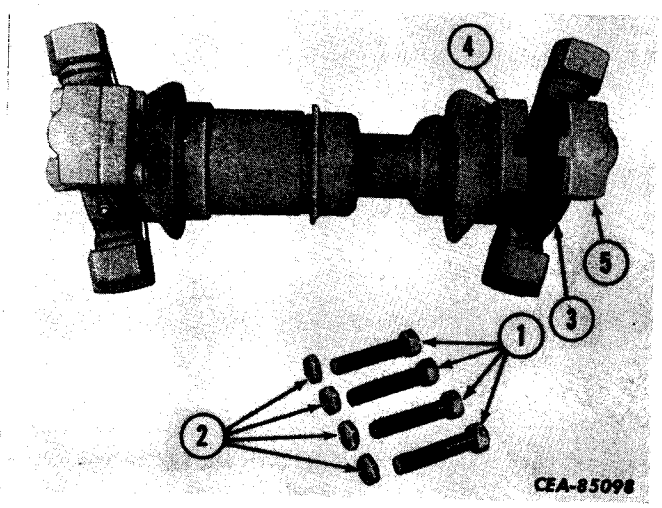


Figure 5-4
Remove Yoke.

Cut strap (1, Fig. 5-5) that holds bearing assemblies (2) on spider (3). Remove grease seals (4) and bearing assemblies from spider.

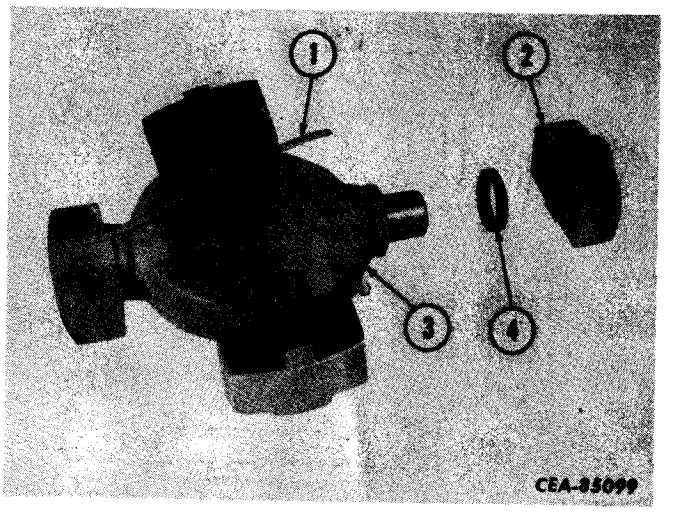


Figure 5-5
Remove Bearings.

Punch mark slip yoke (1, Fig. 5-6) and splined shaft (2) so they will be reassembled in same alignment.

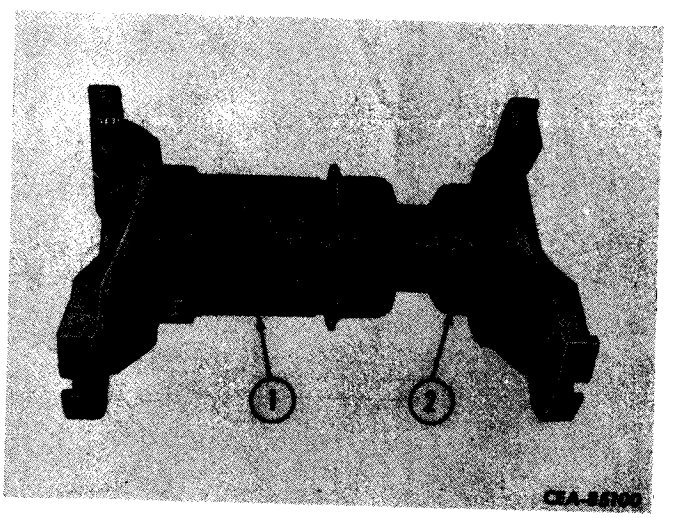


Figure 5-6
Remove Shaft.

Unscrew packing retainer (1, Fig. 5-7) and slide it back on splined shaft. Remove slip yoke (4), packing retainer washers (2) and packing (3).

DISASSEMBLY, INSPECTION AND ASSEMBLY

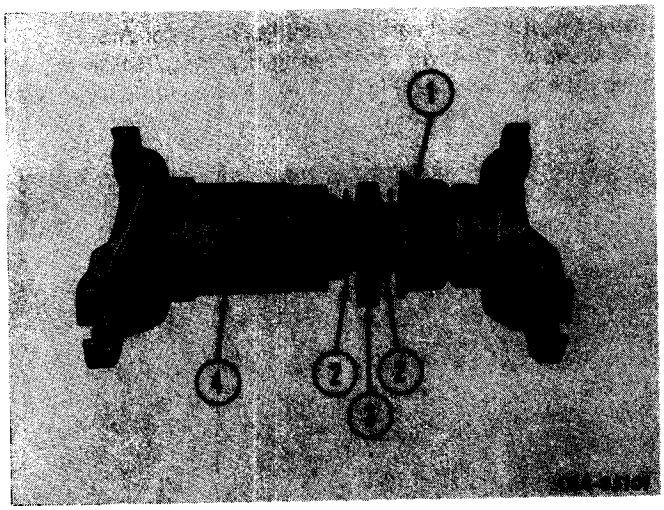


Figure 5-7
Remove Packing.

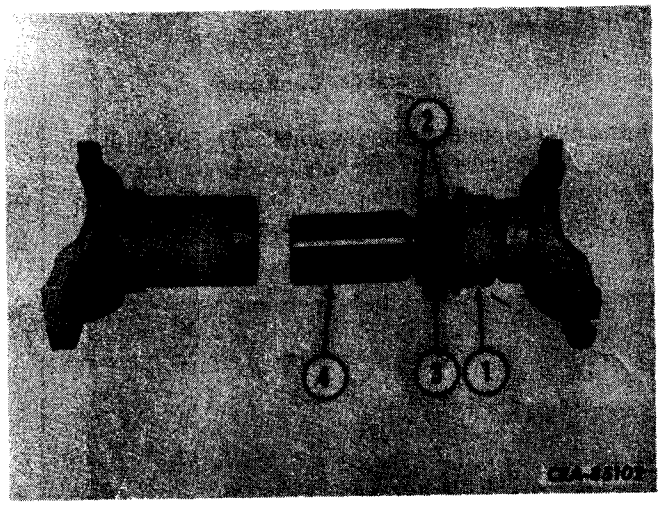


Figure 5-8
Assemble Packing.

Cleaning and Inspection

Clean all parts in solvent. Remove all burrs and rough spots from the yoke flanges and from slip joint splines. Use a fine tooth file or an India stone. Do not disassemble the bearing assemblies. Clean them with a brush and dry with compressed air.

Inspect the drive shaft for signs of torsional fractures or other indications of impending failure.

Parts that are to be assembled immediately should be coated with light oil to prevent corrosion. If parts are to be sorted, coat them with a good grade rust preventive, and wrap them in paper treated to prevent corrosion.

Replace all seals and packings.

Place bearing assemblies on spider and check for wear. If they are worn, replace complete spider and bearing assembly.

Assembly

Place packing retainer (1, Fig. 5-8), packing (3), and packing retainer washers (2) on splined shaft (4) as shown. Use new packing. Coat shaft splines liberally with chassis grease.

Slide slip yoke (2, Fig. 5-9) onto splined shaft (1) aligning punch marks made during disassembly. Screw packing retainer (3) onto slip yoke and tighten it enough to avoid leakage when shaft is greased.

(Continued on next page)

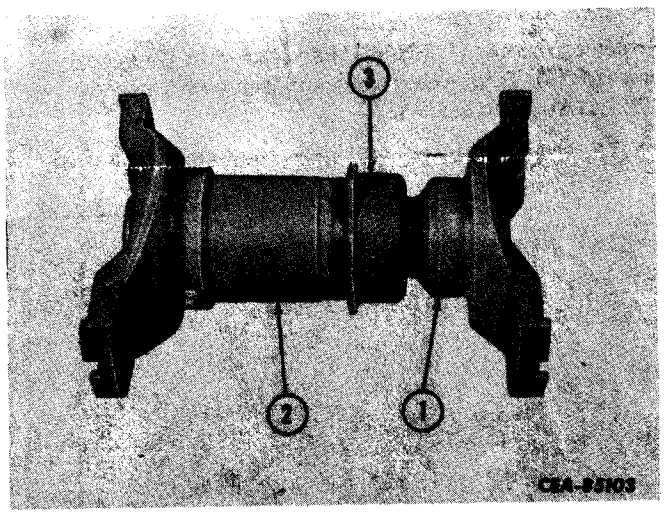


Figure 5-9
Assemble Yoke.

DISASSEMBLY, INSPECTION AND ASSEMBLY

DRIVE SHAFTS - Continued

Assembly - Continued

Install two opposite bearing assemblies (1, Fig. 5-10) on spider (2). Install spider assembly in yoke by inserting the lug on bearing cap into groove in yoke (3) as shown. Tap opposite bearing cap at an angle to seat spider and bearing assembly.

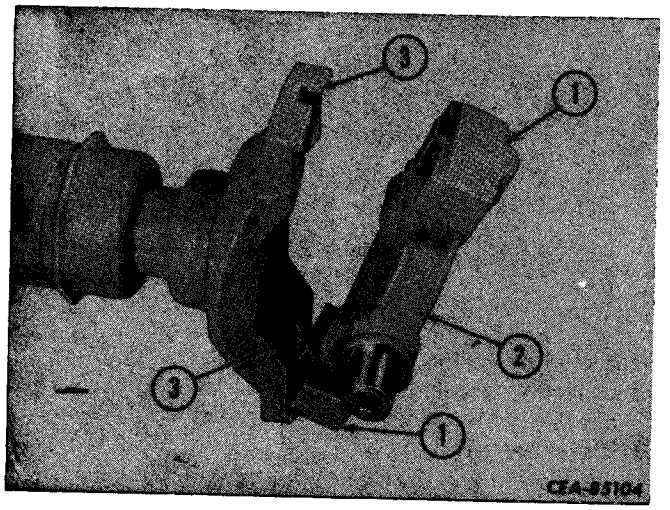


Figure 5-10
Install Spider.

Install cap screws (1, Fig. 5-11) and lock nuts (2) in bearing caps (3). Torque cap screws and lock nuts (refer to "SPECIAL TORQUES").

NOTE: Use new lock nuts (2) when assembling drive shaft.

Torque: _____

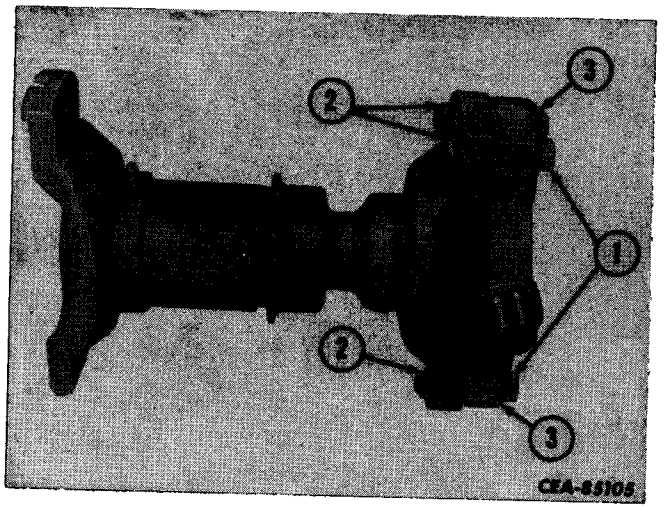


Figure 5-11
Install Bearings.

Install the other two bearing assemblies on spider and wire as shown. This will hold bearing caps on spider during drive shaft installation. (Fig. 5-12.)

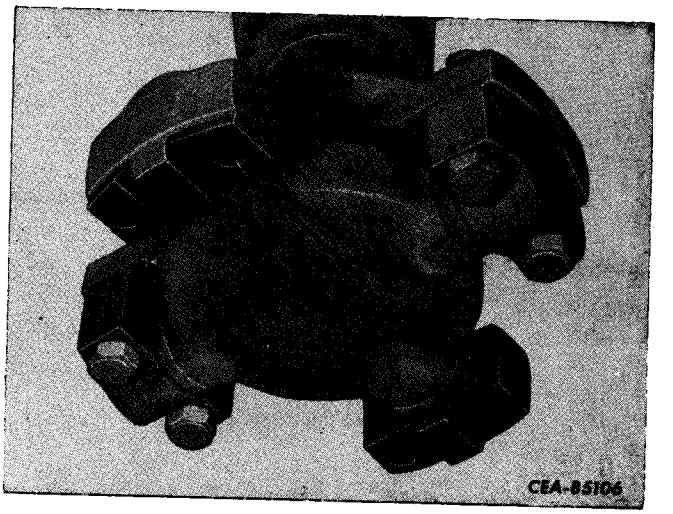


Figure 5-12
Wire Bearings.

Installation

Install drive shaft in tractor. Be certain slip joint end of shaft is located as it was at removal. Fit bearing caps securely in grooves in mounting yokes. Install two cap screws and nuts in bearing cap holes that are not wired. Tighten them just enough to hold caps in place. Remove wire and install cap screws and lock nuts.

NOTE: Use new lock nuts when assembling drive shaft.

Torque cap screws and lock nuts. Refer to "SPECIAL TORQUES" in this section. Remove pipe plug from slip yoke and apply grease. Install pipe plug. Apply grease to universal joint fittings at each end of shaft.

TRANSFER DRIVE

General

Prepare tractor for removal of transfer drive as follows:

a. Park tractor on leval surface.

b. Install safety pins to lock tractor halves in a full turn position. Refer to "SECTION I, CHASSIS" for frame locking pin installation instructions.

c. Block tractor wheels to prevent tractor from rolling.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Removal

Remove dipstick (1, Fig. 5-13) and drain plug from transfer drive housing. Allow all oil to drain from housing. Replace dipstick and drain plug.

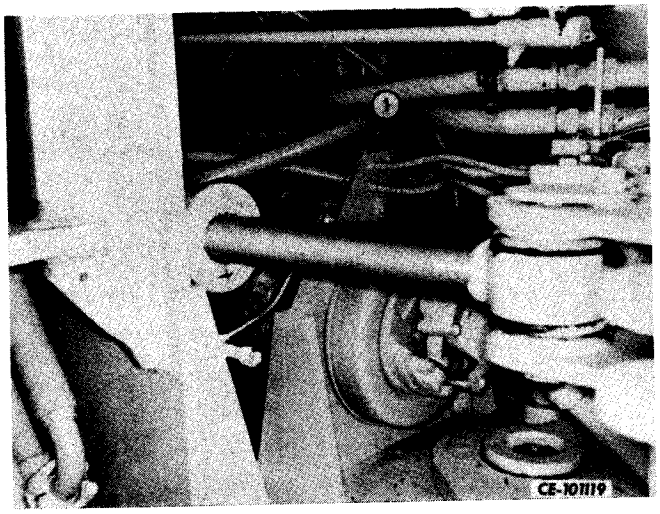


Figure 5-13
Dipstick Location.

Remove cap screws and lock nuts (1, Fig. 5-14) that secure drive shafts (5) to transfer drive yokes (4). Remove drive shafts from yokes.

Disconnect parking brake linkage (2) from the operating cam lever (3).

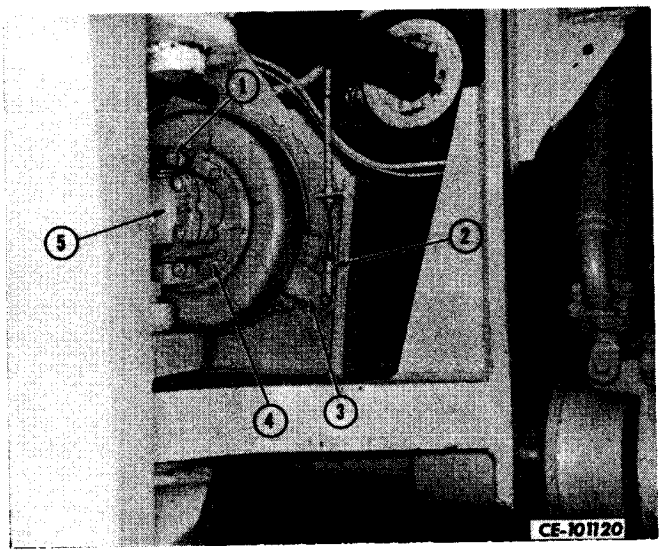


Figure 5-14
Parking Brake Linkage.

Remove cap screws and lock washers (1, Fig. 5-15) that hold hose support (2) in place. Remove cap screws and lock washers (3) that secure transfer drive to front frame. Remove transfer drive from rear side of frame crossmember to which it mounts.

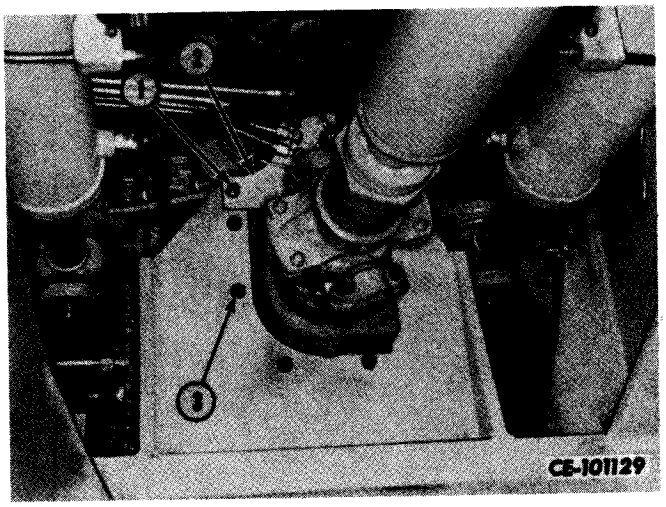


Figure 5-15
Remove Transfer Drive.

Place transfer drive on a clean work bench for disassembly.

Remove lock wire from cap screws. Remove cap screws (1, Fig. 5-16), retainer (2) and seal washer (3) that secure the yoke and drum assembly (4) to shaft (5).

Remove yoke and drum assembly.

(Continued on next page)

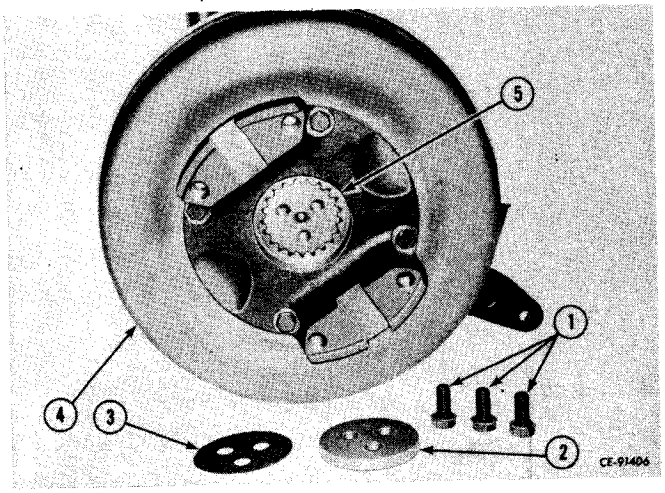


Figure 5-16
Remove Retainer.

DISASSEMBLY, INSPECTION AND ASSEMBLY

TRANSFER DRIVE - Continued

Removal - Continued

Using a brake spring pliers, remove brake springs (1, Fig. 5-17) from brake shoes (2) as shown.

Remove brake shoes from backing plate (3).

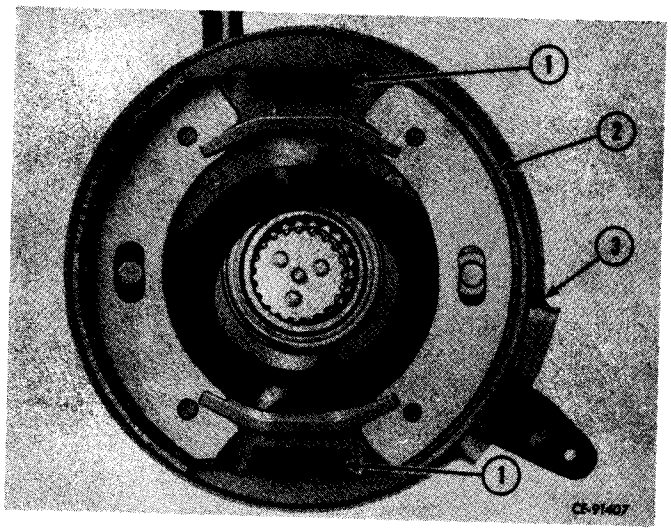


Figure 5-17
Brake Assembly.

Remove operating cam lever (2, Fig. 5-18) and roller (1) from pawls (3 and 4) on backing plate.

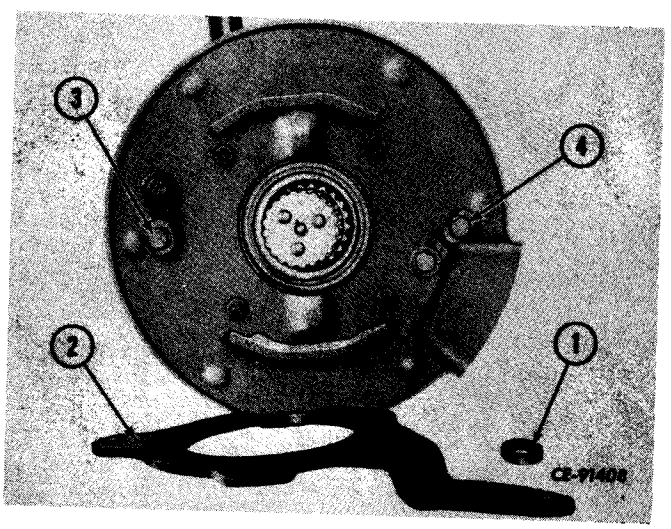


Figure 5-18
Remove Cam Lever.

Remove cap screws and lock washers (1, Fig. 5-19) that secure backing plate (2) to transfer drive housing.

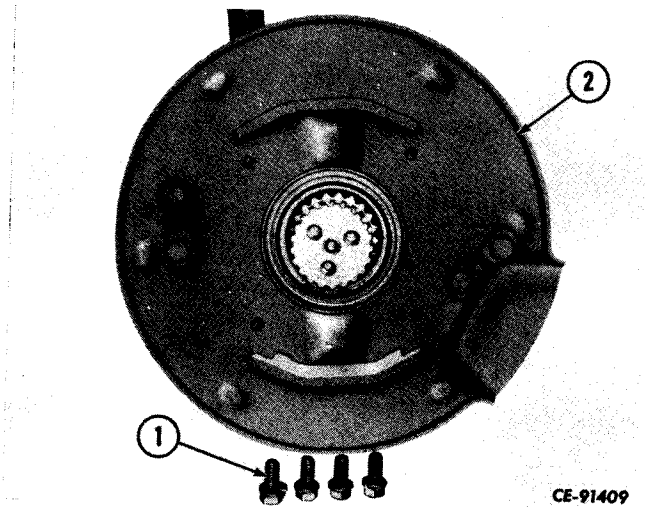


Figure 5-19
Remove Backing Plate.

Remove lock wire from cap screws. Remove cap screws (1, Fig. 5-20), retainer (2), and seal washer (3), where used, that secure output yoke (4) to shaft (5). Remove yoke.

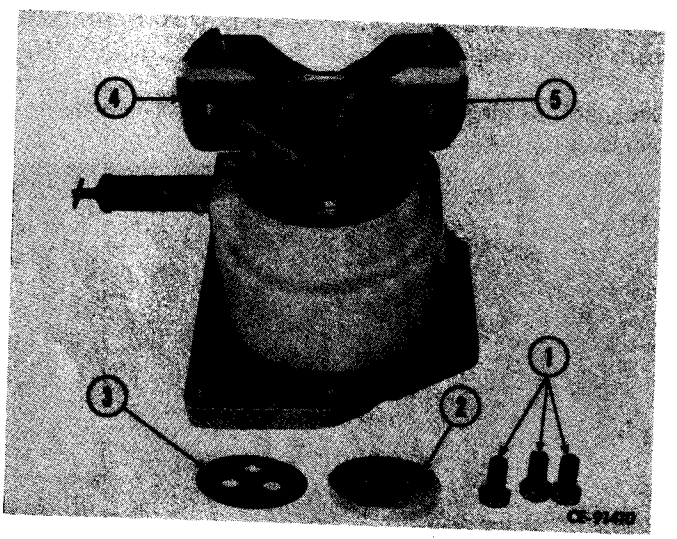


Figure 5-20
Remove Yoke.

Remove drain plug (1, Fig. 5-21) from housing.

Remove cap screws (2) that secure cover (3) to housing. Remove cover and cover "O" ring.

DISASSEMBLY, INSPECTION AND ASSEMBLY

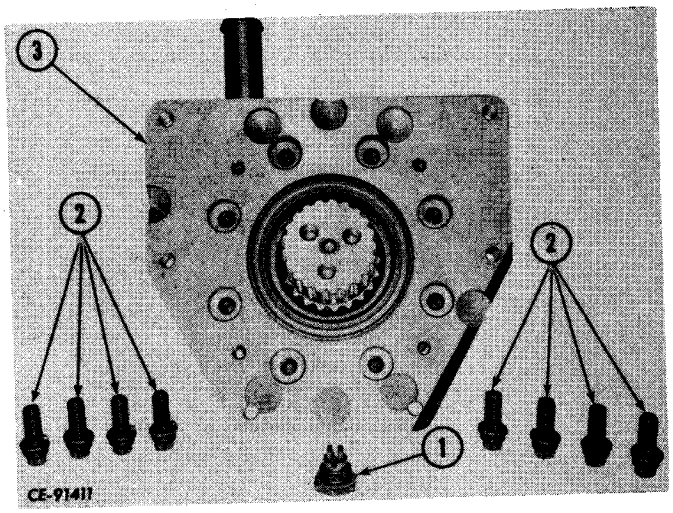


Figure 5-21
Remove Housing.

Press oil seal (1, Fig. 5-22) out of cover (2). Discard seal.

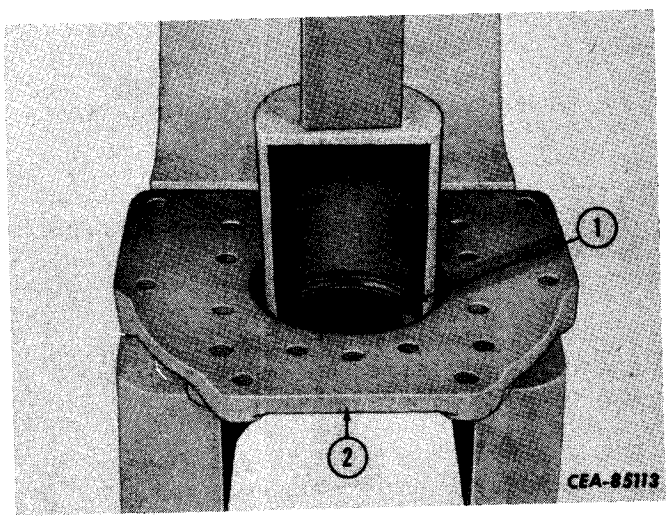


Figure 5-22
Remove Oil Seal.

Using a suitable tool, press shaft (1, Fig. 5-23) out of housing (2). Press on output end of shaft.

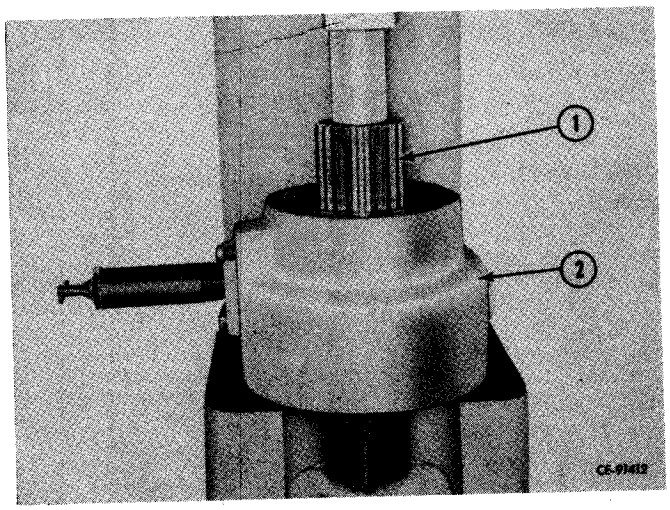


Figure 5-23
Remove Shaft.

Bearing cone (1, Fig. 5-24) will come out with shaft.

Using a flat head drift, drive bearing cup (2) from housing.

(Continued on next page)

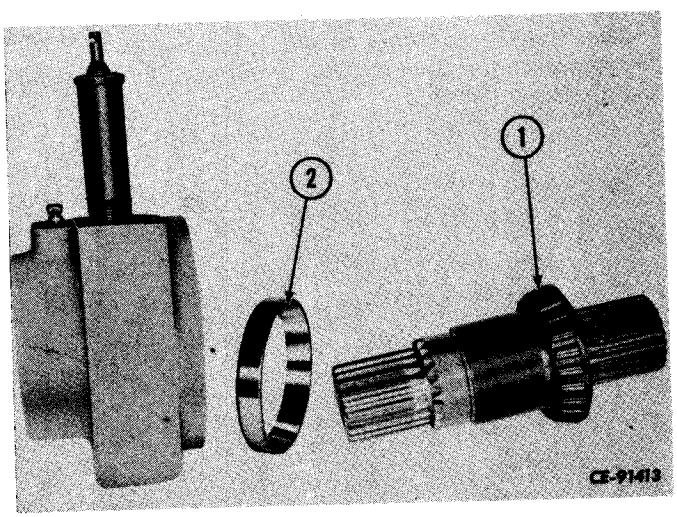


Figure 5-24
Remove Bearing Cup.

DISASSEMBLY, INSPECTION AND ASSEMBLY

TRANSFER DRIVE - Continued

Removal - Continued

Press shaft (1, Fig. 5-25) out of bearing cone (2) as shown.

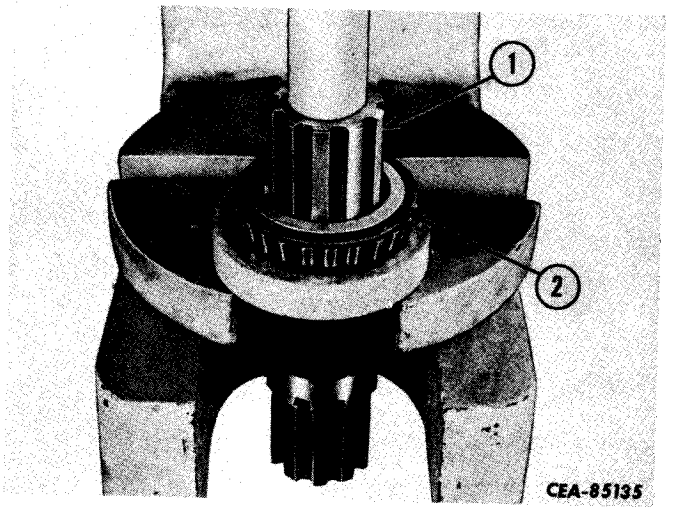


Figure 5-25
Remove Bearing.

Using a flat head drift, drive oil seal (1, Fig. 5-26), bearing cone (2), and bearing cup (3) out of housing output end (5). Discard oil seal.

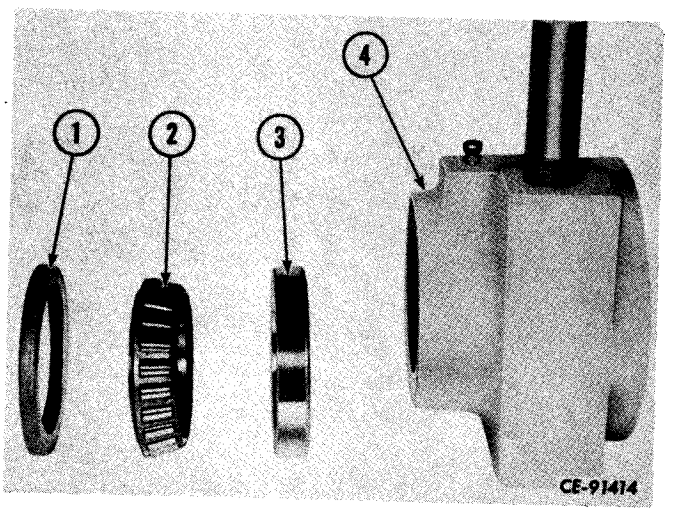


Figure 5-26
Remove Bearing.

Remove breather (1, Fig. 5-27) and dipstick tube (2) from housing if they are damaged.

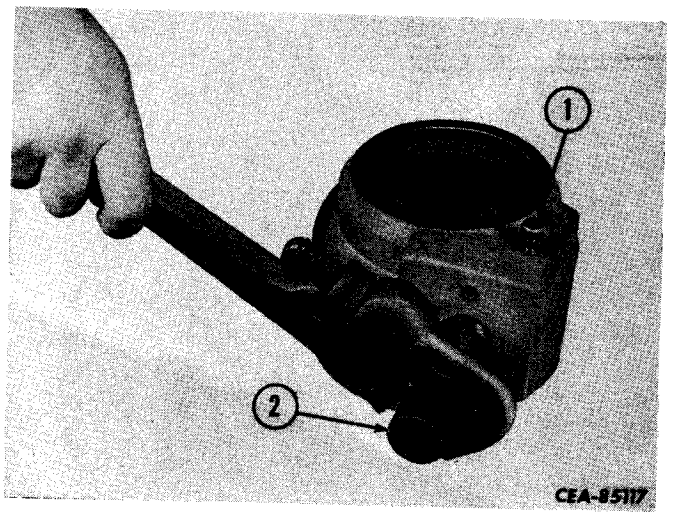


Figure 5-27
Remove Tube.

Cleaning and Inspection

Clean and inspect all parts as follows:

a. Clean all parts thoroughly in solvent. Use compressed air to dry parts.

◆ CAUTION: NEVER dry bearings by spinning with compressed air.

b. Inspect all bearing cups and cones. Check that bearings rotate freely and smoothly. Replace any bearings that are worn or damaged in any way.

c. Inspect transfer drive shaft for signs of wear or ridging. Replace if worn or damaged in any way.

d. Inspect transfer drive housing for wear or damage. Replace if found defective.

e. Replace all oil seals, seal washers, and "O" rings.

f. Parts that are to be assembled immediately should be dipped in light oil to prevent corrosion. If any parts are to be stored for any length of time, they should be coated with a good grade rust preventive and wrapped in paper treated to prevent corrosion.

Assembly

Coat threads on breather and dipstick tube with Mar-Seal or a comparable sealant and install them in housing.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Using a suitable tool, press output and input bearing cups (Fig. 5-28) into housing as shown. Press until cups bottom securely against housing shoulders.

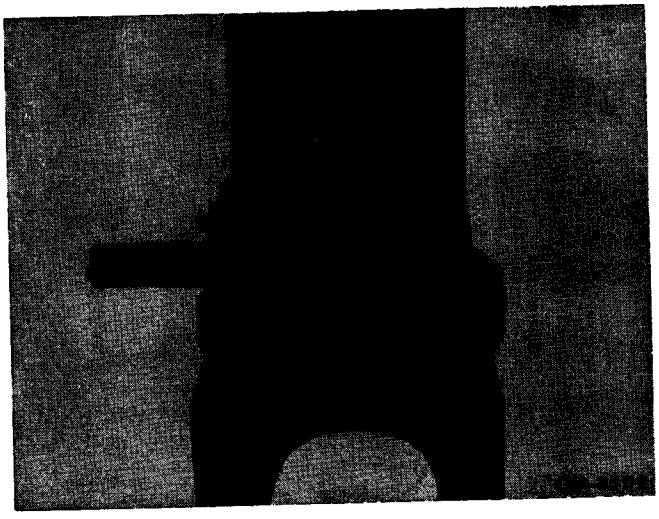


Figure 5-28
Install Bearing Cups.

Position transfer drive shaft (4, Fig. 3-29) in an arbor press, input side up. Position bearing (3) on shaft. Install output yoke (2).

NOTE: For ease in handling use output yoke to press bearing on shaft.

Using a suitable sleeve (1) press bearing on shaft. Continue press pressure until yoke bottoms on end of splines. Bearing (3) is now correctly positioned on shaft. Remove yoke (2) from shaft.

Install shaft and bearing assembly in drive housing.

Coat the O.D. of a new oil seal (1, Fig. 5-30) with sealant and press seal (1) into outside face of cover (2). Spring loaded lip of seal must face in toward center of housing. Press until seal is flush with face of cover.

Install drain plug (1, Fig. 5-21) in housing.

Place a new cover "O" ring in groove in housing.

Install cover (3) on housing and secure with cap screws (2).

Install parking brake backing plate (2, Fig. 5-19) on transfer drive and secure with cap screws and lock washers (1).

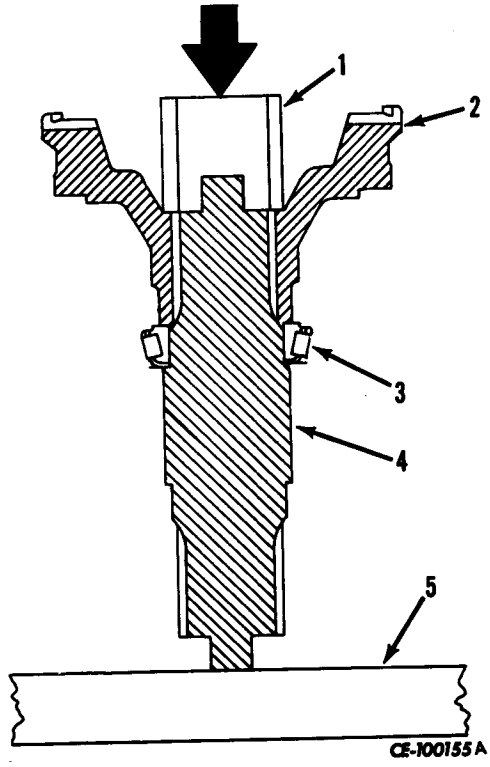


Figure 5-29
Install Yoke.

Place roller (1, Fig. 5-18) on pawl (4) on backing plate. Place operating cam lever (2) on pawl (3) and under roller (1).

Install brake shoes (2, Fig. 5-17) on backing plate (3). Install springs (1) with a brake spring pliers as shown. Be sure springs are installed in rear holes.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

TRANSFER DRIVE - Continued

Assembly - Continued

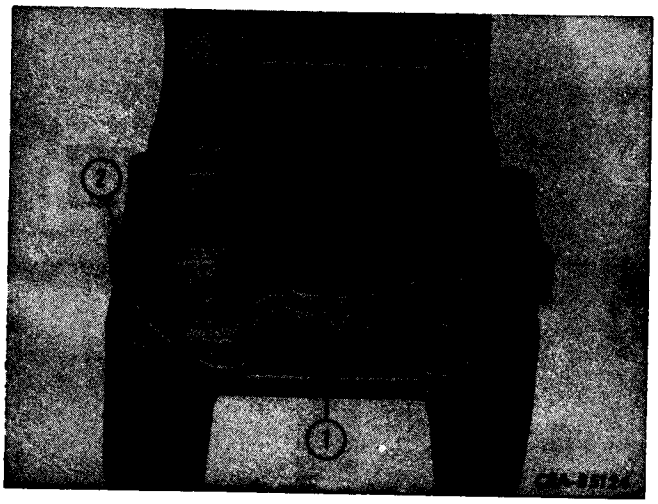


Figure 5-30
Install Seal.

Place yoke and drum assembly (4, Fig. 5-16) on shaft (5) after lubricating seal lip and seal contact surface of yoke with clean, new transfer drive lubricant. Place a new seal washer (3), where used, on shaft. Install retainer (2) and new lock nut (1).

Position transfer drive assembly, input yoke down, in arbor press (Fig. 5-31). Use a suitable spacer (4) between yoke retainer and press table. Press pressure should be on spacer not yoke ends. Position bearing (3) on shaft (6) and slide output yoke (7) on shaft splines. Position a suitable adapter (1) on yoke and carefully, using yoke as a driver, press bearing cone into cups.

Pressure on yoke (7) must be applied slowly and carefully. Rotate housing (5) while pressing bearing into position. As soon as bearings bind slightly during rotation, stop press pressure.

Measure distance from large diameter face of shaft (2, Fig. 5-32) to retainer contact surface (1) on yoke. This is Dimension 5.

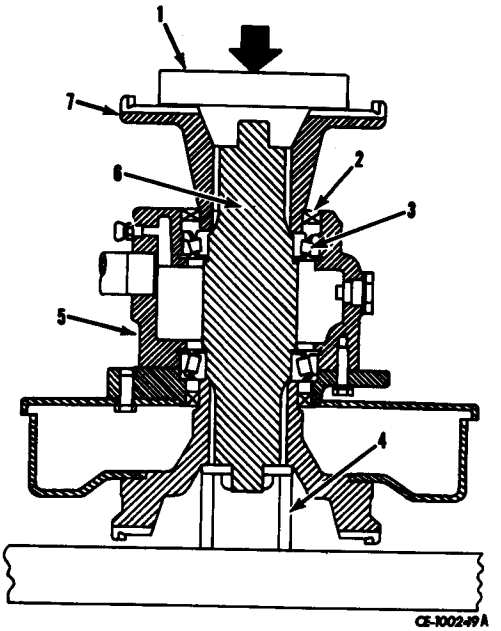


Figure 5-31
Install Yoke.

NOTE:This measurement may be made by drilling a hole in the yoke retainer (2, Fig. 5-20) large enough to accept the shaft of a micrometer (4, Fig. 5-32). Position retainer (3) on yoke and measure distance from top of retainer to face on shaft (Dimension 6). "Mike" the thickness of the retainer (Dimension 7) and subtract this from Dimension 6. The remainder is Dimension 5.

Dimension 5 is the thickness of the required shim pack. Add to this pack sufficient shims to produce the recommended shaft end play (refer to "SPECIFICATIONS").

End Play: .003

Install shim pack, yoke retainer and new lock nut.

Using a new gasket, install drain plug (1, Fig. 5-21) in housing and tighten securely.

DISASSEMBLY, INSPECTION AND ASSEMBLY

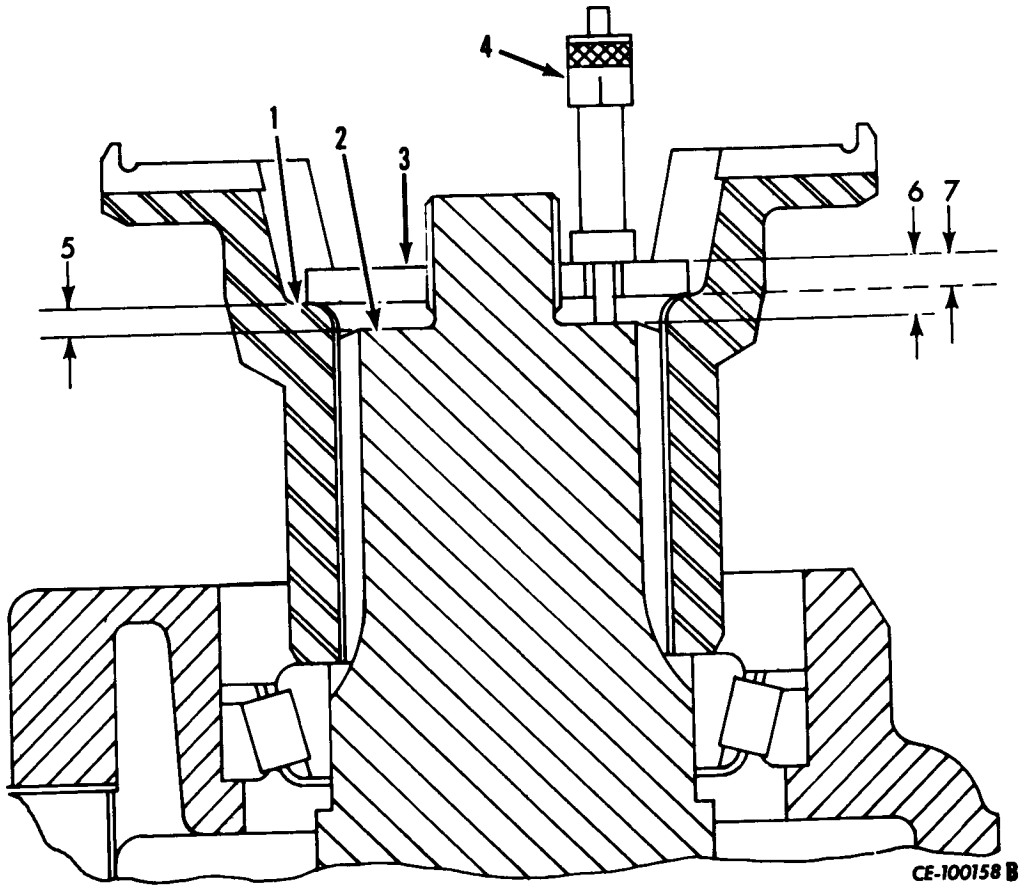


Figure 5-32
Shim Measurement.

1. Yoke.
2. Shaft face.
3. Retainer.
4. Micrometer.
5. Dimension – Shaft to retainer.
6. Dimension – thickness of retainer and gap between retainer and shaft.
7. Dimension – thickness of retainer.

Installation

Install transfer drive in tractor frame crossmember. Install cap screws (3, Fig. 5-15), hose support (2), and cap screws and lock washers (1).

Install drive shafts (5, Fig. 5-14) in transfer drive yokes (4) and secure with cap screws and lock nuts (1). Use new lock nuts when installing drive shafts. Tighten cap screws and lock nuts to recommended torque (refer to "SPECIAL TORQUES").

Torque: 80 Ft lbs

Attach parking brake linkage (2) to operating cam lever (3).

Fill transfer drive housing. (Refer to Operator's Manual.)

TROUBLE SHOOTING

GENERAL

Drive line failures are usually indicated by noise or vibrations. The noise or vibration may come and go as different speeds are reached.

The trouble shooting chart below will help to identify and isolate the cause of trouble in the drive line components.

Inspect the areas of the tractor around the drive shafts for signs of grease that may have been thrown out by the universal joint or slip joints. If grease is found in the area of the universal joints, replace the grease seals on the spider and bearing assemblies. If grease is found in the area of the slip joint, tighten the slip joint seal retainer. If the leakage continues, replace the slip joint grease seal.

Refer to this section for service instructions for the drive shaft assemblies.

Check the drive yokes on the torque converter, transmission, transfer drive and differentials for looseness. If the yokes can be moved back and forth any appreciable amount, disconnect the drive shaft at the yoke and tighten the yoke mounting nuts or cap screws. Before tightening the yoke, check for backlash. Backlash indicates that the yoke splines are worn and the yoke should be replaced.

Check the universal joint spider and bearing assemblies for excessive play. If excessive play is found the spider and bearing assemblies on the drive shaft should be replaced as described in this section.

TROUBLE SHOOTING CHART

DRIVE SHAFTS

COMPLAINT	PROBABLE CAUSE	REMARKS
Noise	1. Lack of lubricant.	1. Check grease seals in slip joints and universals.
	2. Backlash due to worn universal spider or bearings.	2. Replace spider and bearing assembly.
	3. Mounting yokes loose.	
	4. Worn splines in drive shaft slip joints.	4. Replace drive shaft.
Vibration	1. Drive shaft sprung or bent.	
	2. Universal joint bearings not seated properly.	
	3. Mounting yokes loose.	
	4. Transfer drive.	
Noise	1. Lubricant level too low or incorrect lubricant.	
	2. Bearings scored or damaged.	
Loss of Lubricant	1. Lubricant level too high.	
	2. Lubricant foams excessively.	2. Drain and fill with correct type lubricant.
	3. Worn or broken seals.	

SERVICE INFORMATION

TOLERANCES

Transfer drive shaft end play . . . . . .05 - .102 mm (.002-.004 in)

SPECIAL TORQUES

Drive shaft mounting (all) . . . . . 108 N·m (80 ft lb)

PRINTED IN UNITED STATES OF AMERICA

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

DESCRIPTION

The axle assemblies accomplish three main functions; transmit the out-going twisting force (torque) at 90° to the left and right of its input direction, increase the input torque through reduction gearing, and provide a means of securing the wheels and at the same time support the tractor. To each of these main functions several secondary requirements are added suggesting a complex piece of machinery. In reality, each axle uses a minimum of parts to carry out its many functions. Simplicity of design increases reliability and provides easy servicing.

Both axles are full floating, double reduction type. The axles are rigidly attached to their supporting members; the front main frame in the case of the front axle and an oscillating cradle called a bolster for the rear. By allowing the rear axle to oscillate, the tractor is assured great stability in rough terrain.

The first gear reduction takes place in the differential; the second in the planetaries. Each wheel revolves on two tapered roller bearings mounted on the axle spindle. The axles are full floating in that none of the weight is supported by, or transmitted to, the axle shafts. All weight on the axle is supported by the wheels, bearings and axle housing.

The differential assemblies are rigidly mounted; one on the forward side of the rear axle housing and one on the rear side of the front axle housing. The differentials are connected by splined yokes to the yokes on the propeller shafts from the transmission.

The basic differential consists of a hypoid ring gear, pinion gear and spider gear asssembly. The differential and spider gear assembly rotate on tapered roller bearings. The pinion is straddle mounted, having two tapered roller bearings in front of the pinion teeth to take the forward and reverse thrust and a straight roller bearing behind the pinion teeth to carry the radial load.

Three functions of the differential are: transmitting torque from the propeller shaft to the axle shafts; producing the first torque multiplication in the double reduction axles, and allowing one drive wheel to rotate at a different speed than opposite wheel.

AXLE DISASSEMBLY AND ASSEMBLY

DISASSEMBLY PREPARATION

Axle disassembly preparation should include:

Installing frame locking bar with tractor in straight ahead position.

Removing wheels and tires.

Disconnecting drive shaft and brake lines at the axle.

Removing the axle from the tractor.

Using plain steam (no caustic soda) to clean the exterior of the axle.

Preparing a clean work area of sufficient size.

Providing a suitable hoist and sling to lift component parts.

Support the axle assembly with the axle bowl drain plug facing down.

Drain the planetary hubs. Refer to Operator's Manual.

DISASSEMBLY

Remove cap screws (40, Fig. 6-1) that secure planetary cover (39) to carrier assembly (3). Remove planetary cover and discard gasket (41).

Thread axle removal tool (refer to "SPECIAL TOOLS") into tapped pilot hole in axle shaft (22). Remove shaft from housing.

Using a socket head screw key, remove flat head cap screws located between wheel mounting studs (1) on carrier (3).

With a suitable hoist and sling, remove planetary carrier (3) assembly. Refer to "Planetary Disassembly and Assembly" for planetary service. Discard seal ring (32).

Remove locking bolt (10) and nut (9). Remove ring gear (5) and hub (8) assembly.

Using a sling and hoist of ample capacity, remove the wheel hub (4) and brake drum (14) assembly. These two items need not be separated unless replacement is required. Bearing cups (12, 13) may be removed using a drift or suitable puller if replacement is required.

(Continued on page 3)

AXLE DISASSEMBLY AND ASSEMBLY

DISASSEMBLY - Continued

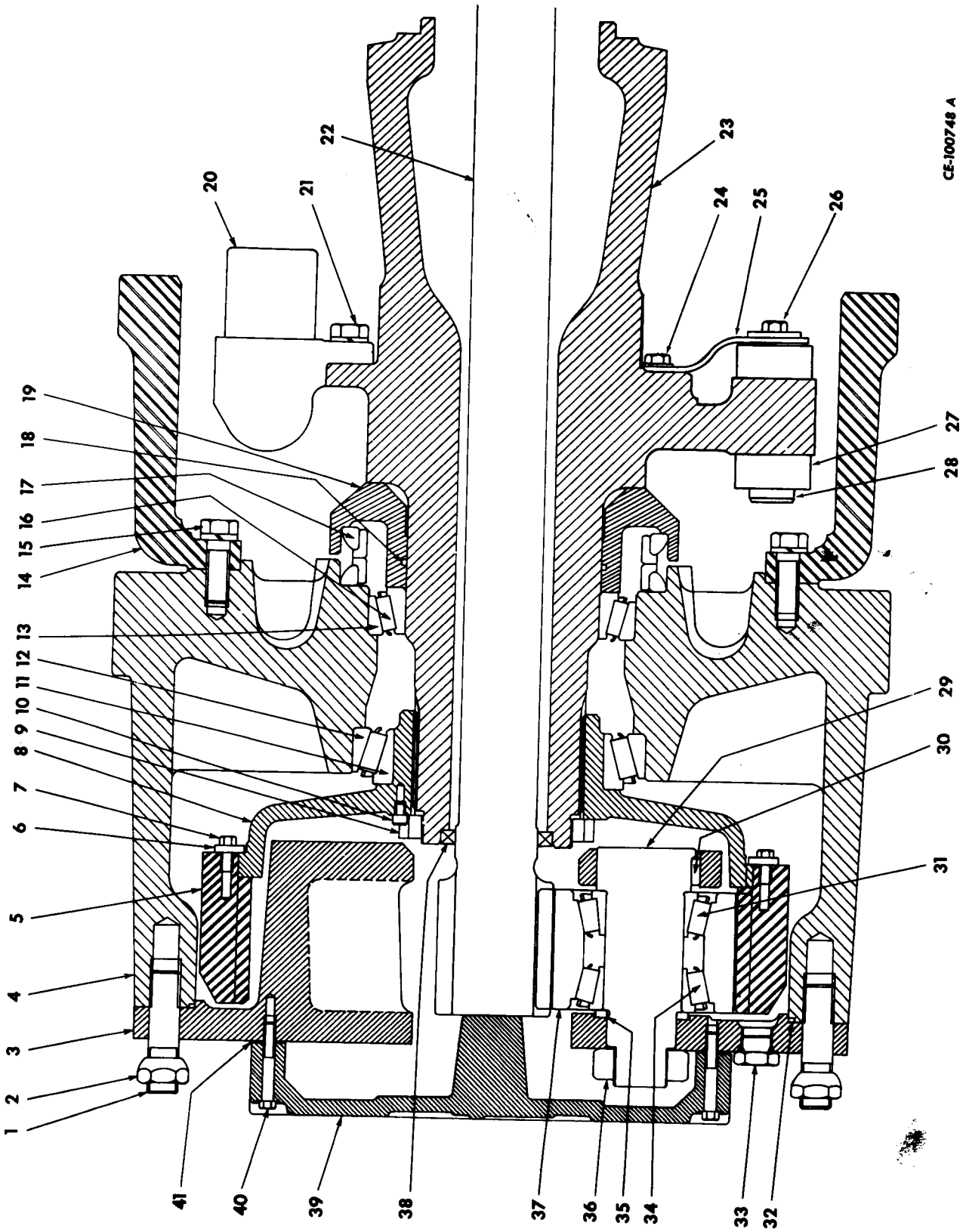


Figure 6-1
Planetary Axle - Cross Section (Early Style).

AXLE DISASSEMBLY AND ASSEMBLY

Legend for Figure 6-1

1. Wheel studs.
2. Wheel nuts.
3. Planetary carrier.
4. Wheel hub.
5. Ring gear.
6. Lock plate.
7. Bolt.
8. Ring gear hub.
9. Bearing adjusting nut.
10. Bolt.
11. Bearing cone.
12. Bearing cup.
13. Bearing cup.
14. Brake drum.
15. Bolt (and lock washer).
16. Bearing cone.
17. Oil seal.
18. "O" ring.
19. Retainer.
20. Wheel cylinder/plunger housing assembly.
21. Bolt (and lock washer).
22. Axle shaft.
23. Axle housing.
24. Bolt (and lock washer).
25. Retainer plate.
26. Anchor pin seal assembly.
27. Brake shoe and lining assembly.
28. Brake shoe anchor pin.
29. Pinion shaft.
30. Dowel.
31. Bearing cone.
32. Seal ring.
33. Level plug (and "O" ring).
34. Bearing cone.
35. Spacer.
36. Nut.
37. Pinion gear.
38. Oil seal.
39. Planetary cover.
*40. Bolt.
41. Cover gasket.

* These bolts were sealant type on early models. Replace them with standard hardware and apply Loctite to them for assembly.

Remove bearing cone (16), seal retainer (19) and one half of seal assembly (17). Remove and discard "O" ring (18) from groove in retainer bore.

Carefully pry seal halves (17) from recesses in wheel hub (4) and seal retainer (19). Protect seal mating face to prevent damage.

Remove and discard lip type seal (38) from axle housing bore.

To disassemble ring gear (5) and hub (8) assembly, remove bolts (7) and lockplates (6) and separate the two components. If bearing cone (11) on hub (8) requires replacement use a suitable bearing puller for removal.

Remove support retaining cap screws (24) and lock washers and support (25). Remove brake shoe return springs. Remove seal retaining ring from ends of anchor pins (28). Remove seal assemblies. Remove anchor pins and brake shoes (27).

Wheel cylinder/plunger housing assembly (20) may be removed by removing retaining bolts (21) and lock washers.

Rotate axle assembly until differential yoke is vertical. Remove all differential retaining cap screws (1, Fig. 6-2).

NOTE: Both axle shafts must be removed before attempting to remove differential assembly.

NOTE: Late style units use spacers under the differential mounting bolts. Remove these after the bolts.

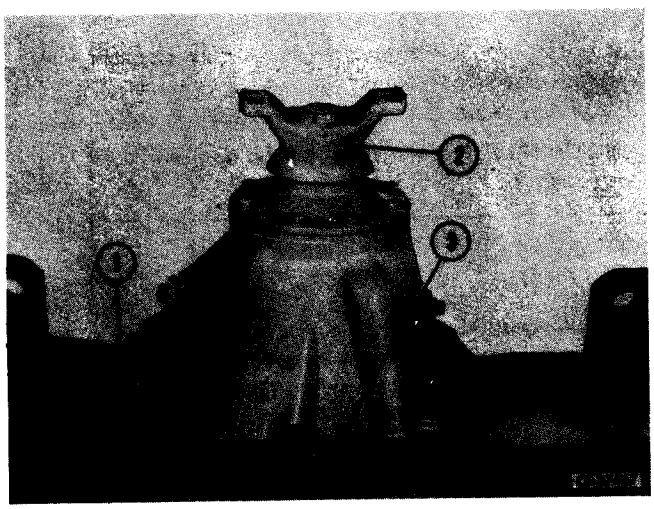


Figure 6-2
Remove Differential.

Place a chain sling about the input yoke (2) and using a suitable hoist exert an upward pressure on the differential assembly.

Using an acetylene torch, heat the entire flange (3) of the differential carrier to liquify the plastic sealant and free the differential assembly.

In some cases it may be necessary to pry the heated units apart.

AXLE DISASSEMBLY AND ASSEMBLY

CLEANING AND INSPECTION

Cleaning

Clean all parts thoroughly. Rough parts such as casting or all metal parts without finished, ground or polished surfaces may be cleaned in a hot solution of mild alkali. Parts should remain in the tank until thoroughly clean and heated through.

> ◆ CAUTION: EXERCISE CARE TO AVOID SKIN RASHES, FIRE HAZARDS AND INHALATION OF VAPORS WHEN USING SOLVENT TYPE CLEANERS.

Clean other parts with a solvent type cleaner, excluding gasoline.

Flush out axle housing being sure it is completely clean. Be sure all flaked metal deposits and dirt are removed from the corners. Cover the differential opening with a plastic cover when housing is clean and dry.

Dry parts thoroughly with soft, clean absorbent paper towel or abrasive free cloth.

> NOTE: NEVER dry bearings by spinning with compressed air.

Inspection

Inspect all bearings, cups and cones, including those not removed from the axle. Replace any parts that are worn, pitted or damaged in any way. Remove parts needing replacement with a puller or press, using suitable arbors. Avoid the use of drifts or hammers.

Inspect all gears and splines for wear or damage. Replace all parts that are scored, pitted, ridged or worn.

Inspect axle shafts for signs of torsional fractures or other indications of impending failure.

Coat parts that are to be assembled immediately with light oil to prevent corrosion. If parts are to be stored for any length of time or if they are not to be assembled immediately, coat them with a good grade of rust preventive and wrap in paper, treated to prevent corrosion.

Replace all seals, gaskets, "O" rings and retaining rings.

NOTE: Face type oil seals (17, Fig. 6-1) may be rebuilt if rubber pivot rings are hardened, decomposed or mis-shapen. Metal sealing faces must be concentric and free of grooves, pocks and deep scratches.

NOTE: Special Torque, Pressure etc., recommendations are listed under "SERVICE INFORMATION." This simplifies revision when necessary. To eliminate constant referral, blank spaces are provided at points where special information is required. These may be filled in by the manual holder, in pencil, and revised when necessary.

ASSEMBLY

Be sure both mating surfaces of the differential carrier and axle housing are absolutely clean and free of burrs.

Coat differential mounting face of axle housing with "Loctite Plastic Gasket." With axle housing securely blocked, lift differential into position on axle housing being sure holes are in correct alignment.

NOTE: Follow manufacturer's instructions for application and curing time for "Loctite Plastic Gasket."

Apply Loctite to and install bolts (1, Fig. 6-2) tightening gradually and evenly around circumference of carrier flange. Tighten bolts to the recommended torque (refer to "SPECIAL TORQUES").

NOTE: Late style units use spacers under the differential mounting bolts.

Torque: _____

Install wheel cylinder/plunger housing assembly (20, Fig. 6-1) securing it with bolts (21) and lock washers. Tighten bolts to recommended torque (refer to "SPECIAL TORQUES")

Torque: _____

Position brake shoe assemblies (27) and secure with anchor pins (28). Install new felt seals (26) on ends of anchor pins and secure with seal retaining rings. Install brake shoe return spring.

Install split, metal face seal halves (17) as follows:

Using clean solvent, thoroughly degrease surfaces of seal bores in wheel hub (4) and seal retainer (19) that will contact rubber Bellville washers (1, Fig. 6-3) of metal face seal.

Before installation be sure rubber washers are flush against inside shoulder of metal sealing rings.

All seal parts must be free of grease, oil, dirt and scale. Lapped sealing faces must not be damaged, scratched or contaminated with dirt or grease.

AXLE DISASSEMBLY AND ASSEMBLY

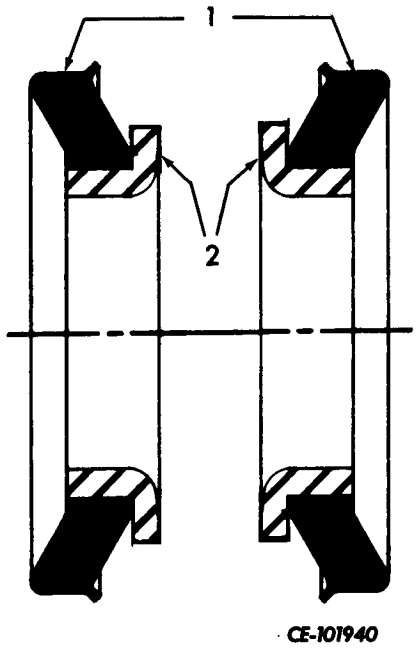


Figure 6-3
Metal Faced Seal.

1. Rubber Bellville washer.
2. Sealing faces.

Install each seal half into its respective bore. Be sure that seal halves are not cocked and that rubber washers are seated evenly in the bottom of their bores.

After installation, wipe both sealing faces (2, Fig. 6-3) clean with a lint free wiper. After wiping, apply a thin film of clean SAE 30 oil to surface of sealing faces only.

When new or rebuilt seals are used follow rebuilding and installation instructions contained in service kit.

Install a new "O" ring (18, Fig. 6-1) in groove in inner bore of retainer. Lubricate retainer inner bore and its mating surface on axle housing with light grease and install retainer assembly on axle housing.

Install bearing cone (16) on axle housing flush against base of seal retainer (19).

If bearing cups (12, 13) were removed from wheel hub (4) bore, install new cups.

NOTE: Bearing cups and cones must be replaced in sets.

Lubricate face of seal lightly with clean, new axle lubricant. Using a suitable sling and hoist position wheel hub and drum assembly (4, 14) on axle housing.

Install ring gear hub (8) in ring gear (5) and secure with lock plates (6) and bolts (7). Tighten bolts to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

If bearing (11) was removed, press a new bearing on ring gear hub. Be sure bearing bottoms on hub shoulder about its entire circumference.

NOTE: Bearing cups and cones must be replaced in sets.

Install ring gear and hub assembly (5, 8) on axle housing and secure with bearing adjusting nut (9).

Tighten wheel bearing adjusting nut (9, Fig. 6-1) to recommended torque (refer to "SPECIAL TORQUES") while rotating hub and drum assembly (4, 14). Mentally note approximate effort to rotate wheel.

Torque: 800#

Continue to torque adjusting nut (9, Fig. 6-1) while rotating hub and drum assembly (4, 14) until either:

a. It is impossible to rotate hub and drum assembly or,

b. A maximum torque of 1085 N·m (800 ft-lbs) is reached on adjusting nut (9).

If no increase is noted in rotational effort with the added torque 1085 N·m (800 ft-lbs), bearings (11, 12, 13, 16) are not seated and assembly is not acceptable until condition is corrected.

If increased rotational effort is noted after torquing to 1085 N·m (800 ft-lbs), re-check torque after a minimum wait of ten minutes to be sure all parts are properly seated (1085 N·m (800 ft-lbs) torque should hold within 10%).

If after the ten minute period, torque on the adjusting nut (9) is still within the acceptable range (within 10% of original 1085 N·m (800 ft-lbs), loosen the adjusting nut to 475 N·m (350 ft-lbs); then retighten to recommended torque (refer to "SPECIAL TORQUES").

Page 25 Torque: 400#

Late type axle has spacer (1, Fig. 6-4) and retaining ring (2). The adjusting nut (3) is larger and so is the lock bolt (4). Seal (38, Fig. 6-1) is no longer used.

(Continued on next page)

AXLE DISASSEMBLY AND ASSEMBLY

ASSEMBLY - Continued

Advance adjusting nut (9) to line up next tapped hole in ring gear hub (8). Install lockscrew coated with plastic gasket (10) and tighten.

Coat the O.D. of a new lip type seal (38) (where used) with sealant and install seal in axle housing with spring loaded lip of seal facing in. Be sure seal bottoms on shoulder in axle housing about its entire circumference.

Install a new seal ring (32) on shoulder of planetary carrier (3). DO NOT ROLL SEAL RING INTO POSITION. Seal ring must be square against carrier shoulder about its entire circumference.

Position planetary carrier assembly (3) on axle assembly and secure with socket head cap screws.

Using a special axle tool (refer to "SPECIAL TOOLS") install axle shaft (22) in axle assembly.

Using a new gasket (41), position planetary cover (39) on carrier (3) and secure with special bolts (40) dipped in Loctite.

Tighten bolts (40) to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

NOTE: When installing planetary cover be sure "FILLER PLUG" arrow on cover points to fill and level plug (33) on planetary carrier.

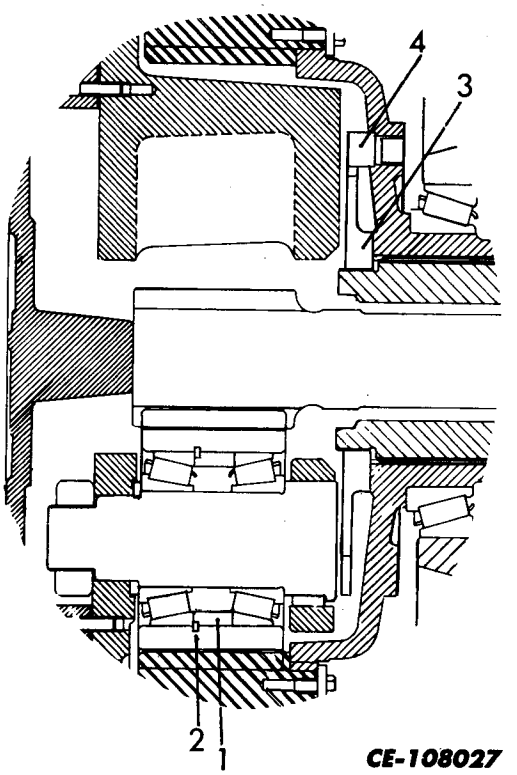


Figure 6-4
Late Type Axle Changes.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

Legend for Figure 6-5

1. Pinion nut.
2. Flat washer.
3. Input yoke.
4. Pinion shaft.
5. Seal.
6. Outer pinion thrust bearing.
7. Spacer.
8. Inner pinion thrust bearing.
9. Pilot bearing.
10. Ring gear thrust bearing.
11. Adjusting nut.
12. Axle shaft.
13. Differential case - plain half.
14. Differential pinion gear.
15. Differential spider.
16. Ring gear.
17. Differential case - flanged half.
18. Side gear.
19. Adjusting nut lock.
20. Ring gear thrust bearing.
21. Thrust block adjusting screw.
22. Jam nut.
23. Thrust block. (early units only).
24. Shims.
25. Pinion bearing cage.
26. Pinion cage cover.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

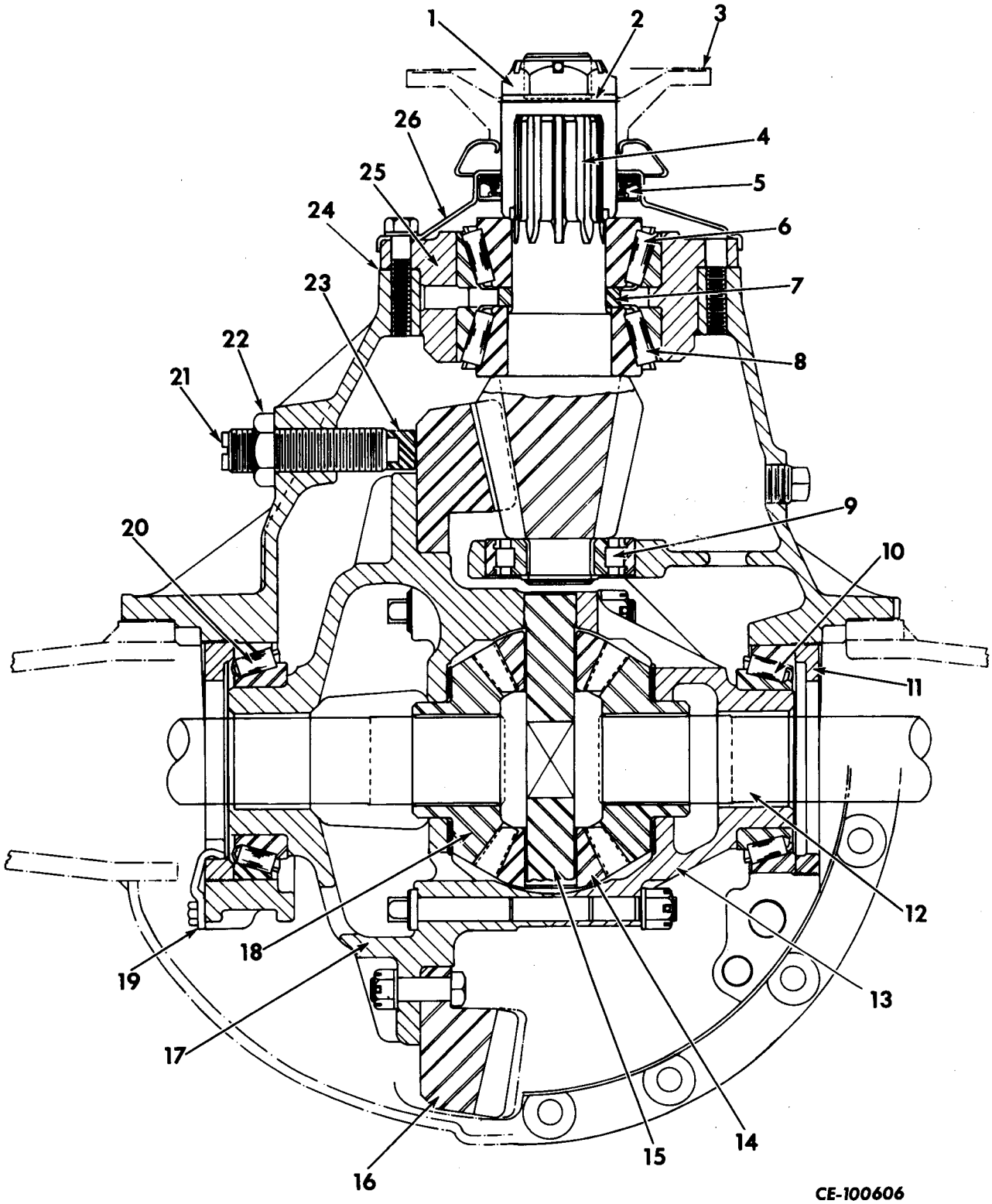


Figure 6-5
Differential - Cross Section.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

DISASSEMBLY PREPARATION

Remove the differential assembly from the axle (refer to "AXLE DISASSEMBLY AND ASSEMBLY"). Differential disassembly preparation should include:

a. Using plain steam (no caustic soda), clean the outside of the differential housing thoroughly.

b. Preparing a clean work area.

c. Gathering the following tools and equipment:

A differential holding fixture (refer to "SPECIAL TOOLS").

A shop press.

A hoist.

DISASSEMBLY

NOTE: The later style differentials do not use lockwire to retain various bolts and nuts.

Place differential assembly in suitable holding fixture (refer to "SPECIAL TOOLS").

If initial inspection indicates that drive gears will not be replaced, record the backlash of ring gear and pinion before disassembly. This measurement will be used during assembly.

Figure 6-6
Differential Stand.

To measure backlash, position dial indicator as shown in Fig. 6-7. Secure the yoke and rotate ring gear back and forth. The indicated movement is the backlash (clearance) between the teeth. A predetermined amount of backlash is necessary and should not be altered to any great extent.

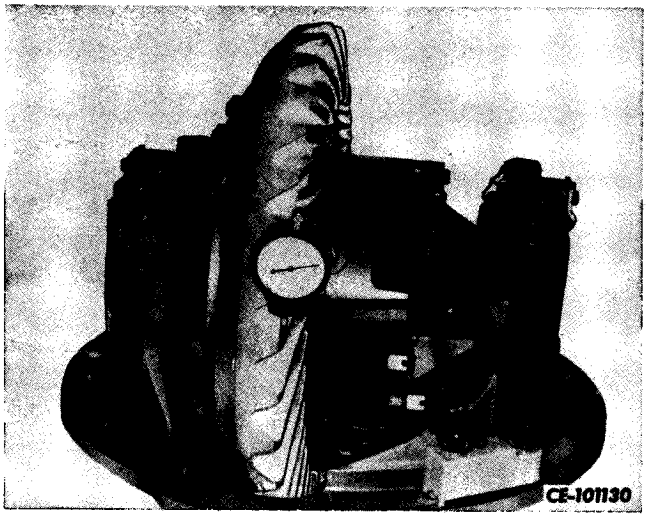


Figure 6-7
Using Dial Indicator.

NOTE: If ring gear is to be replaced, it will be easier to loosen the cap screws that secure the gear to the flanged differential case prior to removal. Hold yoke with a bar to prevent ring gear from turning.

Loosen jam nut (1, Fig. 6-8) and back out thrust block adjusting screw (2).

Rotate differential assembly 180° in holding fixture.

Figure 6-8
Thrust Adjusting Screw.

Center punch one carrier leg (9, Fig. 6-9) and bearing cap (1) for identification during assembly.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

Cut lock wire (3). Remove cap screws (4) and adjusting nut locks (5).

Cut lock wire (2). Remove bearing cap retaining cap screws (6, 7) and washers, bearing caps (1) and adjusting nuts (8).

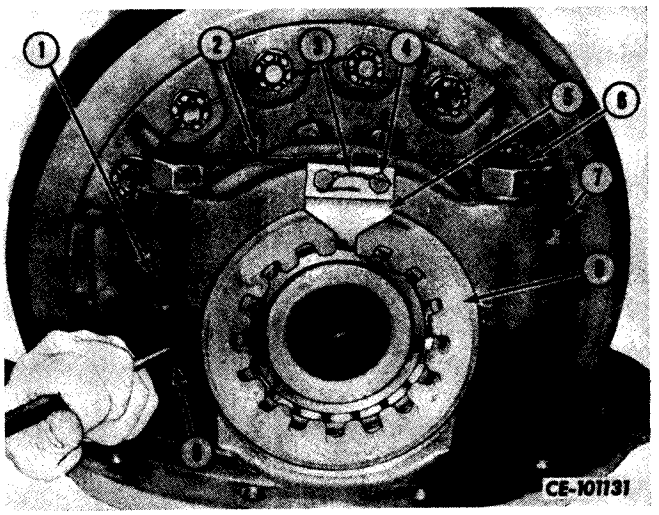


Figure 6-9
Punch the Mating Parts.

Lift differential assembly from carrier (Fig. 6-10).

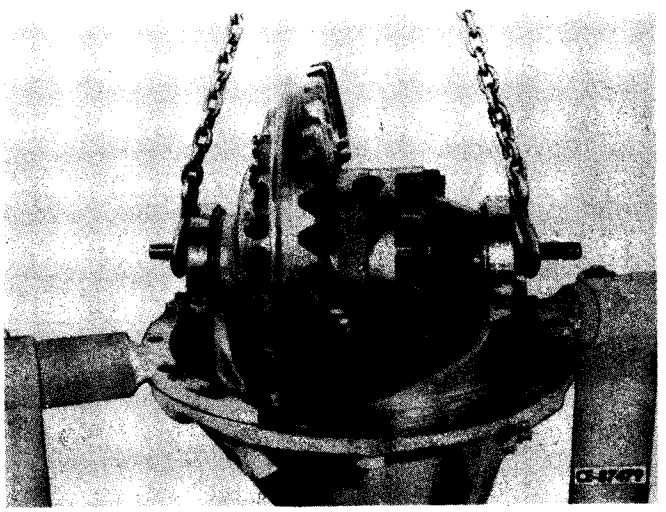


Figure 6-10
Remove Differential Assembly.

If original identification marks are not clear, mark differential case halves (4, Fig. 6-11) with a punch for correct alignment during assembly.

Cut lock wire, remove hex nuts (1), flat washers, and separate case halves (2, 3).

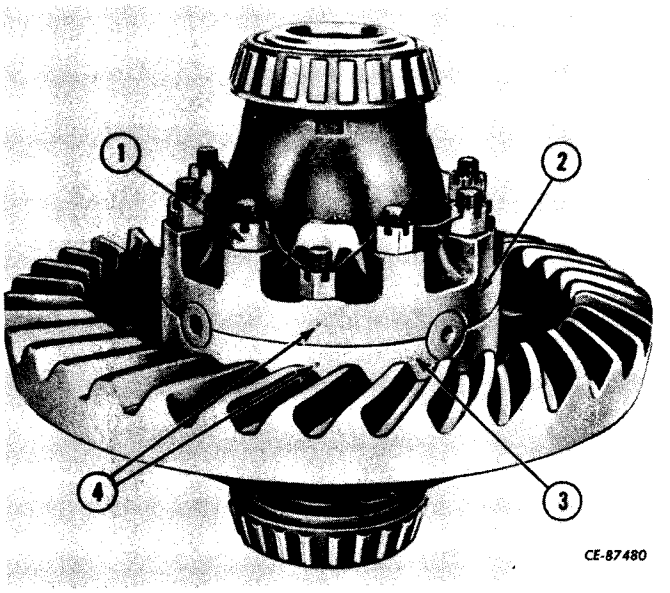


Figure 6-11
Separate Case Halves.

Remove side gears (4, Figs. 6-12 and 6-13), spider (1), thrust washers (3, 5) and pinion gears (2).

(Continued on next page)

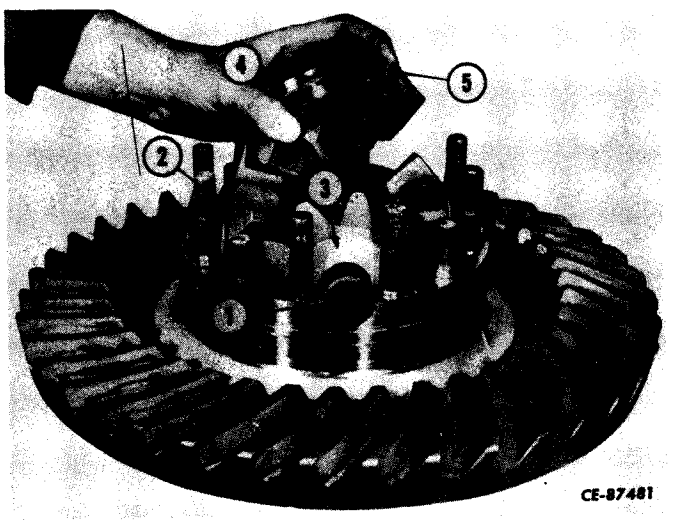


Figure 6-12
Remove Side Gears.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

DISASSEMBLY - Continued

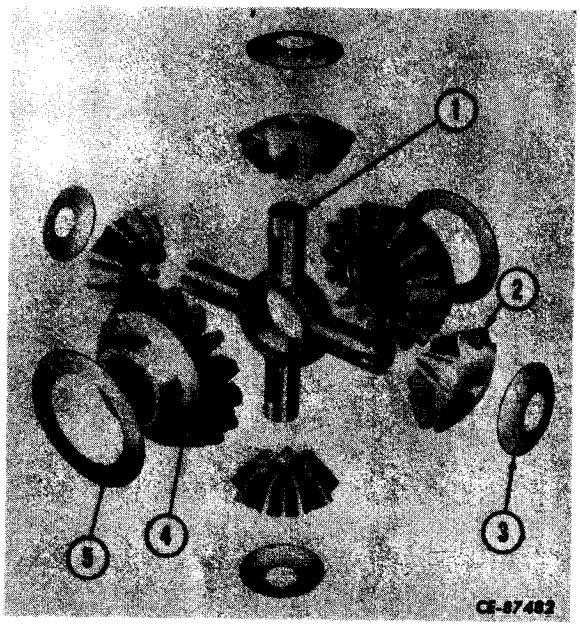


Figure 6-13
Pinion Gears.

Remove hex nuts (1, Fig. 6-14), lock washers (2) and cap screws and separate ring gear (3) from case (4).

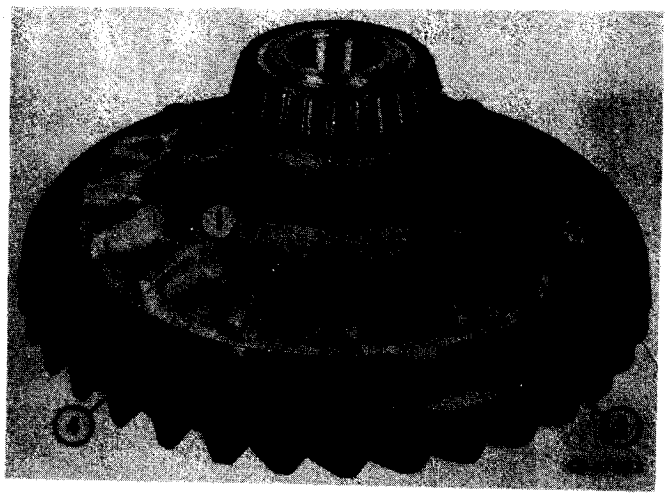


Figure 6-14
Remove Ring Gear.

To remove differential bearings, use a suitable bearing puller or shop press (Fig. 6-15).

Where press is used, support inner bearing race and press case half from it.

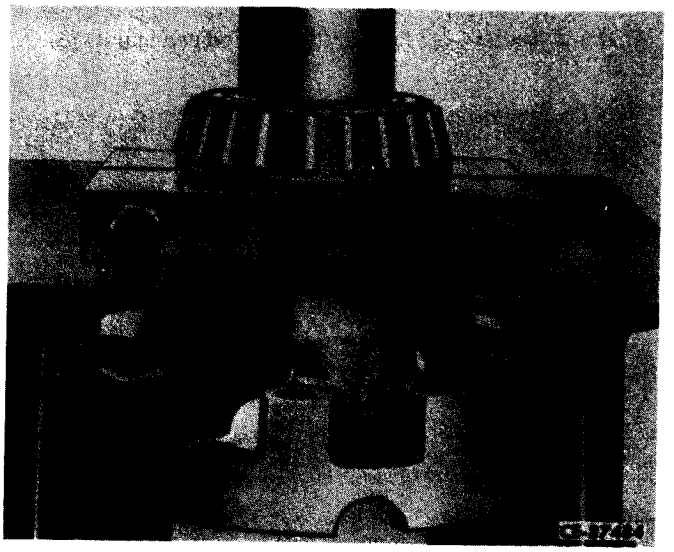


Figure 6-15
Press Out Bearing.

Remove cotter pin (3, Fig. 6-16) from pinion shaft and nut. Hold the input yoke with a suitable tool and remove pinion shaft nut (2) and washer.

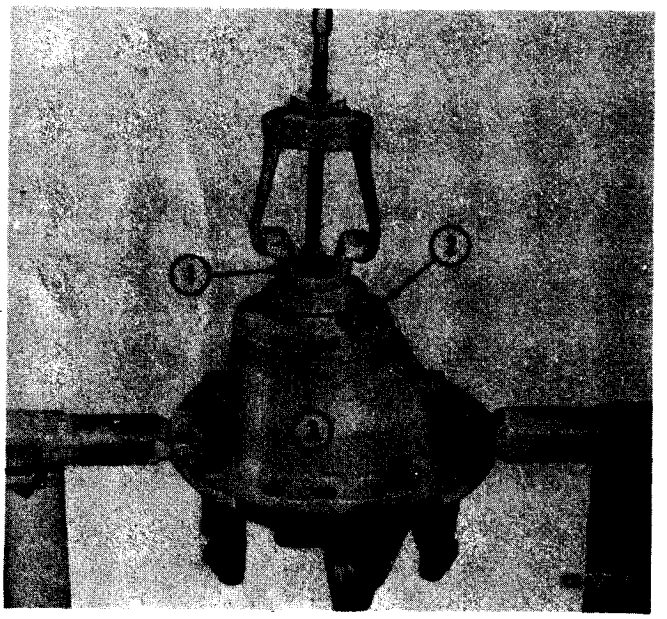


Figure 6-16
Remove Yoke.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

Remove pinion yoke (1) using a suitable puller.

> NOTE: Do not drive the yoke off. Hammer blows will distort the yoke and cause runout.

Remove pinion bearing cage retaining cap screws.

Remove bearing cage cover (26, Fig. 6-5). Pry seal (5) from cage cover.

Using jack screws (2, Fig. 6-17) in tapped holes provided in bearing cage, remove cage (1).

> NOTE: Using any means other than jack screws to remove cage will permanently damage components.

Wire shim pack (3) together to facilitate adjustment during assembly.

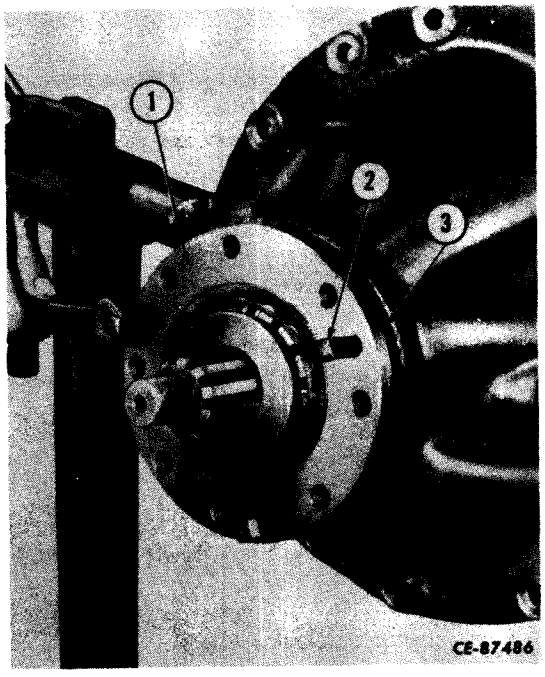


Figure 6-17
Remove Bearing Cage.

Using a soft mallet or press, drive the pinion shaft (1, Fig. 6-18) from the cage (3).

Remove the outer thrust bearing cone (2) from the cage. The bearing cups may be removed from the bearing cage if replacement is necessary.

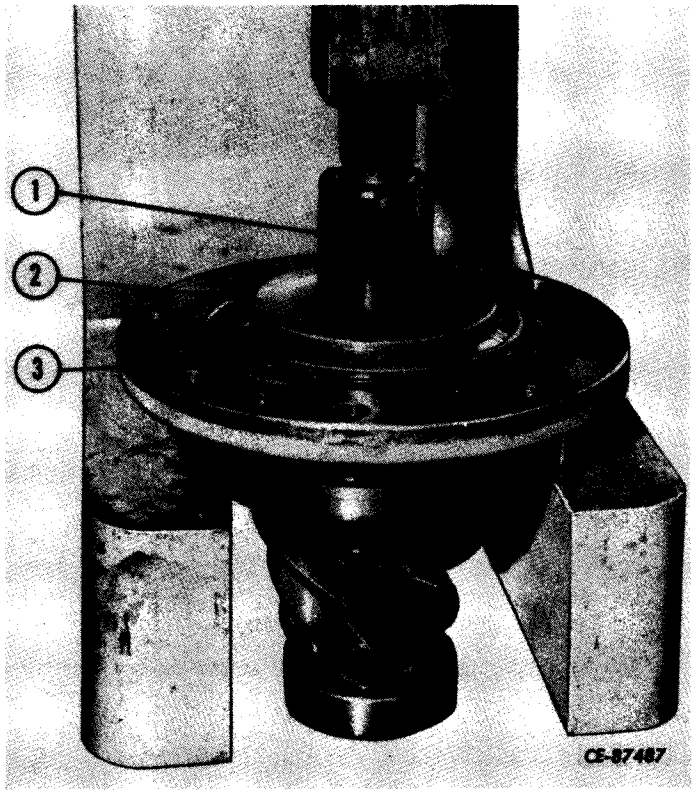


Figure 6-18
Remove Pinion Shaft.

> NOTE: If the pinion bearing assemblies are to be reused it will be necessary to retain the same relationship between the cups and cones because of the established wear pattern. Proper parts identification should be made during disassembly.

Remove spacer (7, Fig. 6-5) from pinion shaft.

Using a suitable adapter, press the inner thrust bearing (2, Fig. 6-19) from the pinion shaft (1).

Remove the snap ring (5) that retains the pinion shaft pilot bearing (3).

Using a suitable adapter, press the pilot bearing and spacer (4) from the shaft.

(Continued on next page)

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

DISASSEMBLY - Continued

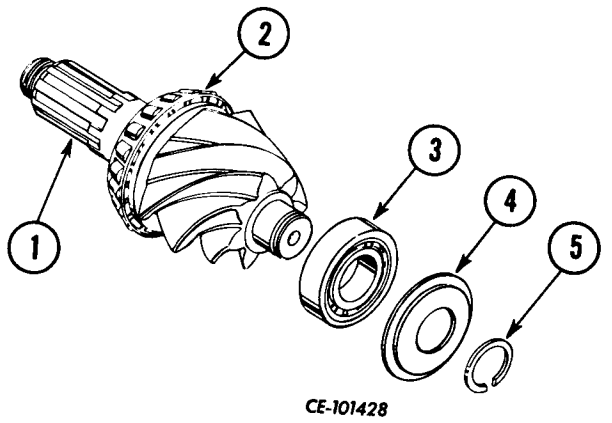


Figure 6-19
Pinion Shaft Assembly.

CLEAN, INSPECT AND REPAIR

Clean

Parts having ground and polished surfaces such as gears, bearings, shafts and collars, should be cleaned in a suitable solvent like kerosene or diesel fuel oil.

NOTE: DO NOT USE GASOLINE.
DO NOT USE A HOT SOLUTION TANK.
DO NOT USE WATER AND ALKALINE SOLUTIONS.
(Sodium hydroxide, orthosilicates or phosphates)

Steam cleaning assembled drive units after their removal from the axle housing is not recommended. Water trapped in these assemblies promotes corrosion of critical parts. This rust can be deposited in the lubricant causing premature failures.

Complete disassembly is necessary for thorough cleaning.

Rough parts such as differential castings may be cleaned in a hot solution of mild alkali providing these parts are not ground and polished. Parts should remain in the tank long enough to be thoroughly cleaned and heated through. This will aid the evaporation of the rinse water. Parts should be thoroughly rinsed to remove all traces of alkali.

◆ CAUTION: EXERCISE CARE TO AVOID SKIN RASHES AND INHALATION OF VAPORS WHEN USING ALKALI CLEANERS.

Parts should be thoroughly dried immediately after cleaning. Use soft, clean, lintless, absorbent paper towels or rags, free of abrasive material. Bearings should never be dried by spinning with compressed air.

Parts that have been cleaned, dried and inspected and are to be assembled immediately should be coated with light oil to prevent corrosion. If parts are to be stored for any length of time, they should be treated with a good rust preventive and wrapped in special paper or other material designed to prevent corrosion.

Inspect

Careful inspection procedures will determine the success of the overhaul operation. A careful selection of reusable parts will eliminate the expense of down time in the near future.

Inspect all bearing cups and cones, including those not removed from parts of the drive unit. Replace these items if cups or rollers are worn, pitted or damaged in any way. Remove parts to be replaced with a suitable puller or press. Do not use drifts or hammers. They may easily damage or distort component parts.

Inspect hypoid gears for wear or damage. Worn, ridged, pitted or scored gears should be replaced. When it becomes necessary to replace either the ring or pinion gear, both gears must be replaced with a matched set.

Inspect differential case halves, thrust washers, spider trunnions and differential gears for pitted, scored or worn thrust surfaces. Thrust washers must be replaced in sets.

Inspect differential pinion gears and side gear teeth for wear or damage. Pinion and side gears must be replaced in sets.

Repair

Replace all worn parts including hex nuts with rounded corners.

Replace all seals, gaskets and lock washers.

Remove nicks, mars and/or burrs from machined or ground surfaces using a mill file or india stone. All threads must be clean and free to obtain accurate adjustment and correct torque.

Where possible, use a press when assembling component parts.

Tighten all nuts to specified torque. Use a soft iron locking wire to eliminate wire breakage.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

The burrs caused by lock washers at the spot surface of stud holes of cages and covers, should be removed to assure easy assembly.

NOTE: Special Torque, Pressure, etc. recommendations are listed on a single page in Section VI. This simplifies revision when necessary. To eliminate constant referral, blank spaces are provided at points where special information is required. These may be filled in by the manual holder, in pencil, and revised when necessary.

ASSEMBLY

NOTE: The later style differentials do not use lockwire to retain various bolts and nuts. With this change, the torque values have changed. Refer to "Special Torques" for the torque values to be used for your unit.

If new bearing cups (1, Fig. 6-20) are to be installed, press the cups firmly against pinion bearing cage (2) shoulders.

Lubricate bearing cups and cones with light machine oil.

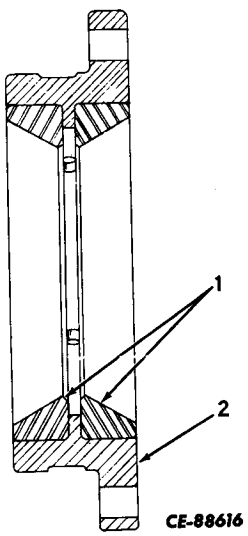


Figure 6-20
Install Bearing Cups.

Press inner thrust bearing (2, Fig. 6-21) on pinion shaft (3). Be sure bearing cone bottoms on gear shoulder.

Press pilot bearing (1) on pinion shaft. Install spacer (4, Fig. 6-19) and retaining snap ring (5). Be sure snap ring bottoms in groove in pinion shaft.

Install spacer (5, Fig. 6-22) on pinion shaft and place entire assembly in bearing cage (4).

Figure 6-21
Install Pilot Bearing.

Press outer thrust bearing (3) on the pinion shaft. Be sure the bearing bottoms on the spacer (5) and the spacer is flush against inner thrust bearing race (6).

Rotate cage (4) several revolutions to assure normal bearing contact.

With cage and pinion assembly in press, check bearing preload torque. If press is not available, the pinion nut may be tightened to the recommended torque (refer to "SPECIAL TORQUES") and preload checked.

If assembly is checked in press, refer to "TOLERANCES" for correct press tonnage.

Press Tonnage: _____

Pinion Nut Torque: _____

(Continued on next page)

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

ASSEMBLY - Continued

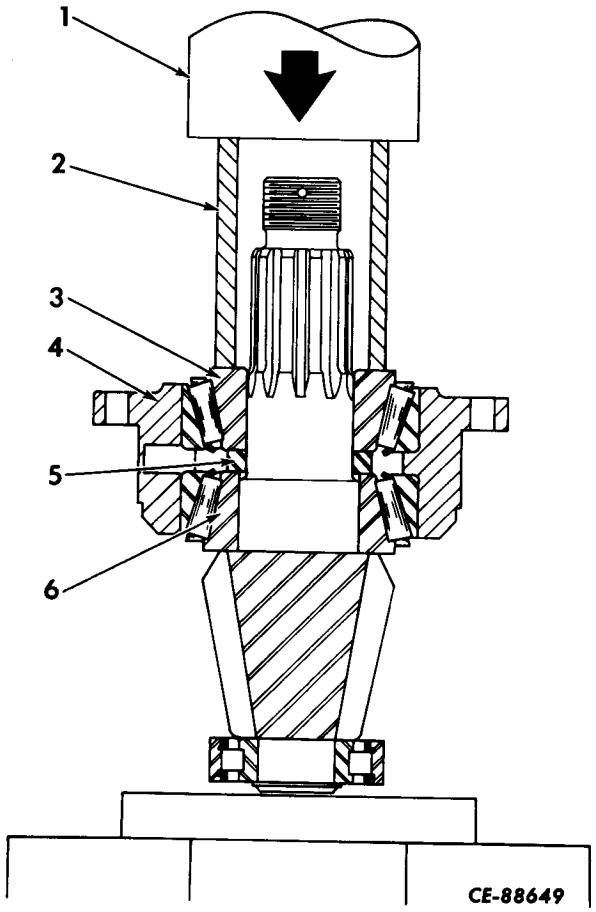


Figure 6-22
Check Bearing Preload.

1. Press ram.
2. Suitable sleeve.
3. Outer thrust bearing.
4. Bearing cage.
5. Spacer.
6. Inner thrust bearing.

Wrap soft iron wire around cage and pull on a horizontal line using a N-m (pound) scale (Fig. 6-23). Read the indicated rotating torque.

NOTE: Use rotating torque, not starting torque.

If torque is not within recommended limitations (refer to "TOLERANCES") install a thinner spacer to increase or thicker spacer to decrease preload.

Preload Torque Limits: _____

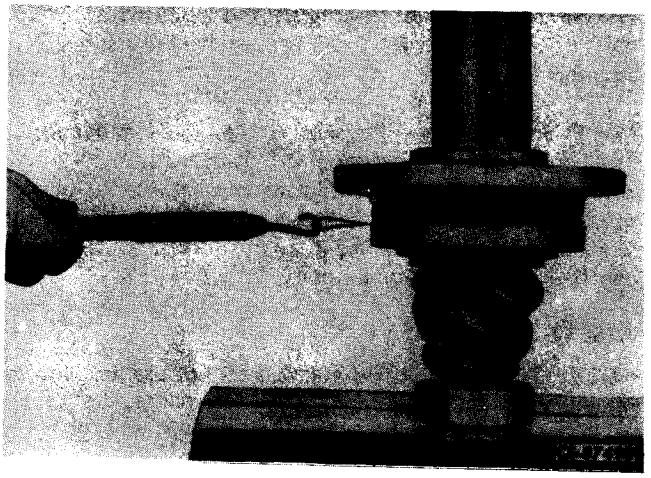


Figure 6-23
Check Rotating Torque.

As an example, let us assume the pinion cage diameter is 178 mm (7 in). The radius would be 89 mm (3.5 in) and, with 18 N (4 lb) of pull, the preload torque would be 1,58 N·m (14 in-lbs). 89 mm x 18 in = 1,58 N·m (3.5 in x 4 lb = 14 ft-lb).

Press yoke (3, Fig. 6-5) against outer pinion thrust bearing and install flat washer and pinion shaft nut.

Install pinion and cage assembly on differential carrier and secure with retaining cap screws. Cap screws need only be snugged up.

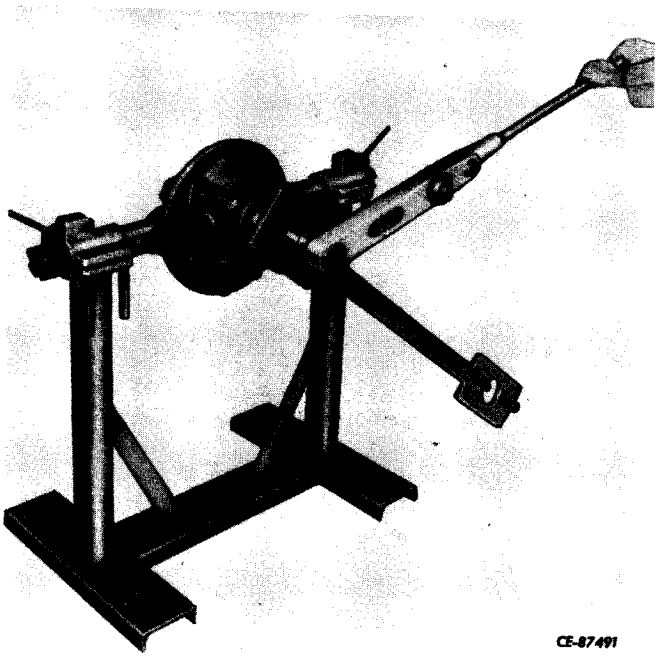


Figure 6-24
Install Shaft Nut.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

Holding the yoke with a suitable tool (Fig. 6-24), tighten the shaft nut to the correct torque (refer to "SPECIAL TORQUES").

Torque: _____

Remove the pinion and cage assembly from the differential carrier. Recheck the pinion bearing preload torque. If the rotating torque is not within the recommended limitations (refer to "TOLERANCES") repeat the adjusting procedure.

Hold the pinion yoke and remove the shaft nut, washer and yoke.

Lubricate pinion shaft oil seal (1, Fig. 6-25). Coat the outer edge of the seal body with a non-hardening sealing compound. Install the seal in the pinion bearing cover (2) using a suitable driver. Be sure lip of seal is toward the pinion cage. Seal body must bottom on shoulder of bearing cover.

Install a new gasket on bearing cage assembly. Place bearing cover (2) on cage.

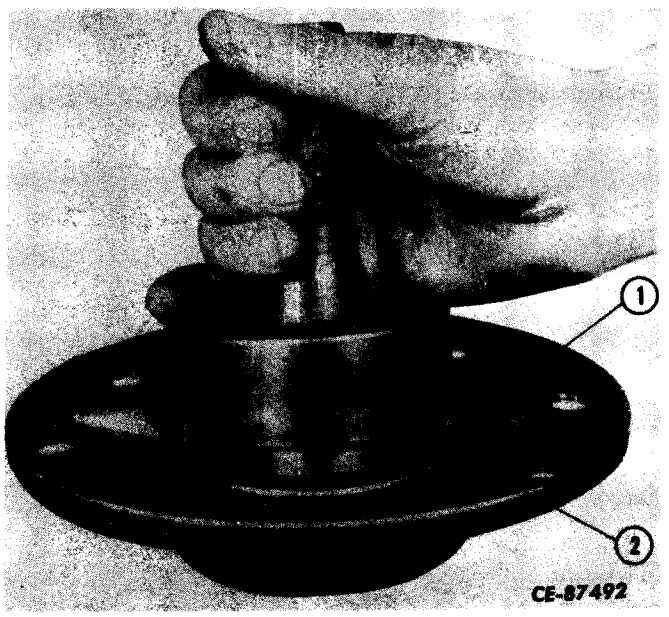


Figure 6-25
Install Seal.

Press the yoke on the pinion shaft and against the outer thrust bearing.

Install the flat washer (2, Fig. 6-5) and pinion nut. Tighten nut to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Install cotter key.

NOTE: Do not back off nut to align cotter key holes.

Install shim pack (2, Fig. 6-26), removed during disassembly, between the bearing cage (1) and the carrier (3).

NOTE: Locate thin shims on outside of pack for best sealing ability.

Tap pinion and cage assembly in position with a soft mallet.

Install cage/cover retaining cap screws and tighten to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

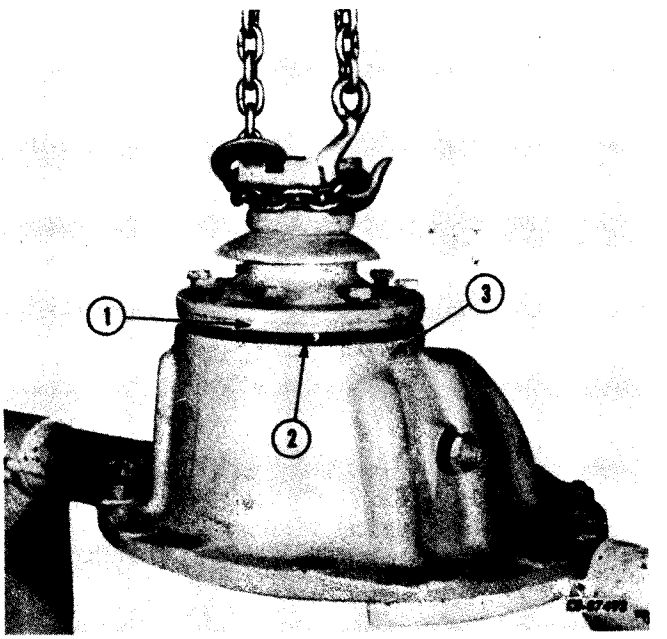


Figure 6-26
Install Shim Pack.

Install ring gear (3, Fig. 6-27) on flanged case half (4) using retaining cap screws, flat washers (2) and hex nuts (1). Tighten the cap screws to the recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Lock wire the cap screws.

(Continued on next page)

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

ASSEMBLY - Continued

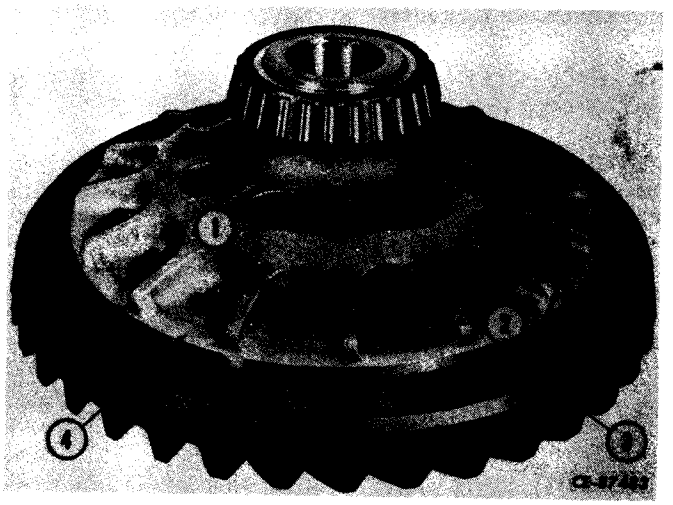


Figure 6-27
Install Ring Gear.

Position thrust washer (3, Fig. 6-28) and side gear (2) in ring gear and case-half assembly (1) after lubricating parts with new axle lubricant.

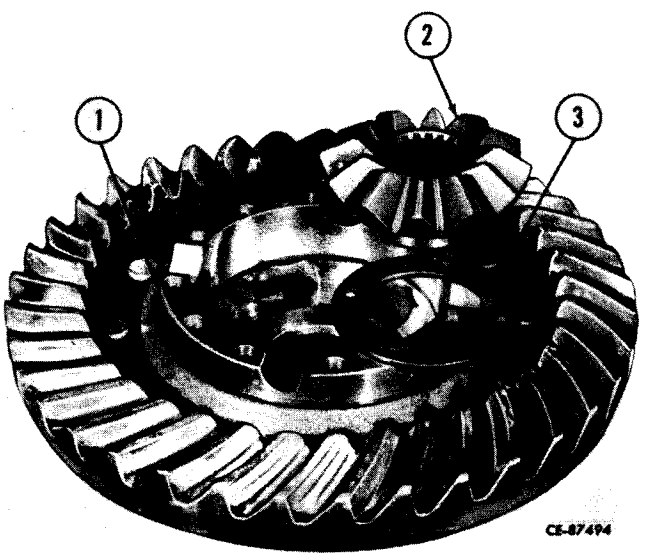


Figure 6-28
Install Side Gear.

Lubricate spider (6, Fig. 6-29), pinion gears (2) and thrust washers (5) with new axle lubricant.

Place spider, pinion gears and thrust washers in position in case half (1).

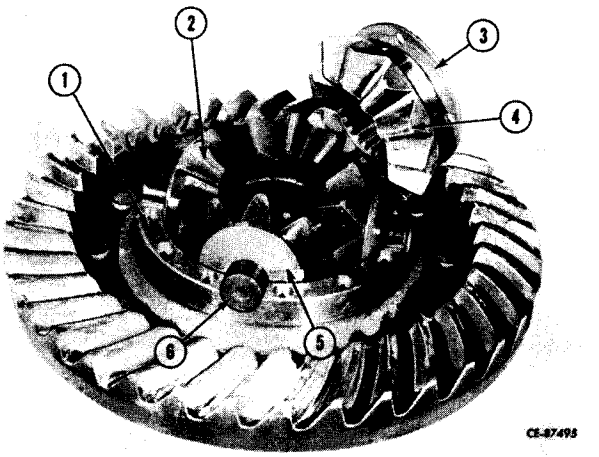


Figure 6-29
Install Spider.

Install remaining side gear (4) and thrust washer (3) after lubricating with new axle lubricant.

Align mating marks (4, Fig. 6-30) on case halves (2, 3) and secure assembly with four equally spaced cap screws, flat washers and hex nuts (1).

Check assembly for free rotation of differential gears. Correct if necessary.

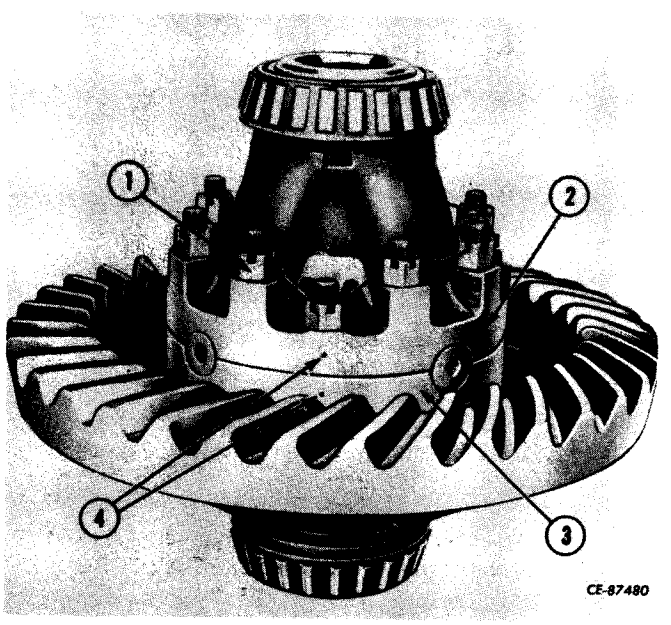


Figure 6-30
Install Case Halves.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

Install remaining cap screws, washers and hex nuts. Tighten all differential case cap screws to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Lock wire case retaining cap screws.

Press bearings (10, 20, Fig. 6-5) squarely on case halves being sure they bottom on case shoulders. Use a suitable sleeve and press only on bearing inner race.

Lubricate bearings with new axle lubricant.

If the differential assembly will not be installed in axle housing immediately, cover the complete assembly with a plastic cover to eliminate the entrance of dirt.

Temporarily install bearing cups (1, Fig. 6-31) and bearing caps (3). Tighten bearing cap retaining cap screws (2) to recommended torque (refer to "SPECIAL TORQUES").

Torque
Large cap screws: _____

Small cap screws: _____

NOTE: Observe reference punch marks (Fig. 6-9) when installing bearing caps.

The bearing cups (1, Fig. 6-31) must be a hand push fit in their respective bores. If cups are too tight, bores must be reworked with emery cloth until a push fit is obtained. Use a blued bearing cup as a gauge and check the fit often. When cups fit properly, remove the bearing caps.

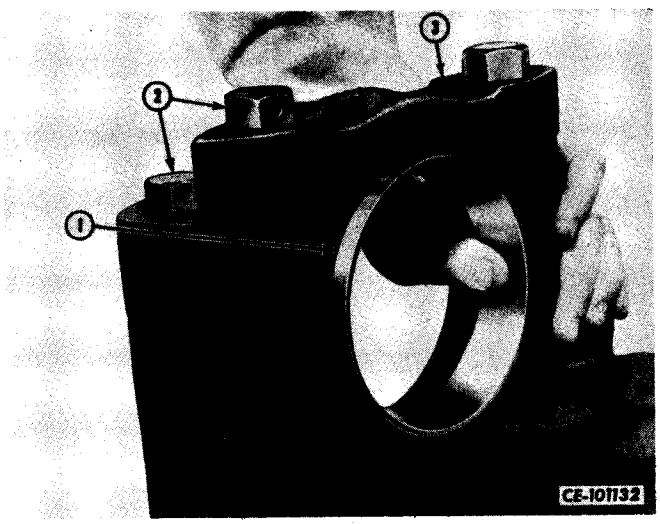


Figure 6-31
Install Bearing Cups.

Coat differential bearing cones and cups with new axle lubricant.

Place bearing cups over differential bearing cones and position differential assembly in carrier (Fig. 6-32).

Install bearing adjusting nuts. Hand turn them against bearing cups.

Install bearing caps on their respective sides (refer to identification marks Fig. 6-9) and tap lightly into position.

If caps do not position properly, adjusting nuts may be cross threaded. Remove caps and reposition the adjusting nuts.

NOTE: Do not force caps into position.

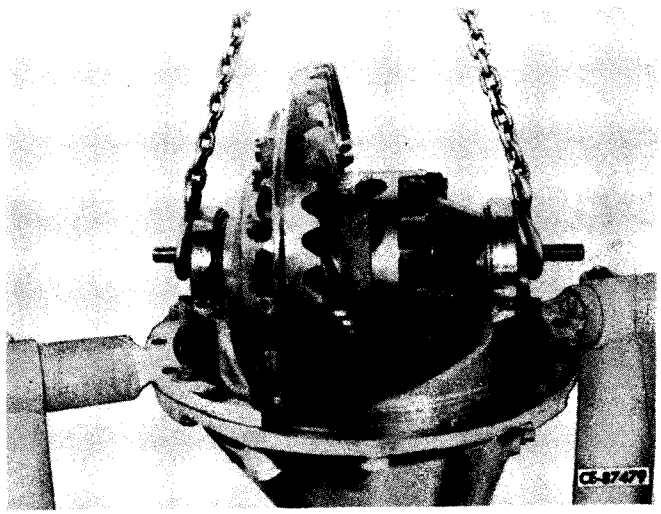


Figure 6-32
Install Differential Assembly.

Install cap screws (1, Fig. 6-33) and tighten to recommended torque (refer to "SPECIAL TORQUES").

Torque
Large cap screws: _____

Small cap screws: _____

(Continued on next page)

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

ASSEMBLY - Continued

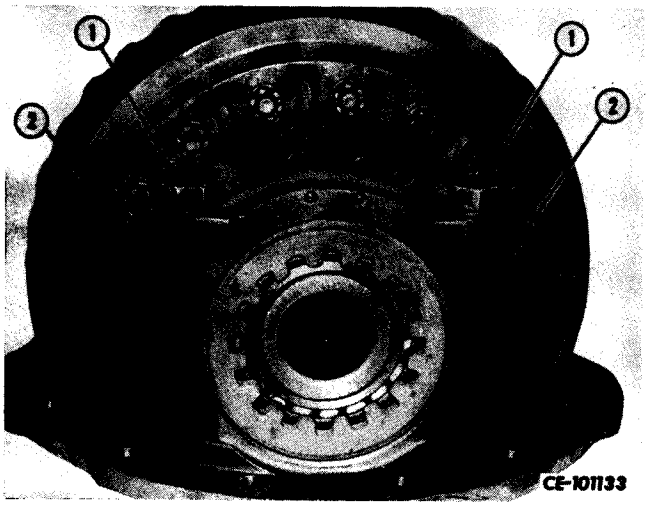


Figure 6-33
Install Bearing Caps.

Using a dial indicator on the back face of the ring gear (Fig. 6-34) loosen the bearing adjusting nut on the side opposite the gear teeth just enough to notice end play on the indicator.

Tighten the same adjusting nut just sufficient to obtain zero end play.

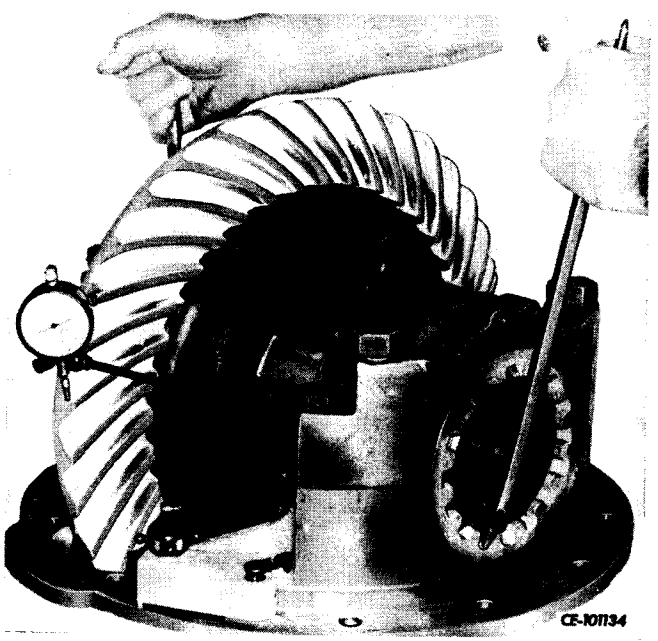


Figure 6-34
Record Backlash.

Check the ring gear for runout. If runout exceeds recommended maximum (refer to "TOLERANCES") remove differential and determine cause.

Max. Runout: _____

From the zero end play setting, tighten the adjusting nuts one notch each to preload the differential bearings.

If ring and pinion gears were not replaced, the backlash dimension (Fig. 6-35) recorded before disassembly should be used.

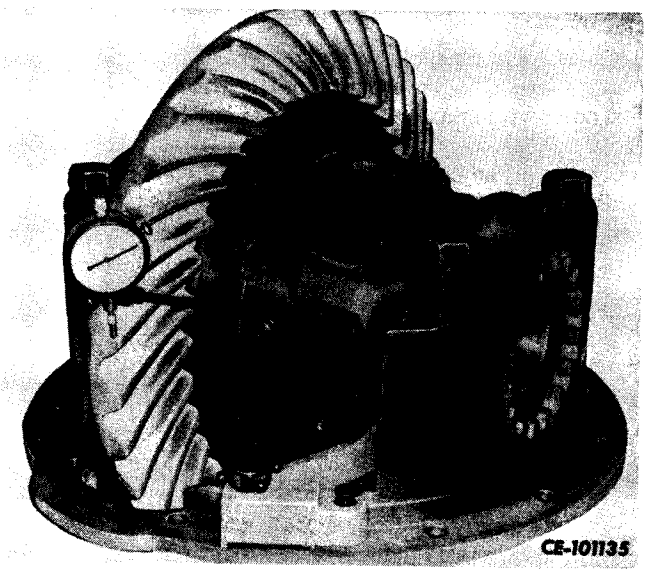


Figure 6-35
Using Dial Indicator.

If gear set was replaced, the recommended backlash setting for new gears (refer to "TOLERANCES") should be adhered to.

Initial backlash - new gears: _____

Backlash is adjusted by backing off one lock ring and advancing the opposite ring the same amount.

Apply oiled red lead (Fig. 6-37) to the ring gear teeth. When the pinion is rotated the red lead is squeezed away by the contact of the teeth leaving an imprint the exact size, shape and location of the contact.

Sharper impressions may be obtained by applying a small amount of resistance to the ring gear with a steel bar and using a wrench to rotate the pinion. When making adjustments, check the drive side of the ring gear teeth. Coating approximately 12 teeth is sufficient to check tooth contact.

After satisfactory tooth contact is obtained, especially in relation to the top and bottom of the tooth, the backlash may

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

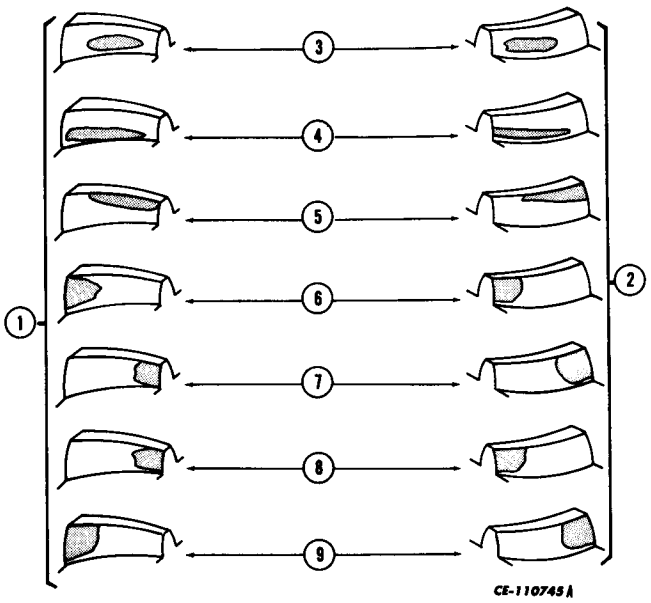


Figure 6-36
Tooth Contact on Driven Gears.

1. **Concave Side of Gear**
2. **Convex Side of Gear**
3. **Correct Contact**
   Correct tooth bearing position with accurate and rigid mounting.
4. **Out of Position Bearing**
   Cause: Pinion too close to cone center.
   Remedy: Move pinion away from cone center.
5. **Out of Position Bearing**
   Cause: Pinion too far from cone center.
   Remedy: Move pinion toward cone center.
6. **Cross Bearing**
   Cause: Shafts do not intersect.
   Remedy: Line up shafts.
7. **Cross Bearing**
   Cause: Shafts do not intersect.
   Remedy: Line up shafts.
8. **Toe Bearing**
   Cause: Shaft angle too large.
   Remedy: Correct the shaft angle. Increase backlash.
9. **Heel Bearing**
   Cause: Shaft angle too small.
   Remedy: Correct the shaft angle. Decrease toward minimum backlash.

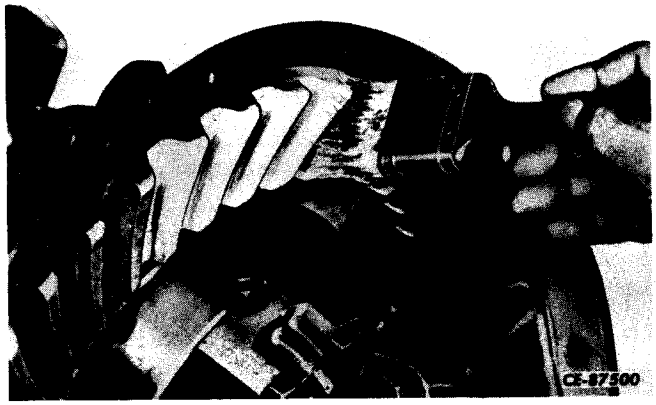


Figure 6-37
Apply Red Lead.

be altered within recommended limits (refer to "TOLERANCES") to obtain a better contact position relative to the length of the tooth.

Backlash alteration limits: _____

A high backlash setting can be used to keep the contact from starting too close to the toe, and a low backlash setting can be used to keep the contact from starting too far away from the toe.

After establishing correct tooth contact, install adjusting nut locks (2, Fig. 6-38) and cap screws (3). Tighten cap screws and lock wire. Lock wire bearing cap screws (1).

(Continued on next page)

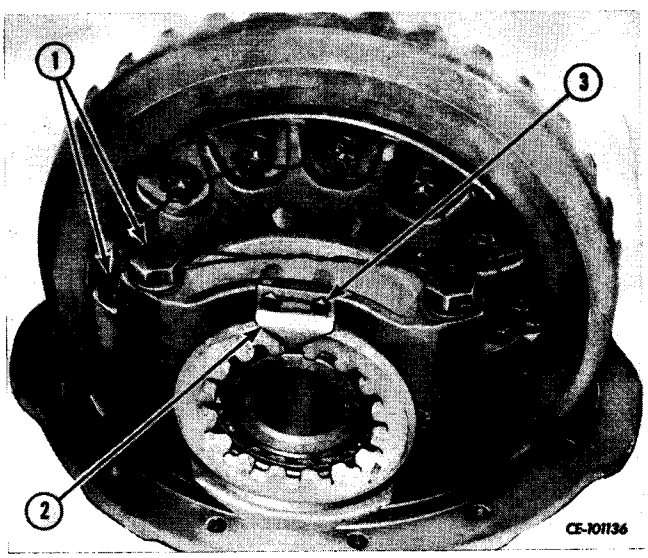


Figure 6-38
Lockwire Cap Screws.

DIFFERENTIAL DISASSEMBLY AND ASSEMBLY

ASSEMBLY - Continued

Remove carrier from the holding fixture. Position the assembly with the back face of the ring gear upward.

Inspect thrust block (3, Fig. 6-39) on lower end of thrust block adjusting screw (2) for excessive wear. Replace assembly if in doubt.

Start jam nut (1, Fig. 6-39) on adjusting screw (2) and thread screw into tapped hole in carrier (4).

Hold jam nut and thread screw in until the thrust block (3) is pressed firmly against back face of ring gear (5).

Back off adjusting screw until the recommended clearance (refer to "TOLERANCES") is obtained.

Thrust block clearance: _____

Hold adjusting screw and tighten the jam nut securely.

Recheck the thrust block-to-ring gear clearance for a full rotation of the ring gear.

Figure 6-39
Install Adjusting Screw.

PLANETARY DISASSEMBLY AND ASSEMBLY

DISASSEMBLY PREPARATION

Disassembly preparation should include:

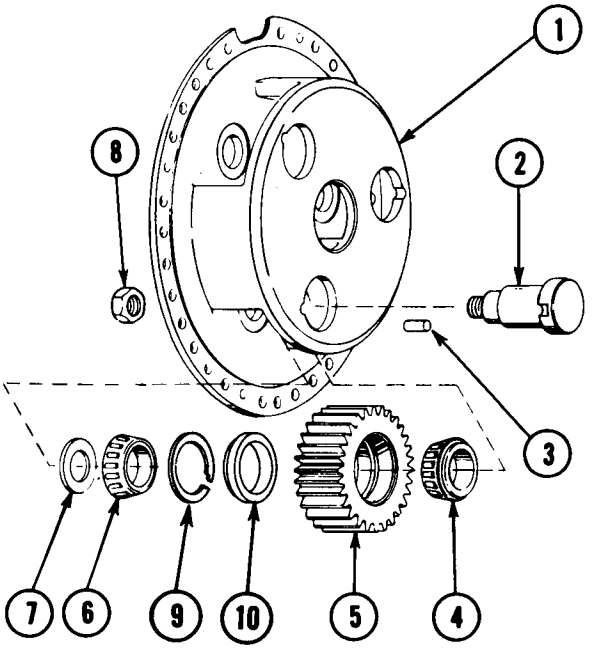
a. Removing planetary assemblies from the axle (refer to "AXLE DISASSEMBLY AND ASSEMBLY").

b. Preparing a clean work area of sufficient size.

c. Cleaning the outside of the planetary carrier assembly with solvent (no caustic soda).

d. Secure the following equipment:

Work Bench
Suitable Hoist
Hydraulic Press



PL-116081

Figure 6-40
Pinion Gears.

DISASSEMBLY

Remove hex nuts (8, Fig. 6-40) from pinion shafts (2).

PLANETARY DISASSEMBLY AND ASSEMBLY

Using a hydraulic press, press the planetary pinion shafts (2) from the carrier (1).

NOTE: Do not lose the dowel locating pins (3).

As each pinion shaft and dowel are removed, remove the pinions (5), bearings (4, 6) and spacers (7) from the carrier. Remove spacer and retaining ring from the gear (5) on later units. Remove ring (9) and spacer (10) on units so equipped.

Tie bearing cones (4, 6) to pinion (5) in their original positions. If these bearings are to be reused they must be assembled in their original positions.

ASSEMBLY PREPARATION

Assembly preparation should include:

a. Cleaning all parts thoroughly in solvent. Dry parts with compressed air.

NOTE: NEVER dry bearings by spinning with compressed air.

b. Inspecting all bearing cones. If replacement of pinion bearings is deemed necessary both pinion gear and bearing cones must be replaced as an assembly.

c. Inspection of pinions, for wear or damage. Pinions showing wear or damage should be replaced together with their bearing cones.

d. Inspection of pinion shafts for wear or ridging.

e. Parts to be assembled immediately should be dipped in light oil to prevent corrosion. Parts to be stored should be coated with a good grade of rust preventive and wrapped in treated paper.

f. Obtaining a sufficient amount of dry ice to chill the pinion shafts.

Pinion shafts must be packed in dry ice for at least 30 minutes to shrink them sufficiently for easier installation.

NOTE: Special Torque, Pressure etc. recommendations are listed under "SERVICE INFORMATION." This simplifies revision when necessary. To eliminate constant referral, blank spaces are provided at points where special information is required. These may be filled in by the manual holder, in pencil, and revised when necessary.

PLANETARY DISASSEMBLY AND ASSEMBLY

ASSEMBLY

Place spacers (2, Fig. 6-41) in position in recesses (1) in carrier.

Assemble pinion and bearing assemblies.

The spacer (10, Fig. 6-43) on units so equipped, has a recess which fits over ring (9) when assembled.

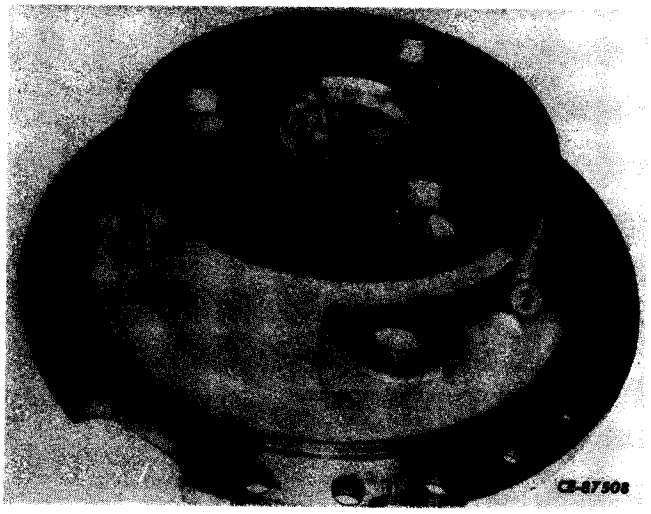


Figure 6-41
Install Spacers.

Install pinion and bearing assemblies in position over spacers and align the bores in the carrier, spacers and pinion assemblies.

Pack the pinion pins (1, Fig. 6-42) in dry ice for at least 30 minutes to shrink them sufficiently for easier installation.

With pinion assembly (4) and spacer in position, install pinion shafts (1) with dowel pin (2). Aligning dowel pin with cutout (3) provided in carrier housing, press in pinion shaft. Be sure second "step" in pinion shaft bottoms on spacer in carrier recess.

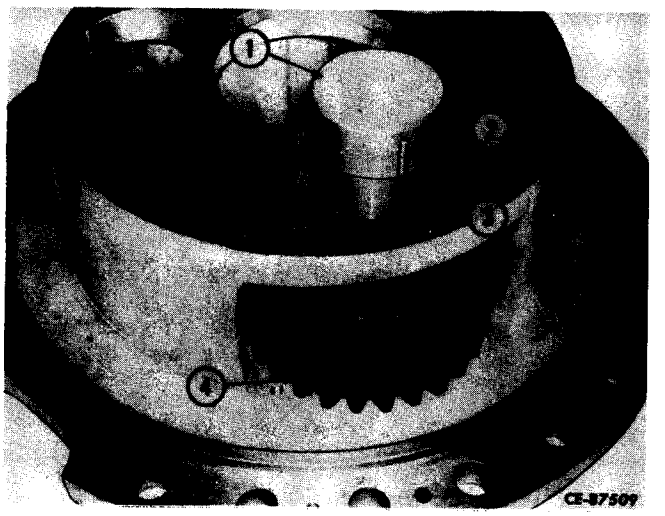


Figure 6-42
Install Pinion Shaft.

When all pinion shafts (2, Fig. 6-43) are installed in carrier, install hex nuts (1) and tighten to recommended torque (refer to Section VI under "SPECIAL TORQUES").

Torque: _____

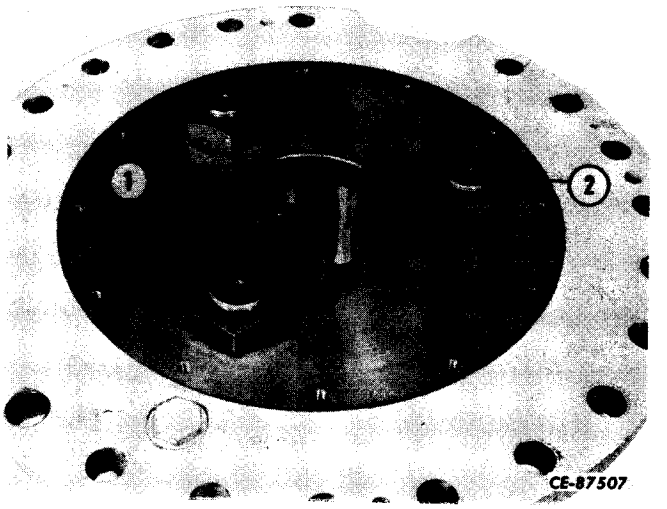


Figure 6-43
Torque Pinion Shaft Nuts.

TROUBLE SHOOTING

GENERAL

Noise and vibration originating in the transmission, drive shafts or tires is often attributed to an axle. The source of noise should be investigated before deciding that the cause is in the axle.

The source of noise may be isolated within the axle by jacking up the tractor so the tires clear the ground. If the noise is in one axle, disconnect the drive shaft of the opposite axle at the transmission. Now the noise may be isolated with only the noisy axle turning. Run the engine at a moderate speed with the transmission in first gear. Both wheels must be off the ground to prevent damage to the differential.

CAUTION: If a failure should occur in the differential, the tractor must not be operated under its own power. If the tractor must be moved, disconnect the drive shaft at the transmission, or remove the drive shaft completely. Drain both planetary hubs of the noisy axle, remove the planetary covers and pull the axle shafts to prevent further damage. When shafts are removed, install planetary covers and fill hubs before moving tractor. The tractor may be driven a short distance with one axle if the drive shaft and axle shafts are removed from the noisy axle or differential.

TROUBLE SHOOTING CHART

AXLE		
COMPLAINT	PROBABLE CAUSE	REMARKS
Noise.	1. Incorrect lubricant, or level too low. 2. Wheel bearings scored or damaged. 3. Wheel bearings improperly adjusted. 4. Sun gear teeth excessively worn or damaged.	4. Replace axle shaft.
Loss of lubricant.	1. Lubricant level too high. 2. Lubricant foams excessively. 3. Lubricant leaks at planetary cover. 4. Worn or broken oil seal on axle spindle housing (oil leak from behind wheel into brake compartment). 5. Worn or broken drive axle oil seal (oil level in differential rises).	1. Drain to correct level. 2. Drain and fill with correct type and viscosity of oil. 3. Tighten cap screws or replace gasket.
DIFFERENTIAL		
Noise when turning.	1. Worn spider gears or side gears.	
Loss of lubricant.	1. Worn drive pinion oil seal. 2. Scored or worn differential drive yoke.	2. Replace drive yoke and drive pinion oil seal.

(Continued on next page)

TROUBLE SHOOTING

TROUBLE SHOOTING CHART - Continued

COMPLAINT	PROBABLE CAUSE	REMARKS
Differential overheats.	1. Incorrect lubricant or level too low. 2. Pinion or ring gear bearing worn. 3. Gear teeth excessively worn or damaged. 4. Unmatched pinion and ring gear.	1. Check differential housing for leaks. 4. Replace with a new matched pinion and ring gear.
Noise when driving.	1. Incorrect lubricant or level too low. 2. Pinion and ring gear adjustment too tight.	1. Check differential housing for leaks.
Noise when coasting.	1. Pinion or ring gear bearings damaged. 2. Pinion and ring gear adjustment too loose.	
NOTE: The following problems can be checked when the differential has been removed and disassembled.		
Side gear broken at hub.	1. Misaligned or bent drive axle. 2. Worn thrust washers.	1. Replace damaged gears. Check drive axle for alignment and examine other gears and bearings for possible damage and replace as needed. 2. Replace damaged parts. Examine other gears and bearings for possible damage. Replace all thrust washers.
Gears scored.	1. Incorrect lubricant or level too low. 2. Excessive wheel spinning.	1. Replace scored gears. Inspect all gears and bearings for possible damage. Clean out housing and fill with correct grade and type of lubricant. 2. Replace scored gears. Inspect all gears, pinion bores and shafts for scoring. Inspect bearings for possible damage and replace as needed.
Pinion and/or ring gear tooth breakage.	1. Improper pinion and ring gear adjustment (backlash). 2. Excessive shock loading of gears.	1. Replace gears with new matched set. 2. Inspect remaining parts for possible damage and replace as needed.

TROUBLE SHOOTING

PLANETARY		
COMPLAINT	PROBABLE CAUSE	REMARKS
Noise.	1. Planetary gears or ring gear teeth worn, chipped or broken. 2. Bearings in planetary gears worn or broken.	

SERVICE INFORMATION

TOLERANCES

Press Tonnage - Differential pinion cage preload test	12, 7 Mg (14 tons)
Preload Torque Limits - Differential pinion cage	0,565 - 1,69 N·m (5 - 15 in lb)
Ring Gear Runout - Maximum	0,203 mm (.008 in)
Initial Backlash - New ring and pinion gear set	0,254 mm (.010 in)
Backlash Alteration Limitations - Permissible during adjustment	0,127 - 0,381 mm (.005 - .015 in)
Thrust Block Clearance (Early Style)	0,254 - 0,381 mm (.010 - .015 in) = (1/4 turn)

SPECIAL TORQUES

Axle Mounting Bolts	3118 N·m (2300 ft lb)
Wheel Stud Nuts - Phosphate Coated - 122 mm (4.8 in) long	922 - 1017 N·m (680 - 750 ft lb)
Wheel stud nuts - 19 mm (3/4 in) - Standard Finish	1220 N·m (900 ft lb)
DIFFERENTIAL:	
Mounting Bolts w/Loctite - 16 mm (5/8 in)	217 N·m (160 ft lb)
Mounting Bolts w/Loctite - 19 mm (3/4 in) long)	380 - 420 N·m (280 - 310 ft lb)
Pinion Shaft Nut w/Cotter Pin	1491 - 1898 N·m (1100 - 1400 ft lb)
Pinion Bearing Cage-to-Housing Cap Screws w/Lockwire	217 - 278 N·m (160 - 205 ft lb)
Ring Gear-to-Case Cap Screws w/Lockwire	251 - 319 N·m (185 - 235 ft lb)
Case-Half Cap Screws w/Lockwire	251 - 319 N·m (185 - 235 ft lb)
Bearing Cap Bolts:	
Large (7/8" Dia.) Bolts w/Lockwire	515 - 658 N·m (380 - 485 ft lb)
Small (5/8" Dia.) Bolts w/Lockwire	176 - 230 N·m (130 - 170 ft lb)
Brake Cylinder-to-Axle Housing Bolts	380 N·m (280 ft lb)
Brake Drum-to-Wheel Hub Bolts	380 N·m (280 ft lb)
Planetary Ring Gear-to-Ring Gear Hub Bolts	43 N·m (32 ft-lb)
Wheel Bearing Adjusting Nut (Initial)	542 N·m (400 ft lb)
Wheel Bearing Adjusting Nut (Maximum)	1085 N·m (800 ft lb)
Wheel Bearing Adjusting Nut (Final)	542 N·m (400 ft lb)
Planetary Cover Bolts	41 - 46 N·m (30 - 34 ft lb)
Planetary Carrier Pinion Shaft Nuts	610 N·m (450 ft lb)
Anchor Pin Lock Plate-to-Axle Housing Bolt	108 - 115 N·m (80 - 85 ft lb)
Anchor Pin-to-Lock Plate Bolts	108 - 115 N·m (80 - 85 ft lb)
Wheel bearing adjusting nut lock bolt w/plastic gasket	244 N·m (180 ft lb)

PRINTED IN UNITED STATES OF AMERICA

SERVICE INFORMATION

TORQUE CHART

(For differential hardware without lockwire or cotter pins)

	ft-lb	N·m
1/4 - 20	12-15	16-20
1/4 - 28	14-18	19-24
5/16 - 18	22-28	30-38
5/16 - 24	23-29	31-39
3/8 - 16	35-50	47-68
3/8 - 24	40-55	54-75
7/16 - 14	60-75	81-102
7/16 - 20	65-90	88-122
1/2 - 13	90-120	122-163
1/2 - 20	105-135	142-183
9/16 - 12	130-170	176-230
9/16 - 18	150-190	203-258
5/8 - 11	185-235	251-319
5/8 - 18	210-270	285-365
3/4 - 10	325-420	441-569
3/4 - 16	365-470	495-637
3/4 - 20	380-485	515-658
7/8 - 9	530-680	719-922
7/8 - 14	585-750	793-1017
7/8 - 20	615-790	834-1071
1 - 12	870-1120	1180-1518
1 - 14	890-1150	1207-1559
1 - 16	910-1170	1234-1586
1 - 20	920-1190	1247-1613
1-1/8 - 12	1260-1620	1708-2196
1-1/8 - 16	1300-1680	1762-2277
1-1/4 - 12	1750-2260	2373-3064
1-1/4 - 16	1810-2340	2454-3173
1-1/4 - 18	1830-2360	2481-3200
1-3/8 - 12	2360-3040	3200-4122
1-3/8 - 16	2440-3140	3308-4257
1-1/2 - 12	3100-3990	4203-5410
1-1/2 - 16	3190-4100	4325-5559

SERVICE INFORMATION

SPECIAL TOOLS

Axle Removal and Installation Tool

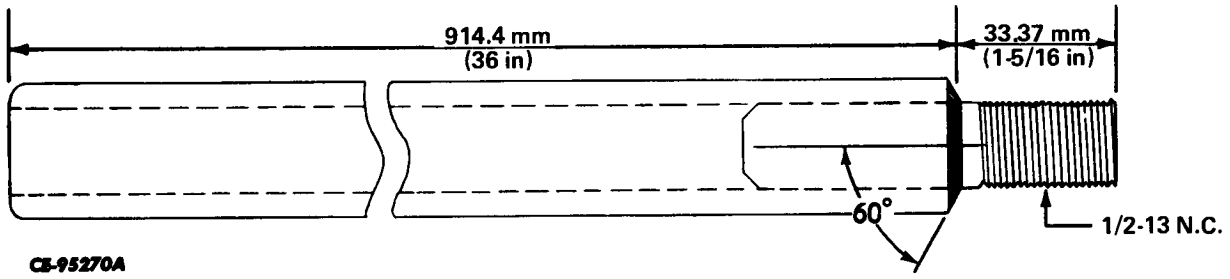


Figure 6-44

Differential Holding Fixture

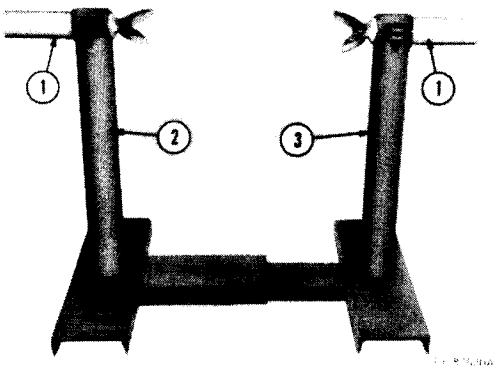


Figure 6-45
Assembled Differential Holding Fixture.

A. Swivel weldment (Figure 6-46).
B. Stand weldment - left hand (Figure 6-47).
C. Stand weldment - right hand (Figure 6-48).

SERVICE INFORMATION

SPECIAL TOOLS - Continued

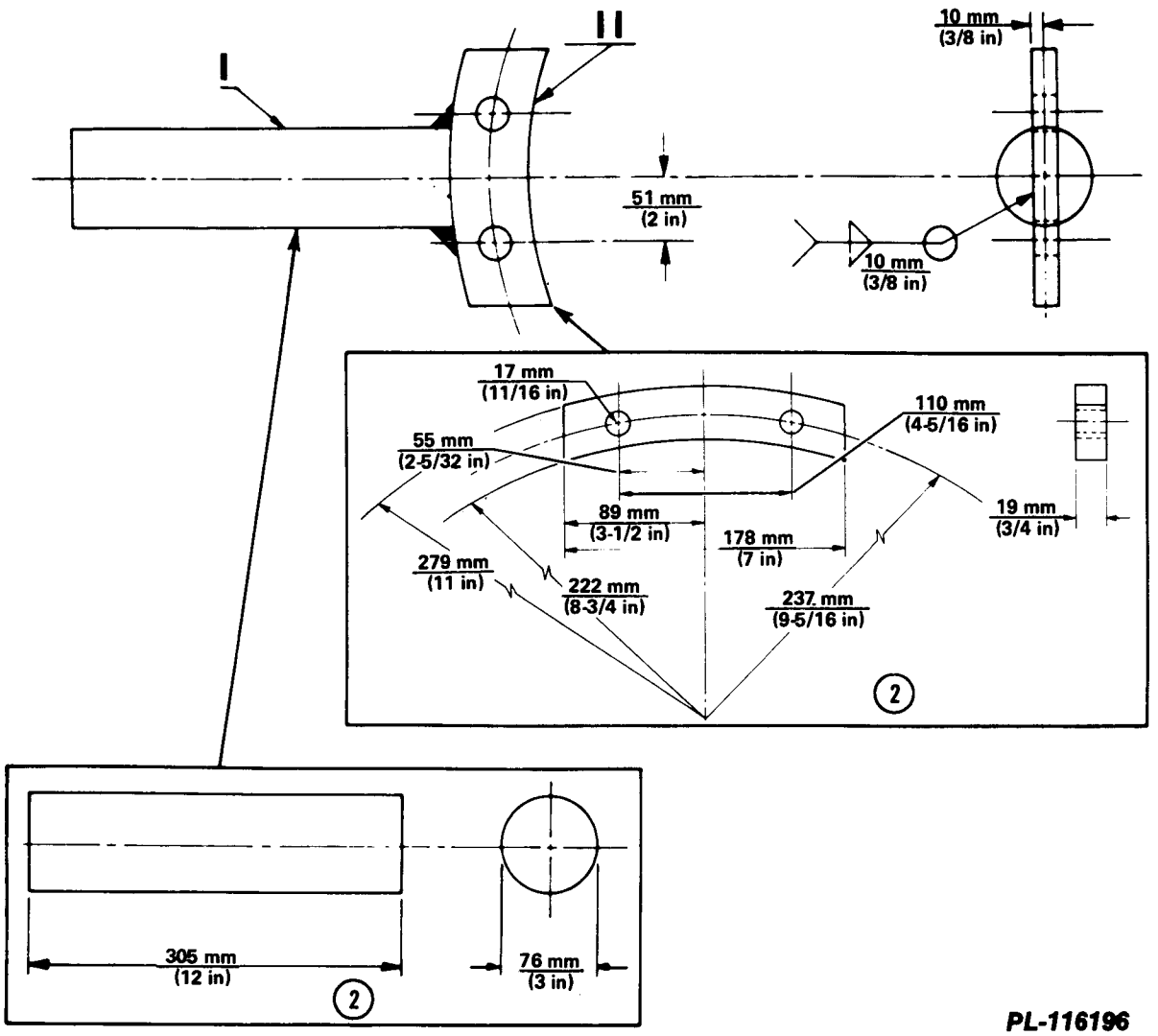


Figure 6-46
A. Swivel Weldment (2 Required).

SERVICE INFORMATION

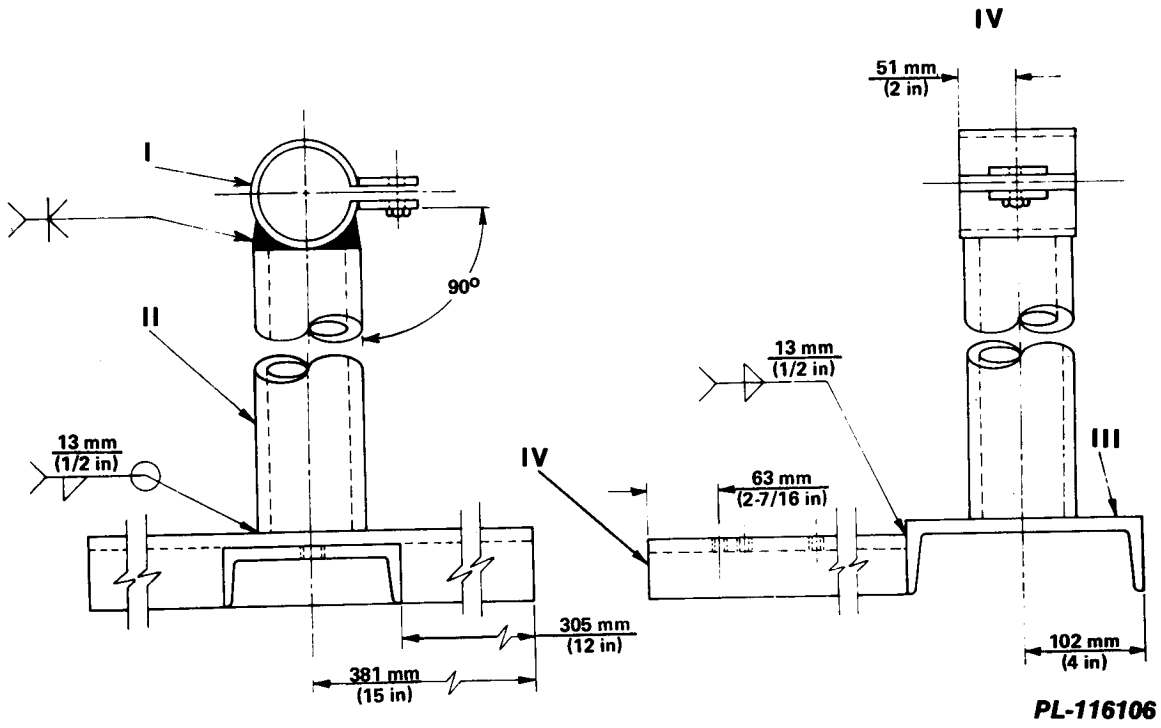


Figure 6-47
B. Stand Weldment Assembly - Left Hand (1 Required).
(Details Shown in Figures 6-49, 6-50, 6-51, 6-52).

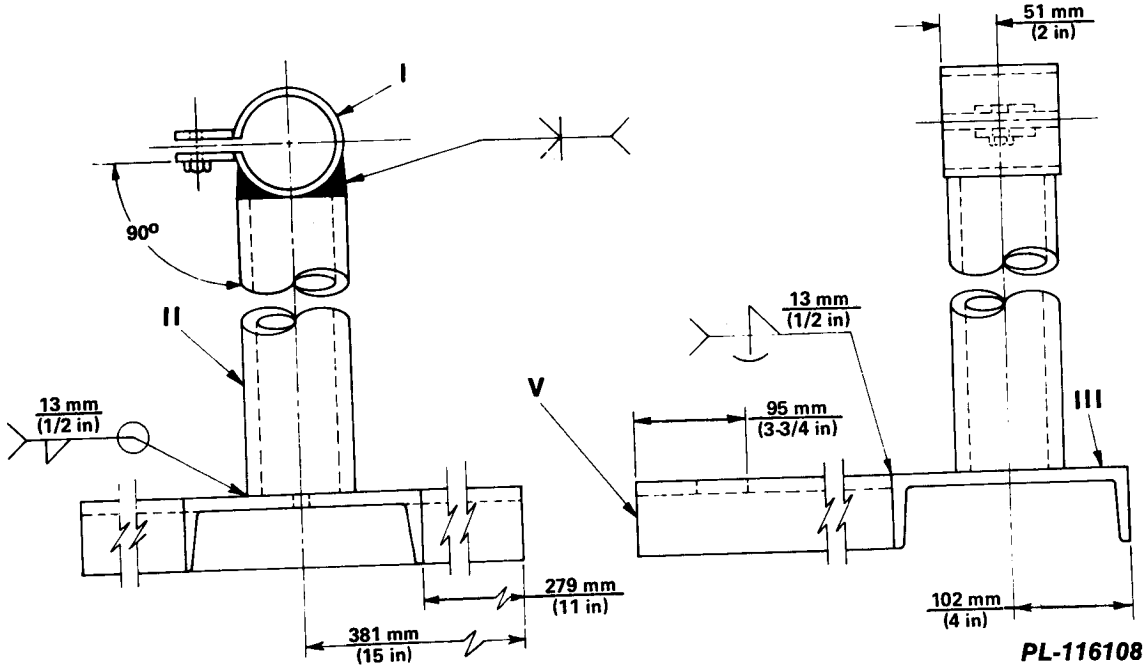


Figure 6-48
C. Stand Weldment Assembly - Right Hand (1 Required).
(Details Shown in Figures 6-49, 6-50, 6-51, 6-53).

(Continued on next page)

SERVICE INFORMATION

SPECIAL TOOLS - Continued

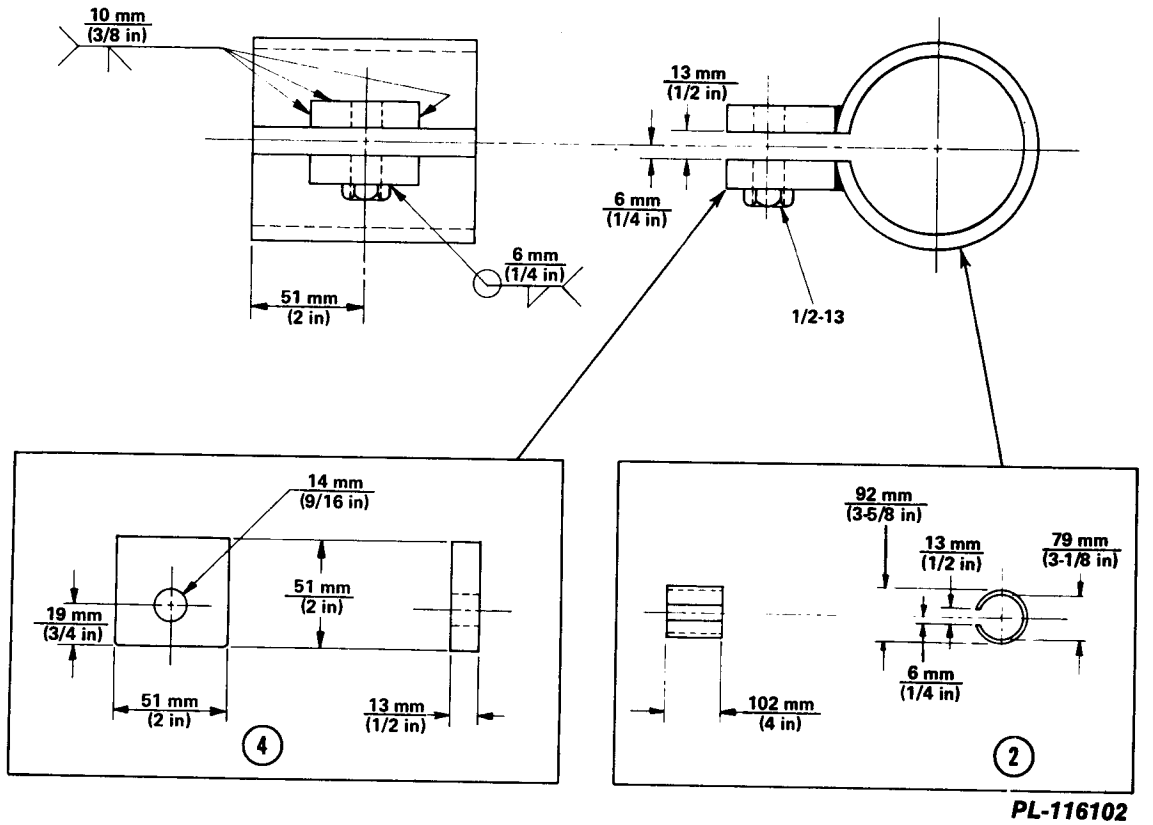


Figure 6-49
Item I. Clamp Assembly (2 Required).

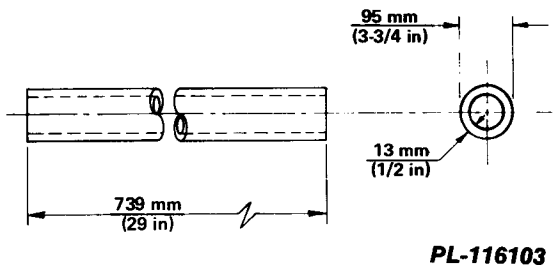


Figure 6-50
Item II. Tube (2 Required).

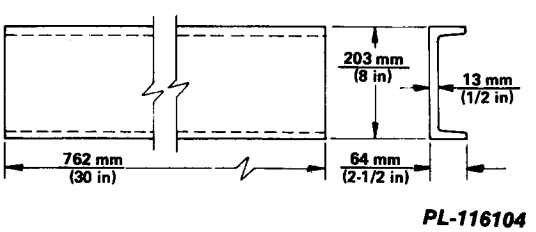


Figure 6-51
Item III. Base (2 Required).

SERVICE INFORMATION

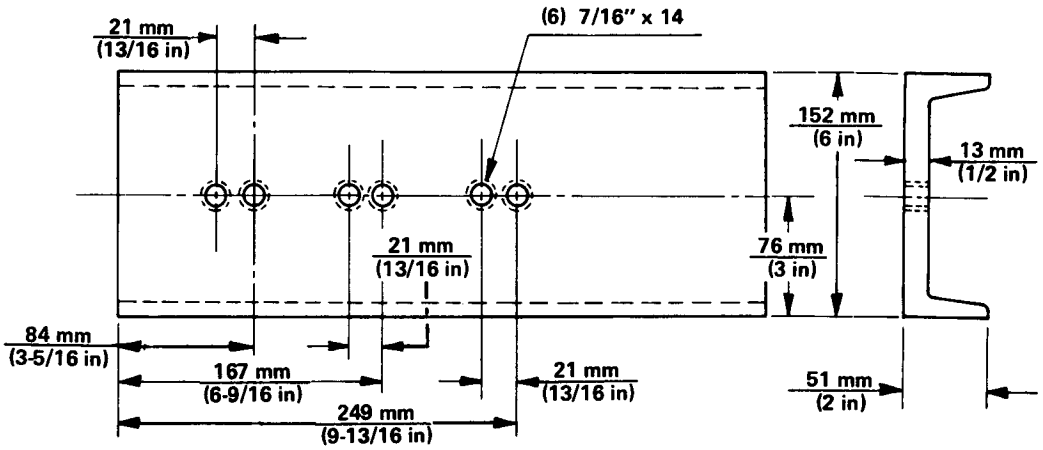


Figure 6-52
Item IV. Slide-Stand Weldment (Left Hand).

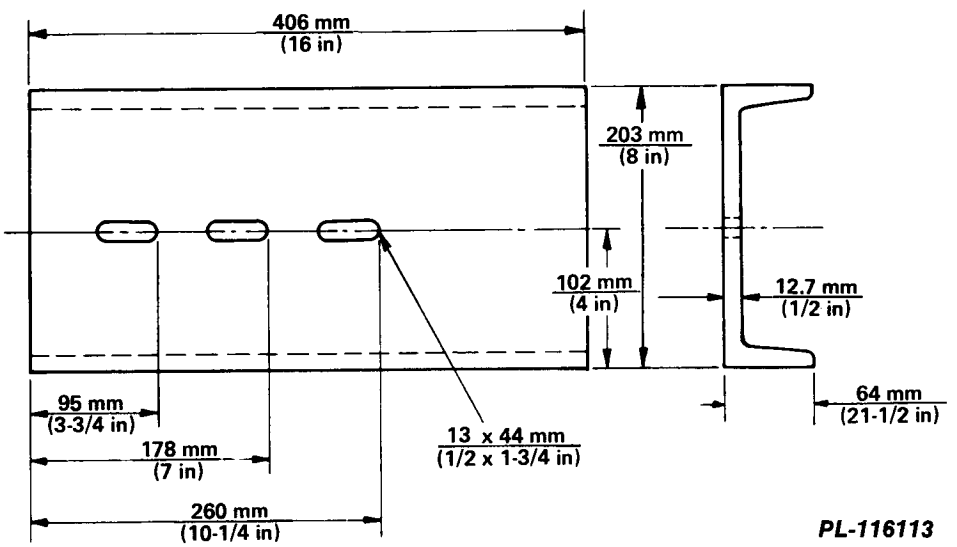


Figure 6-53
Item V. Slide-Stand Weldment (Right Hand).

SECTION 7

STEERING AXLES

(NOT APPLICABLE)

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

DESCRIPTION

The steering gear is a recirculating ball bearing, worm and nut type.

The recirculating ball type gear consists of a "ball nut" connected to the steering worm and in mesh with the sector gear.

Precision finished helical grooves within the ball nut match helical grooves in the worm. The ball bearings roll within these grooves when the steering wheel is turned. There are two complete circuits using tubular ball guides to deflect the balls away from their helical path at one end of the grooves and guide them back to the other end.

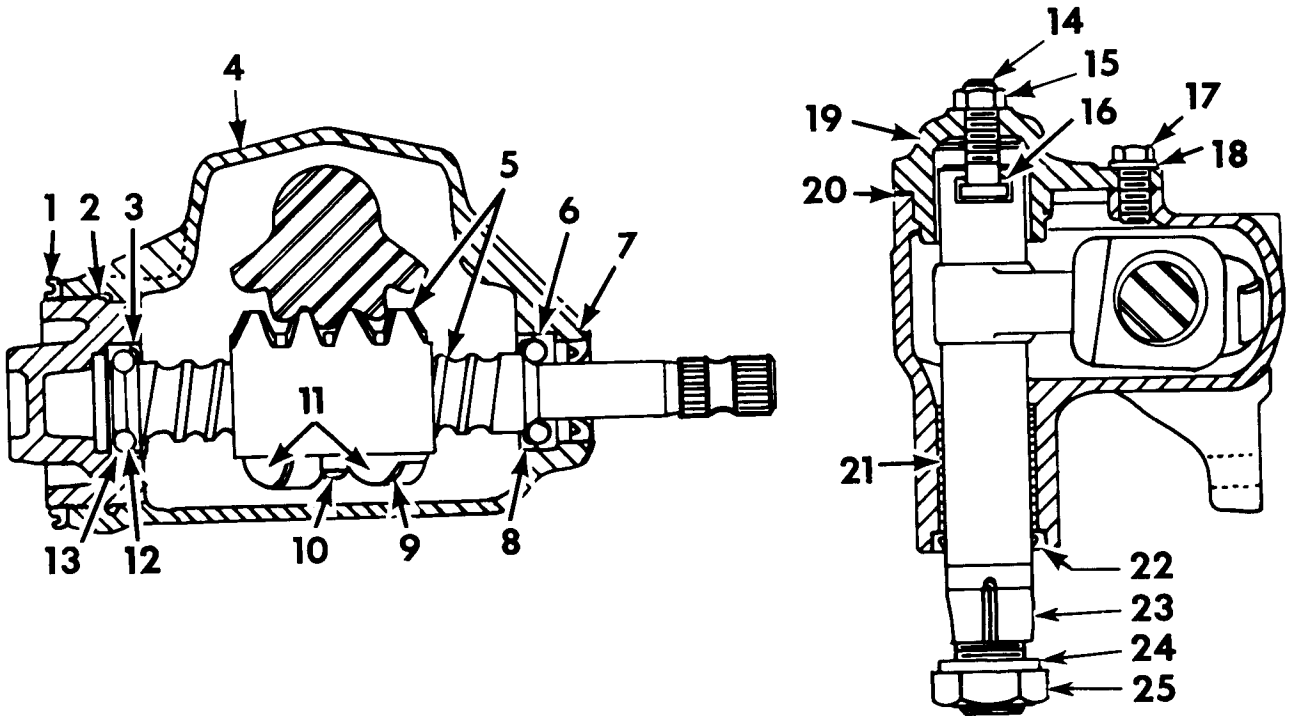


Figure 8-1
Steering Gear - Cross Section.

1. Adjuster lock nut.
2. Bearing adjuster.
3. Bearing retainer.
4. Housing.
5. Worm shaft and ball nut.
6. Bearing cup.
7. Seal.
8. Bearing.
9. Guide clamp.
10. Screw and washer.
11. Ball return guides.
12. Bearing.
13. Bearing cup.
14. Lash adjuster.
15. Nut.
16. Shim.
17. Cap screw.
18. Washer.
19. Side cover.
20. Gasket.
21. Bushing.
22. Seal.
23. Sector gear and shaft.
24. Washer.
25. Pitman arm nut.

DISASSEMBLY, INSPECTION AND ASSEMBLY

STEERING GEAR

Removal

Remove the gear as follows:

Mark location of pitman arm on sector gear shaft. Remove arm using a suitable puller.

Mark location of steering shaft on worm gear shaft. Loosen clamp bolt attaching steering shaft to gear shaft.

Remove cap screws and lock washers securing steering gear to tractor.

Remove steering gear assembly from tractor.

Disassembly

Place gear assembly in vise.

NOTE: Do not clamp housing too tightly in vise as damage may result from excess pressure.

Remove lock nut (3, Fig. 8-2) from lash adjuster screw (2).

Turn lash adjuster screw (2) a few turns counterclockwise. This will remove load from worm bearings caused by close meshing of rack and sector teeth.

Loosen bearing adjuster nut (4) and remove adjuster (5) with ball bearing retainer and nut.

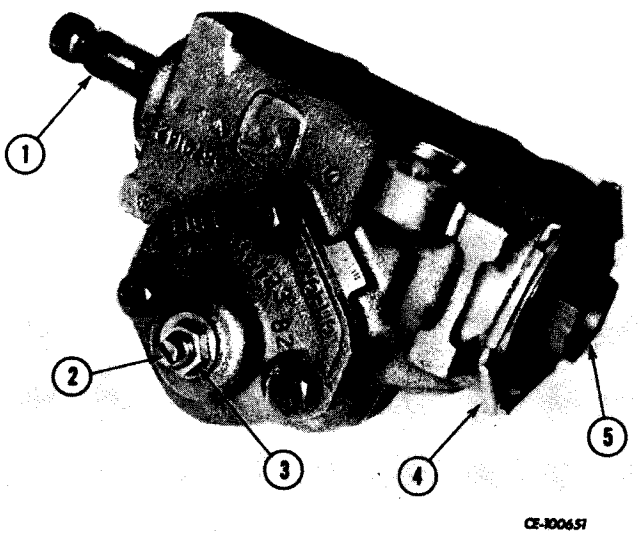


Figure 8-2
Steering Gear.

Remove cap screws and lock washers that secure side cover (1, Fig. 8-3) to housing (3).

Pull side cover with sector and shaft from housing.

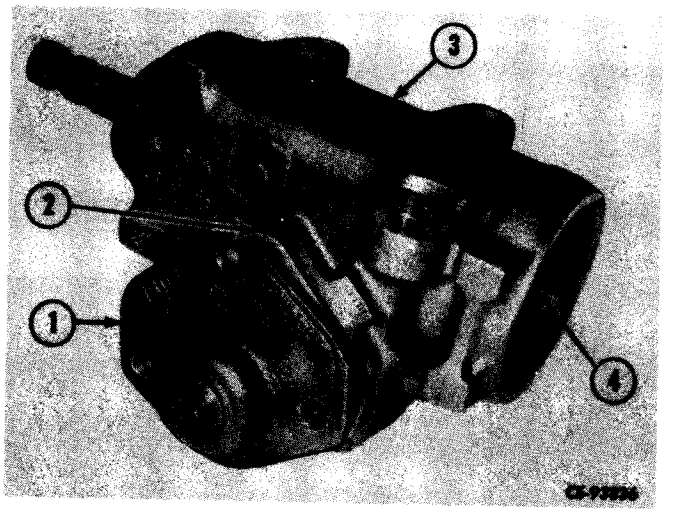


Figure 8-3
Remove Side Cover.

NOTE: If sector does not clear opening in housing easily, turn worm shaft by hand until sector will pass through opening.

Remove and discard cover gasket (2).

Carefully withdraw worm shaft (4) and ball nut as an assembly from housing (3).

> NOTE: If shaft with ball nut is held in vertical position, ball nut will travel by its own weight to the end of shaft. If ball nut strikes either end of worm sharply, ball guides will be damaged. If ball nut does not require disassembly, tape each end of worm to prevent movement of ball nut.

Try action of ball nut on worm. Nut must rotate smoothly with no evidence of binding or roughness. If damage is evident, disassemble as follows (Fig. 8-4):

a. Remove screw (1) attaching ball guide clamp (2) to ball nut (5). Remove clamp. Pull ball guides (4) out of ball nut, one pair at a time. Separate guides and remove balls.

b. Turn ball nut upside down, rotate shaft (3) back and forth until all balls have dropped from ball nut into a clean pan. With balls removed, pull ball nut endwise from shaft worm.

DISASSEMBLY, INSPECTION AND ASSEMBLY

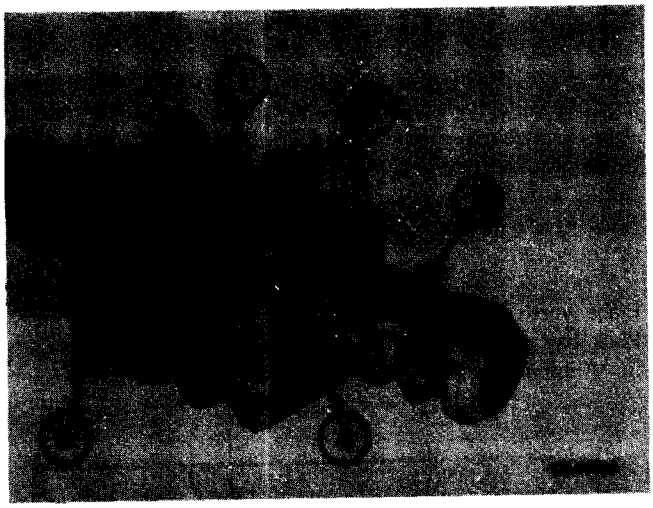


Figure 8-4
Ball Return Guides.

Removal and replacement of housing bushing may be deferred until after inspection of parts on units so equipped.

Remove and discard seals (1 and 3, Fig. 8-6).

Clean

Thoroughly clean all parts in clean solvent and dry with compressed air.

Inspect

Inspect gear housing for cracks or stripped threads in tapped holes.

Check clearance between Pitman shaft (on units so equipped) and bushing in housing. If bushing is worn, replace. Refer to "REPAIR."

Inspect upper and lower ball bearing. If balls are damaged or worn replace.

Examine side cover for cracks or damage. Check clearance between Pitman shaft and side cover bushing (on units so equipped). If bushing is scored, damaged or excessively worn, replace side cover and bushing assembly.

Inspect Pitman shaft for damaged splines and/or threads. Examine sector gear teeth for scuffing and scoring. Check shaft OD. If excessive wear is evident at any of these points, replace shaft.

Inspect bearing areas and thread groove on worm. If worm is galled, replace steering shaft and ball nut assembly completely.

Check worm ball nut teeth for scuffing and scoring. Inspect holes and passages for obstructions. Check all worm balls for flat spots, wear or other damage. Balls must be the same size within ,003 mm (0.0001 in).

Examine ball guides for distortion and bent pick-up fingers. Place two halves of guide together and try action of balls.

Inspect threads on lower end of worm gear. Threads must be clean and free of nicks and burrs. On units equipped with bushing (2, Fig. 8-5), check condition of bushing.

Repair
(On units equipped with bushing)

To replace Pitman shaft bushing (2, Fig. 8-5) press bushing from housing (1) using improvised tool.

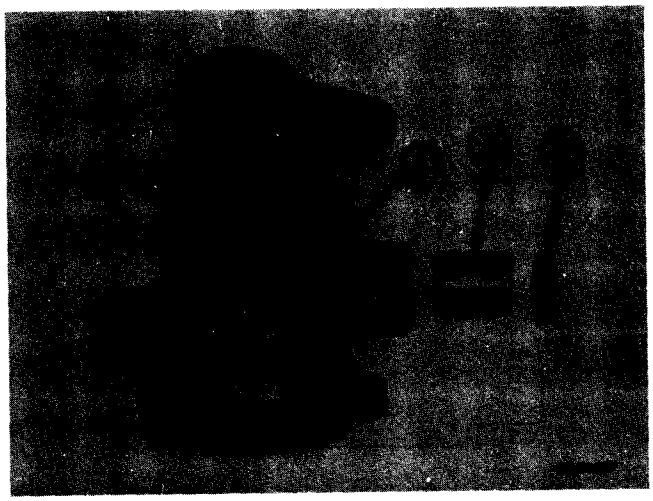


Figure 8-5
Bushing.

Carefully press new shaft bushing into position using a suitable driver. Press bushing flush with edge of housing bore (Fig. 8-6).

(All Units)

A tubular driver may be fabricated to install seals (1 and 3) during the final assembly.

Pull old cup (1, Fig. 8-7) from the adjuster (2). Carefully press a new cup into the adjuster.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

STEERING GEAR - Continued

Repair - Continued

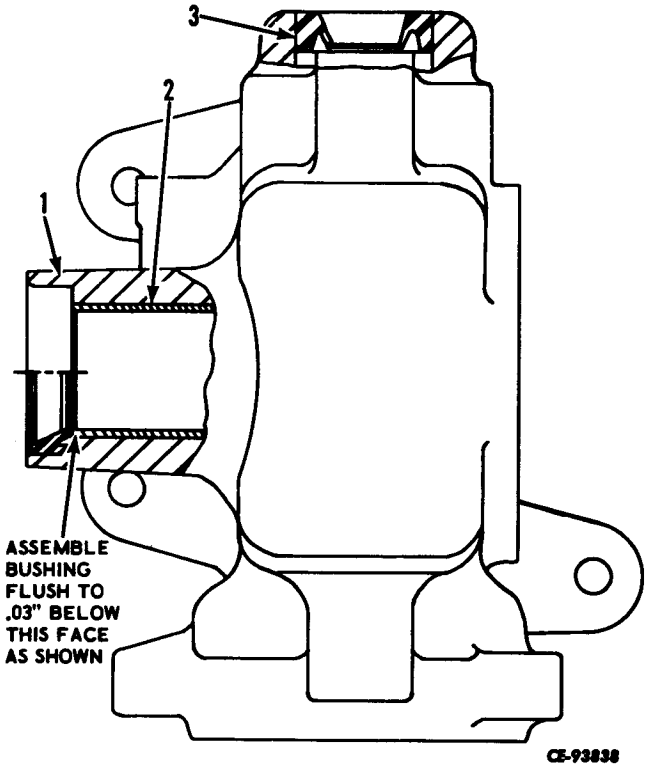


Figure 8-6
Install Bushing.

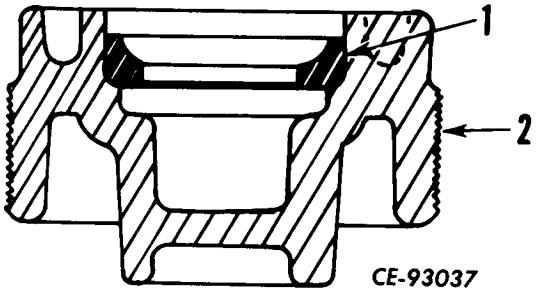


Figure 8-7
Install Cup.

Assembly

One of the most important phases of assembling the steering gear components is cleanliness. All parts must be kept clean. Any abrasive material remaining in the housing during assembly will quickly damage the mechanism. Grease and oil used during assembly must be free from dirt or other contaminates. Prelubricate all bearings and moving parts with "Lubriplate" or equivalent.

Place worm shaft assembly horizontal on clean work bench. Place ball nut over worm with return guide holes in nut facing up. Align groove in worm and ball nut by sight. (Fig. 8-8.)

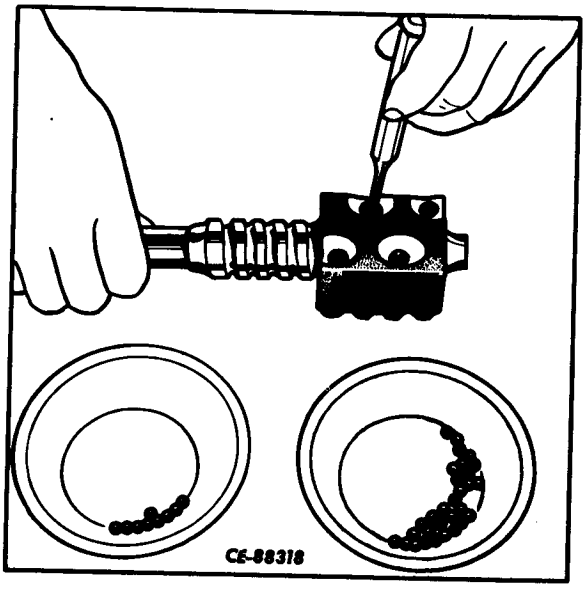


Figure 8-8
Install Balls.

Count one-half of the total amount of balls into a clean container.

Drop balls into one of the ball return guide holes. Slowly rotate worm away from that hole while inserting balls. Continue until circuit is filled from the bottom of one hole to the bottom of the other, or until stopped by reaching end of worm.

If balls are stopped by reaching end of worm hold down balls already installed with a rod or punch. Rotate shaft in a reverse direction a few turns. Filling of the circuit may then be continued. It may be necessary to work shaft back and forth holding balls down first in one hole and then in the other. This will close-up spaces between balls filling the circuit completely.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Lay one half of ball guide groove up, on bench. Place the remaining balls into the groove of the guide. Cover assembly with opposite half of guide. Hold the two halves together and plug each end with vaseline to prevent balls from dropping out while installing guide. (Fig. 8-9.)

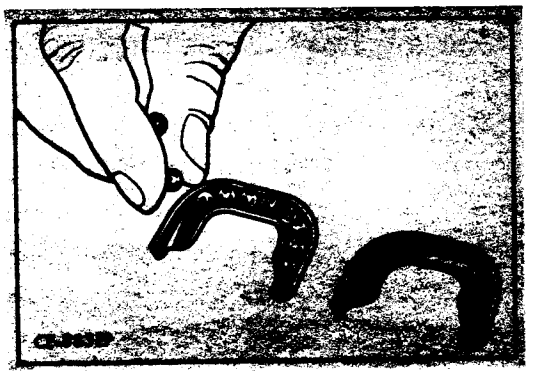


Figure 8-9
Install Balls in Guides.

Push ball return guide completely into holes in ball nut (Fig. 8-10). If guide does not push down all the way easily, tap it lightly into place with the wooden handle of a screwdriver. This completes one circuit of balls.

Figure 8-10
Install Ball Return Guides.

Fill remaining circuit with balls in same manner described above.

Install ball return guide clamp (2, Fig. 8-4) on ball nut with screw (1).

Be certain ball nut and balls are thoroughly lubricated. Test assembly by rotating ball nut on worm. Do not rotate ball nut to end of worm threads. Assembly must move freely. Temporarily tape shaft at both ends of ball nut until ready to install assembly in housing.

Remove tape. Grasp worm below and above ball nut to prevent nut from running to extreme ends. Insert worm shaft through lower opening in gear housing and guide shaft carefully through the upper housing bearing.

Place original shim (3, Fig. 8-11) on lash adjuster screw (2). Insert adjuster screw and shim into slotted end of Pitman shaft (1).

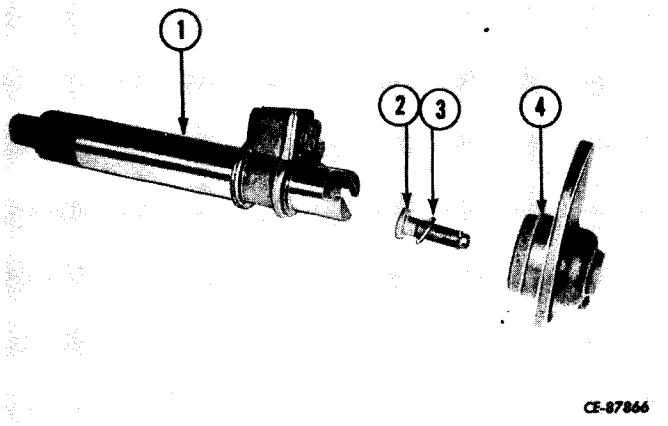


Figure 8-11
Install Lash Adjuster.

Check clearance between screw head and shaft. Clearance must not exceed 0,05 mm (.002 in). If clearance is greater, select a thicker shim. Four sizes are available. (Fig. 8-12).

(Continued on next page)

Figure 8-12
Check Clearance.

DISASSEMBLY, INSPECTION AND ASSEMBLY

STEERING GEAR - Continued

Assembly - Continued

With lash adjuster screw and shim in place in slotted end of Pitman shaft, start side cover (4, Fig. 8-11) over end of shaft. Engage screw slot with screwdriver using hole in side cover.

Rotate worm shaft until ball nut is in approximate center of worm. Center tooth of sector gear must enter center tooth space of ball nut.

With new gasket (2, Fig. 8-3) in place on side cover (1), insert Pitman shaft into housing (3), meshing teeth as described above. Rotate lash adjuster screw to pull cover over end of shaft. Back off adjuster screw to permit lash (play) between sector gear and ball nut.

Install side cover bolts with lock washers and tighten to recommended torque. Refer to "SPECIAL TORQUES."

Torque: _____

Place the lower ball bearing in the adjuster and secure with the retainer. Thread the adjuster (6, Fig. 8-2) into the housing until snug. Be sure the bearing is seated on the end of the shaft. Install the nut (5) but do not tighten.

Installation

Position steering gear assembly on tractor frame at the same time engaging the steering shaft on the worm shaft. Align the two shafts using the reference marks made prior to removal.

Secure steering gear assembly to tractor frame with cap screws and lock washers.

Tighten steering shaft clamp bolt securely.

Position pitman arm on sector shaft using reference marks made prior to removal. Secure the arm with lock washer and hex nut.

STEERING SHAFT AND COUPLING ASSEMBLY (EARLY)

Removal

Using a punch or other suitable means mark the position of the steering shaft and coupling assembly in relation to the worm shaft in the steering gear and the steering wheel shaft. During assembly shaft must be installed in its original position.

Loosen clamp bolts (3, Fig. 8-13) on either end of steering shaft. Telescoping action of couplings (2) should allow removal of shaft and coupling assembly. In some cases it may be necessary to remove steering gear mounting bolts to provide sufficient clearance for shaft removal.

Disassembly

Using a screwdriver, carefully pry out retaining ring (1, Fig. 8-13). Cover balance of ring with a rag during removal to prevent it from springing out. Carefully separate seal (2, Fig. 8-14) and coupling (5). Seal need not be removed from shaft unless replacement is necessary.

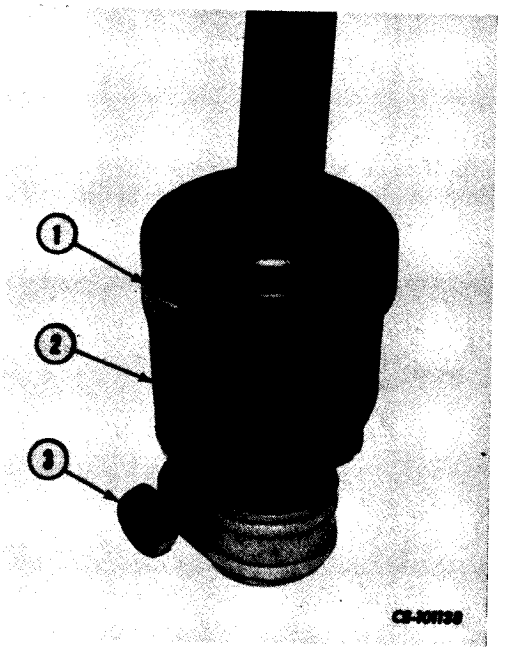


Figure 8-13
Remove Retaining Ring.

Pull the shaft (8, Fig. 8-14) and bearing (3) assembly from the coupling (5). Separate the shaft, bearings and spring (4). The dowel pin (7) need not be removed unless replacement is necessary.

DISASSEMBLY, INSPECTION AND ASSEMBLY

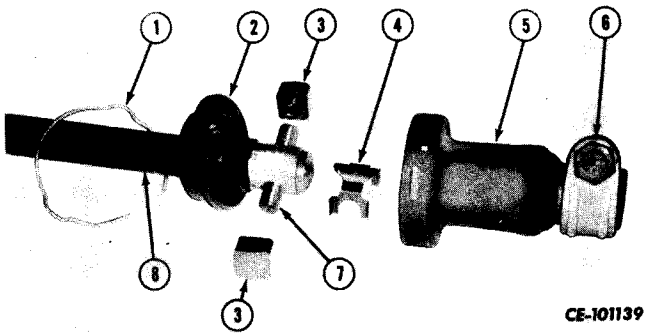


Figure 8-14
Shaft and Coupling Disassembled.

1. Retaining ring.
2. Seal.
3. Bearing.
4. Spring.
5. Coupling.
6. Clamp.
7. Dowel pin.
8. Shaft.

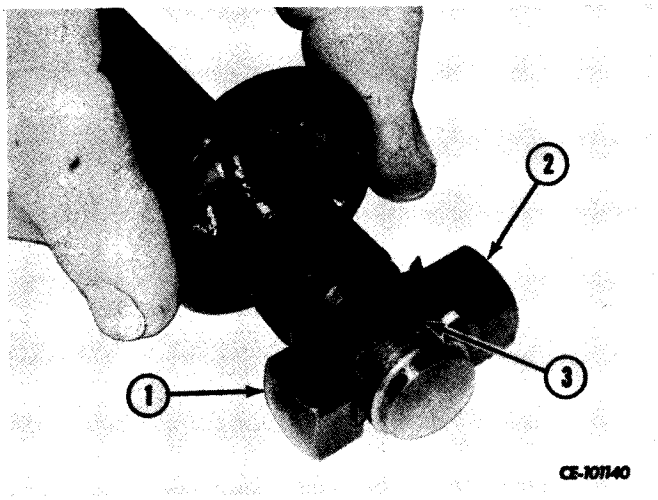


Figure 8-15
Assemble Bearings.

Clean

Wash all parts (except seal) in clean solvent and dry with compressed air. Wipe seal free of grease and dirt with a clean, lint-proof cloth.

Inspect

Inspect all parts closely for wear and/or damage. Check fit of bearing on dowel pin. Check fit of bearings in coupling grooves. Check seal for rips or deterioration. Check spring action. Replace parts if in doubt.

Assembly

Apply a light coat of lubricant to dowel pin (7, Fig. 8-14). Assemble bearings (1, 2, Fig. 8-15) on dowel pin and retain with spring (3).

Fill coupling (5, Fig. 8-14) with correct amount of recommended lubricant. Refer to Operator's Manual.

Carefully install shaft and bearing assembly in coupling. Position seal (2, Fig. 8-14) in coupling recess and secure with retaining ring (1, Fig. 8-13). Be sure nubs on retaining ring are fully engaged in coupling slots.

Installation

Position steering shaft on worm shaft on steering wheel shaft according to marks made prior to removal. Be sure couplings fully engage splines on their mating shafts. Tighten clamp bolts (3, Fig. 8-13) securely.

DISASSEMBLY, INSPECTION AND ASSEMBLY

COLUMN AND WHEEL ASSEMBLY (EARLY)

Removal

Position tractor in straight ahead position and secure with frame locking bar (refer to Section I, "CHASSIS"). Lower bucket to ground. Shut off engine.

Pry adjustment knob cover (1, Fig. 8-16) from knob (4) using a small thin screwdriver under one of the slots on lower face of the cover O.D.

Remove nut (2), plug button (3) and knob (4).

Remove steering wheel retaining nut (5). Using a suitable steering wheel puller, remove wheel (6).

NOTE: Protect exposed end of adjuster bolt (1, Fig. 8-17) with a suitable sleeve before using steering wheel puller. Puller pressure must not be imposed upon adjuster bolt.

Loosen upper clamp (6, Fig. 8-14) that secures steering shaft assembly to steering column assembly.

Remove upper and lower clamps (8, Fig. 8-16) that secure column assembly to tractor.

(Continued on page 10)

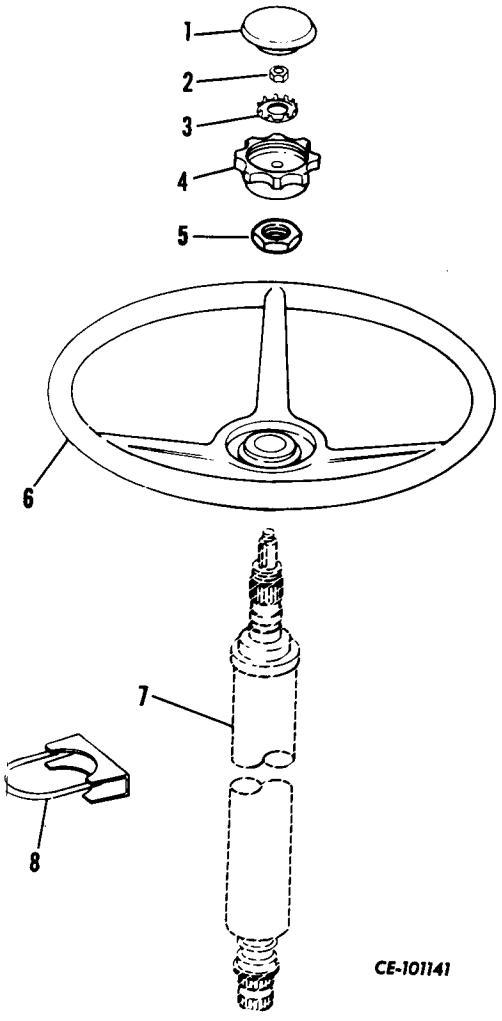


Figure 8-16
Column and Wheel Assembly.

Legend for Figure 8-17

1. Adjuster bolt.
2. Inner steering shaft.
3. Scraper.
4. Dust cover.
5. Bearing adapter sleeve.
6. Retainer spring.
7. Steering shaft upper stop ring.
8. Steering shaft slip ring.
9. Steering shaft lower stop ring.
10. Steering column jacket.
11. Steering outer shaft.
12. Dowel pin.
13. Adjuster nut.
14. Steering shaft ring.
15. Ball.
16. Steering shaft nut.
17. Intermediate steering shaft.
18. Steering shaft bearing seat.
19. Bearing retaining washer.
20. Bearing adapter.
21. Bearing assembly.
22. Spring.
23. Spacer.
24. Retaining ring.

DISASSEMBLY, INSPECTION AND ASSEMBLY

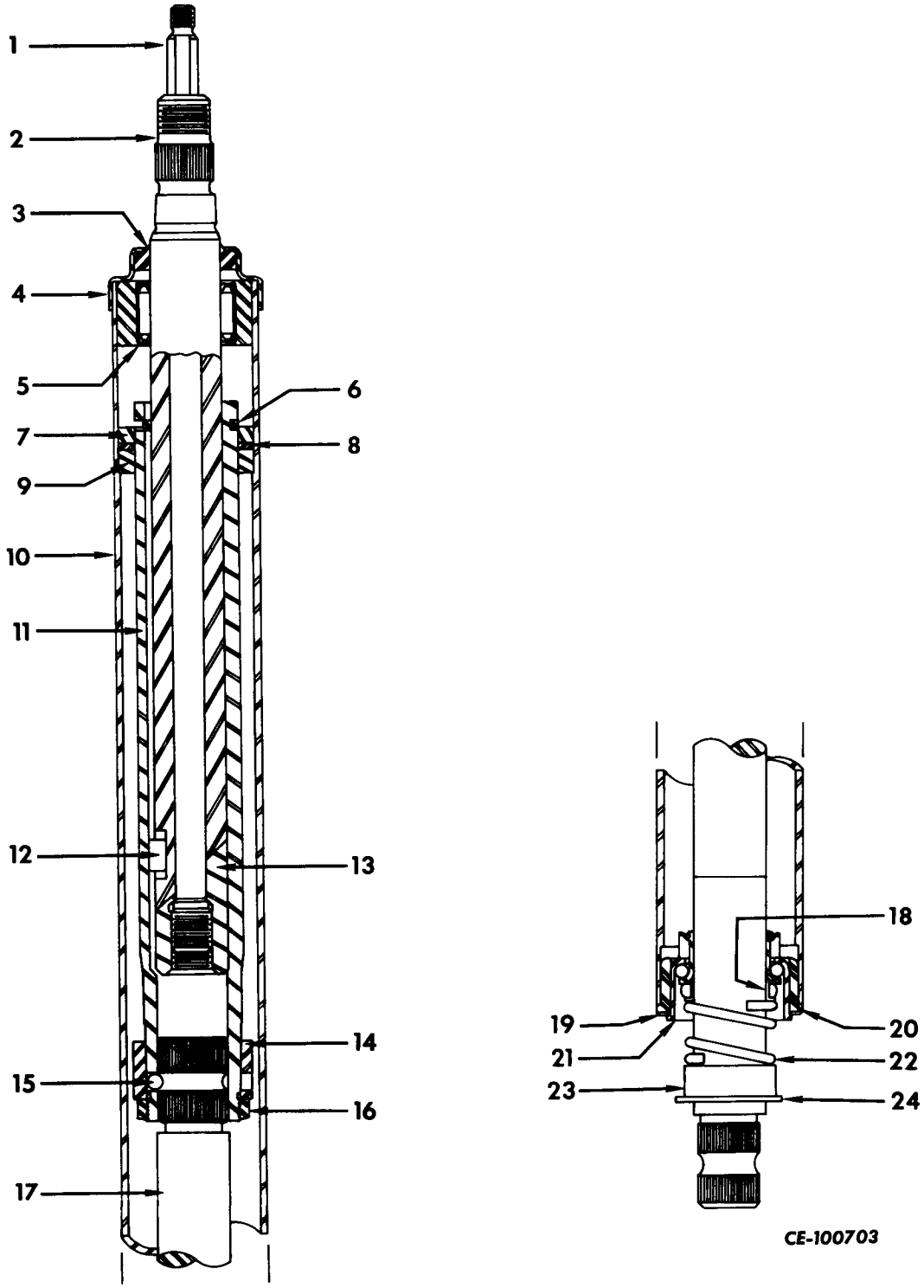


Figure 8-17
Column Assembly.

DISASSEMBLY, INSPECTION AND ASSEMBLY

COLUMN AND WHEEL ASSEMBLY (EARLY) - Continued

Disassembly

Place steering column assembly on a clean bench. Position the assembly so that open end of retaining ring (9, Fig. 8-18) is facing up.

Using a screwdriver, carefully pry retaining ring from its groove (2) in intermediate steering shaft.

> ◆ CAUTION: DO NOT ALLOW RETAINING RING (9, FIG. 8-18) TO EJECT IN AN UPWARD DIRECTION. TO DO SO COULD RESULT IN PERSONAL INJURY.

Remove spacer (8), spring (7) and bearing seat (6).

Use a punch to raise crimped O.D. of bore (1, Fig. 8-18) in column jacket.

Using a punch and thin screwdriver, pry bearing adapter (3) and bearing assembly (5) from column jacket. Separate bearing (5), retaining washer (4) and bearing adapter (3).

Using a plastic or rawhide mallet against lower end of intermediate shaft (2, Fig. 8-18) drive shaft up until dust cap (1, Fig. 8-19) separates from column jacket (3). Scraper in bore of dust cap may be pried out if replacement is required.

With dust cover removed continue to drive intermediate shaft up until bearing adapter sleeve (7, Fig. 8-20) clears column jacket. Slide bearing and adapter sleeve assembly from inner shaft (9).

Remove retainer spring (6, Fig. 8-20) from slot in outer shaft (2). Pull outer shaft assembly from lower end of column jacket.

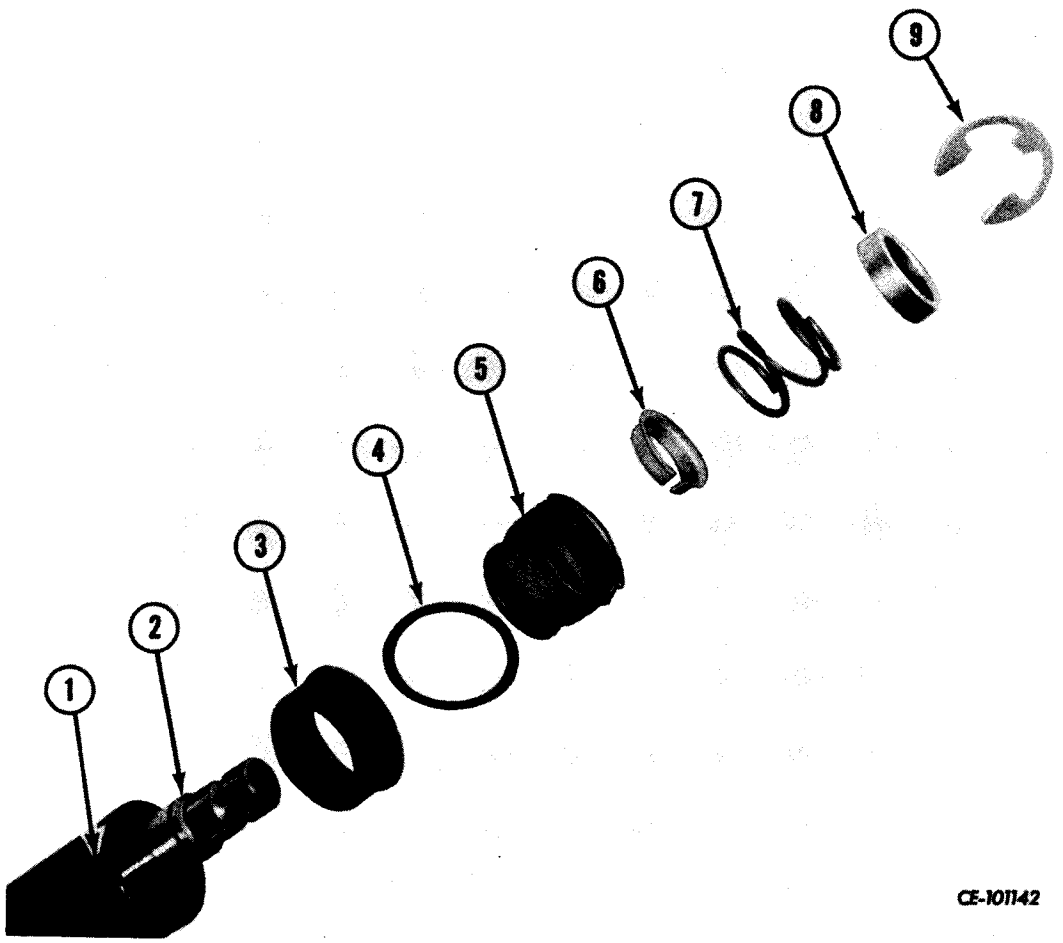


Figure 8-18
Disassemble Column.

DISASSEMBLY, INSPECTION AND ASSEMBLY

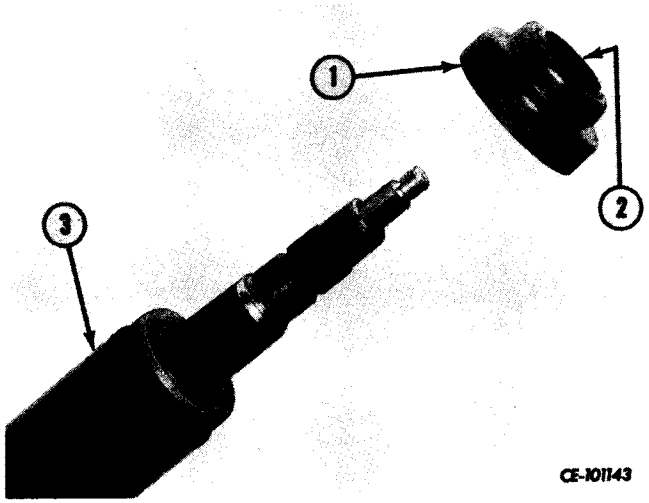


Figure 8-19
Remove Dust Cap.

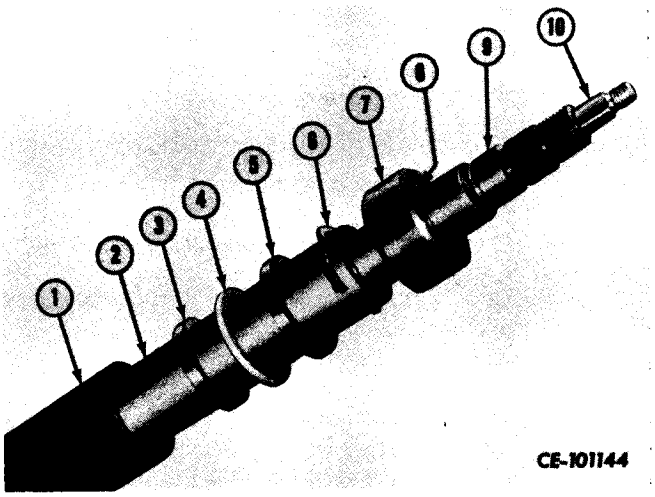


Figure 8-20
Remove Bearing Adapter.

If any or all of the stop rings (5, 3, Fig. 8-20) or slip ring (4) failed to eject with outer shaft (2) as bearing and sleeve assembly (7, 8) were removed, they may now be driven from column jacket. Use a brass rod or hardwood dowel of suitable length and diameter as a drift.

Pull inner shaft (9, Fig. 8-20) and adjuster bolt (10) assembly from outer shaft (2). Do not loose dowel pin (2, Fig. 8-21). Pull adjuster bolt (3) and nut (4) assembly from inner shaft (1). Adjuster nut and bolt may be separated if replacement is required.

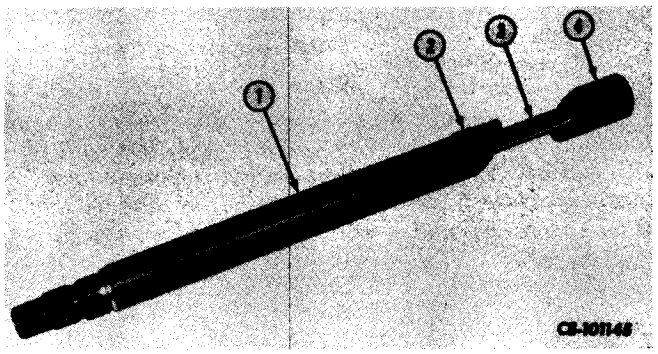


Figure 8-21
Inner Shaft Assembly.

Remove nut (4, Fig. 8-22) from end of outer steering shaft (1). Tap ring (3) with a brass hammer or drift to remove it. Remove steel ball (2) from its bore in outer shaft. Separate outer shaft (1) and intermediate shaft.

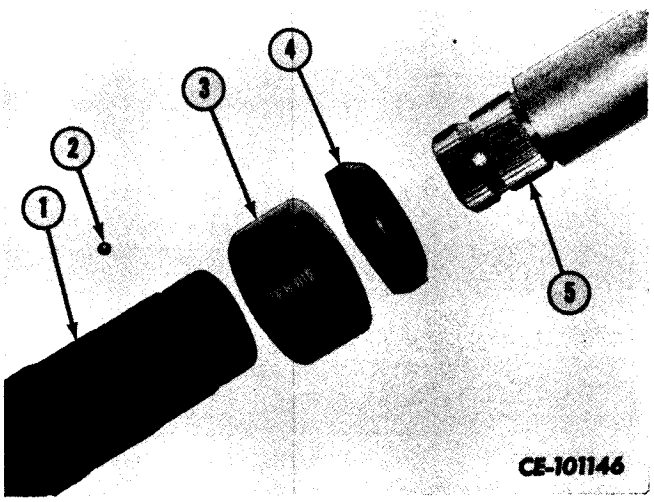


Figure 8-22
Remove Ring.

Clean

Wash all metal parts (with the exception of the bearing assemblies) in clean solvent. Dry with clean, lint free cloths or compressed air. Wipe dirt from bearing assemblies with clean, lint free cloths.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

COLUMN AND WHEEL ASSEMBLY (EARLY) - Continued

Inspect

Inspect all parts closely for wear or damage. Check splines for fit and condition. Check bearings for free rotation. If bearings drag or have a tight spot in them they must be replaced. If slip ring has grooved or worn faces it must be replaced. Replace scraper if it has a loose fit on inner shaft.

Assembly

Insert intermediate shaft (5, Fig. 8-22) in outer shaft (1) centering groove under ball bore in outer shaft. Install ring (3) centering its ball bore over bore in shaft. Insert steel ball in ball bore in ring. Be sure ball drops through ring and outer shaft and bottoms on groove in intermediate shaft (5). Push ring further up on taper of outer shaft. Install nut (4) and tighten snugly.

Assemble adjuster bolt (3, Fig. 8-21) and nut (4) and install in inner shaft (1). Retain dowel pin (2) in its recess with a small amount of grease. Align dowel pin with groove in inner bore of outer shaft (2, Fig. 8-20) and install adjuster and inner shaft assembly in outer shaft.

Grease both faces of the slip ring (4, Fig. 8-20). Install lower stop ring (3) in bore of column jacket (1) flush against inner shoulder. Install greased slip ring (4) followed by upper stop ring.

Install inner and outer shaft assemblies (2, 9, Fig. 8-20) in jacket (1). Install retainer spring in groove on end of outer shaft. Install bearing (8) and adapter sleeve (7) assembly on inner shaft (9). Using a suitable sleeve drive adapter (7) down into jacket (1) until flush with end.

If removed, install new scraper (2, Fig. 8-19) in dust cover (1) using a grease resistant adhesive. Position cover on jacket (1) and using a suitable sleeve drive cover down on jacket until it bottoms.

Install retainer washer (4, Fig. 8-18) on bearing assembly (5). Install bearing assembly in bearing adapter (3) and press entire assembly into jacket bore. When assembly bottoms on lip of adapter (3), crimp in O.D. of hole (1) jacket slightly.

Install bearing seat (6, Fig. 8-18), spring (7) and spacer (8). Secure assembly by installing snap ring (9) in its groove (2) in intermediate shaft.

Installation

Position column assembly in tractor with splined end of intermediate shaft engaging splined bore of steering shaft assembly.

Install upper and lower clamps (8, Fig. 8-16) to secure column to tractor. Tighten clamp (6, Fig. 8-14) on steering shaft assembly securing shaft and column together.

Install steering wheel (6, Fig. 8-16) on splines of inner shaft and secure with nut (5).

Position adjuster knob (4, Fig. 8-16) on end of adjuster bolt; add plug botton (3) and secure with nut (2). Install cover (1).

Remove frame locking bar and return it to the stored position. (Refer to Section I, "CHASSIS.")

STEERING SHAFT AND UNIVERSAL JOINT (LATE)

Removal

Scribe the universal joints (both ends) to the shaft, column and steering gear shaft. Items must be reassembled in their original position.

Disassembly

Loosen the bolt (9, Fig. 8-23) so the yoke clamp (11) is free at both ends of shaft.

Slide the yokes in one direction until one of them comes off either the column or the steering gear shaft.

Remove shaft assembly from machine.

Remove snap rings (14), then bearings (15) and seals (16) from cross (17).

Make a note of how yokes (11 and 12) were mounted together for assembly.

Inspect

Inspect all parts for signs of wear and/or damage. Check the fit of the bearings for looseness. Check seals for deterioration.

Assembly

Assemble the shaft assembly in the reverse order it was disassembled. Apply chassis lube at the grease fittings on the universal joints.

DISASSEMBLY, INSPECTION AND ASSEMBLY

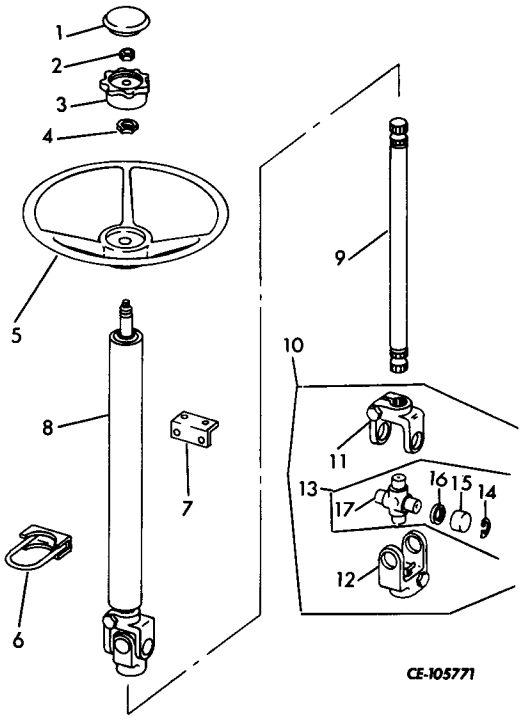


Figure 8-23
Wheel, Column and Shaft.

COLUMN ASSEMBLY (LATE)

Removal

Removal of the late style column assembly is the same as the early style.

Disassembly

Scribe the "U" joint assembly to the wheel shaft.

Remove "U" joint.

Remove dust cap and spring.

Push the shaft assembly from the wheel end and the spring seat will come out.

Push the shaft assembly from the "U" joint end and force out the jacket tube bearing (19, Fig. 8-24).

With the shaft assembly protruding from the jacket, remove the snap ring (18).

Shaft assembly will now come out the "U" joint end of the tube.

Remove the wheel tube, dowel pin (8) and unscrew locking rod from the tube lock.

Remove retaining ring (15), dowel pin (13) and separate the wheel shaft and the outer sleeve.

Inspect

Inspect all parts for wear or damage. Check splines for fit and condition. Check bearings for free rotation. If bearings drag or have a tight spot, they should be replaced. If signs of deterioration, replace.

Assembly

Reassemble the column in the reverse order it was disassembled. Pin (21, Fig. 8-24), must be pressed flush or 0,762 mm (.03 in) in from the outer surface of tube lock (20).

Installation

Install the column assembly in the reverse order it was removed.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

COLUMN ASSEMBLY (LATE) - Continued

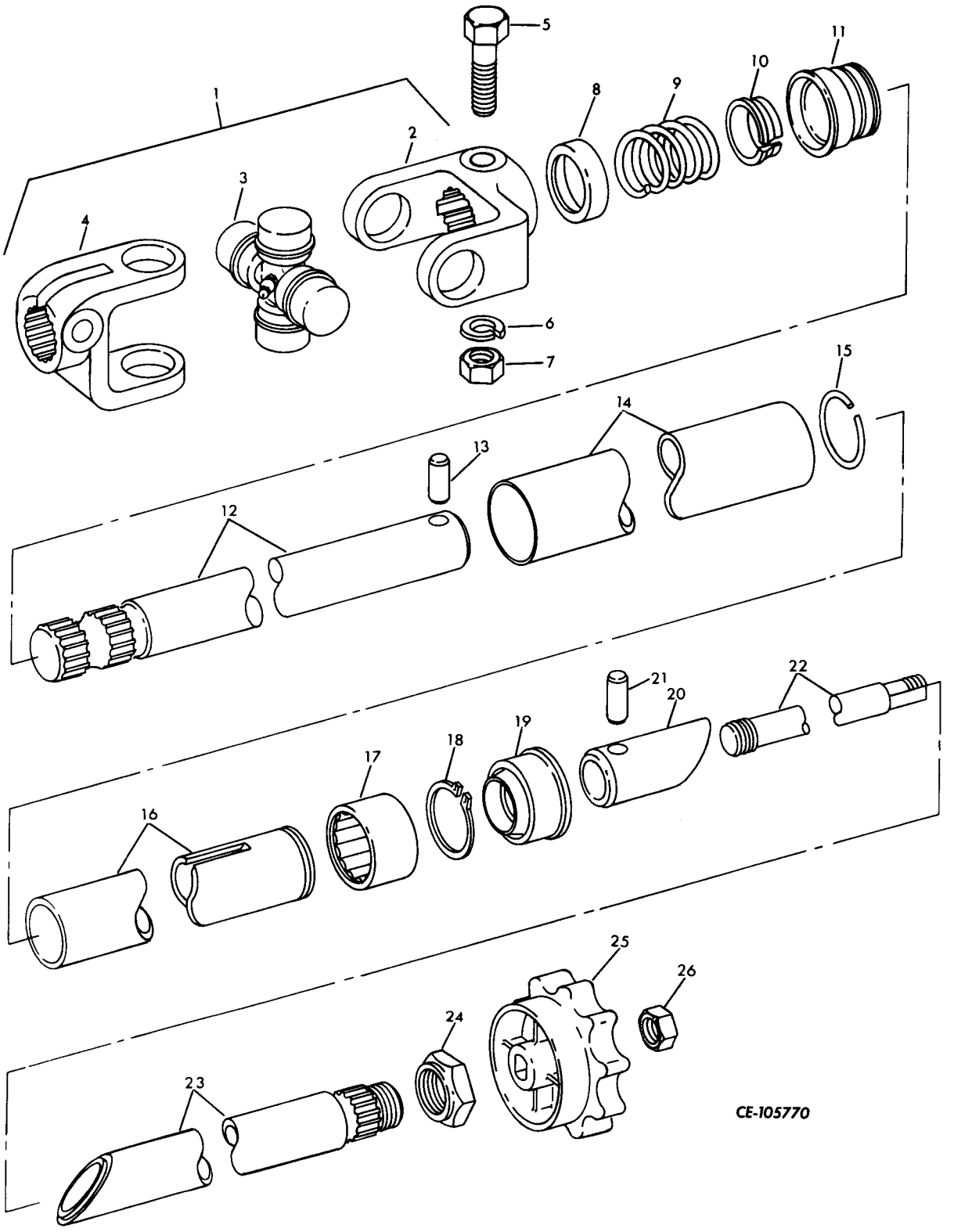


Figure 8-24
Column Assembly.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Legend for Figure 8-24

1. "U" joint assembly.
2. Yoke.
3. Cross and bearings.
4. Yoke.
5. Yoke retaining bolt.
6. Lock washer.
7. Nut.
8. Dust Cup.
9. Spring.
10. Spring seat.
11. Jacket tube bearing.
12. Wheel shaft.
13. Dowel pin.
14. Tube.
15. Retaining ring.
16. Outer sleeve.
17. Bearing.
18. Retainer ring.
19. Jacket tube bearing.
20. Tube lock.
21. Dowel pin.
22. Locking rod.
23. Wheel tube.
24. Nut.
25. Adjustment knob.
26. Lock nut.

TROUBLE SHOOTING

COMPLAINT	POSSIBLE CAUSE	REMARKS
Steering wheel stops turning before tractor halves hit stop blocks.	1. Steering gear not centered.	1. Adjust.
Play in steering gear.	1. Worn gears in steering gear housing. 2. Sector shaft gear lash out of adjustment.	
Hard steering while driving.	1. Frozen hinge pin bearings. 2. Steering adjustment tight.	1. Replace bearings. 2. Check adjustment by removing Pitman arm from sector shaft or disconnecting linkage from Pitman arm ball. Adjust if necessary.
Poor steering return.	1. Frozen hinge pin bearings. 2. Tires not inflated properly. 3. Tight steering linkage. 4. Steering adjustment tight.	1. Replace bearings. 3. Lubricate. 4. Check adjustment by removing Pitman arm from sector shaft or disconnecting linkage from Pitman arm ball. Adjust if necessary.
Gear noise (rattle or chuckle).	1. Loose over-center adjustment. NOTE: A slight rattle may occur on turns because of the increased lash on either side of the high point. 2. Gear mounting loose.	

(Continued on next page)

PRINTED IN UNITED STATES OF AMERICA

TROUBLE SHOOTING

COMPLAINT	POSSIBLE CAUSE	REMARKS
Hard steering when turning slowly.	1. Lack of lubrication in linkage. 2. Tires not properly inflated.	
Excessive wheel kick-back or loose steering.	1. Excess lash in steering linkage. 2. Excessive lash between sector shaft and ball nut.	

SERVICE INFORMATION

SPECIAL TORQUES

NOTE: Threads lubricated with oil or grease.

Column-to-flange nuts	20-27 N·m (15-20 ft lb)
Flange bolt	34-48 N·m (25-35 ft lb)
Lash adjuster lock nut	24-37 N·m (18-27 ft lb)
Lash adjuster assembly cover cap screws	34-48 N·m (25-35 ft lb)
Pitman arm nut	163-217 N·m (120-160 ft lb)
Worm bearing adjuster lock nut	95-149 N·m (70-110 ft lb)
Steering gear mounting cap screws	72-81 N·m (53-60 ft lb)

ADJUSTMENTS

The following adjustments must be made with the drag link disconnected from the Pitman arm and the steering shaft removed from the worm shaft.

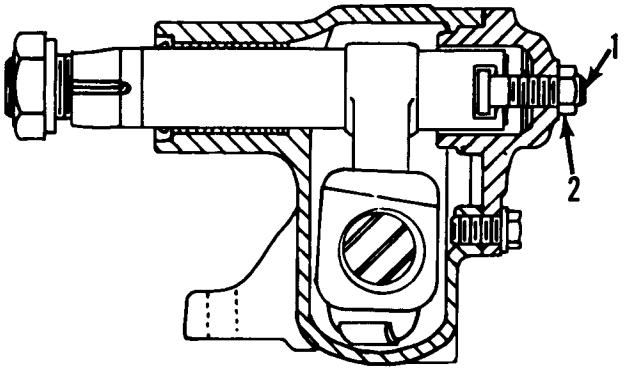
Loosen the lock nut (2, Fig. 8-25) and turn the lash adjuster screw (1) all the way in (clockwise), then out (counterclockwise) three turns. This will remove the load imposed on the worm bearings by the close meshing of rack and sector teeth.

Using a socket on the steering gear worm shaft, turn the shaft from one stop all the way to the other, carefully counting the total number of turns.

NOTE: Do not turn hard against stops when drag link is disconnected as damage to ball guides may result.

Turn the shaft back to the center position and using a torque wrench, measure the pull required to keep the worm shaft in motion through the center position. This should be 0.170 - 0.622 N·m (1-1/2 - 5-1/2 in lb).

If the indicated pull does not lie between the given limits, make the following adjustments:



CE-93842

Figure 8-25
Lash Adjuster.

a. Loosen the lock nut (2, Fig. 8-26).

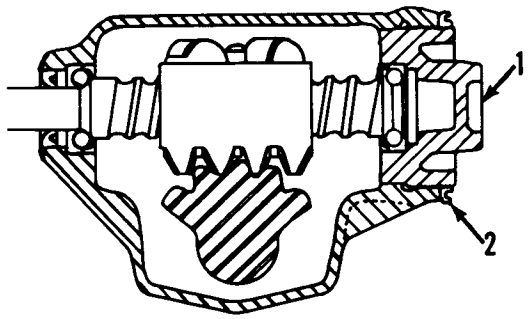
b. Turn the adjuster (1) until the required resistance to pull is reached.

c. Tighten the lock nut and recheck pull. It must lie between limits specified after lock nut is tightened.

d. Turn lash adjuster screw (1, Fig. 8-25) clockwise to remove lash from gear teeth and tighten lock nut (2).

e. Check pull with socket and inch-pound torque wrench as before, taking the highest reading of scale as shaft is

SERVICE INFORMATION



CE-93843

Figure 8-26
Bearing Adjustment.

turned through center position. This should be 0,339 - 0,791 N·m (3 - 7 in lb) over the bearing adjustment but not to exceed a total of 1,243 N·m (11 in lb).

f. Readjust the lash adjuster screw if necessary to obtain proper pull.

g. Tighten lock nut and recheck pull. It must lie between the specified limits after nut is tightened.

Reconnect the drag link to the Pitman arm.

Install flange on gear and connect column to the flange. Torque the nuts. Refer to "SPECIAL TORQUES."

Torque: _____

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

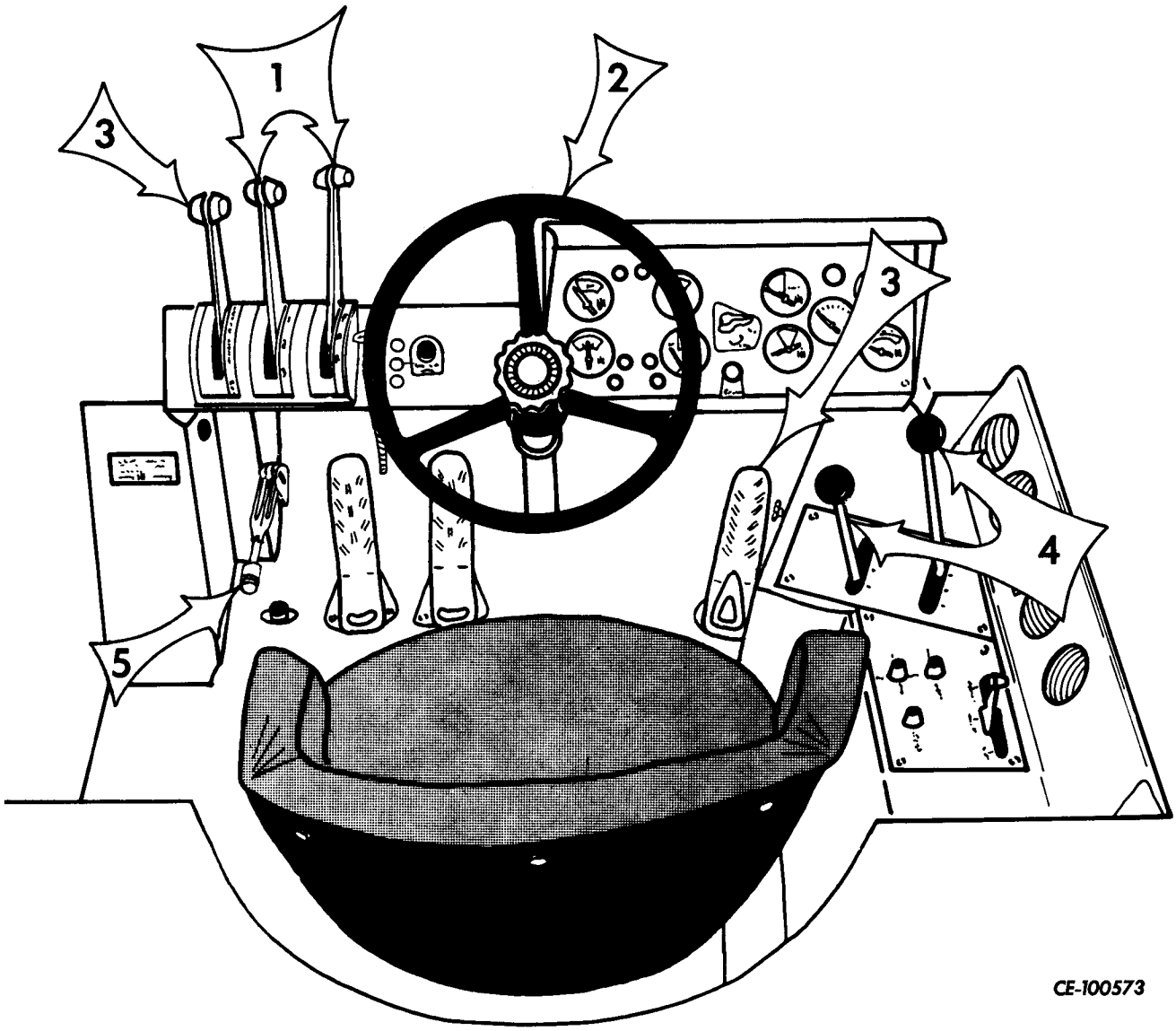


Figure 9-1
Control Linkage.

1. Transmission control linkage.
2. Steering linkage.
3. Accelerator linkage.
4. Hydraulic control linkage.
5. Parking brake linkage (If so equipped).

TRANSMISSION CONTROL LINKAGE

CABLE REMOVAL

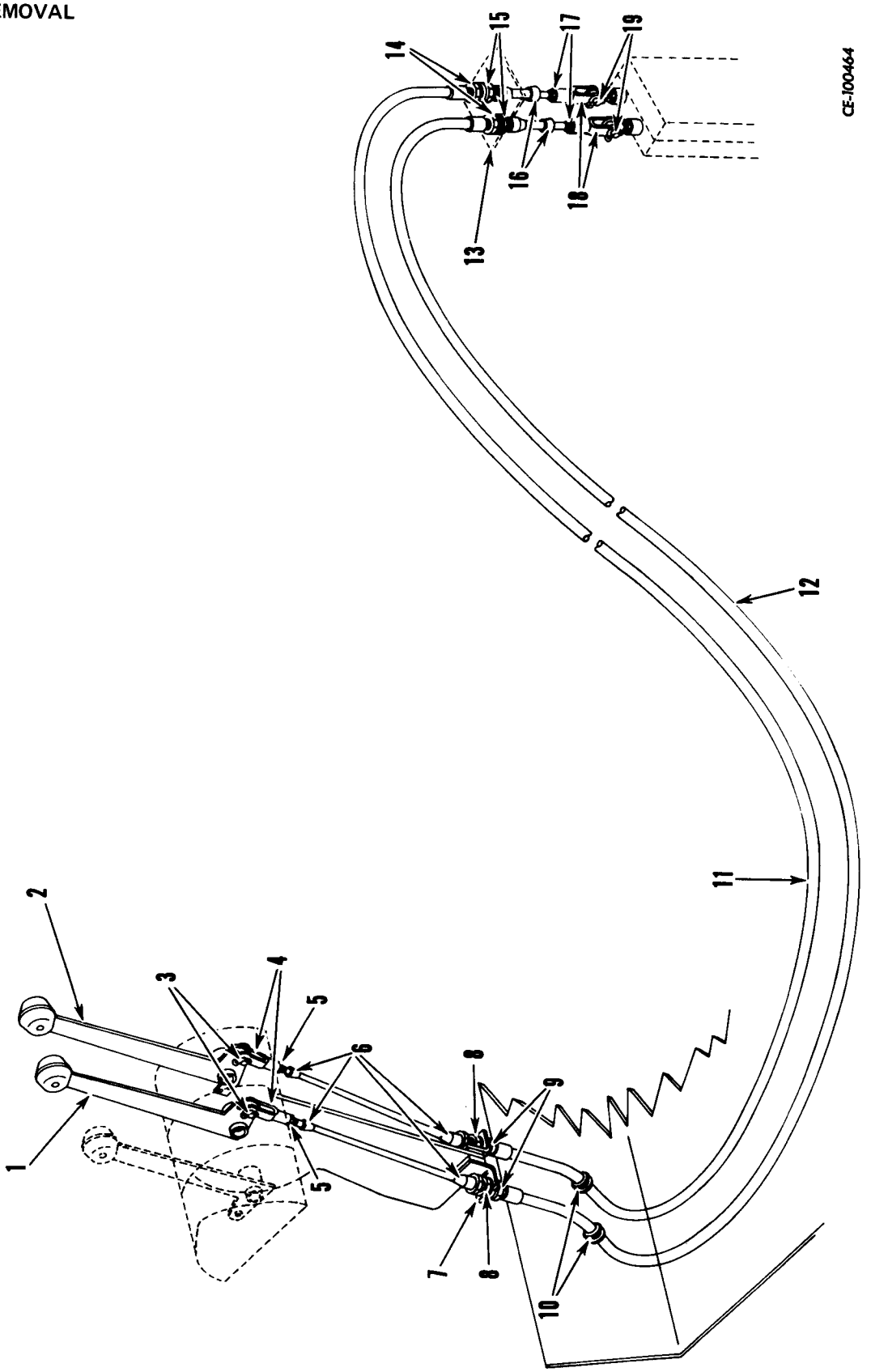


Figure 9-2
Transmission Control Linkage.

TRANSMISSION CONTROL LINKAGE

Legend for Figure 9-2

1. Range control lever.
2. Directional control lever.
3. Cotter pin and clevis pin.
4. Clevis.
5. Jam nut.
6. Cable boots.
7. Cable support brackets.
8. Cable nut and washer.
9. Cable nut and washer.
10. Grommets.
11. Directional control cable.
12. Range control cable.
13. Support bracket.
14. Cable nut and washer.
15. Cable nut and washer.
16. Cable boots.
17. Jam nut.
18. Clevis.
19. Cotter pin and clevis pin.

From the operator's compartment, disconnect control cables (11, 12, Fig. 9-2) from control levers (1, 2) by removing cotter pins and clevis pins (3). Remove clevises (4), jam nuts (5) and cable boots (6). Loosen cable nuts and washers (8) and remove cables from cable supports (7). Remove all cable nuts and washers from cable.

From the transmission valve disconnect cables (11, 12, Fig. 9-2) by removing cotter pins and clevis pins (19). Remove clevises (18), jam nuts (17), cable boots (16) and lower cable nuts and washers (15).

Remove cable clamps (where used) from frame and pull cables through floorboard and bracket (13).

CABLE INSTALLATION

Remove all hardware from control cables (11, 12, Fig. 9-2) except upper cable nuts and washers (14). Insert cable ends through support bracket (13). Install lower cable nuts and washers (15), cable boots (16), jam nuts (17) and clevises (18). Connect clevises to transmission valve with clevis pins and cotter pins (19). Refer to "ADJUSTMENT" for adjustment procedures. Adjust and tighten jam nuts (17) and cable nuts and washers (14, 15).

Insert grommets (10, Fig. 9-2) in floorboard. Insert cable ends (11, 12) through grommets. Install lower cable nuts and washers (9) and insert cables in support bracket (7). Install upper cable nuts and washers (8), cable boots (6), jam nuts (5) and clevises (4). Install clevis pins and cotter pins (3) securing end of control cables to control levers (1, 2). Refer to "ADJUSTMENT" for recommended adjustment procedures. Adjust and tighten jam nuts (5) and cable nuts and washers (8, 9).

SERVICING CONTROL LEVER BRACKET LIGHTS

To service the lights in the control lever (3, Fig. 9-3) remove screws (1) securing strips (2) to control lever.

(Continued on next page)

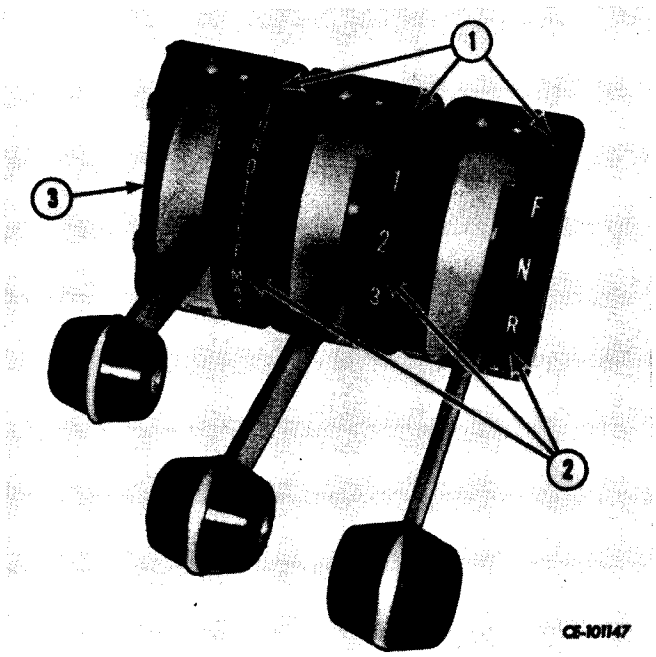


Figure 9-3
Remove Strips.

TRANSMISSION CONTROL LINKAGE

SERVICING CONTROL LEVER BRACKET LIGHTS - Continued

Replace bulbs (1, Fig. 9-4). Install positioning strips (2, Fig. 9-3) and install and tighten screws (1).

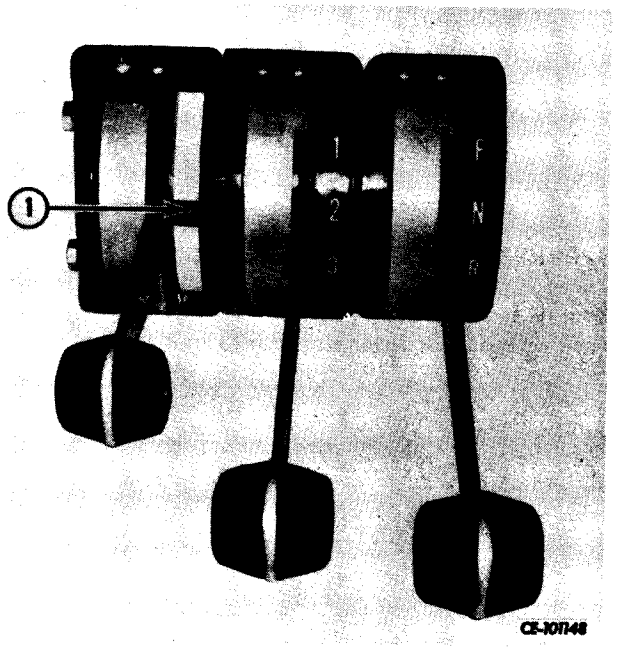


Figure 9-4
Remove Bulb.

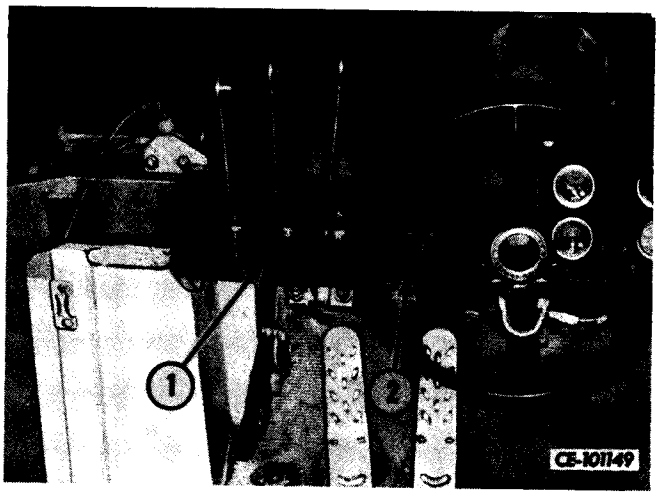


Figure 9-5
Control Levers.

CONTROL LEVER

Removal

From under dash panel disconnect electrical connections. Remove cotter pins and clevis pins disconnecting control levers from control cable ends.

Remove hardware that secures control lever assembly (1, Fig. 9-5) to dash panel (2).

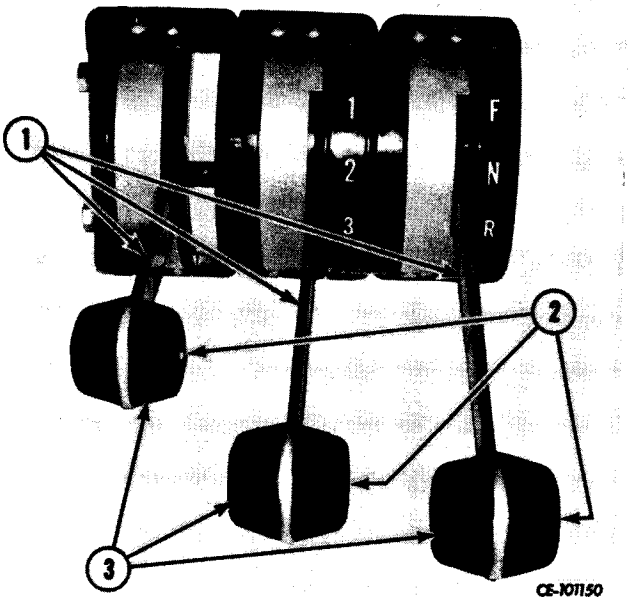


Figure 9-6
Remove Knobs.

Disassembly

Remove cap screws and nuts (2, Fig. 9-6) separating knobs (3) from control levers (1).

Loosen set screw (6, Fig. 9-7) and with aid of a suitable punch, drive pivot pin (1) out of lever bracket disconnecting control levers from lever bracket. Remove cap screws (2, 4) separating lever brackets (5) and adapter plate (3).

TRANSMISSION CONTROL LINKAGE

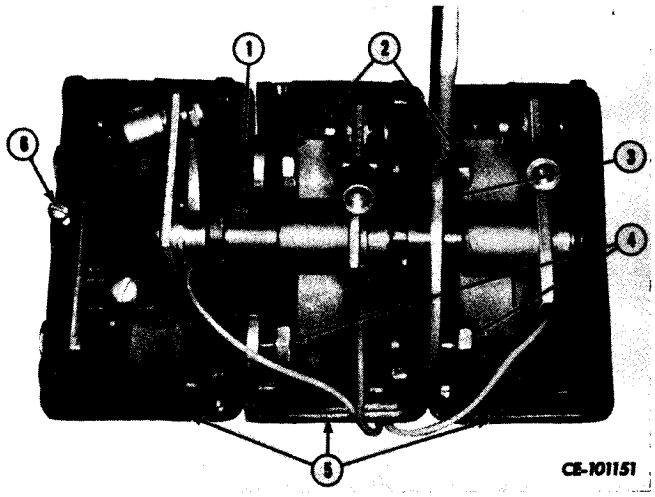


Figure 9-7
Remove Control Levers.

Assembly

Position control lever brackets (5, Fig. 9-7), adapter plate (3) and install and tighten cap screws (2, 4). Install control levers up through bottom of brackets and drive pivot pin (1) through brackets. Rotate pivot pin so flat side of pin is in position for set screw (6).

Position lever knobs (3, Fig. 9-6) on ends of control levers (1) and install and tighten cap screws and nuts (2).

Installation

Position control lever assembly (1, Fig. 9-5) in dash panel (2) and secure with mounting hardware.

Connect electrical wires to loom. Install clevises to control levers and install cotter pins. For linkage adjustments refer to "ADJUSTMENT" in this section.

ADJUSTMENT

A correctly adjusted transmission linkage will allow full engagement of the control plunger detents at each indicated lever position. Correct linkage adjustment prevents clutch slippage.

At transmission, position RANGE control valve spool and DIRECTIONAL control valve spool in their furthest "out" position.

In the operator's compartment, position range lever (1, Fig. 9-2) in FIRST and directional control lever (2) in FORWARD. Adjust clevises (4) to fit control levers, by loosening jam nuts (5) and turning clevis in either direction, depending on the adjustment required.

Additional adjustment can be made at the transmission valve. Loosen jam nuts (17, Fig. 9-2) and turn clevises (18) in either direction depending on the adjustment required. After adjustments have been made at both ends of cables tighten jam nuts (5, 17) against clevises and secure with cotter pins and clevis pins (3, 19).

ACCELERATOR LINKAGE

CABLE REMOVAL

Remove cable (30, Fig. 9-8) from fuel injection pump lever by removing spring (32) from clips (23, 35). Loosen nut (36) and remove cable. Remove cable boots (34) and inside nuts (31). Pull cable through mounting bracket.

Remove ball joint (25, Fig. 9-8) from bellcrank (24). Loosen jam nut (26) and remove ball joint, nut, cable boots (27) and inside nut (28). Pull cable through mounting bracket.

CABLE INSTALLATION

Remove all hardware from control cable (30, Fig. 9-8) except inside cable nuts (29, 31). Install cable through support bracket. Install the first clip (23), cable nut (33) and cable boots (34) on cable. Install second clip (35) and insert cable end in nut (36) and tighten nut. Install spring (32) between clips. Refer to "ADJUSTMENT," this section, for proper adjustment procedures.

Insert other end of cable (30, Fig. 9-8) through mounting bracket. Install cable nut (28), cable boots (27), jam nut (26) and ball joint (25) on cable.

Refer to "ADJUSTMENT," this section, for proper adjustment procedures. Install ball joint in bellcrank (24) and secure with nut.

(Continued on next page)

ACCELERATOR LINKAGE

CABLE INSTALLATION - Continued

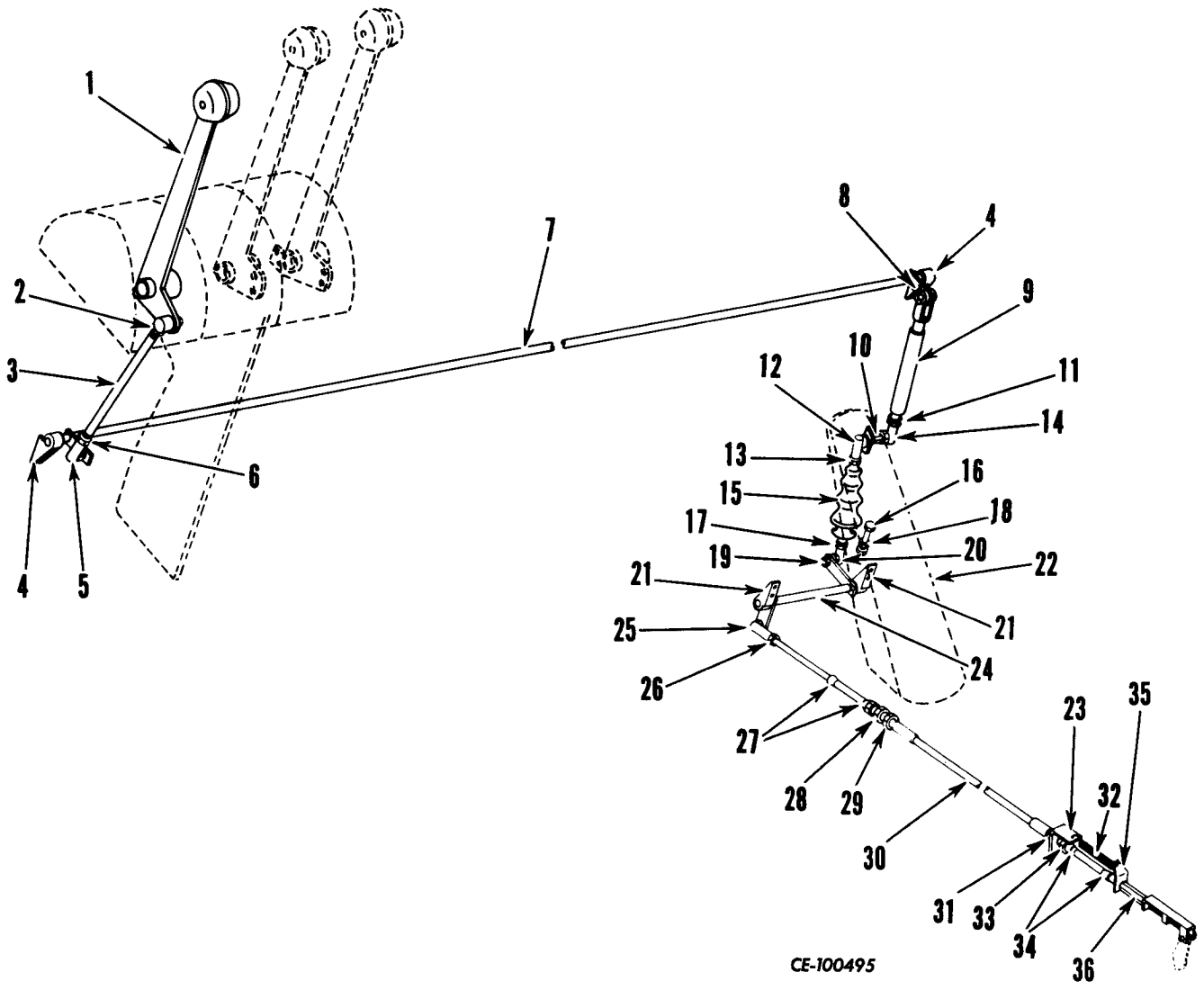


Figure 9-8
Accelerator Linkage.

1. Hand throttle lever.
2. Jam nut.
3. Rod.
4. Mounting bearings.
5. Ball joint.
6. Jam nut.
7. Bellcrank.
8. Cotter pin and clevis pin.
9. Tube.
10. Nut.
11. Jam nut.
12. Upper ball joint.
13. Jam nut.
14. Ball joint.
15. Seal.
16. Pedal stop.
17. Jam nut.
18. Jam nut.
19. Nut.
20. Lower ball joint.
21. Mounting bearings.
22. Pedal.
23. Clip.
24. Bellcrank.
25. Ball joint.
26. Jam nut.
27. Cable boots.
28. Cable nut.
29. Cable nut.
30. Cable.
31. Cable nut.
32. Return spring.
33. Cable nut.
34. Cable boots.
35. Clip.
36. Nut.

ACCELERATOR LINKAGE

HAND AND FOOT LINKAGE REMOVAL

From the operator's compartment remove ball joint (5, Fig. 9-8) from bellcrank (7). Loosen jam nut (2) and unscrew rod (3) from control lever (1). Remove cotter pin and clevis pin (8) and remove tube (9) from bellcrank. Loosen jam nut (11) and unscrew tube from ball joint (14). Remove ball joint (14) and nut (10) from bracket underneath pedal (22). Loosen jam nut (13) and remove ball joint (12). Remove seal (15) if damaged.

From underneath operator's compartment remove nut (19, Fig. 9-8) and ball joint (20) from bellcrank (24). Pull rod out of seal and floorboard. Loosen jam nut (17) and remove ball joint from rod. Remove nut and ball joint (25) from bellcrank.

For bellcrank removal, remove cap screws, lock washers and nuts disconnecting mounting bearings (4, 21) from frame. Remove bellcranks (7, 24).

HAND AND FOOT LINKAGE INSTALLATION

Position one mounting bearing (4, 21, Fig. 9-8) on tractor frame and install and tighten cap screws, lock washers and nuts. Insert bellcrank (7, 24) with remaining mounting bearing positioned on bellcrank, into previously installed bearing. Position loose bearing and secure with cap screws, lock washers and nuts.

Connect ball joint (25, Fig. 9-8) to bellcrank (24) and secure with nut. Install jam nut (17) and ball joint (20) on rod. If seal (15) was removed, install a new one. Insert rod up through floorboard and seal. Connect lower ball joint to bellcrank with nut (19). Install jam nut (13) and upper ball joint (12) on rod. Insert upper ball joint through bracket underneath pedal (22). Install nut (10) and ball joint (14). Install jam nut (11) on tube (9) and thread tube into ball joint. Refer to "ADJUSTMENT," this section, for proper adjustment procedures. Install yoke on bellcrank (7) and secure with cotter pin and clevis pin (8).

Install jam nuts (2, 6, Fig. 9-8) and ball joint (5) on rod (3). Thread rod into control lever (1). Install ball joint on bellcrank (7) and secure with nut. Refer to "ADJUSTMENT," this section, for proper adjustment procedures.

ADJUSTMENT

Adjust pedal and cable linkage so that as accelerator pedal (22, Fig. 9-8) is fully depressed the fuel injection pump lever travels through its full stroke. Adjustment of accelerator pedal can be accomplished by disconnecting all or one of the ball joints (12, 14, 20) from pedal linkage and rotating ball joints and jam nuts (11, 13, 17) in either direction required for proper adjustment. Additional adjustment can be accomplished by loosening cable nuts (28, 29, 31, 33) or nut (36) and lengthen or shorten cable for required adjustment.

With linkage properly adjusted as above, adjust foot pedal stop (16, Fig. 9-8) by pressing foot pedal down until maximum travel is reached. Adjust stop to contact foot pedal in this position by turning stop bolt in either direction. Once proper adjustment is obtained, tighten jam nut (18) against floorboard.

For hand throttle adjustment, engine should be at low RPM with lever (1, Fig. 9-8) all the way forward. When lever is pulled all the way back the fuel injection pump lever should travel its full stroke. Adjustment of hand throttle can be accomplished by disconnecting ball joint (5) from bellcrank (7). Loosen jam nuts (2, 6) and rotate jam nuts, ball joint and or rod (3) in either direction required for proper adjustment. Additional adjustment can be made by disconnecting tube (9) from bellcrank. Loosen jam nut (11) and rotate nut and tube in either direction required for proper adjustment.

Once all adjustments have been completed connect all parts and tighten all nuts securely.

PARKING BRAKE LINKAGE

MANUAL LEVER APPLIED BRAKE

Removal

Remove cotter pin, flat washer and pull clevis pin (8, Fig. 9-9) from parking brake assembly, disconnecting control cable (14) from link.

Remove clevis (9) and jam nut (10) from end of control cable (14). Remove cable nut (11) from the top side of cable support bracket (12) and pull cable from support bracket.

Remove cotter pin and clevis pin (20) from brake actuating lever (21). Remove clevis (19) and jam nut (18) from end of control cable. Remove cable nut (17) from bottom side of cable support bracket (16) and pull control cable out of bracket.

To remove lever assembly (5), loosen cap screws (2) from frame. Do not remove cap screws (2) from lever assembly during assembly removal. This will retain spacers (1) within the assembly until it is taken from the mounting.

Installation

Install lever assembly (5, Fig. 9-9) on frame by inserting cap screws (2) and lock washers (3) through lever assembly and spacers (1). Spacers fit between lever assembly side plates.

Install end of control cable up through cable support bracket (12) with bottom cable nut (13) already installed. Install top cable nut (11). DO NOT TIGHTEN. Install jam nut (10) and clevis (9) to end of control cable. Position parking lever in "OFF" position and install pin (8) through lever assembly (5) and link. Install flat washer and cotter pin on end of pin (8).

Install remaining end of control cable down through support bracket (16) with top cable nut (15) installed on cable. Install bottom cable nut (17). DO NOT TIGHTEN. Install jam nut (18) and clevis (19) on end of control cable. Insert clevis pin (20) through clevis (19) and brake lever (21). Secure with cotter pin.

Adjustment

A minor parking brake adjustment can be made by rotating adjusting cap (4, Fig. 9-9) mounted on top of parking brake lever. To increase tension, turn cap clockwise. If adjustment is at its maximum, major adjustment is necessary.

A major adjustment is made by removing control cable (14) from lever assembly. Remove cotter pin, flat washer and clevis pin (8). Turn adjusting cap (4) counterclockwise until cap adjustment is at a minimum. Back off jam nut (10) and rotate clevis (9) in required direction until clevis pin enters bosses in clevis and link freely. Install clevis pin (5), flat washer and cotter pin. Check adjustment.

If additional adjustment is required, remove control cable from brake actuating lever (21) by removing cotter pin and clevis pin (20). Back off jam nut (18) and rotate clevis (19) in required direction until clevis pin enters clevis and lever bosses freely. Install clevis pin (20) and cotter pin. Check adjustment.

To check parking brake adjustment, start engine and position transmission levers in FORWARD and HIGH range. Apply parking brake and accelerate the engine to maximum engine rpm. If parking brake does not hold, stop engine and repeat linkage adjustment.

If major adjustment has been made several times, it is advisable to check for brake lining wear and roughness of parking brake drum.

Once linkage has been properly adjusted loosen cap screws and nut (7) and position switch (6) against link, with parking brake in off position. Tighten cap screw and nut (7). Recheck switch position.

Legend for Figure 9-9

1. Spacer.
2. Cap screw.
3. Lock washer.
4. Adjustment cap.
5. Parking brake lever assembly.
6. Warning light switch.
7. Cap screw and nut.
8. Clevis pin.
9. Clevis.
10. Jam nut.
11. Cable nut.
12. Cable support bracket.
13. Cable nut.
14. Control cable.
15. Cable nut.
16. Cable support bracket.
17. Cable nut.
18. Jam nut.
19. Clevis.
20. Clevis pin.
21. Brake actuating lever.
22. Parking brake.

PARKING BRAKE LINKAGE

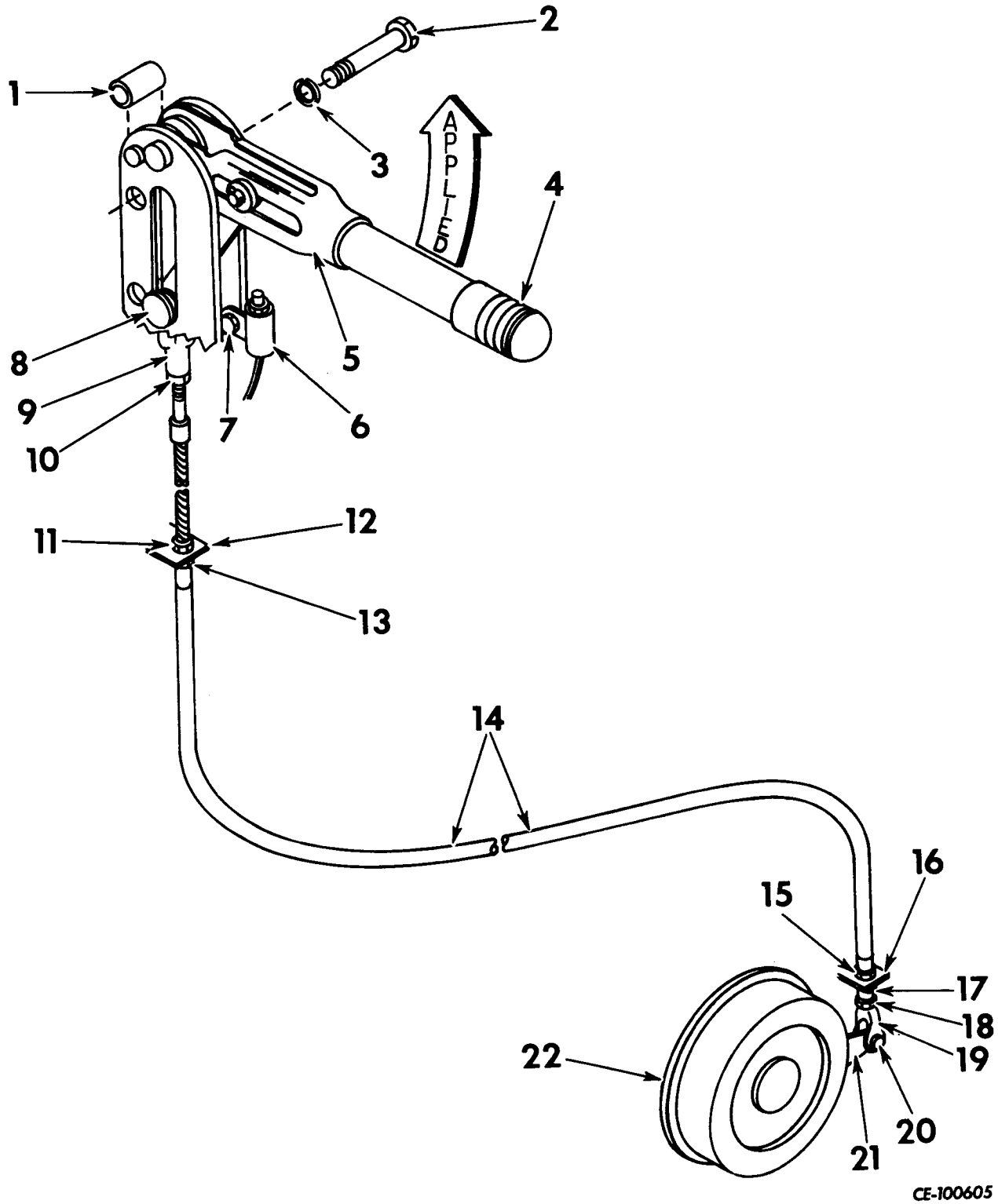


Figure 9-9
Manual Lever Applied Parking Brake Linkage.

PARKING BRAKE LINKAGE

REMOTE CONTROLLED, SPRING APPLIED BRAKE

General

A spring loaded, air relieased cylinder actuates the parking brake on those tractors equipped with the remote controlled, spring applied parking brake.

A brake control valve, mounted on the instrument panel allows the operator to select the applied or released position for the brake. The valve permits the flow of air to or releases air from the air cylinder. With air pressure exhausted from the air cylinder the spring within the cylinder is allowed to expand, retracting the actuator within the cylinder and apply the brake.

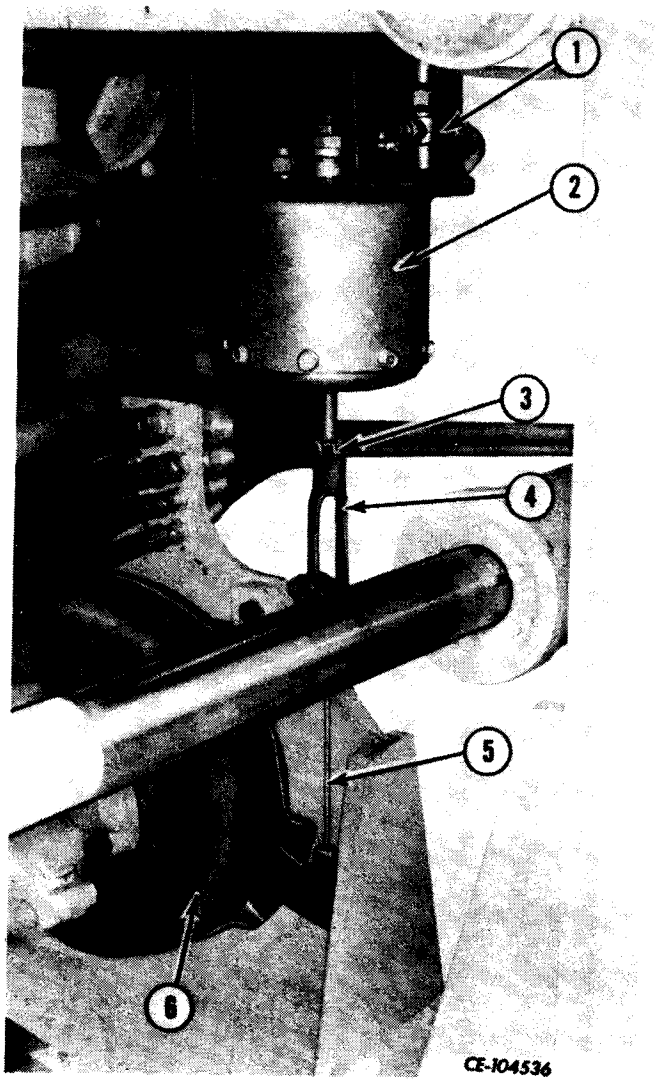


Figure 9-9A
Spring Applied Parking Brake.

1. Holding valve.
2. Air cylinder.
3. Jam nut.
4. Yoke.
5. Cable assembly.
6. Parking brake assembly.

Pushing the control knob in applies the brake; pulling it out releases the brake. An indicator light glows when the brake is applied. Do not attempt to move the machine when the light is on.

Reservoir air pressure releases the parking brake therefore the brake will not release even though the knob is in the release position if air pressure in the reservoir is low. Use the indicator light as a guide. Do not move the machine until the light goes out with the engine running.

Removal

Lock machine in a full left turn with locking pin (refer to Section 1, "CHASSIS.") Stop engine. Lower bucket to ground.

Be sure air pressure in reservoir is at normal operating level, then position parking brake control knob in "RELEASE" position. Remove cotter pin (6, Fig. 9-9B) and yoke pin (7) from yoke (5).

Position parking brake control knob in the "APPLY" position. Remove air line from air cylinder (3, Fig. 9-9B). Remove nuts and lock washers (1) that secure air cylinder to its mounting bracket and remove cylinder.

Installation

Position air cylinder (3, Fig. 9-9B) on its mounting bracket and secure with lock washers and nuts (1). Tighten nut securely.

Connect air line to cylinder (3, Fig. 9-9B) at its port (2). Be sure line is not kinked when tightening connection at cylinder. Position parking brake control knob in the "RELEASE" position.

NOTE: If pressure in air reservoir is below normal operating capacity, start engine and charge system. Stop engine before continuing work on parking brake.

With air cylinder in the released position loosen jam nut (4, Fig. 9-9B) and holding cable assembly (8) taut, adjust yoke (5) up or down, as required, until pin (7) will pass with a very slight drag through yoke (5) and cable end yoke. Do not over tighten. Install cotter pin (6). Hold yoke with a suitable wrench and tighten jam nut (4).

Remove locking pin from frame and return to storage position (refer to Section 1, "CHASSIS.")

PARKING BRAKE LINKAGE

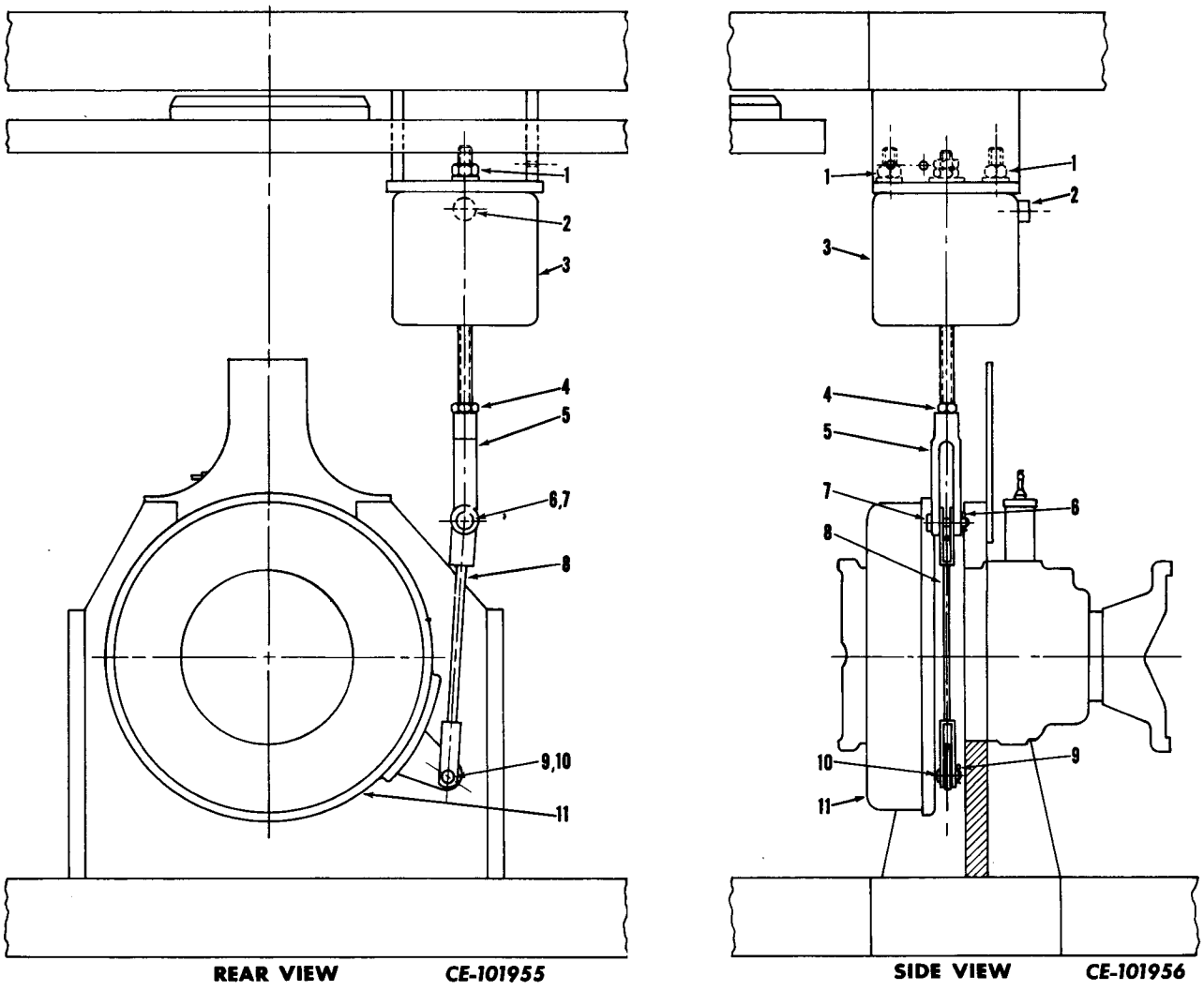


Figure 9-9B
Spring Applied Parking Brake Installation.

1. Nuts and lock washers.
2. Air line connection.
3. Air cylinder.
4. Jam nut.
5. Yoke.
6. Cotter pin.
7. Yoke pin.
8. Cable assembly.
9. Cotter pin.
10. Yoke pin.
11. Parking brake assembly.

Adjustment

Lock machine in a full left turn with locking pin (refer to Section 1, "CHASSIS"). Stop engine. Lower bucket to ground.

Be sure air pressure in reservoir is at normal operating level, then position parking brake control knob in the "RELEASE" position.

Loosen jam nut (4, Fig. 9-9B) and rotate yoke (5) until all slack has been removed from cable assembly (8) and cable is taut. Do not over adjust. Hold yoke (5) with a suitable wrench and tighten jam nut (4).

Remove locking pin from frame and return to storage position (refer to Section 1, "CHASSIS.")

NOTE: After several adjustments it is advisable to check the parking brake lining wear and roughness of the parking brake drum.

HYDRAULIC CONTROL VALVE LINKAGE

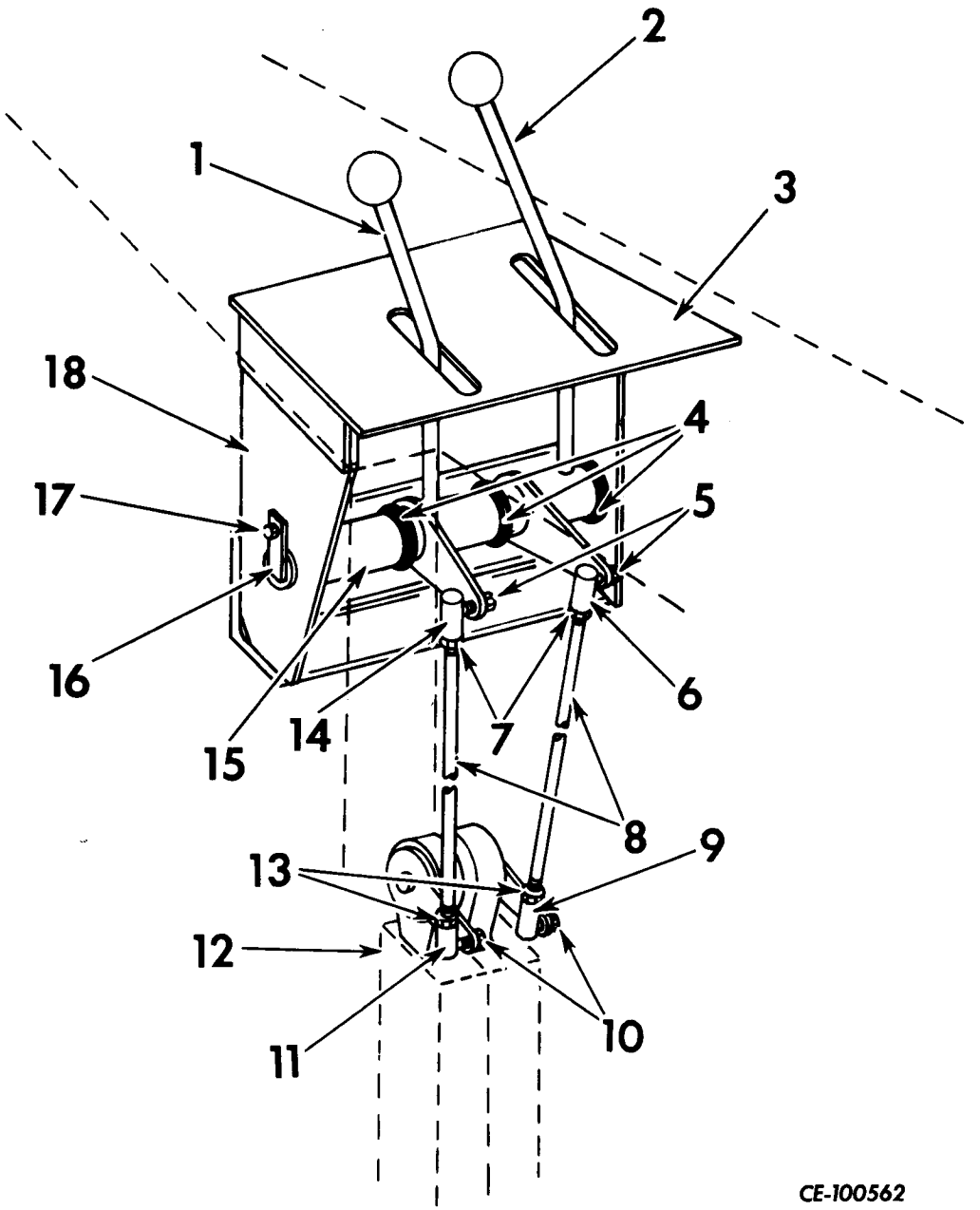


Figure 9-10
Hydraulic Control Valve Linkage.

1. Bucket lever.
2. Boom lever.
3. Panel.
4. "O" rings.
5. Nuts.
6. Ball joint.
7. Jam nut.
8. Rod.
9. Ball joint.
10. Nut.
11. Ball Joint.
12. Primary control valve.
13. Jam nut.
14. Ball joint.
15. Spacer.
16. Pin.
17. Cap screw.
18. Support.

HYDRAULIC CONTROL VALVE LINKAGE

REMOVAL

Remove panel that provides access to control valve linkage. Remove nuts (5, 10, Fig. 9-10). Remove ball joints (6, 9, 11, 14) with rods (8) from valve (12) and levers (1, 2). Loosen jam nuts (7, 13) and remove ball joints and nuts from rods. Remove knobs from levers (1, 2). Remove panel (3). Remove cap screw (17) and slide out pin (16). Remove spacer (15), "O" rings (4) and levers from support (18). If bushings (9, Fig. 9-11) in levers are damaged, remove and replace.

INSTALLATION

If bushings (9, Fig. 9-11) were removed, press in new bushings. Hand pack bushings with grease (NLGI-2). Install and align spacer (3), new "O" rings (2, 4, 6, 8) and levers (5, 7) in support (18, Fig. 9-10). Slide in pin (16) and secure with cap screw (17). Install panel (3) and screw knobs on levers. Install jam nuts (7, 13) and ball joints (6, 9, 11, 14) on rods (8). Install ball joints in levers and valve (12) and secure with nuts (5, 10).

ADJUSTMENT

Boom control lever should raise the boom when the lever is pulled back. When lever is moved forward one position, boom should be in a hold position. The boom should lower under pressure when lever is moved one position forward from hold and should float down when lever is moved to a full forward position.

Bucket control lever should cause the bucket to roll back when lever is pulled back. Bucket should dump when lever is pushed all the way forward. Lever should return automatically to hold position, (center position) when lever is released.

If adjustment is for boom and bucket control levers, remove nuts (5, Fig. 9-10) from ball joints (6 and 14). Loosen jam nuts (7) and turn ball joints in either direction for required adjustment. If additional adjustment is needed, repeat above procedure for valve end of linkage.

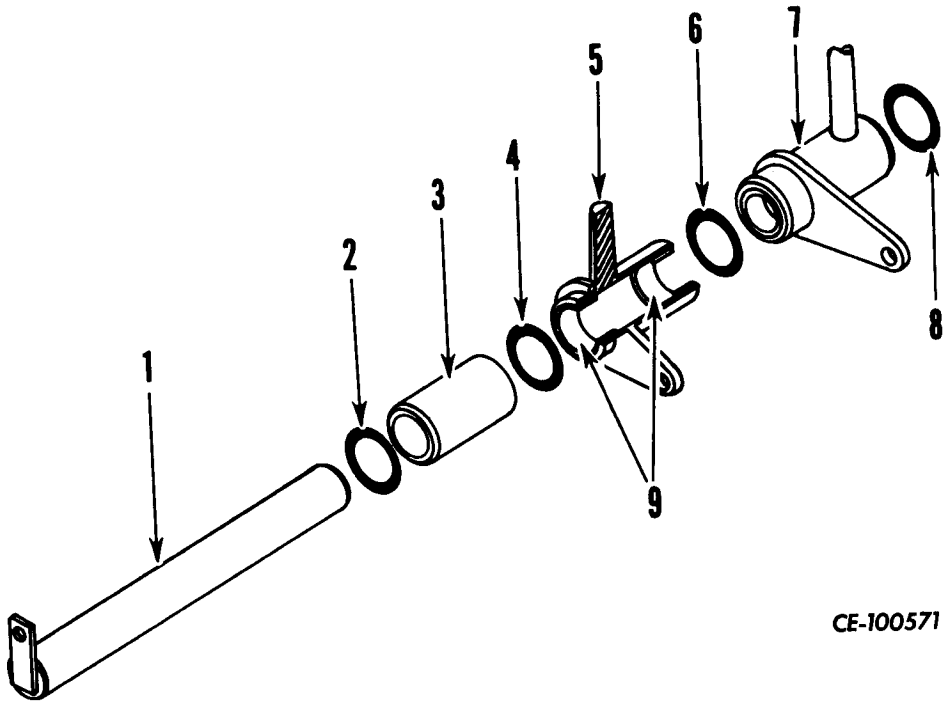


Figure 9-11
Control Lever Assembly.

1. Pin.
2. "O" rings.
3. Spacer.
4. "O" ring.
5. Bucket lever.
6. "O" ring.
7. Boom lever.
8. "O" ring.
9. Bushings.

STEERING LINKAGE

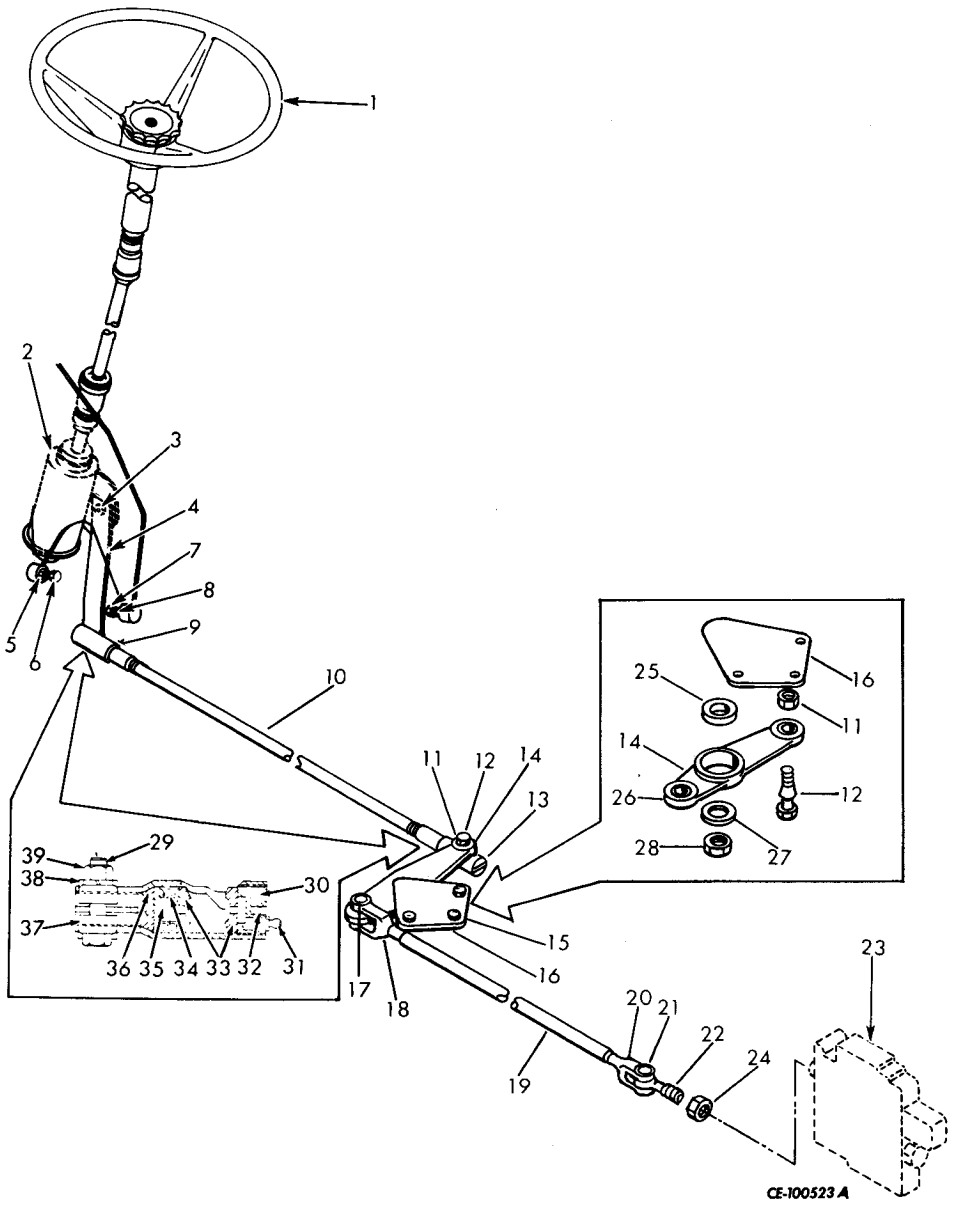


Figure 9-12
Steering Linkage.

1. Steering wheel.
2. Steering gear.
3. Nut.
4. Pitman arm.
5. Jam nut.
6. Stop bolt.
7. Stop bolt.
8. Jam nut.
9. Drag link end.
10. Drag link.
11. Nut.
12. Ball stud.
13. Drag link end.
14. Lever.
15. Bolt.
16. Pivot.
17. Cotter pin and clevis pin.
18. Rod end.
19. Rod.
20. Rod end.
21. Cotter pin and clevis pin.
22. Valve eye.
23. Steering valve.
24. Nut.
25. Bearing.
26. Bearing.
27. Flat washer.
28. Nut.
29. Cap screw.
30. Adjustment plug.
31. Grease fitting.
32. Cotter pin.
33. Ball seats.
34. Spring.
35. Safety plug.
36. Seat.
37. Clamp.
38. Lock washer.
39. Nut.

PRINTED IN UNITED STATES OF AMERICA

STEERING LINKAGE

Installation and Adjustment

If ball stud (12, Fig. 9-12) was removed, insert it in lever (14) and install and tighten nut (11). Refer to "Special Torques" for nut (11). If bearings (25 and 26) have been removed, press new ones into lever. Position lever on pivot (16) and tighten with hardware. Refer to "Special Torques".

Install the pitman arm (4) in the following manner:

Rotate the steering wheel as far as it will go in one direction.

Count the number of revolutions required to reach the end of travel in the opposite direction.

Turn the wheel back 1/2 the number of revolutions. The wheel in now centered.

Install the pitman arm in a vertical position. Refer to Fig. 9-13). Refer to "Special Torques".

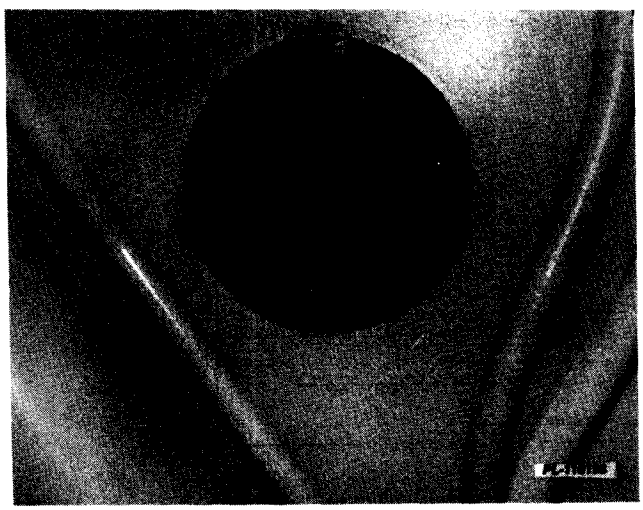


Figure 9-13
Pitman Arm Installation.

Assemble drag link ends (9 and 13) by installing seat (36), plug (35), spring (34), ball seats (33) and plug (30). Partially thread plug into rod end. Install grease fitting (31) in plug end. Assemble remaining drag link end in same manner.

Position assembled drag link ends, with end clamps (37) installed, on ends of drag link (10).

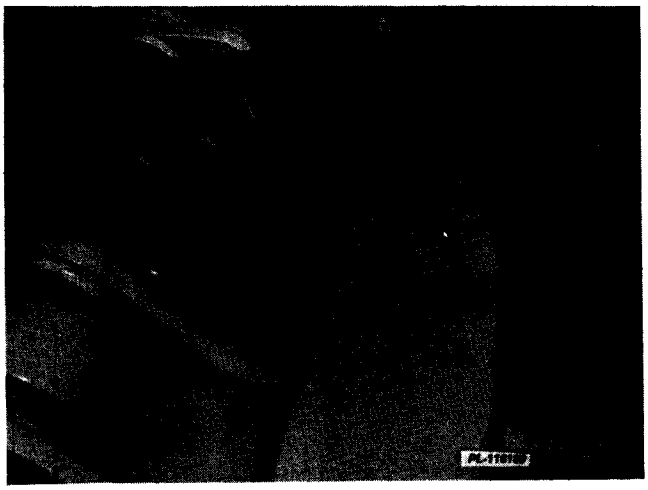


Figure 9-14
Position Lever.

Position lever (14) at 90° to side of frame. Refer to Fig. 9-14. Line up both capscrew mounting holes (17 and 21) with the edge of the square.

Assemble rod (19) to rod ene (22) and thread rod eye into valve with lock nut (24).

Thread rod eye into valve until the holes line up to install capscrew (17) without disturbing the position of lever (14). Tighten lock nut (24) against valve.

Turn the machine to one side until it is 6 mm (1/4 in) from contacting the frame stop pad. Adjust the Pitman arm stop so it will prevent any further movement of the arm.

Repeat the procedure for the opposite direction.

(Continued on next page)

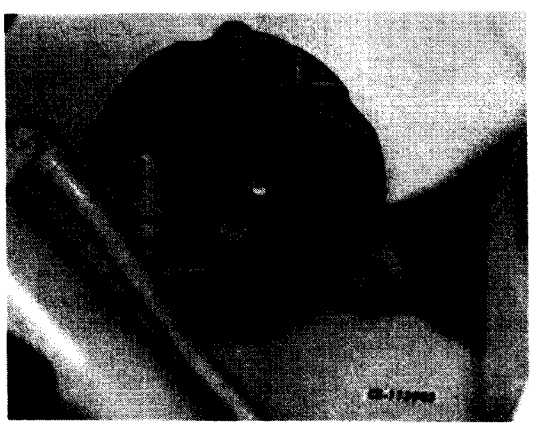


Figure 9-15
Adjust Frame Stops (Typical).

STEERING LINKAGE

Installation and Adjustment - Continued

Install a 34474 kPa (5000 psi) pressure gauge at the quick disconnect on left hand steering cylinder.

Turn the machine to a full left turn, observe the gauge reading. If the pressure does not drop below 2758 kPa (400 psi), adjust the Pitman arm stop until it does.

Release the steering wheel once the full turn in completed. The linkage might bind just enough to affect the pressure and a slight tap on the wheel would relieve the bind and give a more accurate reading.

Sometimes this function can be helped by moving the machine forward and reverse at 1200 RPM to relieve tire squeeze which could affect the pressure reading.

Repeat the process for the opposite direction.

This last step is to assure that the high pressure oil is cancelled from the cylinders once the turn has been completed.

Bucket Leveler

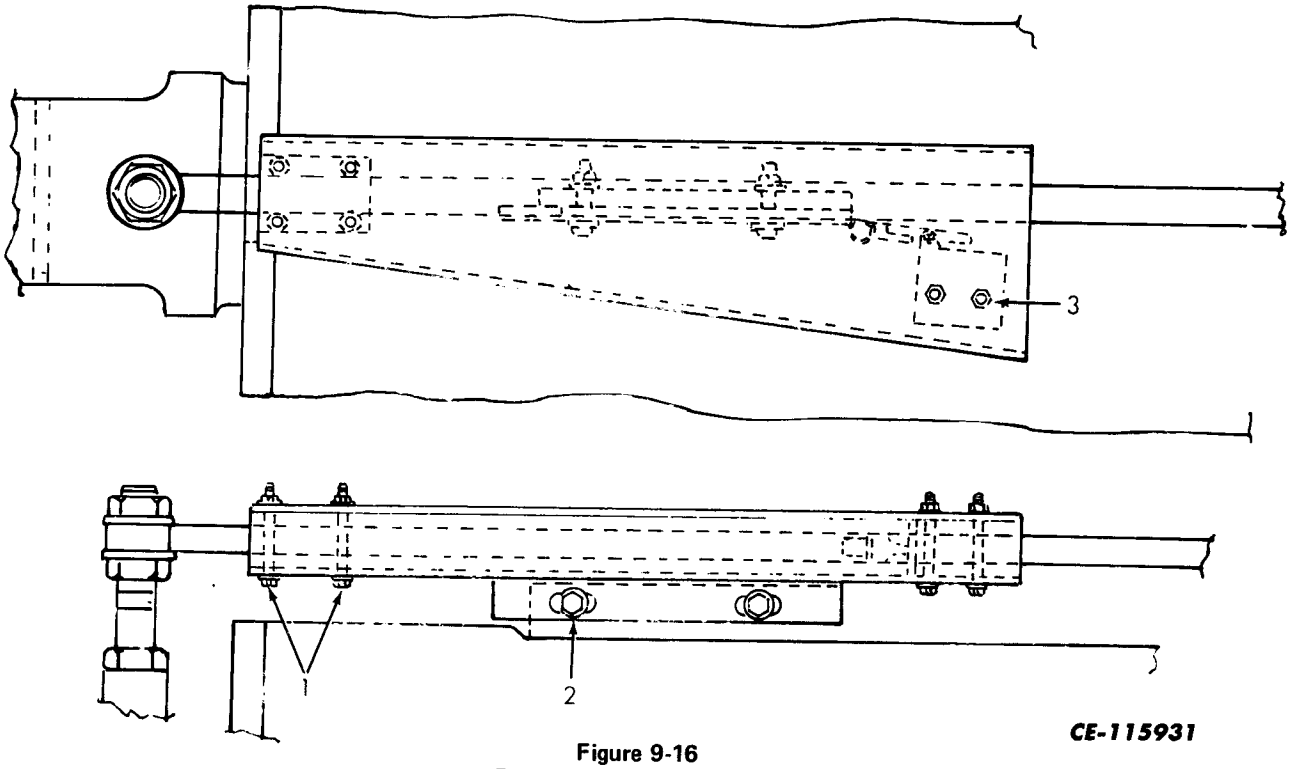


Figure 9-16
Bucket Leveler Assembly.

1. Bushing retainer - Torque to 5,4 N·m (4 ft lb).
2. Plate mounting.
3. Valve mounting.

When installing the bucket leveler assembly, the complete unit can be moved forward or backwards at the slots (2, Fig. 9-16) a small amount.

Also, the valve mounting has slotted holes (3, Fig. 9-16) to assist in correct positioning of the valve.

SPECIAL TORQUES

Ball stud to lever	108 N·m (80 ft lb)
Pivot to lever	298 N·m (220 ft lb)
Steering wheel mounting nut	48 N·m (35 ft lb)
Pitman arm nut	163 - 217 N·m (120 - 160 ft lb)
Bucket leveler bushing retainer	5,4 N·m (4 ft lb)

SECTION 10

HYDRAULIC LINES AND FITTINGS

(INCLUDED IN SECTION 11)

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

DESCRIPTION

Early Hydraulic System (Demand Valve and Vane Type Pumps)

The hydraulic system is comprised of two circuits, the loader circuit and the steering circuit. Both circuits, use the same reservoir for oil. Each circuit has its own vane type supply pump mounted on the torque converter and driven by same. The steering pump supplys oil to the demand valve which merely directs the entire supply to the steering valve. The loader pump supplys oil to the loader control valve. The switch pump on the rear of the loader pump supplys oil to the demand valve. Within the demand valve, a spring loaded plunger will direct both steering pump flow and switch pump flow to the steering valve when the R.P.M. is low. This provides for very good steering at low idle. When the R.P.M's are increased, higher oil pressure moves the plunger and it now will direct oil to the steering valve and the loader valve at the same time. At high R.P.M.'s the steering pump is sufficient to handle any steering valve request and the entire switch pump flow is directed to the loader valve. The line from the demand valve to the loader valve supply line is equipped with a check valve in the demand valve to prevent the loader pump from forcing oil into the demand valve.

When the steering wheel is moved, it moves the mechanical linkage connected to the steering valve, which in turn moves the plunger within the valve permitting oil to flow either to one cylinder or the other. Excess oil is routed back to the reservoir. Some of the excess oil is routed to the oil cooler and then to the reservoir. Whenever an outside mechanical force tends to articulate the machine, the service port relief valves in the steering valve will open and permit the higher pressure oil to flow to the other side of the cylinders and equalize.

The pilot valve controls the movements of the loader control plungers by hydraulic means and itself is control by the control levers. The pilot valve merely directs the oil to the various ports and routes the excess and return oil to the reservoir.

Oil is directed from the loader valve to the ends of the boom or bucket cylinders and back to the loader valve and on to the reservoir.

Late Hydraulic System (Diverter Valve and Gear Type Pumps)

The late hydraulic system is basically the same as the early with a few noteable exceptions. The hydraulic supply pumps are gear type pumps and the loader valve is a single unit pump while the steering and switch pumps are tandem mounted with an external mounted diverter valve replacing the function of the demand valve. The latest version of the system now has an internally mounted diverter valve between the steering and switch pumps.

(Continued on next page)

GENERAL INFORMATION

DESCRIPTION - Continued

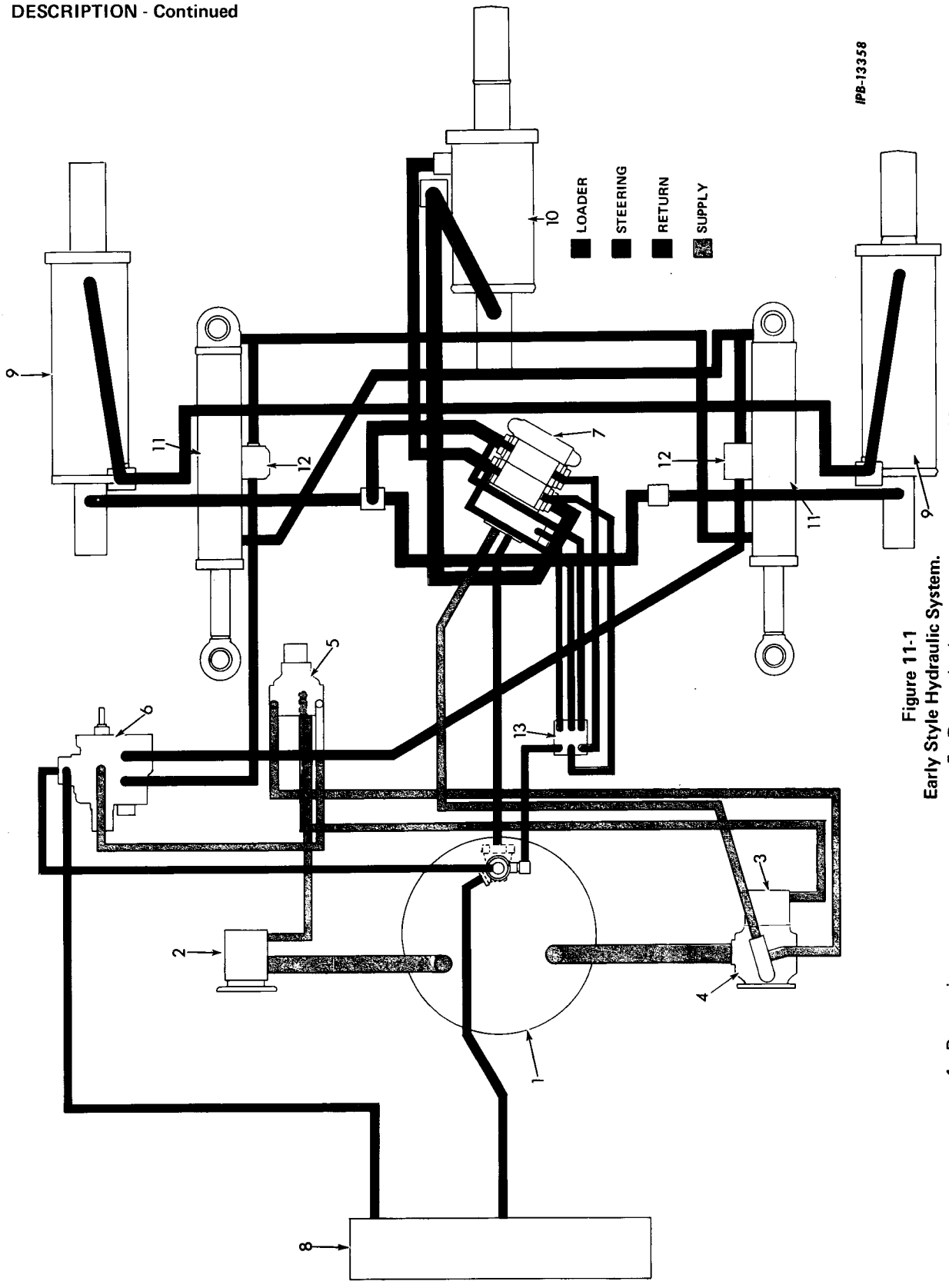


Figure 11-1
Early Style Hydraulic System.

1. Reservoir.
2. Steering pump.
3. Loader pump.
4. Switch pump.
5. Demand valve.
6. Steering valve.
7. Loader valve.
8. Oil cooler.
9. Boom cylinders.
10. Bucket cylinder.
11. Steering cylinders.
12. Check valves.
13. Pilot valve.

GENERAL INFORMATION

ESCRIPTION – Continued

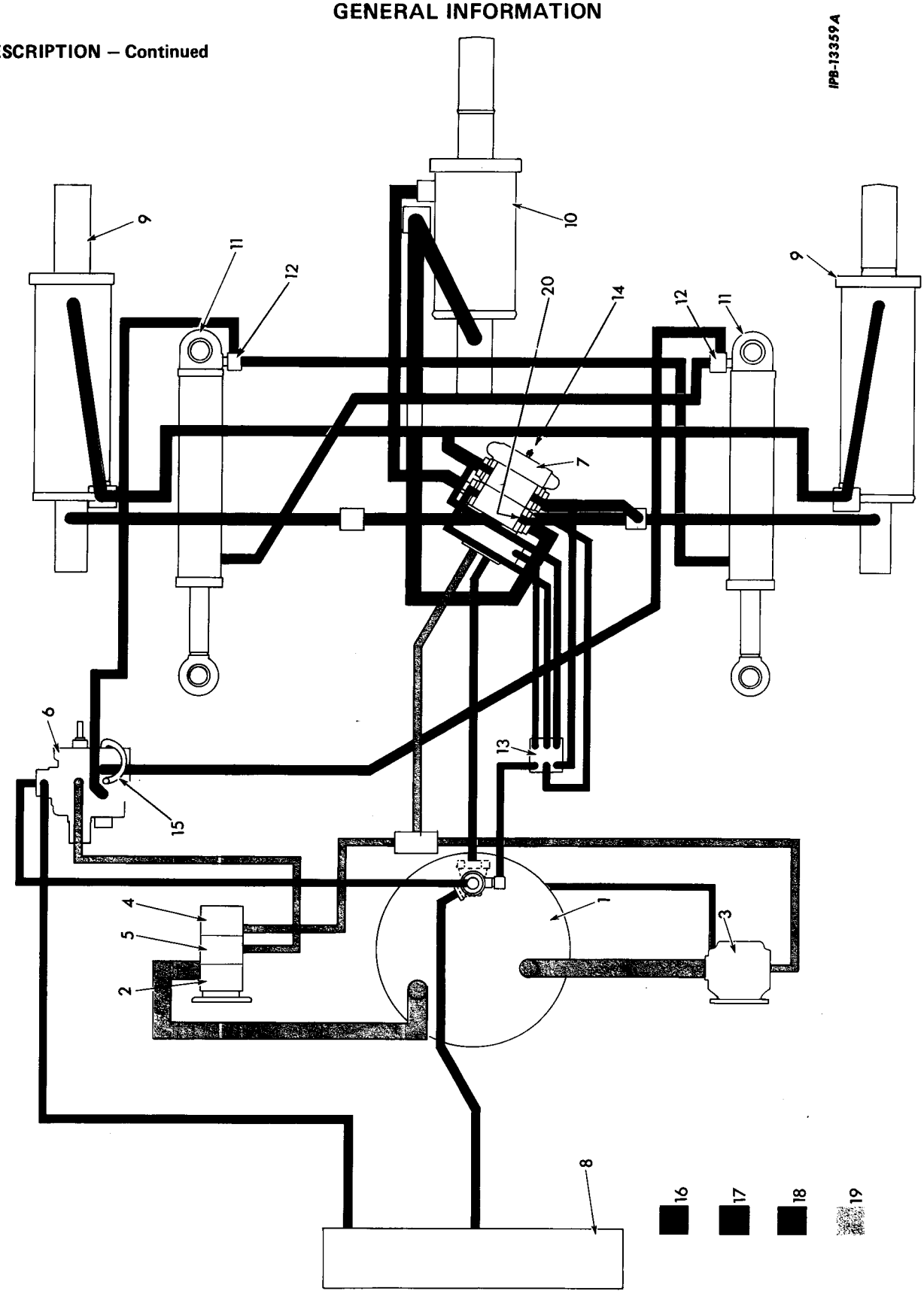


FIG. 11-1 – Hydraulic System.

DISASSEMBLY, INSPECTION AND ASSEMBLY

HYDRAULIC RESERVOIR

General

All components of the hydraulic reservoir may be serviced or removed without removing the reservoir from the tractor.

Perform the following operations before disassembling the reservoir for replacement and servicing of internal parts.

a. Start engine and operate hydraulic control levers several times until system oil becomes warm. Stop engine.

b. Loosen reservoir filler cap gradually to bleed off reservoir pressure before removing filler cap.

c. Place a container of sufficient capacity under reservoir drain. Remove drain plug (17, Fig. 11-1B) from drain valve (16). Use a funnel and length of hose to direct draining oil to container. Open drain valve (16). When oil has stopped running, close valve and remove sump drain plug (18) to completely drain remaining oil.

Removal

Tag all connections to reservoir for reference during installation. Disconnect all lines, drain them and cap or plug them to keep out dirt.

Disconnect the air cleaner indicator line from the indicator.

> NOTE: Do not use rags to plug lines or ports. Units equipped with anti-vandilism kits do not have a drain valve (16).

Remove mounting hardware and remove reservoir from tractor.

Disassembly

Remove relief valves (3, Fig. 11-1B) from cover (7). Remove nuts (1) from bolts (6) and remove cover clamps (2). Remove

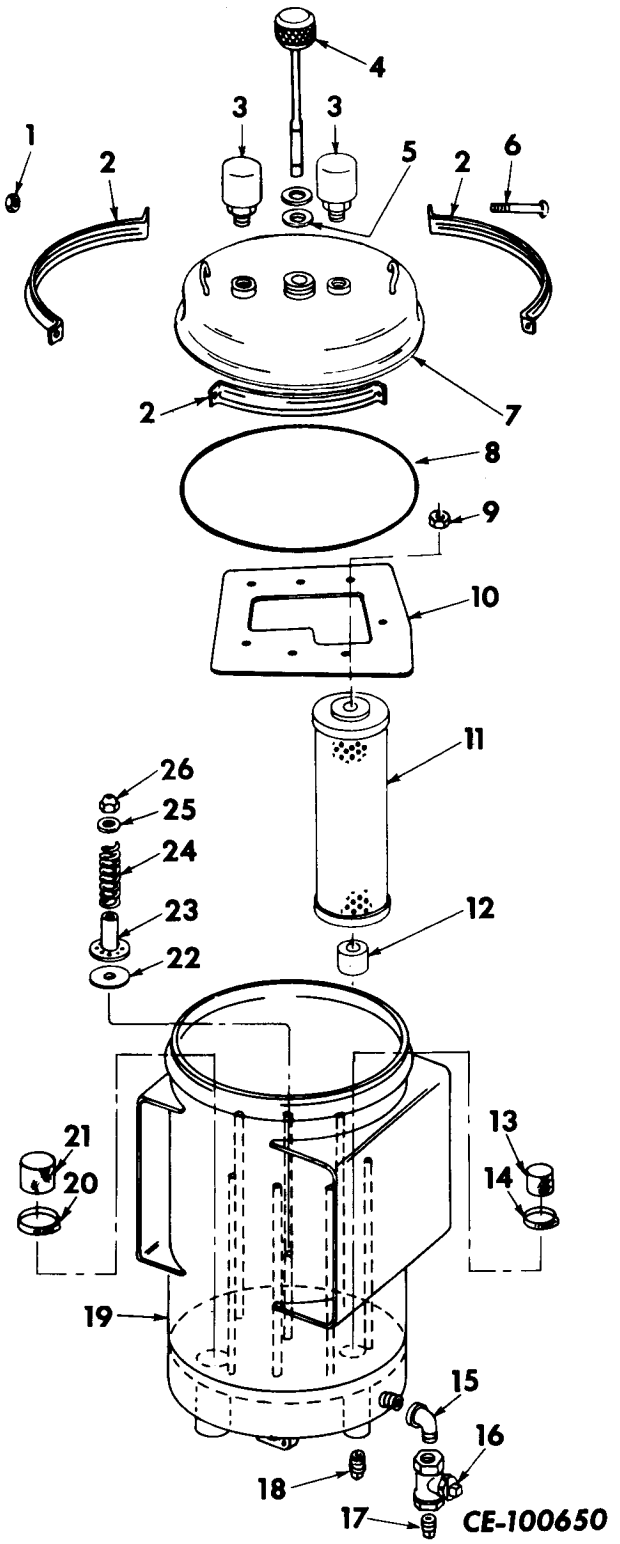


Figure 11-1B
Hydraulic Reservoir Assembly.

Legend for Figure 11-1B

1. Nut.
2. Cover clamp.
3. Relief valve.
4. Filler cap-dipstick.
5. Seals.
6. Retainer bolt.
7. Cover.
8. Cover seal.
9. Nut.
10. Retainer plate.
11. Filter.
12. Spacer.
13. Screen.
14. Clamp.
15. Elbow.
16. Drain valve.
17. Drain plug.
18. Drain plug.
19. Reservoir.
20. Clamp.
21. Screen.
22. Insulator.
23. Sleeve.
24. Spring.
25. Washer.
26. Acorn nut.

DISASSEMBLY, INSPECTION AND ASSEMBLY

cover and "O" ring (8). Remove nuts (9) securing retainer plate (10) and lift retainer plate from reservoir. Withdraw used filters (11) and discard them. Remove spacers (12), clamps (14, 20) and screens (13, 21) from bottom of reservoir.

Disassemble anti-backwash valve by removing acorn nut (26), washer (25), spring (24), sleeve (23) and insulator (22). Unscrew drain valve (16) from elbow (15) and elbow from reservoir (19). Discard used insulator (22).

Inspection

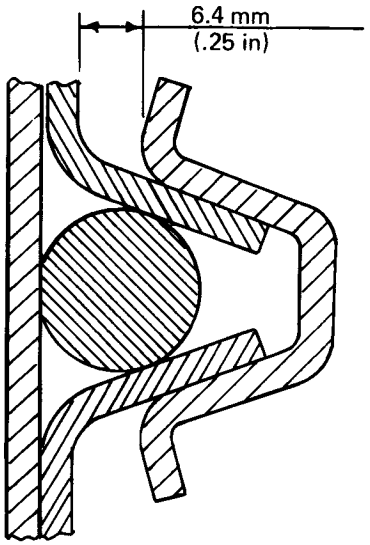
Check parts for wear and deterioration. Replace if necessary.

Clean reservoir as follows:

Clean reservoir exterior and screens with a spray of clean solvent. Rinse inside of reservoir with a warm flushing solution made of four parts clean diesel fuel oil to one part clean lubrication oil. Dry reservoir interior with compressed air and cover large opening.

NOTE: Do not use steam or caustic soda when cleaning inside of reservoir or any internal parts.

Assembly



PL-116890

Figure 11-1C
Reservoir Clamp.

When you install reservoir lid and clamp, tighten clamp to torque specified in "Special Torques". The dimension shown in Fig. 11-1A is the maximum allowable opening after tightening.

Thread elbow (15, Fig. 11-1B) onto reservoir and drain valve (16) onto elbow. Replace and tighten drain plugs (17, 18). Install screens (13, 21) in bottom of reservoir and secure with clamps (14, 20).

Install new insulator (22), sleeve (23), spring (24), washer (25) and acorn nut (26) on stud. Tighten acorn nut securely. Install spacers (12) over filter support rods, followed by new filters (11). Position retainer plate (10) over filters and rods and secure with retainer nuts (9). Tighten nuts to torque recommended in "SPECIAL TORQUES."

Filter Retaining Plate Nuts: _____

Position seal ring (8) on lip of reservoir. Apply sealant G.E. RTV-112 to seal ring (8). Position cover (7) on reservoir and secure with cover clamps (2), bolts (6) and nuts (1). Tighten cover clamp hardware to specified torque. Refer to "SPECIAL TORQUES."

Cover Clamp Bolts: _____

Thread relief valves (3) into cover and tighten. Install new seals (5) in dipstick cap (4).

Installation

Mount reservoir in tractor, install and tighten mounting hardward. Remove caps and plugs from previously tagged lines and securely connect all lines to reservoir.

Add oil to reservoir through dipstick opening. Refer to Operator's Manual for type oil to use according to expected work and ambient temperature conditions.

RELIEF VALVE

Disassemble valve in numerical order.

Clean and inspect parts.

Replace parts: 5, 9, 13, 14.

Assemble in reverse order. Apply Loctite Grade "E" to threads of Item No. 15.

RELIEF VALVE - Continued

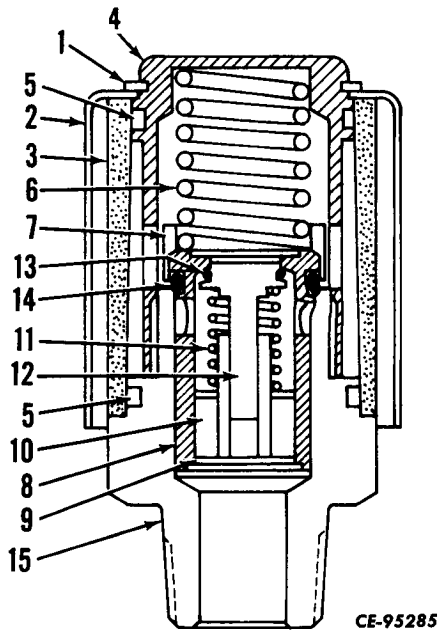


Figure 11-2
Relief Valve.

1. Lock ring.
2. Cover.
3. Filter.
4. Cap.
5. Filter seal (2).
6. Spring.
7. Retainer.
8. Sleeve.
9. Lock ring (2).
10. Guide.
11. Poppet spring.
12. Poppet.
13. Poppet seal.
14. Sleeve seal.
15. Body.

DRAIN VALVE

Disassemble valve in numerical order.

Clean and inspect parts.

Replace parts: 6, 7, 9.

Assemble in reverse order.

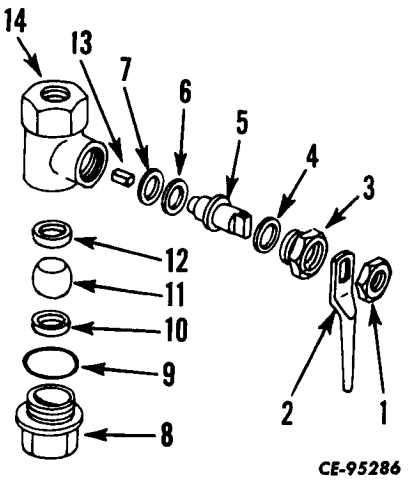


Figure 11-3
Drain Valve.

1. Locknut.
2. Handle.
3. Bushing nut.
4. Thrust washer.
5. Stem.
6. Back-up ring.
7. Stem seal.
8. End cap.
9. Body seal.
10. Seat.
11. Ball.
12. Seat.
13. Stop pin.
14. Body.

MAIN HYDRAULIC PUMP (VANE TYPE)

General

Do not remove or disassemble pump unless it is known to be in need of repairs. First, eliminate all other possibilities of hydraulic system malfunction as outlined in "TROUBLE SHOOTING" section.

Before disassembly, have correct pump gasket set on hand. Pump disassembly will probably damage "O" rings, back-up rings and seals. Pump assembly without replacing these parts is not practical.

NOTE: For correct repair parts, refer to current "Parts Manual."

The following instructions describe disassembly, inspection and assembly of a typical pump. A variation in parts configuration may be found between pumps of different application on any given machine; however, the basic design remains the same.

(Continued on page 8)

DISASSEMBLY, INSPECTION AND ASSEMBLY

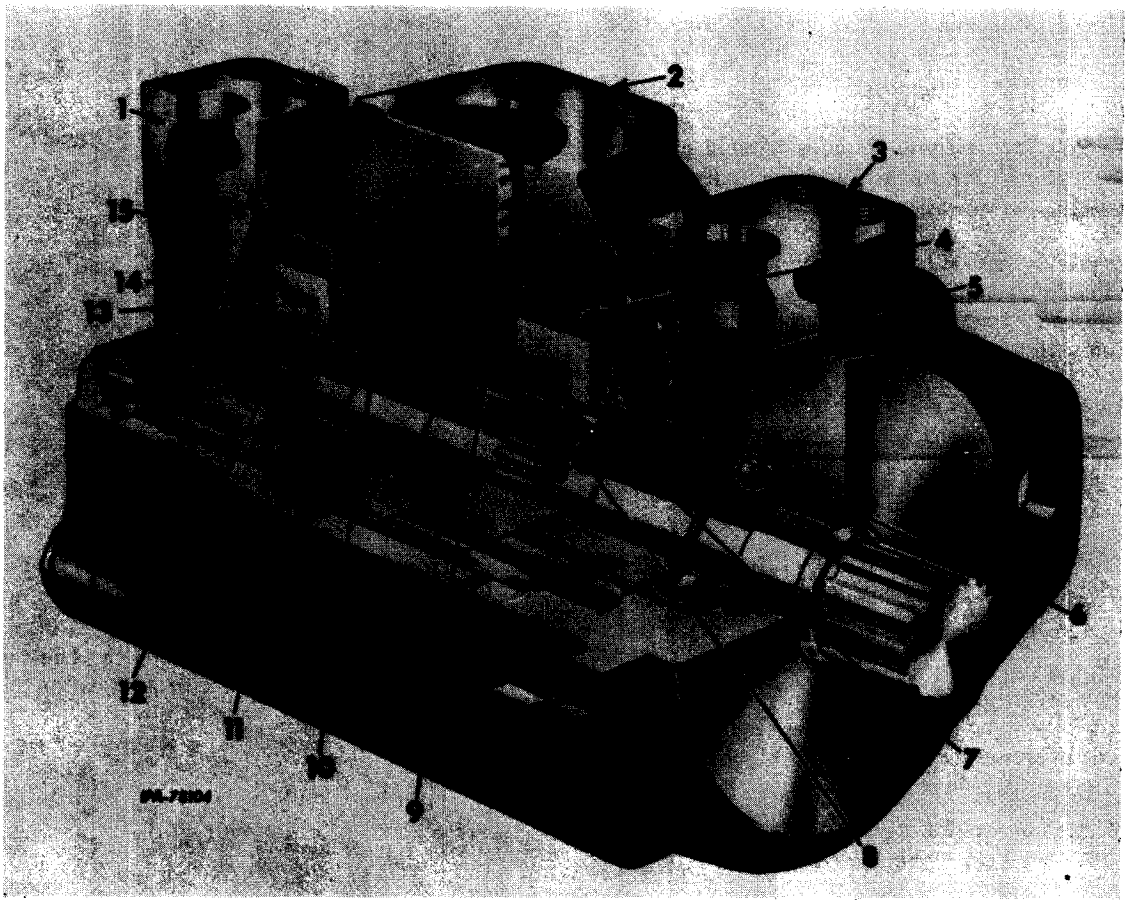


Figure 11-4
Main Hydraulic Pump - Cutaway View.

1. Outlet cover.
2. Inlet housing.
3. Outlet body.
4. Ring.
5. Pressure plate.
6. Vane.
7. Intra-vane.
8. Rotor.
9. Wear plate.
10. Wear plate.
11. Rotor.
12. Intra-vane.
13. Vane.
14. Ring.
15. Pressure plate.

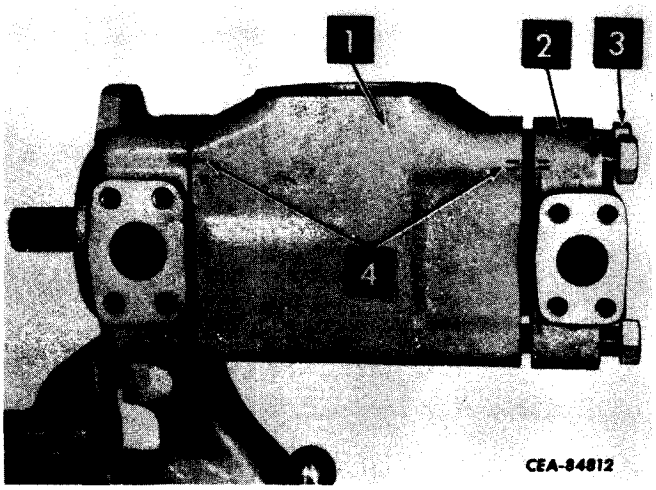


Figure 11-5
Scribe Covers Housing.

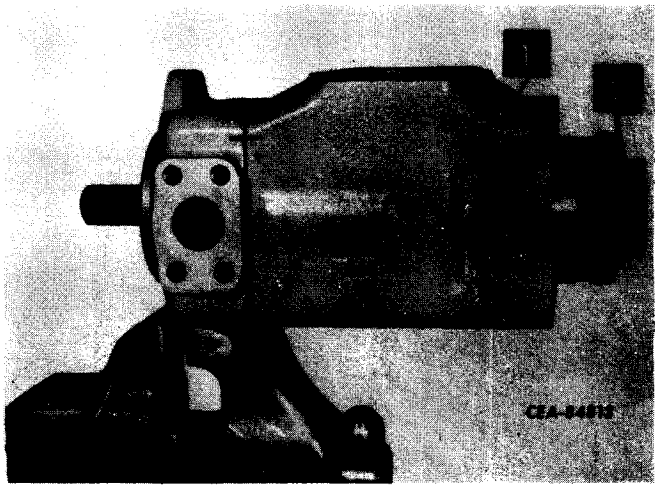


Figure 11-6
Remove Cartridge.

DISASSEMBLY, INSPECTION AND ASSEMBLY

MAIN HYDRAULIC PUMP (VANE TYPE) - Continued

Removal

a. Drain oil from reservoir. Remove pump lines and cap to prevent entry of dirt. Identify each line to insure proper installation when pump is replaced on tractor.

b. Remove cap screws holding pump to converter. Remove pump carefully, being sure that splined shaft is not damaged. Cap pump ports and clean exterior of pump before disassembly.

c. Disassemble pump on a clean work bench to prevent entry of dirt and/or foreign material.

Disassembly

Place pump in a vise and scribe marks (4, Fig. 11-5) on pump housing to aid in positioning parts during assembly.

Remove cap screws (3) that secure cover (2) to inlet housing (1).

Before removing cartridge from housing note direction of rotation and GPM rating (Fig. 11-11). It is essential that cartridge be reassembled correctly. Remove cartridge (2) from inlet housing (1, Fig. 11-6).

NOTE: Direction of rotation is viewed from shaft end; right hand rotation is clockwise; left hand, counterclockwise.

Slide housing (3, Fig. 11-7) from pump body (1) and cartridge (2).

Slide cartridge (3, Fig. 11-8) from shaft (2) and pump body (1). Once again, note direction of rotation and GPM rating on cartridge.

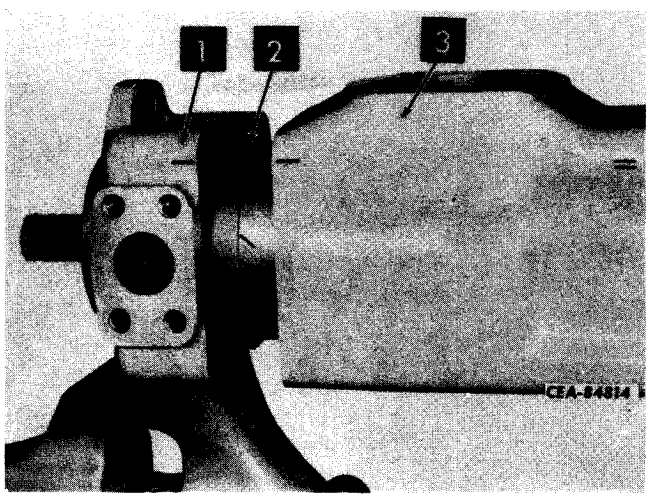


Figure 11-7
Remove Housing.

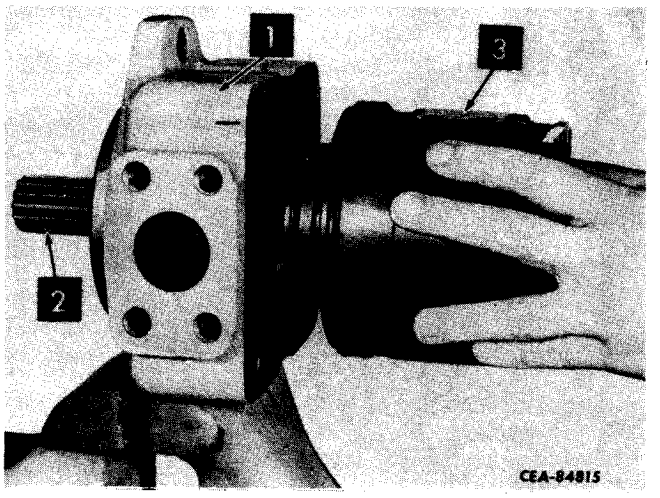


Figure 11-8
Remove Cartridge.

Remove Spir-O-Lox retaining ring (2, Fig. 11-9) from groove in pump body (1). Remove shaft and bearing assembly by tapping on spline end of shaft with a fiber hammer.

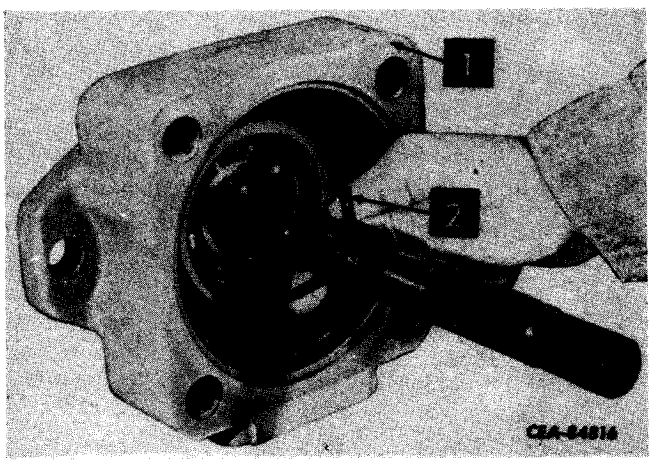


Figure 11-9
Remove Retaining ring.

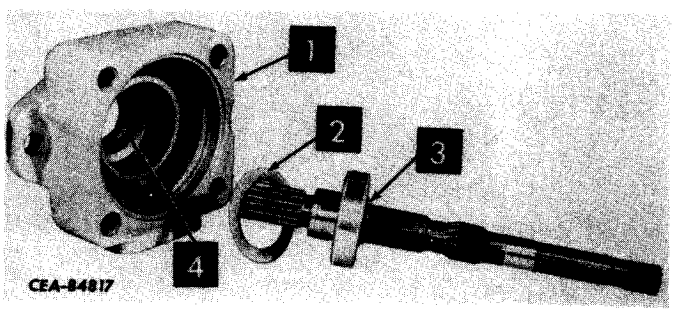


Figure 11-10
Remove Shaft Assembly.

DISASSEMBLY, INSPECTION AND ASSEMBLY

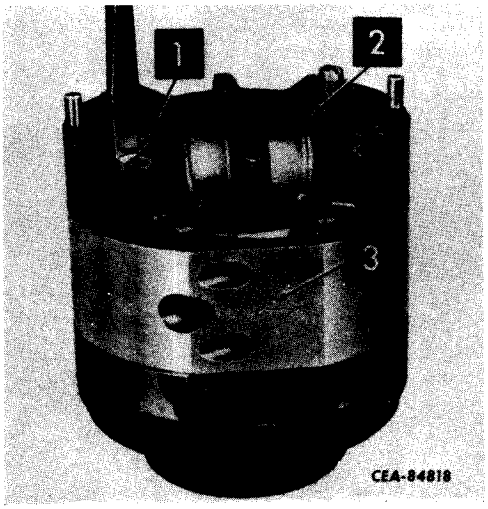


Figure 11-11
Cartridge Assembly.

Remove washer (2, Fig. 11-10). Remove seal (4) from pump body (1). Remove small snap ring (3) and press bearing from shaft.

Remove screws (1, Fig. 11-11) from cartridge assembly (2). Note capacity and direction of rotation stamped on ring of cartridge assembly (3).

Note position of all parts before disassembly cartridge.

Remove wear plate (6, Fig. 11-12). Remove rotor (3) being careful that vanes (4) stay in position. Remove cam ring (2). Remove locating pins (1) by sliding them out of pressure plate (5).

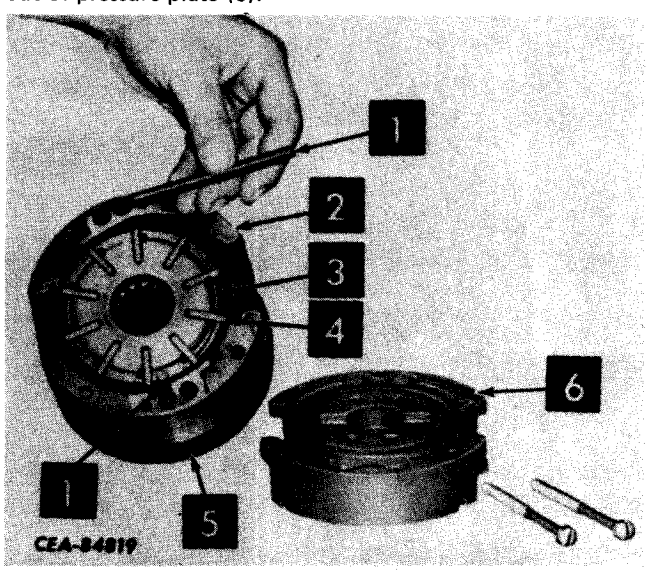


Figure 11-12
Disassemble Cartridge.

If it is necessary to remove vanes from rotor, be sure during assembly that highest edge of bevel (1, Fig. 11-13) is in direction of rotation.

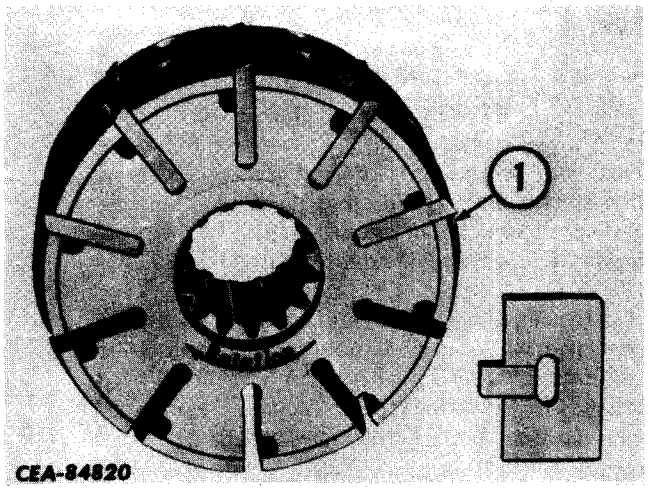


Figure 11-13
Bevel Position.

Inspection

Discard shaft seal and all "O" rings and back-up rings. Use a new gasket kit for assembly. Wash metal parts in clean mineral solvent, dry with filtered compressed air and place them on a clean surface for inspection.

Check pumping cartridges for signs of wear. Inspect cam rings for scoring and corresponding marks on vanes. All vanes should slide freely in rotor slots without sticking or side play. Vanes should drop in rotor slots by their own weight when both slots and vanes are dry. Check slots and rotor shaft for wear.

Do not repair or "touch-up" any parts contained in pump cartridges. These parts are machined to close tolerances which can easily be destroyed. Replacement of complete cartridge assemblies is recommended if worn rings or vanes are found.

Check pressure plate faces for scoring marks. Lap out score marks if possible or replace plates.

Assembly

NOTE: Coat all parts with clean hydraulic fluid to facilitate assembly and provide initial lubrication. Use small amounts of petroleum jelly to hold "O" rings in place during assembly.

NOTE: Direction of rotation is viewed from shaft end; right hand rotation is clockwise; left hand, counter-clockwise.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

MAIN HYDRAULIC PUMP (VANE TYPE) - Continued

Assembly - Continued

Place rotor on pressure plate with arrow on rotor pointed in correct direction of rotation. Place inserts in vanes and install assembly in rotor slots. Be sure sharp edges are toward direction of rotation (Fig. 11-13).

Install locating pins in pressure plate and place ring over them with ring arrow pointing in correct direction of rotation. Apply a small amount of grade "B" "LOCTITE" to screw threads. Install wear plate and screws. Be certain to tighten screws securely.

Install a new felt wiper and new oil seal. Using proper seal installation tool (refer to "SPECIAL TOOLS" under "SERVICE INFORMATION,") press seal into position (Fig. 11-14).

Figure 11-14
Install Seal.

Clamp pump body in a vise, as during disassembly procedure and place bearing washer against shoulder in housing.

Press shaft into bearing in an arbor press, supporting inner race. Install small snap ring.

Tape end of shaft and lubricate seal lip with grease or petroleum jelly to protect seal. Tap shaft and bearing gently into body and install Spir-O-Lox ring.

Install "O" ring and back-up ring on cartridge pressure plate hub. Install large back-up ring (3, Fig. 11-15) and "O" ring (4) on cartridge. Install small "O" ring (2) and back-up ring (1). Carefully install cartridge in pump body so flats on ring will align with inlet port when inlet housing is installed.

Place inlet housing (1, Fig. 11-5) over cartridge so locating pins are properly engaged and inlet is in correct position with respect to outlet body. Refer to reference marks (4).

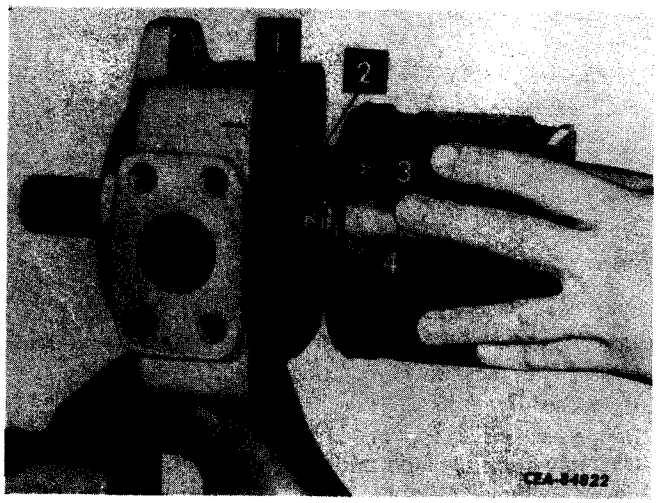


Figure 11-15
Install Cartridge.

Install cover-end cartridge (1, Fig. 11-16), being certain pins engage in body. Place large back-up ring (2) and "O" ring (3) on pressure plate. Install small "O" ring (4) and back-up ring (5).

Install cover (2, Fig. 11-5) and screws (3). Torque cover retaining screws. Refer to "SPECIAL TORQUES."

Torque: _____

Figure 11-16
Install Housing.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Installation

Carefully align pump shaft splines with torque converter drive and mount pump in its original position. Secure pump to converter housing with proper hardware and tighten to torque recommended in "SPECIAL TORQUES."

Torque: _____

Remove caps and plugs from previously tagged lines. Connect lines securely, being sure they are tight and leak-free.

MAIN HYDRAULIC PUMP (GEAR TYPE)

Disassembly

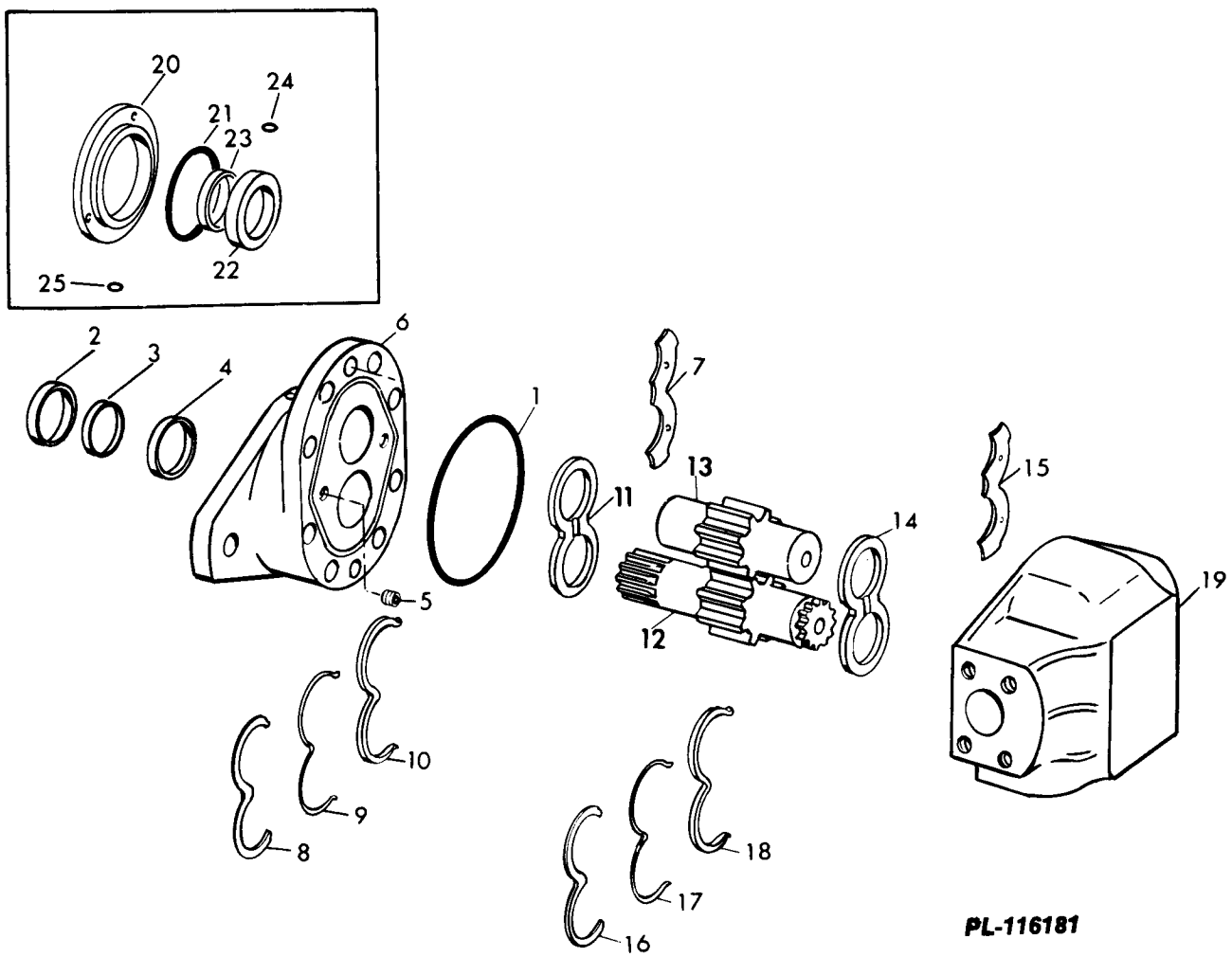


Figure 11-17
Main Hydraulic Pump (Gear Type).

1. "O" ring.
2. Seal.
3. Spacer.
4. Seal.
5. Plug.
6. Flange.
7. Isolation plate.
8. Retainer ring.
9. "O" ring.
10. Back-up ring.
11. Pressure plate.
12. Driving gear.
13. Driven gear.
14. Pressure plate.
15. Isolation plate.
16. Retainer ring.
17. "O" ring.
18. Back-up ring.
19. Housing.
20. Seal retainer.
21. "O" ring,
22. Large inner seal.
23. Small outer seal.
24. "O" ring.
25. "O" ring.

NOTE: Items 20 thru 25 are used only with the interim pump, identifiable by the seal retainer (20).

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

MAIN HYDRAULIC PUMP (GEAR TYPE) - Continued

Disassembly - Continued

On units equipped with seal retainer (20), the disassembly order is as follows; (20, 21, 6, 5, 1, 22, 23, 24, 25 and 7 thru 19).

On units not equipped with seal retainer (20), the disassembly order is items (1 thru 19).

Disassemble the component parts in the sequence indicated by the reference numbers in Fig. 11-17.

NOTE: Scribe a line from section to section so the bodies can be reassembled in their original position. Do not interchange any parts. Retain the exact relationship between all the parts so they can retain the wear pattern they have established (this includes the gears). Do not remove studs unless replacement is necessary.

Inspection

Clean and dry all parts thoroughly.

Inspect the housings for signs of cracking, deterioration or excessive wear. If the gear track in the housing is deeper than 0.127 mm (0.005 in), replace the entire section assembly.

Replace the seals in the front flange.

Replace all "O" rings.

Inspect all parts for signs of wear or damage. Refer to the Parts Manual for the serviceable parts and replace as needed.

When ordered, the section kit will come completely assembled with covers holding the components in place within the housing. To assemble, remove the covers, lightly oil the components and assemble in place.

Assembly

NOTE: Be sure all items with scribe lines are lined up properly. Install the pressure plate with bronze faces toward the gear and with the trap slot on the discharge side of the pump.

If isolation plate has a rounded edge on one side, place that side in the gear housing.

Install the outer seal in the flange so it is a minimum of 5.3 mm (0.210 in) in from the mounting face on pumps not equipped with seal retainer.

Assemble the component parts in the reverse order they were disassembled in Fig. 11-17.

Torque the stud nuts to the torque specified in "Special Torques".

Refer to "Special Torques for Split Flange Connections" for the split flanges mounting to the pump. Refer to the raised dimension on the split flange clamp half to determine which torque is needed from the chart.

SWITCH PUMP (VANE TYPE)

General

Do not remove or disassemble pump unless it is known to be in need of repairs. First, eliminate all other possibilities of hydraulic system malfunction as outlined in "TROUBLE SHOOTING."

Before disassembly, have correct pump gasket set on hand. Pump disassembly will probably damage "O" rings, back-up rings and seals. Pump assembly without replacing these parts is not practical.

NOTE: For correct repair parts, refer to current "PARTS MANUAL."

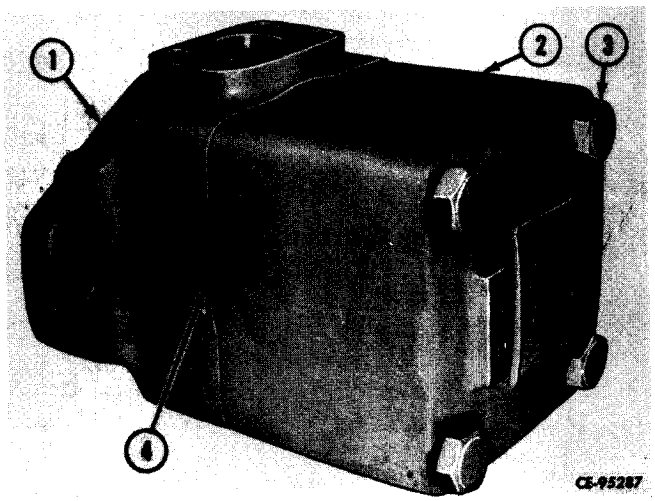


Figure 11-17
Scribe Housings.

Removal

Drain oil from reservoir. Remove pump lines and cap to prevent entry of dirt. Identify each line to insure proper installation.

Remove cap screws holding pump to converter. Remove pump carefully, being sure that splined shaft is not damaged. Cap pump ports and clean exterior of pump before disassembly.

Disassemble pump on a clean work bench to prevent entry of dirt and/or foreign material.

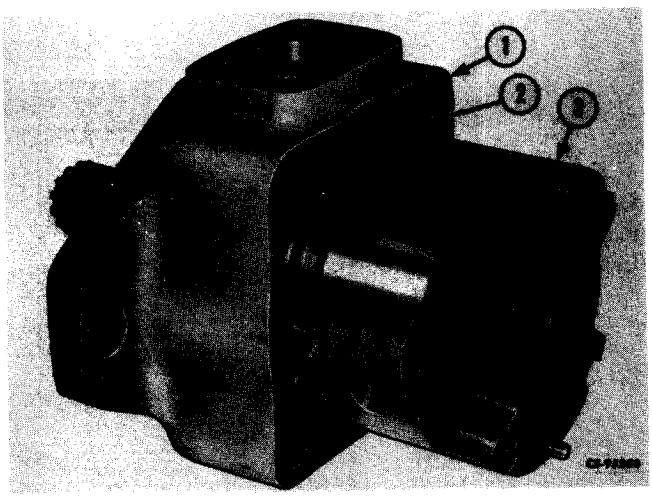


Figure 11-18
Remove Cartridge.

Disassembly

Scribe marks (4, Fig. 11-17) on pump housing to aid in positioning parts during assembly.

Remove cap screws (3) that secure cover (2) to body (1).

Remove "O" ring (2, Fig. 11-18) and cartridge (3) from body (1).

Remove "O" rings (2 and 3, Fig. 11-19) and back-up rings (1 and 4) from cartridge.

Remove screws (9) from cartridge. Note capacity and direction of rotation (10) stamped on ring (6) of cartridge.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

SWITCH PUMP (VANE TYPE) - Continued

Disassembly - Continued

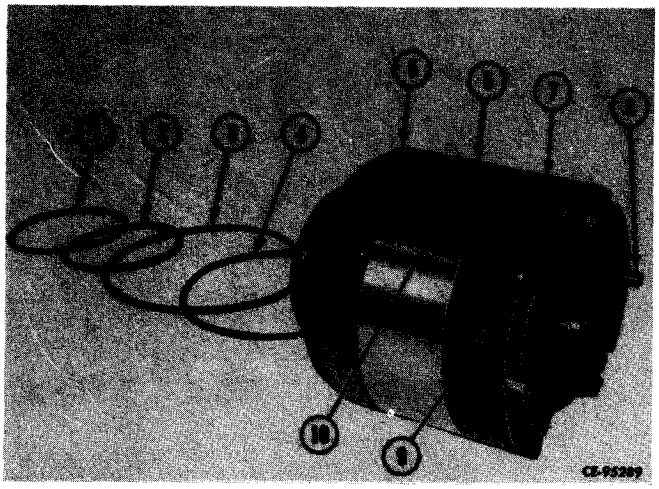


Figure 11-19
Cartridge Assembly.

Remove wear plate (7). Remove rotor, being careful that vanes stay in position. Remove cam ring (6) and locating pins (8).

NOTE: If it is necessary to remove vanes from rotor, be sure during assembly that highest edge of bevel (1, Fig. 11-20) is in direction of rotation.

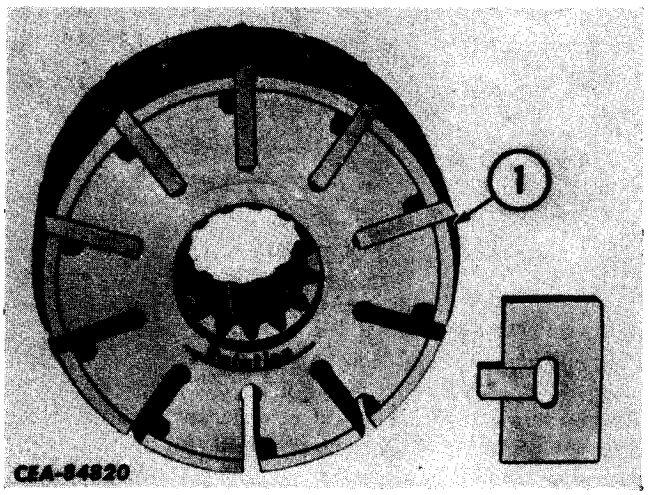


Figure 11-20
Bevel Position.

Remove snap ring (3, Fig. 11-21). Remove shaft with bearing (2) from body (1).

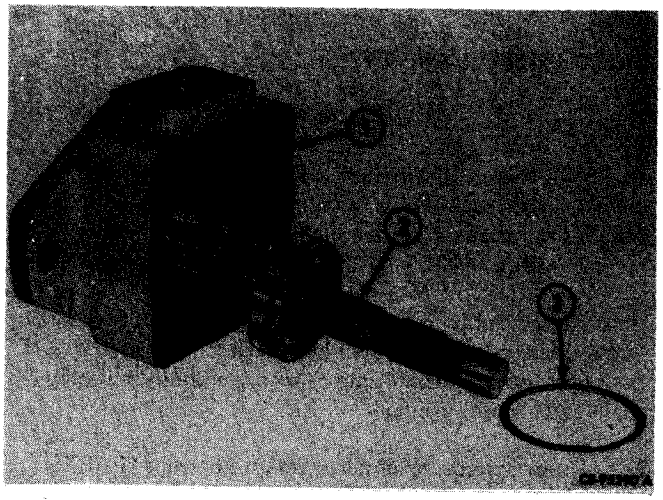


Figure 11-21
Remove Shaft Assembly.

Remove washer (4, Fig. 11-22), seal (3) and wiper (2) from body (1).

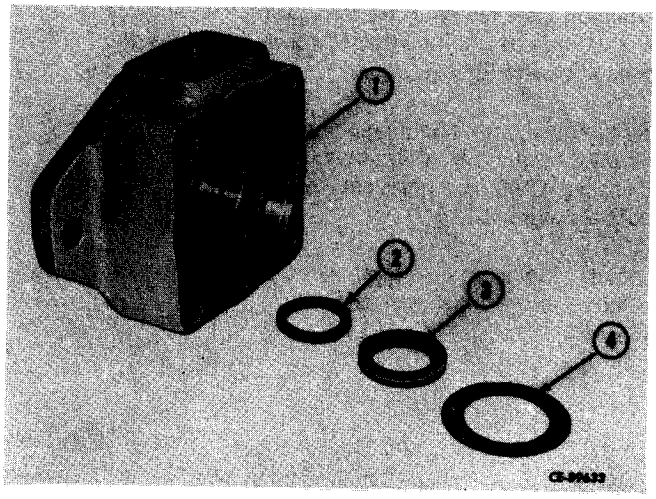


Figure 11-22
Remove Seal.

Using snap ring pliers (1, Fig. 11-23) remove snap ring (2).

Press bearing (1, Fig. 11-24) from shaft in an arbor press, supporting inner race.

NOTE; Current bearings (1, Fig. 11-24) do not use snap ring and groove on outer bearing race O.D.

DISASSEMBLY, INSPECTION AND ASSEMBLY

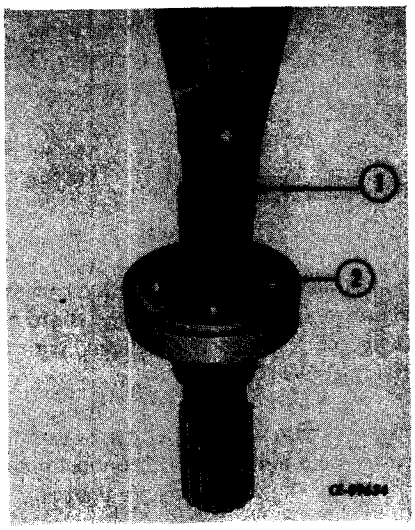


Figure 11-23
Remove Snap Ring.

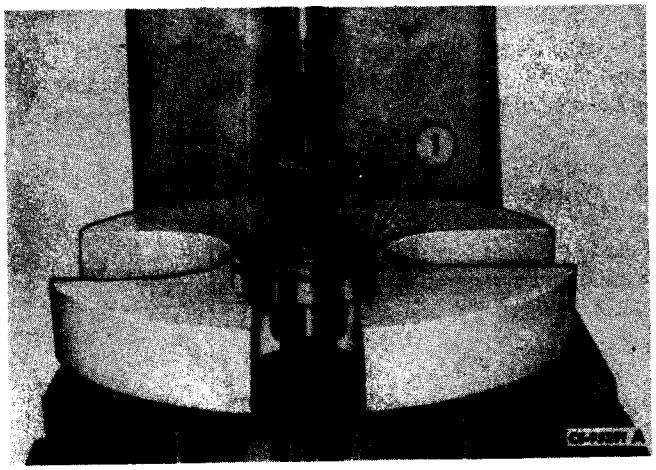


Figure 11-24
Remove Bearing.

Inspection

Discard shaft seal and all "O" rings and back-up rings. Use a new gasket kit for assembly. Wash metal parts in clean mineral solvent, dry with filtered compressed air and place them on a clean surface for inspection.

Check pumping cartridges for signs of wear. Inspect cam rings for scoring and corresponding marks on vanes. All vanes should slide freely in rotor slots without sticking or side play. Vanes should drop in rotor slots by their own weight when both slots and vanes are dry. Check slots and rotor shaft for wear.

Do not repair or "touch-up" any parts contained in pump cartridges. These parts are machined to close tolerances which can easily be destroyed. Replacement of complete cartridge assemblies is recommended if worn rings or vanes are found.

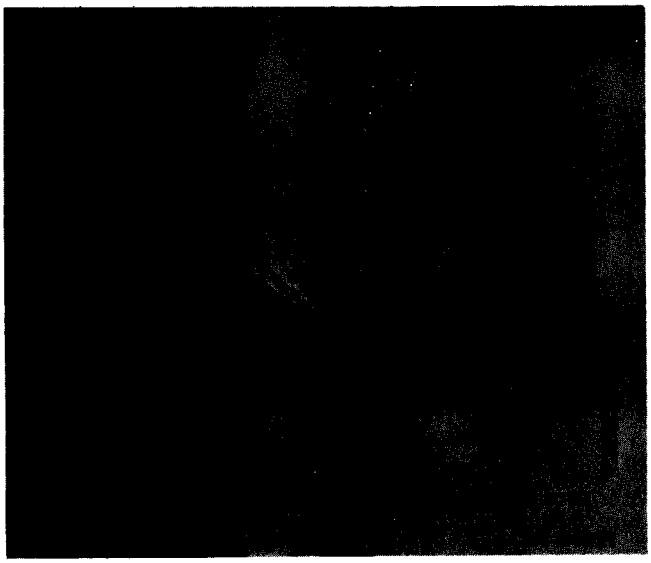


Figure 11-25
Install Seal.

Check pressure plate faces for scoring marks. Lap out score marks if possible or replace plates.

Assembly

NOTE: Coat all parts with clean hydraulic fluid to facilitate assembly and provide initial lubrication. Use small amounts of petroleum jelly to hold "O" rings in place during assembly.

Install a new felt wiper and new oil seal. Using proper seal installation tool (refer to "SPECIAL TOOLS"), press seal into position (Fig. 11-25).

Press shaft into bearing (1, Fig. 11-26) in an arbor press, supporting inner race.

(Continued on next page)

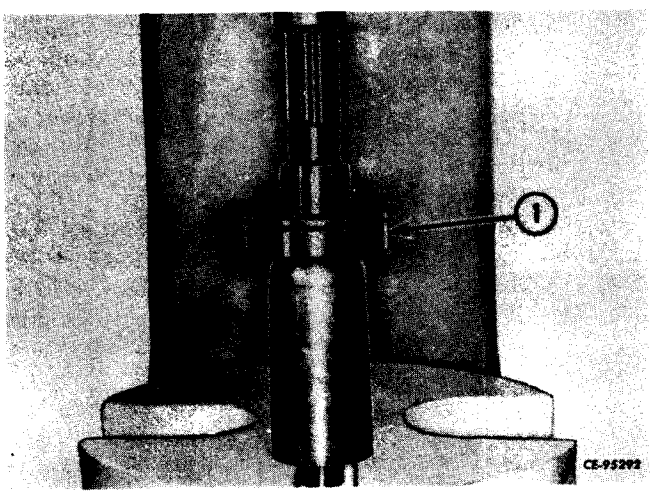


Figure 11-26
Install Bearing.

DISASSEMBLY, INSPECTION AND ASSEMBLY

SWITCH PUMP (VANE TYPE) - Continued

Assembly - Continued

Using snap ring pliers (1, Fig. 11-23), install snap ring (2) on shaft.

Install washer (4, Fig. 11-22) in body (1).

Install shaft with bearing (2, Fig. 11-21) in body (1) and secure with ring (3).

NOTE: Direction of rotation is viewed from shaft end; right hand rotation is clockwise; left hand, counterclockwise.

Place rotor on pressure plate (5, Fig. 11-19) with arrow on rotor pointed in correct direction of rotation (10). Place inserts in vanes and install assembly in rotor slots. Be sure sharp edges are toward direction of rotation.

Install locating pins (8) in pressure plate and place ring (6) over them with ring arrow pointing in correct direction of rotation. Apply a small amount of grade "B" "Loctite" to screw threads. Install wear plate (7) and screws (9). Be certain to tighten screws securely.

Install new "O" rings (2 and 3, Fig. 11-19) and back-up rings (1 and 4) after lubricating them with petroleum jelly.

Install cartridge (3, Fig. 11-18) and "O" ring (2).

Install cover (2, Fig. 11-17). Be certain cartridge pins engage in cover. Align marks (4) on the body (1) and cover (2). Install cap screws (3). Torque cap screws. Refer to "SPECIAL TORQUES."

Torque: _____

Installation

Mount pump in original position on torque converter, being careful not to damage splined pump shaft. Be certain pump shaft splines are properly aligned with torque converter drive. DO NOT FORCE.

Attach pump to housing with proper hardware and tighten securely. Remove caps and plugs and connect previously tagged lines. Be sure all connections are tight and leak-free.

SWITCH AND STEERING PUMP - GEAR TYPE (EARLY)

The basic disassembly, inspection and reassembly is the same for this pump as for the late gear type pump except in the area of the diverter valve.

Disassemble the component parts in the sequence indicated by the reference numbers in Figure 11-27.

Follow the same suggestions shown in the late gear type write up for disassembly, inspection and assembly where it pertains.

Legend for Figure 11-27

1. Socket head screws.
2. "O" rings.
3. "O" ring.
4. Socket head screws.
5. Valve adapter.
6. "O" rings.
7. Plug.
8. "O" ring.
9. Retainer.
10. Piston.
11. Piston seat.
12. "O" ring.
13. Nut.
14. "O" ring.
15. Lock nut.
16. Adjusting screw.
17. "O" ring.
18. Cover.
19. "O" ring.
20. Retainer.
21. Spring.
22. Retainer.
23. Snap ring.
24. Check valve.
25. Valve spool.
26. Orifice plugs.
27. Diverter valve body.
28. Front flange.
29. Not used.
30. Spacer ring.
31. Seal.
32. "O" ring.
33. Back up retainer.
34. Seal strip.
35. Retainer.
36. Isolation plate (top).
37. Pressure plate.
38. Drive gear.
39. Idler gear.
40. Pressure plate.
41. Bottom isolation plate.
42. Back up retainer.
43. Seal strip.
44. Retainer.
45. Front section.
46. Spline coupling.
47. Snap ring.
48. "O" ring.
49. Center section.
50. "O" ring.
51. Isolation plate (top).
52. Back up retainer.
53. Seal strip.
54. Retainer.
55. Pressure plate.
56. Idler gear.
57. Drive gear.
58. Pressure plate.
59. Isolation plate (bottom).
60. Back up retainer.
61. Seal strip.
62. Retainer.
63. Stud.
64. Rear section.

DISASSEMBLY, INSPECTION AND ASSEMBLY

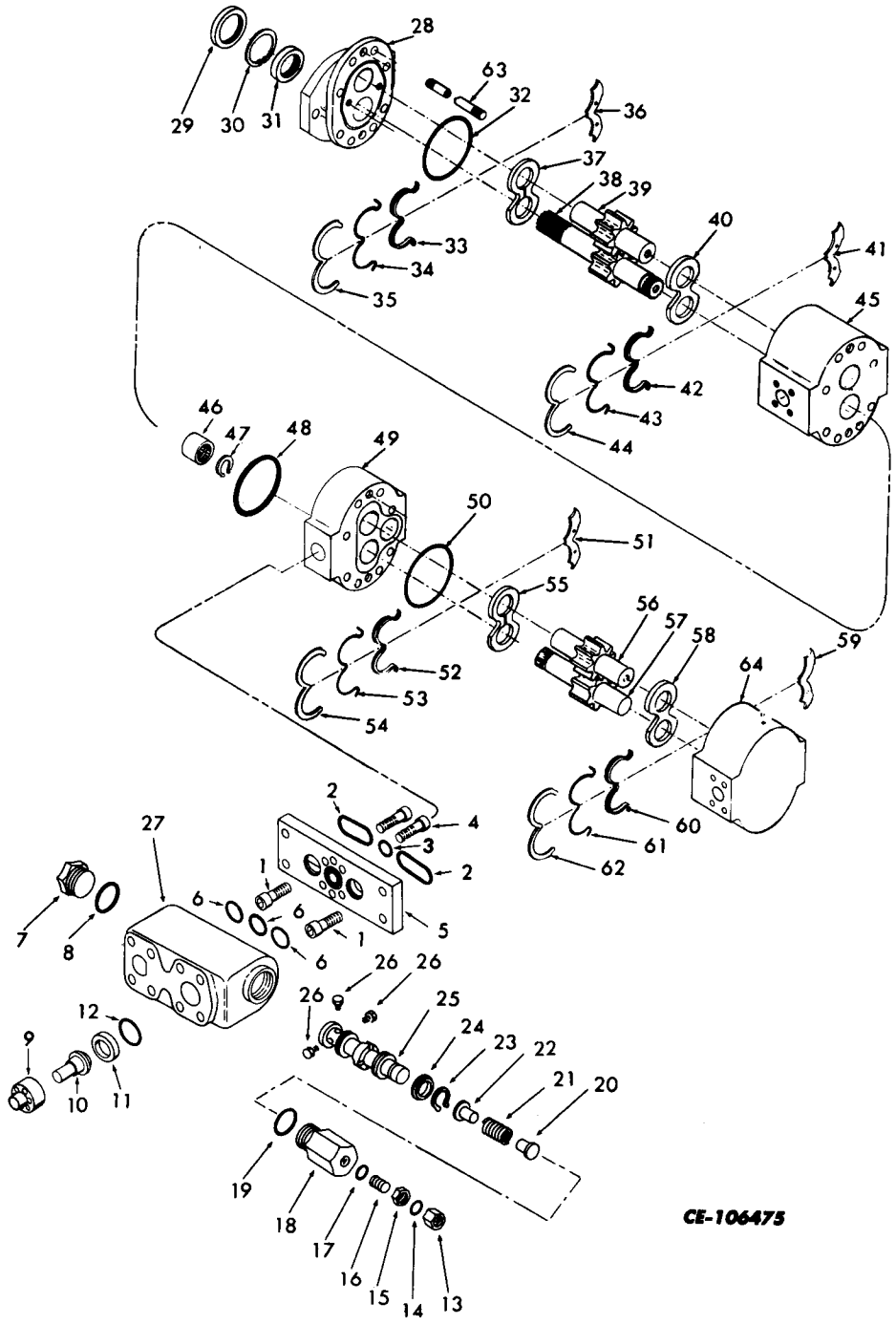


Figure 11-27
Switch and Steering Pump (Gear Type - Early).

DISASSEMBLY, INSPECTION AND ASSEMBLY

SWITCH AND STEERING PUMP - GEAR TYPE (2 SECTION)
(Ref. Nos. Refer to Figure 11-28)

Disassembly

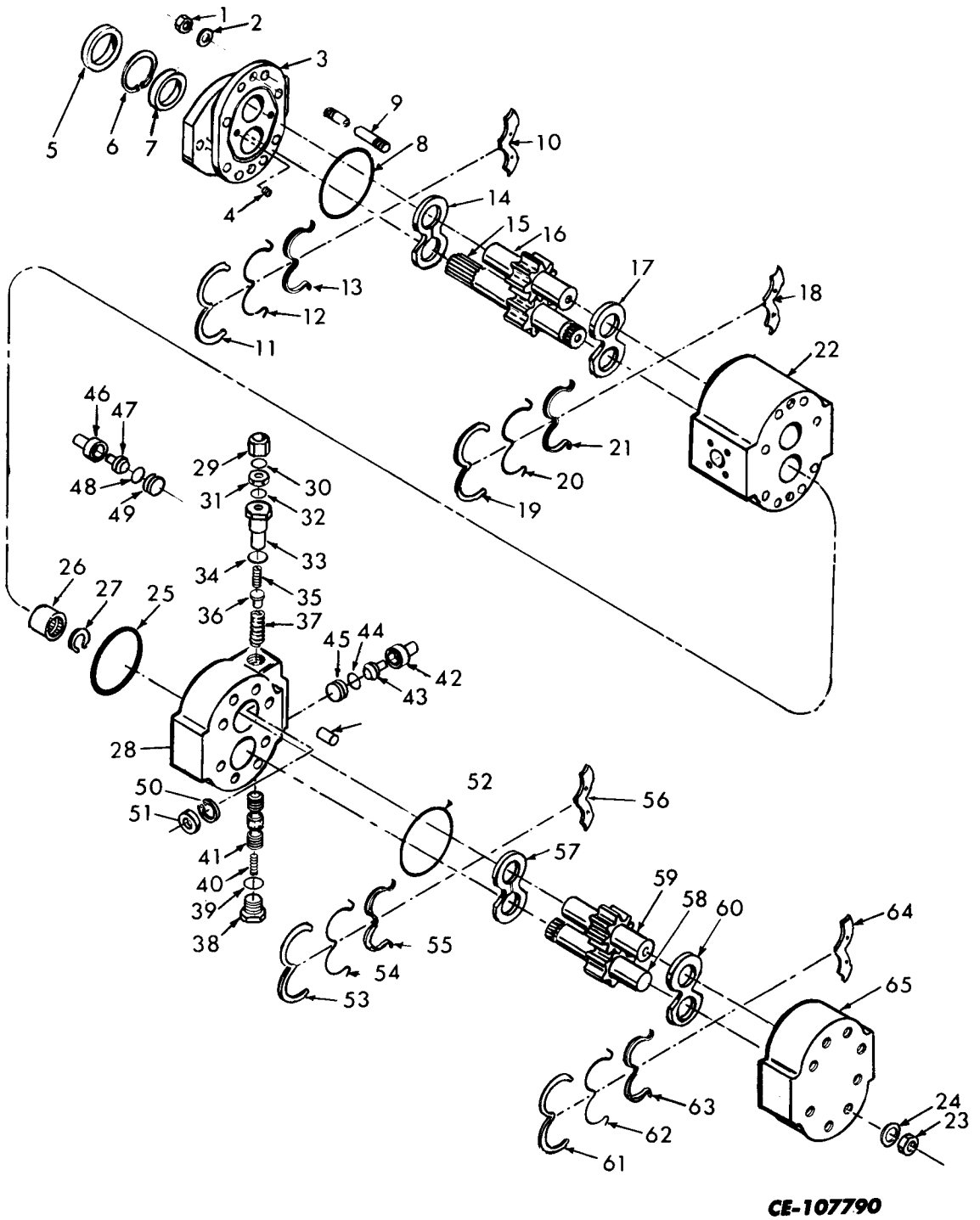


Figure 11-28
Switch and Steering Pump (2 Section).

DISASSEMBLY, INSPECTION AND ASSEMBLY

Legend for Figure 11-28

1. Retaining nut.
2. Hardened washer.
3. Flange housing.
4. Plug.
5. Flange seal (exterior).
6. Spacer.
7. Flange seal (interior).
8. "O" ring.
9. Front section studs.
10. Isolation plate (upper).
11. Retainer ring.
12. "O" ring.
13. Back-up ring.
14. Pressure plate.
15. Front drive gear.
16. Front idler gear.
17. Pressure plate.
18. Isolation plate (lower).
19. Retainer ring.
20. "O" ring.
21. Back-up ring.
22. Front housing.
23. Retaining nut.
24. Hardened washer.
25. "O" ring.
26. Coupling.
27. Retaining ring.
28. Valve housing.
29. Cap nut.
30. "O" ring.
31. Lock nut.
32. "O" ring.
33. Plug.
34. "O" ring.
35. Adjusting screw.
36. Piston retainer.
37. Piston spring.
38. Plug.
39. "O" ring.
40. Set screw.
41. Valve spool.
42. Piston retainer.
43. Piston (steering).
44. "O" ring.
45. Piston seat.
46. Piston retainer.
47. Piston (loader).
48. "O" ring.
49. Piston seat.
50. Retaining ring.
51. Orifice.
52. "O" ring.
53. Retainer ring.
54. "O" ring.
55. Back-up ring.
56. Isolation plate (upper).
56. Pressure plate.
58. Rear idler gear.
59. Rear drive gear.
60. Pressure plate.
61. Retainer ring.
62. "O" ring.
63. Back-up ring.
64. Isolation plate (lower).
65. Rear housing.

Clean the exterior of the pump.

Scribe each section of the pump to the adjoining section so reassembly will locate them in the same original position.

Start disassemble at the flange end of the pump.

As you remove a part, lay it out on the work bench in the exact position it occuppied in the pump. This will assist in reassembly.

NOTE: Do not interchange parts.

Apply tape to the splined portion of the drive gear shaft so the seal on the flange is not damaged when the flange is removed.

Remove the nuts (1), washers (2) and flange (3) from the front housing.

Remove the plug (4) from the face of the flange.

Position the flange so you can drive the seal (5), spacer (6) and seal (7) from the flange. Do not scar the bore of the flange with the punch.

Remove "O" ring (8).

Do not remove the studs (9) unless replacement is necessary.

Remove isolation plate (10), retainer ring (11), "O" ring (12) and back-up ring (13).

Grasp the ends of the gear shafts and pull them out of the housing, bringing the pressure plate (14) with them. Before you completely remove the gears (15 and 16) from the housing, scribe the two together so the exact same wear pattern will be retained.

Using thumb and forefinger in the two holes of the pressure plate (17), gently remove it from the housing. If the pressure plate is not kept level, it will cock in the housing and bind.

Remove isolation plate (18), retainer ring (19), "O" ring (20) and back-up ring (21).

Remove the front housing (22).

Remove the nuts (23) and washers (24) from the rear studs. Do not remove the studs unless replacement is necessary.

Remove "O" ring (25).

Remove coupling (26), snap rings (27) from within coupling (26) and remove valve body (28) with studs from the rear housing.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

SWITCH AND STEERING PUMP - GEAR TYPE (2 SECTION) - Continued (Ref. Nos. Refer to Figure 11-28)

Disassembly - Continued

Remove cap (29), "O" ring (30), lock nut (31), "O" ring (32), plug (33), "O" ring (34), adjusting screw (35), piston retainer (36) and piston spring (37) from the valve body.

Remove plug (38), "O" ring (39), set screw (40) and valve spool (41) from the valve body.

Remove piston retainer (42), piston (43), "O" ring (44) and piston seat (45) from valve body. This is the steering system check for the valve.

Remove piston retainer (46), piston (47), "O" ring (48) and piston seat (49) from the valve body. This is the loader system check for the valve.

Remove snap ring (50) and orifice plug (51) from the valve body thru the discharge port.

Remove "O" ring (52), retainer ring (53), "O" ring (54), back-up ring (55) and isolation plate (56).

Grasp the gear shafts and pull upward to remove the pressure plate (57).

Scribe the two gears to each other so the original wear pattern can be retained.

Remove drive gear (58) and idler gear (59).

Insert thumb and forefinger into holes of pressure plate (60) and keeping it level, remove from housing.

Remove retainer ring (61), "O" ring (62), back-up ring (63) and isolation plate (64) from the rear housing (65).

Inspection

Clean and dry all parts thoroughly.

Inspect the housings for signs of cracking, deterioration or excessive wear. If the gear track in the housing is deeper than .005, replace the entire section assembly.

Replace the seals in the front flange.

Replace all "O" rings.

Inspect all parts for signs of wear or damage. Refer to the Parts Manual for the serviceable parts and replace as needed.

When ordered, the section kit will come completely assembled with covers holding the components in place within the housing. To assemble, remove the covers, lightly oil the components and assemble in place.

Assembly

Apply a light coat of oil to all internal parts before assembling.

Install isolation plate (64) into the rear housing (65). Make sure the isolation plate is the one with rounded shoulders and the round portion goes against the bottom of the housing.

Install back-up ring (63), "O" ring (62) and retainer ring (61).

Install pressure plate (60) so the bronze face is up facing the gears and the trap slot is on the discharge side of the pump which is the left side of the pump. Pressure plate will bind in housing if not installed level. Do not force.

Install idler gear (59) and drive gear (58). Make sure the scribe marks line up.

Install pressure plate (57) with bronze face down and trap slot on left side of pump.

Install isolation plate (56), back-up ring (55), "O" ring (54) and retainer ring (53).

Install "O" ring (52) in groove on rear housing face. Be sure it stays in groove. Use grease if necessary.

Install orifice plug (51) into valve body and lock in place with snap ring (50).

Install "O" ring (48) onto the piston seat (49), lubricate the "O" ring with a light coat of grease and install the seat into the valve housing.

Install the piston (47) into the piston retainer (46) and install the retainer and piston into the valve housing until it reaches bottom.

Repeat the procedure for items (45), (44), (43) and (42).

Install the valve spool (41) into the valve housing so the spool end with the larger opening is on the top side of the valve housing.

Install the set screw (40) into the lower end of the valve spool.

Install the "O" ring (39) and plug (38).

Install the spring (37) with spring retainer (36) into the valve.

Install the "O" ring (34) and plug (33).

Install the adjusting screw (35).

Install the "O" ring (32) and lock nut (31). Do not assemble "O" ring (30) or cap (29) until adjustment has been preformed.

Install section (28) and section (65) together making sure the scribe marks on the housings line up. Secure with washers (24) and nuts (23).

Install snap rings (27) into coupling (26) and install coupling on shaft (58).

Install "O" ring (25) and housing (22) to housing (28).

Install isolation plate (18) with the rounded edges seating against the housing.

Install back-up ring (21), "O" ring (20) and retainer ring (19).

Install pressure plate (17), bronze face up and trap slot to the discharge side of pump.

Align scribe marks on gear set (15 and 16) and install them. Time the gear set as follows.

Looking down through the opening in the upper and lower housings, line up one upper gear tooth tip with the valley between two of the teeth on the lower gear.

Install the pressure plate (14) with the bronze side to the gears and the trap slot on the discharge side.

Install the isolation plate (10), back-up ring (13), "O" ring (12) and retainer ring (11).

Install "O" ring (8).

Install new seals (5 and 7) into flange (3) so the metal portion of the seal faces contact the spacer (6), one on each side. The outer seal is to be pressed in a minimum of .130 from the flange mounting face.

Install the flange to the housing (22) and secure with washers (2) and nuts (1).

Torque the nuts on both ends to that specified in "SPECIAL TORQUES."

Torque: _____

Installation

Mount pump to converter and secure with hardware.

Remove all plugs and install the lines to the pump.

Refer to "SPECIAL TORQUES FOR SPLIT FLANGE MOUNTING" in "SERVICE INFORMATION," Refer to the raised dimension on the split flange clamp half to determine what torque is needed from the chart mentioned above.

Fill the hydraulic reservoir. Refer to the Operator's Manual.

SWITCH AND STEERING PUMP (3 SECTION)

Disassembly

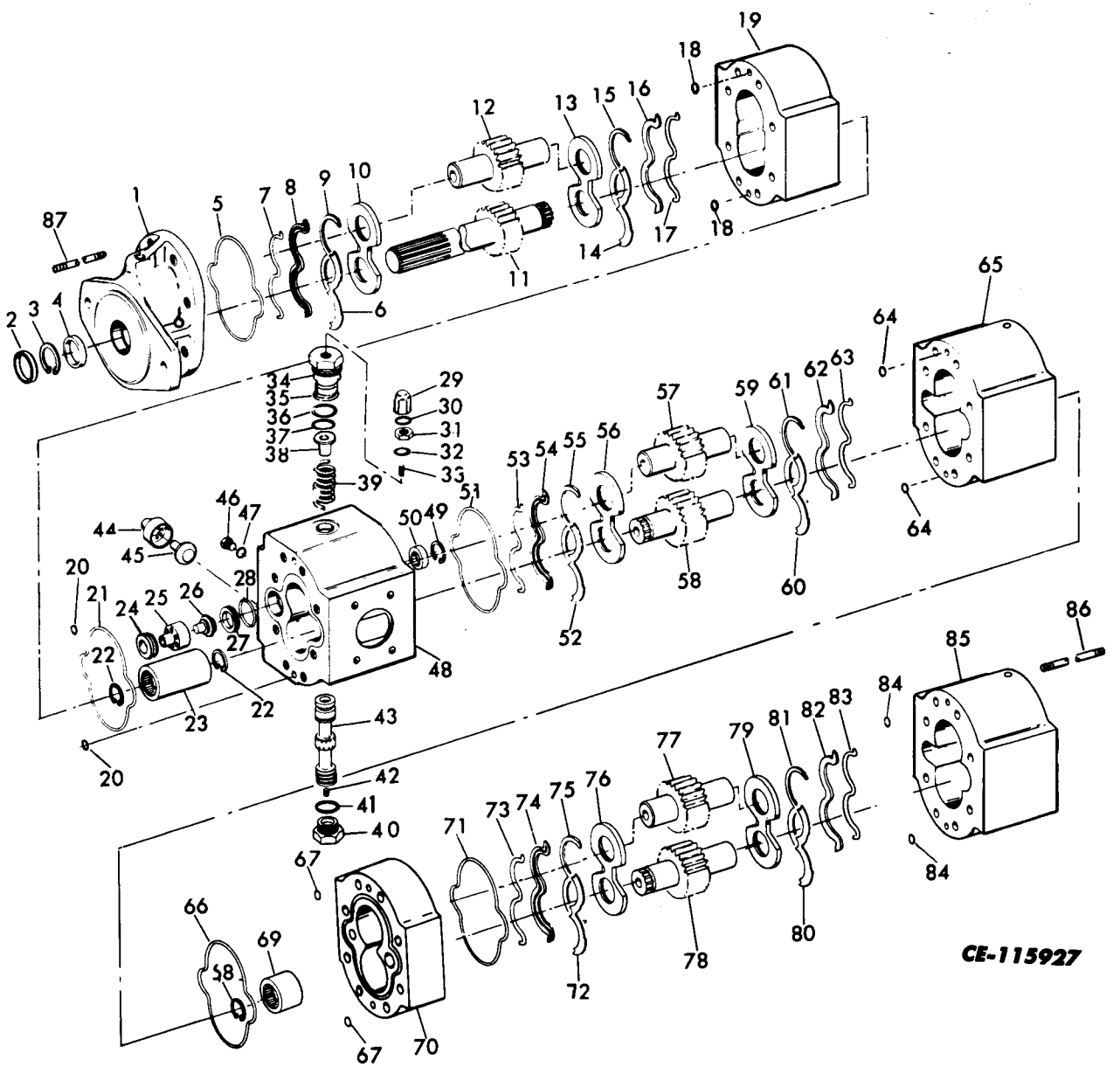


Figure 11-28A
Switch and Steering Pump.

DISASSEMBLY, INSPECTION AND ASSEMBLY

1. Flange.
2. Outer seal.
3. Snap ring.
4. Inner seal.
5. "O" ring.
6. Top isolation plate.
7. "O" ring.
8. Back-up ring.
9. Retaining ring.
10. Pressure plate.
11. Front drive gear.
12. Front idler gear.
13. Pressure plate.
14. Isolation plate.
15. Retaining ring.
16. Back-up ring.
17. "O" ring.
18. "O" ring.
19. Front body.
20. "O" ring.
21. "O" ring.
22. Retaining ring.
23. Coupling.
24. Plug.
25. Retainer.
26. Piston.
27. Piston seat.
28. "O" ring.
29. Cap.
30. Washer.
31. Lock nut.
32. Washer.
33. Adjusting screw.
34. Plug.
35. "O" ring.
36. Back-up ring.
37. "O" ring.
38. Spring retainer.
39. Spring.
40. Plug.
41. "O" ring.
42. Set screw.
43. Plunger.
44. Retainer.
45. Piston.
46. Front section pump gauge port.
47. "O" ring.
48. Valve block.
49. Snap ring.
50. Orifice.
51. "O" ring.
52. Isolation plate.
53. "O" ring.
54. Back-up ring.
55. Retaining ring.
56. Pressure plate.
57. Rear idler gear.
58. Rear drive gear.
59. Pressure plate.
60. Isolation plate.
61. Retaining ring.
62. Back-up ring.
63. "O" ring.
64. "O" ring.
65. Pump body.
66. "O" ring.
67. "O" ring.
68. Snap ring.
69. Coupling.
70. Idler body.
71. "O" ring.
72. Isolation plate.
73. "O" ring.
74. Back-up ring.
75. Retaining ring.
76. Pressure plate.
77. Idler gear.
78. Drive gear.
79. Pressure plate.
80. Isolation plate.
81. Retaining ring.
82. Back-up ring.
83. "O" ring.
84. "O" ring.
85. Rear body.
86. Long stud.
87. Short stud.

Disassemble the component parts in the sequence indicated by the reference numbers in Fig. 11-28A.

NOTE: Scribe a line from section to section so the bodies can be reassembled in their original position. Do not interchange any parts. Retain the exact relationship between all the parts so they can retain the wear pattern they have established (this includes the gears). Do not remove studs unless replacement is necessary.

Inspection

Clean and dry all parts thoroughly.

Inspect the housings for signs of cracking, deterioration or excessive wear. If the gear track in the housing is deeper than 0.13 mm (0.005 in), replace the entire section assembly.

Replace the seals in the front flange.

Replace all "O" rings.

Inspect all parts for signs of wear or damage. Refer to the Parts Manual for the serviceable parts and replace as needed.

When ordered, the section kit will come completely assembled with covers holding the components in place within the housing. To assemble, remove the covers lightly oil the components and assemble in place.

Assembly

NOTE: Be sure all items with scribe lines are lined up properly. Install the pressure plates with bronze faces toward the gear and with the trap slot on the discharge side of the pump.

If isolation plate has a rounded edge on one side, place that side in the gear housing.

Install the outer seal in the flange so it is a minimum of 3.3 mm (0.130 in) in from the mounting face.

The gear sets (if scribe marks are not used) will have to be timed upon assembly. Do this in the following manner:

Looking down thru the opening in the housings, line up one drive gear tooth tip with the valley between two of the teeth on the other drive gear. Repeat the procedure for the third drive gear. The scribe line from gear to gear should show gear tooth tip, gear tooth valley and then gear tooth tip in that order.

Assemble the component parts in the reverse order they were disassembled in Fig. 11-28A.

Torque the stud nuts to the torque specified in "Special Torques".

Refer to "Special Torques for Split Flange Connections" for the split flanges mounting to the pump. Refer to the raised dimension on the split flange clamp half to determine which torque is needed from the chart.

SPLIT SPOOL VALVE

Removal

Thoroughly clean outside of valve. Tag and disconnect all lines from valve. Plug and cap disconnected lines and valve ports to prevent entry of dirt. Weight of valve requires caution during removal. Remove mounting hardware and valve from tractor.

Disassembly

Place valve on its mounting pads in a clean, adequate work area. All valve covers are spring loaded, so use caution in removing them.

(Continued on page 25)

DISASSEMBLY, INSPECTION AND ASSEMBLY

SPLIT SPOOL VALVE - Continued

Relief Valve Adjustment - Continued

NOTE: Attach a suitable vacuum source to the top of the hydraulic reservoir to prevent fluid loss when the cover (62, Fig. 11-29) is removed.

Remove socket head cap screws (63) and cover (62). Loosen lock nut (8, Fig. 11-30) and turn adjusting screw clockwise to increase pressure or counterclockwise to reduce pressure. (One full turn of screw is equal to approximately 1600 psi.) Tighten lock nut (8). Replace cover, tighten screws evenly and repeat pressure check with test gauge. When properly adjusted, tighten cover cap screws to recommended torque (refer to "SPECIAL TORQUES.")

Torque: _____

PILOT VALVE

Removal

Thoroughly clean exterior of valve. Tag all connections for installation reference. Disconnect all lines from valve. Cap or plug openings and lines to prevent entry of foreign material. Remove hardware securing link rod ball joint ends to lever arms (3, Fig. 11-31) and disconnect them. Remove mounting hardware. Remove valve from tractor to a clean work area.

Disassembly

Remove nut and cap screw (1, Fig. 11-31) that secure lever arm (3) to actuating housing (2).

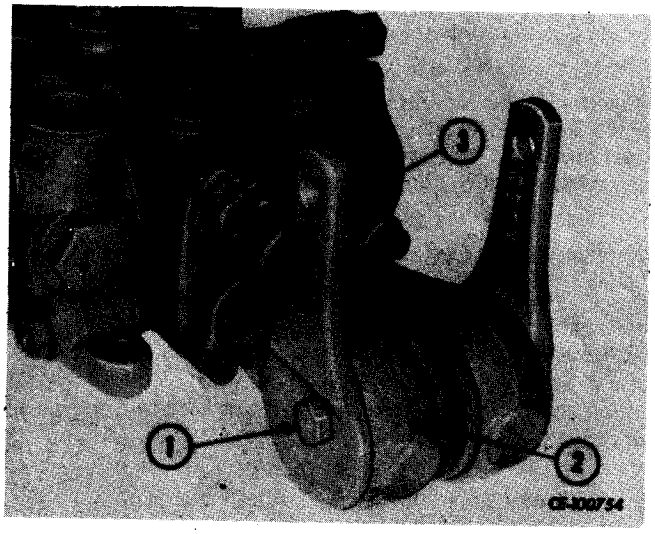


Figure 11-31
Pilot Valve.

Remove left lever arm (2, Fig. 11-32), end plate (9) and nut (10). Repeat above procedure for right lever arm. Remove pin (4) which attaches plunger lever (7) to friction disc (3). Remove socket head cap screws (5) securing housing to valve. Withdraw housing and friction disc and separate them. Remove seal plate (6).

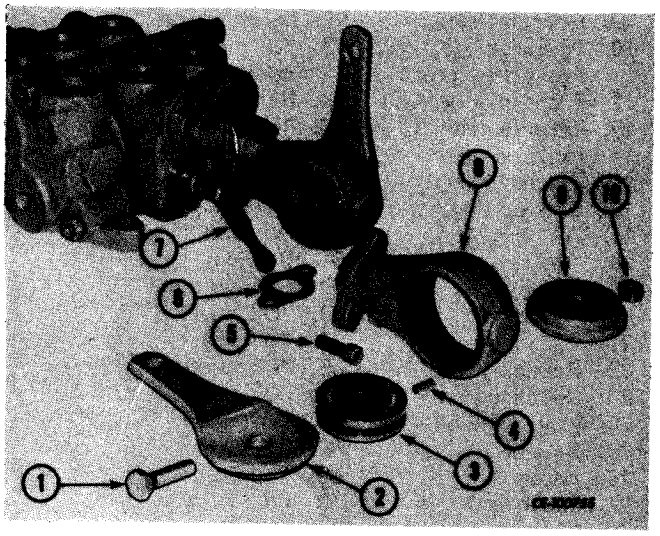


Figure 11-32
Control Lever Disassembly.

1. Cap screw.
2. Lever arm.
3. Friction disc.
4. Pin.
5. Socket head cap screw.
6. Seal plate.
7. Plunger lever.
8. Housing.
9. End plate.
10. Nut.

Disassemble right lever arm in same way. Note positioning of parts carefully during disassembly so they can be reassembled correctly.

Remove tie rod nuts from one side of valve. Note that upper rod is of larger diameter than bottom rods.

NOTE: Load check poppets (3, Fig. 11-31), springs (4) and "O" rings (5) are enclosed between sections. Exercise care to avoid losing poppets and springs when sections are separated. Tag poppets with respect to their plunger sections.

Slide tie rods from valve and carefully separate sections. Remove poppets (3), springs (4) and "O" rings (5). Both plunger sections are similar, therefore service instructions apply to both. Remove relief valves (1) from plunger section. Remove wiper (26) and "O" ring (25) from eye end of plunger (27). Remove socket head cap screws (6) securing spacer (22) and plunger cap (20). Slide plunger assembly from section housing. Firmly grip plunger cap (20) and unscrew pilot plug (10). Remove pin (11), spring (12),

DISASSEMBLY, INSPECTION AND ASSEMBLY

Legend for Figure 11-29

1. Spool cover.
2. Socket head cap screw.
3. Spool cover.
4. Socket head cap screw.
5. Socket head cap screw.
6. "O" ring.
7. "O" ring.
8. "O" ring.
9. "O" ring.
10. Blank cover.
11. Spring.
12. Spring.
13. Spring.
14. Spring.
15. "O" rings.
16. Washer and "O" ring.
17. Washer and "O" ring.
18. Washer and "O" ring.
19. Washer and "O" ring.
20. Springs.
21. Poppet.
22. Poppet.
23. Poppet.
24. Poppet.
25. Poppets.
26. Spool.
27. "O" ring.
28. Check valve.
29. Spool.
30. Spool.
31. Spool.
32. Washer and "O" ring.
33. Washer and "O" ring.
34. Poppet and "O" ring.
35. Washer and "O" ring.
36. "O" ring.
37. Washer.
38. Spring.
39. Spring.
40. Spring.
41. Spring.
42. Float poppet subassembly.
43. Part of item 42.
44. Part of item 42.
45. Tie rod.
46. Inlet housing.
47. End cover.
48. Boom plunger housing.
49. Bucket plunger housing.
50. "O" ring.
51. "O" ring.
52. Plug.
53. "O" ring.
54. Poppet.
55. "O" ring.
56. "O" ring.
57. "O" ring.
58. Socket head cap screw.
59. Blank cover.
60. Blank cover.
61. Socket head cap screw.
62. Inlet cover.
63. Socket head cap screw.
64. "O" ring.
65. Spring.
66. "O" ring.
67. Sleeve.
68. Spring.
69. Low pressure relief valve.
70. Main relief valve.

Remove tie rods (45, Fig. 11-29).

INLET SECTION - Mark both inlet section covers (10, 62) for reference at assembly. Carefully note position and sequence of parts so they can be reassembled correctly.

Remove socket head cap screws (5) and blank poppet cover (10). Remove and tag springs (20) and poppets (25). Remove and discard "O" rings (15) from inlet housing. Remove socket head cap screws (63) and inlet cover (62). Remove and tag springs (65, 68). Remove low pressure relief valve sleeve (67) with subassembly (69) and main relief valve subassembly (70). Remove and discard "O" rings (64, 66).

To disassemble main relief valve (70) remove snap ring (6, Fig. 11-30) and withdraw adjusting plug (8) and associated parts intact. Slide spring (3), poppet (16) and piston (17) from sleeve (18). Remove and discard "O" rings (2, 5, 12, 15). Remove back-up rings (1, 4, 13, 14).

Remove lock nut (8) from adjustment screw (9). Remove adjustment screw from plug (10) and slide spring (7) and poppet (11) out.

BUCKET PLUNGER SECTION - Mark both section covers (1, 60, Fig. 11-29) for assembly reference. Carefully note position and sequence of parts for correct reassembly.

Remove socket head cap screws (2), cover (1), "O" rings (6, 7), springs (11, 12) and washer assemblies (16, 17).

NOTE: Mark each spool (26, 29) with respect to its proper bore and position (top and bottom) before removing them. Reversing spools will result in a malfunction. Identification of each poppet (21, 22) with respect to its spool is mandatory.

Remove spools, poppets, "O" ring (27) and check valve (28). Remove socket head cap screws (61), blank cover (60), "O" rings (50, 51), springs (39, 40) and washer assemblies (32, 33). Discard all used "O" rings.

BOOM PLUNGER SECTION - Mark both section covers (3, 59) for assembly reference. Carefully note position and sequence of parts during disassembly.

Remove socket head cap screws (4), cover (3), "O" rings (8, 9), springs (13, 14) and washer assemblies (18, 19). Discard used "O" rings.

NOTE: Mark each spool (30, 31) with respect to its proper bore and position (top and bottom) before removing spools. Reversing spools will result in a malfunction. Identification of each poppet (23, 24, 34) with respect to its spool is essential.

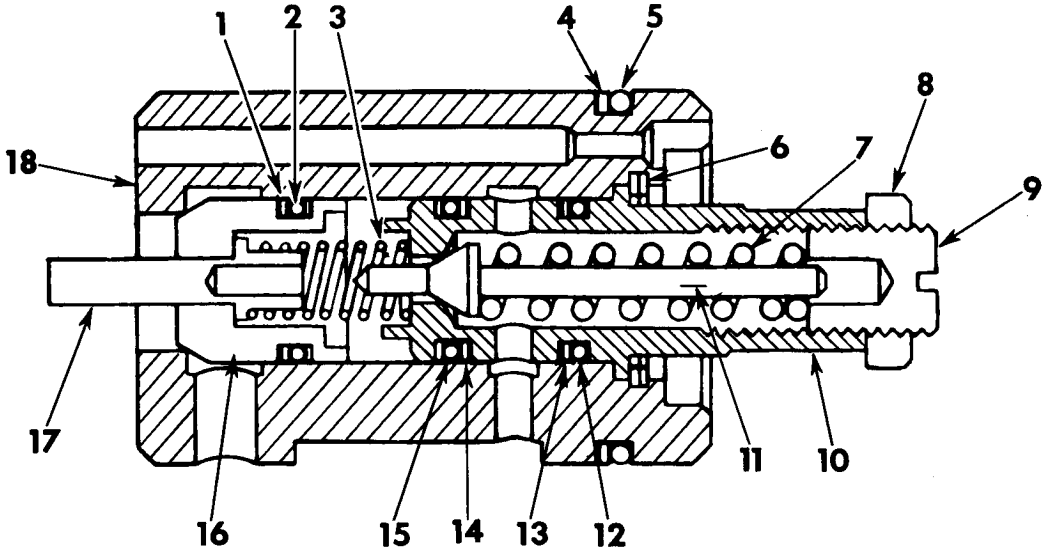
Remove spools, springs (41, 38), washer assemblies (35, 37) and poppets (23, 24, 34). Remove float poppet assembly (42) as a unit. Remove and discard poppet "O" ring (36).

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

SPLIT SPOOL VALVE - Continued

Disassembly - Continued



CE-100773

Figure 11-30
Main Relief Valve.

1. Back-up ring.
2. "O" ring.
3. Spring.
4. Back-up ring.
5. "O" ring.
6. Snap ring.
7. Spring.
8. Lock nut.
9. Adjustment screw.
10. Adjustment plug.
11. Poppet.
12. "O" ring.
13. Back-up ring.
14. Back-up ring.
15. "O" ring.
16. Poppet.
17. Piston.
18. Sleeve.

Remove socket head cap screws (58), cover (59), "O" rings (55, 56, 57) and poppet (54). Complete disassembly by removing plug (52) and "O" ring (53). Discard all used "O" rings.

Inspection

Clean all parts, including subassemblies in clean solvent and dry with compressed air. Examine all springs for breaks or distortion. Inspect all poppet seating surfaces and poppet faces for nicks or excessive wear. All seats must be sharp and free of nicks. All bores and surfaces of sliding parts must be free of nicks, scores or excessive wear.

INLET SECTION - Inspect bore and ball poppet of low pressure subassembly (69, Fig. 11-29) for foreign particles. Clean with compressed air. Insert poppets (25) into their respective bores and test for fit. Poppets should fit snugly without binding, for a complete revolution. Check fit between sleeve (67) and low pressure subassembly (69) in same way.

Examine main relief valve (Fig. 11-30) poppet faces and seats. If any components of main relief valve are unfit for further service, replace entire valve. With "O" rings and back-up rings removed, insert poppet (16) into sleeve (18) and test for fit. Poppet must fit snugly without binding throughout a complete revolution.

BOOM AND BUCKET PLUNGER SECTIONS - Inspect bore and ball poppet of float poppet assembly (42, Fig. 11-29) for foreign particles. Clean with compressed air. Examine spools and their bores for scratches or scoring. Test spools for fit by carefully inserting them into their proper bores. Spools should fit snugly, without binding, through a complete revolution.

Inspect flow passages in spools and covers. These passages must be clean and free of foreign particles. Replace defective parts.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Assembly

INLET SECTION - Coat all parts, including housing bores, with clean hydraulic oil. Insert poppets (25, Fig. 11-29) and springs (20) into their proper bores in housing (46). POPPETS MUST BE INSTALLED IN CORRECT PO- Coat new "O" rings (15) lightly with grease and seat them in grooves in cover (10). Attach cover to housing with socket head cap screws (5) and hand tighten.

Slide low pressure relief (69) into sleeve (67). Coat all parts of main relief valve (70) with clean hydraulic oil. Insert poppet (11, Fig. 11-30) and spring (7) into adjusting plug (10) and thread adjustment screw (9) into plug until it just contacts spring. Tighten adjustment screw exactly 1-1/4 turns. Hold adjustment screw to prevent movement and install lock nut (8) and tighten.

Assemble new "O" rings (2, 5, 12, 15) and back-up rings (1, 4, 13, 14) to poppets, plug and sleeve. Insert piston (17) and spring (3) into poppet (16) and install as an assembly into sleeve (18). Insert assembled adjustment plug (10) into sleeve (18) and install snap ring (6).

Slide relief valve assembly into bore of housing (46, Fig. 11-29). Install spring (65). Lightly coat new "O" rings (64, 66) with grease and install in grooves of cover (62). Attach cover to housing with socket head cap screws (63) and tighten evenly and securely.

BUCKET PLUNGER SECTION - Coat all parts, including housing (49) bores, with clean hydraulic oil. Insert poppets (21, 22) into spools (26, 29). POPPETS MUST BE INSTALLED IN CORRECT POSITION. Install washer assemblies (16, 17) and springs (11, 12) into spools (26, 29). Slide spools into their respective bores. IT IS IMPERATIVE THAT SPOOLS ARE CORRECTLY POSITIONED.

> NOTE: Spools should be installed in the same bore from which they were removed. Top of most spools are marked with a "V" identification groove. If "V" groove is not on spool, top can be identified by vertical drilled passages to center of spool. The smaller ID goes towards the top.

Install check valve poppet (28). Lightly coat new "O" rings (6, 7, 27) with grease and install in grooves in cover (1). Assemble cover to housing (49) and secure with socket head cap screws (2) hand tight.

Slip washer assemblies (32, 33) and springs (39, 40) into bores of spools (26, 29). Coat new "O" rings (50, 51) with grease, install in grooves of cover (60) and secure cover to housing (49) with socket head cap screws (61), hand tight.

BOOM PLUNGER SECTION - Coat all parts, including bores of housing (48) with clean hydraulic oil. Insert poppets (23, 24) into spools (30, 31). POPPETS MUST BE INSTALLED IN CORRECT POSITION. Install washer assemblies (18, 19) and springs (13, 14) in spools. Slide spools into their respective bores. IT IS VERY IMPORTANT THAT SPOOLS BE POSITIONED CORRECTLY. Slip float poppet subassembly (42) into housing.

Coat new "O" rings (8, 9, 36) with a small amount of grease and install in grooves of cover (3). Attach cover to housing (48) with socket head cap screws (4). Tighten screws hand tight.

Slide poppet (34) into bore of spool (30), being certain poppet is correctly positioned. (Secure poppet in plunger with chassis grease.) Once installed, both plungers should be the same height in the valve. If not, recheck poppet (34). Slide washer assemblies (35, 37) and springs (41, 38) into spool bore. Install poppet (54) in housing bore. Lightly coat new "O" rings (55, 56, 57) with grease and install in grooves of cover (59). Install new "O" ring (53) on plug (52) and install and tighten plug in cover. Attach cover to housing with socket head cap screws (58). Tighten socket head cap screws (5, 2, 4, 61, 58) to recommended torque (refer to "SPECIAL TORQUES.")

Torque: _____

Apply chassis grease to "O" rings between valve sections and install them into the proper recess. Install tie rods. Refer to "SPECIAL TORQUES."

Torque: _____

Installation

Install valve in its original position in tractor, being certain that all mounting hardware is securely tightened. Remove caps and plugs from valve bores and hydraulic lines. Connect previously tagged lines to their proper ports. Use new "O" rings at all split flange connections. Be sure all connections are tight and leak free.

Relief Valve Adjustment

The preliminary relief valve adjustment of 1-1/4 turns of the adjustment screw must be checked with an accurate pressure gauge of 20684 kPa (3000 psi) capacity. Attach gauge to quick disconnect in end cover (47, Fig. 11-27). Operate until system temperatures are stabilized. Roll back bucket and hold lever while gauge is read. If reading is not within range indicated in "SYSTEM PRESSURES," shut down engine, relieve hydraulic pressure by lowering boom and bucket flat to ground. Operate boom and bucket levers throughout their complete range several times.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

SPLIT SPOOL VALVE - Continued

Relief Valve Adjustment - Continued

NOTE: Attach a suitable vacuum source to the top of the hydraulic reservoir to prevent fluid loss when the cover (62, Fig. 11-29) is removed.

Remove socket head cap screws (63) and cover (62). Loosen lock nut (8, Fig. 11-30) and turn adjusting screw clockwise to increase pressure or counterclockwise to reduce pressure. (One full turn of screw is equal to approximately 11032 kPa (1600 psi). Tighten lock nut (8). Replace cover, tighten screws evenly and repeat pressure check with test gauge. When properly adjusted, tighten cover cap screws to recommended torque (refer to "SPECIAL TORQUES.")

Torque: _____

PILOT VALVE

Removal

Thoroughly clean exterior of valve. Tag all connections for installation reference. Disconnect all lines from valve. Cap or plug openings and lines to prevent entry of foreign material. Remove hardware securing link rod ball joint ends to lever arms (3, Fig. 11-31) and disconnect them. Remove mounting hardware. Remove valve from tractor to a clean work area.

Disassembly

Remove nut and cap screw (1, Fig. 11-31) that secure lever arm (3) to actuating housing (2).

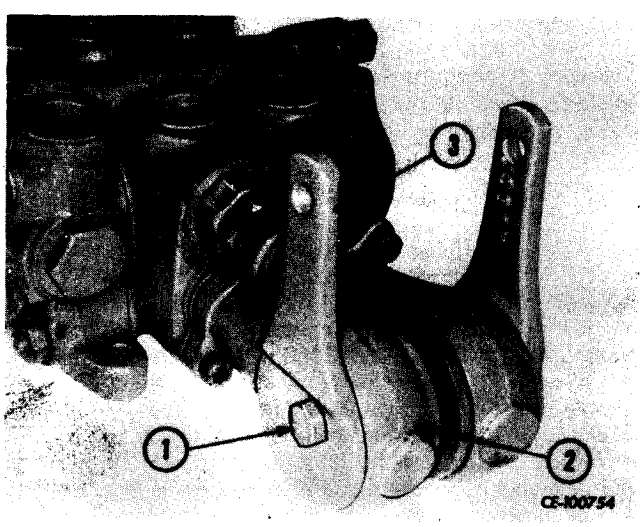


Figure 11-31
Pilot Valve.

Remove left lever arm (2, Fig. 11-32), end plate (9) and nut (10). Repeat above procedure for right lever arm. Remove pin (4) which attaches plunger lever (7) to friction disc (3). Remove socket head cap screws (5) securing housing to valve. Withdraw housing and friction disc and separate them. Remove seal plate (6).

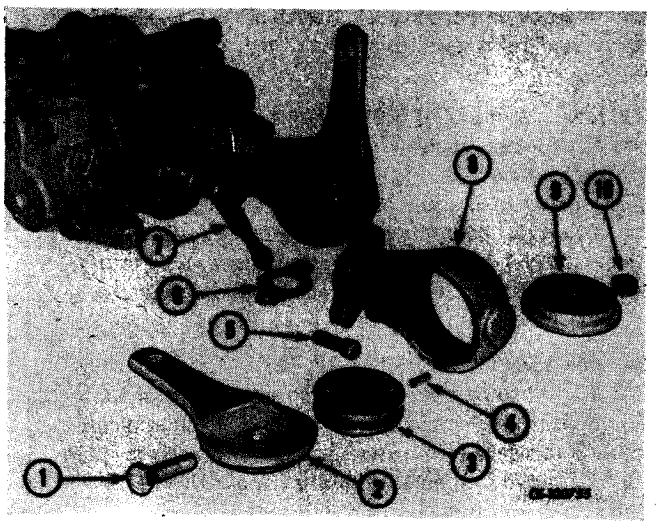


Figure 11-32
Control Lever Disassembly.

1. Cap screw.
2. Lever arm.
3. Friction disc.
4. Pin.
5. Socket head cap screw.
6. Seal plate.
7. Plunger lever.
8. Housing.
9. End plate.
10. Nut.

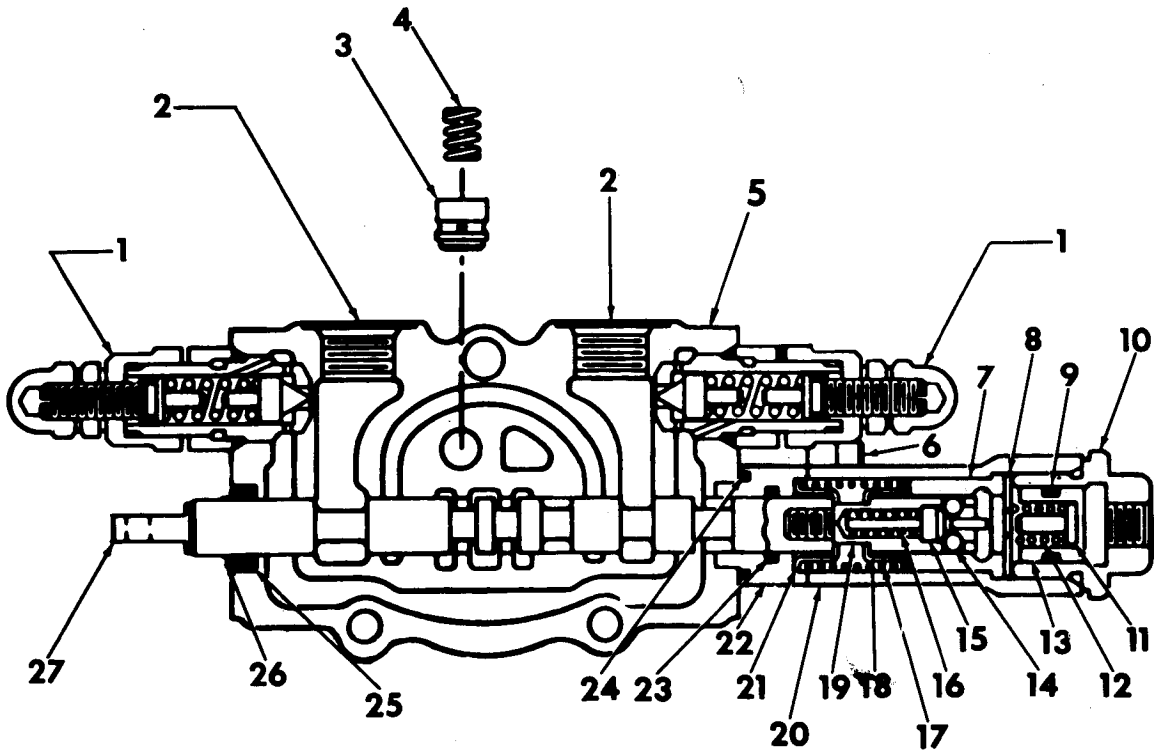
Disassemble right lever arm in same way. Note positioning of parts carefully during disassembly so they can be reassembled correctly.

Remove tie rod nuts from one side of valve. Note that upper rod is of larger diameter than bottom rods.

NOTE: Load check poppets (3, Fig. 11-31), springs (4) and "O" rings (5) are enclosed between sections. Exercise care to avoid losing poppets and springs when sections are separated. Tag poppets with respect to their plunger sections.

Slide tie rods from valve and carefully separate sections. Remove poppets (3), springs (4) and "O" rings (5). Both plunger sections are similar, therefore service instructions apply to both. Remove relief valves (1) from plunger section. Remove wiper (26) and "O" ring (25) from eye end of plunger (27). Remove socket head cap screws (6) securing spacer (22) and plunger cap (20). Slide plunger assembly from section housing. Firmly grip plunger cap (20) and unscrew pilot plug (10). Remove pin (11), spring (12),

DISASSEMBLY, INSPECTION AND ASSEMBLY



CE-100772 A

Figure 11-33
Pilot Valve Plunger Section.

1. Relief valve.
2. Cylinder port.
3. Load check poppet.
4. Spring.
5. Housing.
6. Socket cap screw.
7. Detent sleeve.
8. Spacer.
9. "O" ring.
10. Pilot plug.
11. Pin.
12. Spring.
13. Piston.
14. Detent balls.
15. Cam.
16. Spring.
17. Spring.
18. Spring seat.
19. Detent pin.
20. Plunger cap.
21. Spring seat.
22. Spacer.
23. "O" ring.
24. "O" ring.
25. "O" ring.
26. Wiper.
27. Plunger.

piston (13) and spacer (8). Remove "O" ring (9) from piston.

Clamp eye end of plunger in a vise having protective jaws.

To avoid losing detent balls (14), wrap a cloth around plunger cap (20) and with a rapid motion pull off plunger cap. Remove detent sleeve (7), balls (14), cam (15) and spring (16). Insert a rod through cross hole in detent pin (19), exert slight pressure against pin and unscrew it from plunger. Remove spring seat (21), plunger spring (17), spacer (22) and both "O" rings (23, 24) from spacer.

It is suggested that items 1, 2, 3, and 12 (Fig. 11-34) remain assembled on cap (4) to preserve original pressure setting.

Separate cap (4) with associated parts intact, from sleeve (7).

Remove spring guide (11), "O" ring (10), spring (9), poppet (8) and "O" ring (6).

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

PILOT VALVE - Continued

Disassembly - Continued

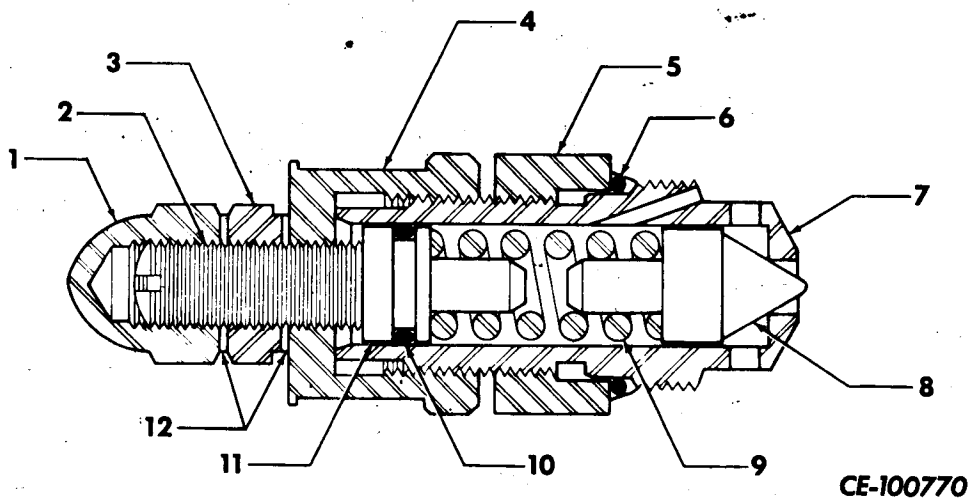


Figure 11-34
Relief Valve.

1. Acorn nut.
2. Adjusting screw.
3. Lock nut.
4. Cap.
5. Nut.
6. "O" ring.
7. Sleeve.
8. Poppet.
9. Spring.
10. "O" ring.
11. Spring guide.
12. Washers.

Inspection

Clean all parts, including housings, in clean solvent. Dry with compressed air. Seal counterbores must be free of nicks and contaminants. Examine all springs for breaks or distortion. Inspect sliding contact surfaces of piston (13, Fig. 11-33) and pilot plug (10) for nicks, scoring or signs of excessive wear. With "O" ring removed, test fit of piston (13) in pilot plug (10). Piston must fit freely, without binding, through a complete revolution. "O" ring grooves in piston and cap spacer (22) must be clean and free of nicks.

Examine face of load check poppet (3) and its corresponding seat in plunger section housing for nicks or scratches. If minor scratches are found, poppet should be lapped with fine lapping compound to seat properly. Poppet must fit loosely in housing. Use extreme care to prevent lapping compound from entering or remaining in valve. Cylinder port relief valve seats in section housing must be free of nicks or grooves.

Plunger (27) must be free of longitudinal score marks. Should either the plunger or plunger housing require repair, the complete plunger section should be sent to the valve manufacturer because of the close tolerances and selective fit of plunger to housing. Test fit of plunger in its bore. Plunger should fit snugly without binding throughout a complete revolution.

Examine relief valve poppet face (8, Fig. 11-34) and corresponding seat in sleeve (7) for nicks or scratches. Seat must be sharp.

Inspect spring (9) for breakage or distortion. Replace any defective parts.

Assembly

Coat all parts, including housing bores, with clean hydraulic oil. Install new "O" rings (23, 24, Fig. 11-33) and slide over plunger end. Clamp eye end of plunger in a vise with protective jaws. Assemble spring seat (21) over plunger end. Install plunger spring (17) and spring seat (18). Apply pressure and thread detent pin (19) into plunger. Apply grease to cross holes of detent pin (19) to hold balls (14) in place. Insert detent spring (16) in cam (15). Slide detent sleeve (7) into plunger cap (20) and place as an assembly over a drive pin or punch. Depress cam (15) and spring (16) with drive pin and insert detent balls (14) into detent pin (19) cross holes.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Guide detent sleeve (7) and plunger cap (20) assembly over detent pin until sleeve contacts spring seat (21). Install new "O" ring (9) on piston (13). Assemble pin (11) and spring (12) to piston and insert as an assembly into pilot plug (10). Install spacer (8) in plunger cap (20) and thread pilot plug (10) assembly into plunger cap. Carefully insert plunger (27) into bore of section housing. Secure plunger cap to housing with socket head cap screws (6).

Carefully install new "O" ring (25) and wiper seal (26) over plunger and into housing counterbore.

Lightly coat "O" rings (5) with grease and install in grooves of section housings. Insert load check poppets (3) and springs (4) between sections and stack inlet, plunger, and end cap sections together. Be certain poppet springs and "O" rings remain in place.

Install tie rods and tie rod nuts. Tighten nuts to torque specified in "SPECIAL TORQUES."

Upper tie rod nut torque: _____

Lower tie rod nuts torque: _____

Assemble right lever arm assembly first. Position seal plate (6, Fig. 11-32) over plunger.

Place friction disc (3) within housing (8), being sure milled face of disc is to the right. Slide housing and disc over plunger lever (7) with lever in groove of friction disc. Lever end must be at bottom of disc, in six o'clock position. Install pin (4) through hole in outer edge of disc and end of lever. Pass cap screw (1) through end plate (9) and bore of friction disc. Slip lever arm (2) over end of cap screw and secure with nut (10).

Align seal plate (6) with mounting ears of housing (8) and install socket head cap screws (5) to secure housing to valve section. Tighten screws securely. Install left lever arm assembly in similar manner, except assemble lever arm to outside left of housing as shown in Figure 11-31.

Assemble relief valve by installing new "O" ring (6, Fig. 11-34) on sleeve (7) and new "O" ring (10) on spring guide (11). Insert poppet (8), spring (9) and spring guide (11) into sleeve (7). Thread cap (4) with adjusting screw and associated parts intact onto sleeve (7). Back off nut (5) one complete turn, then thread valve assembly into plunger section until face of sleeve (7) is in firm contact with housing seat. Tighten lock nut (5) and cap (4) to torque recommended in "SPECIAL TORQUES."

Lock nut torque: _____

Cap torque: _____

Installation

Mount pilot valve in its original position in tractor. Remove caps and plugs from previously tagged lines and connect them to their proper valve ports. Connect control lever link rods to valve lever arms. Be sure all connections are tight and leak free.

Cylinder relief valves of the bucket spool must be checked and adjusted on a bench set-up. If calibration of these relief valves is required, your International Harvester distributor is equipped to perform this service.

STEERING VALVE

Removal

Thoroughly clean valve exterior. Tag and disconnect all lines and linkage from valve. When removing split flange connections at relief valve, replace one bolt from each flange half to retain relief valve to main valve. Provide adequate means of support before removing mounting hardware, as valve is very heavy. Move valve to a clean work area. Plug all lines to prevent entry of dirt.

Disassembly

Work carefully and note positioning and sequence of parts as valve is disassembled to avoid error during assembly.

Remove cap screws (1, Fig. 11-35) that temporarily secure relief valve (2) to steering valve (3).

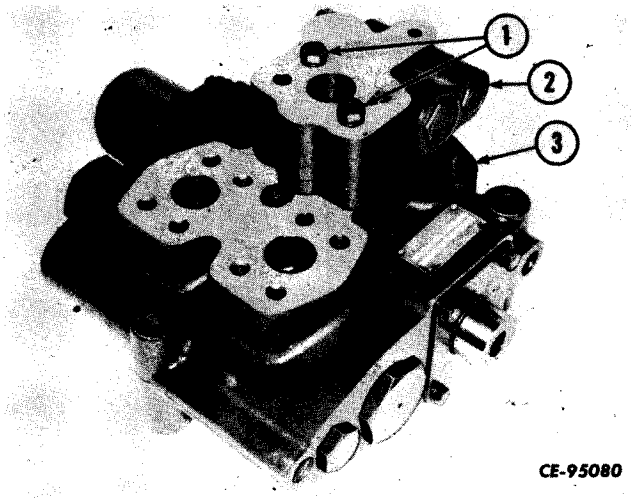


Figure 11-35
Remove Relief Valve.

DISASSEMBLY, INSPECTION AND ASSEMBLY

STEERING VALVE - Continued

Disassembly - Continued

Separate relief valve (1, Fig. 11-36) from steering valve (5). Remove pilot (2) and "O" rings (3 and 4).

Figure 11-36
Relief Valve Removed.

Remove plugs (5 and 6, Fig. 11-37) from relief valve (1). Slide spring (3) and check (2) from valve. Remove "O" rings (4, 7) from plugs (5, 6).

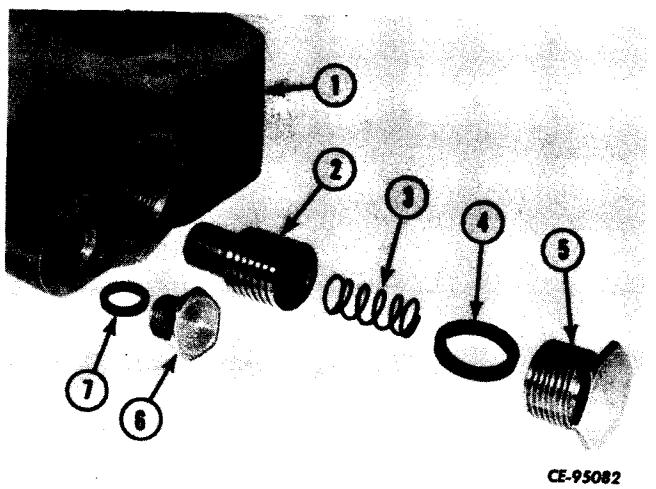


Figure 11-37
Remove Check Valve.

Remove crown nut (3, Fig. 11-38) and washer (2) from relief valve (1).

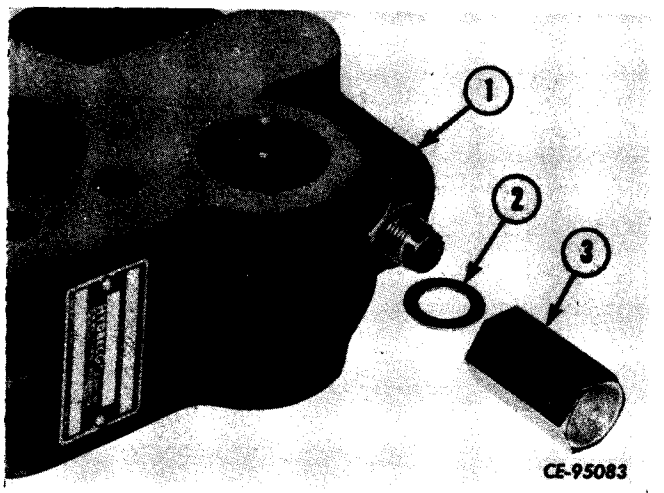


Figure 11-38
Remove Nut.

Loosen and remove nut (6, Fig. 11-39) and washer (5). Remove screw (4). Slide spring (3) and poppet (2) from valve (1).

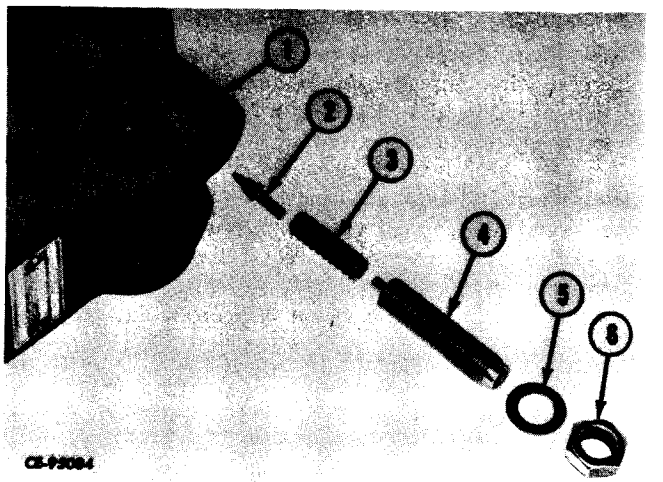


Figure 11-39
Remove Relief Valve.

Remove cap screws securing retainer plate(s) (3, Fig. 11-40) to main valve (1). Remove plate(s) and wiper (2).

DISASSEMBLY, INSPECTION AND ASSEMBLY

Figure 11-40
Remove Plate.

Remove cap screws securing cover (7, Fig. 11-41) to valve. Slide plunger assembly (6) out of valve. Remove back-up ring (2), shim pack (3), spacer (4) and shim pack (5) from plunger. Remove plunger seal (1) from bore of valve body.

NOTE: The control plunger is adjusted with shims at the factory. Measure thickness of shim packs (3 and 5). The same thickness of shims must be used during assembly of valve. If shims are in good condition tie pack together and reuse.

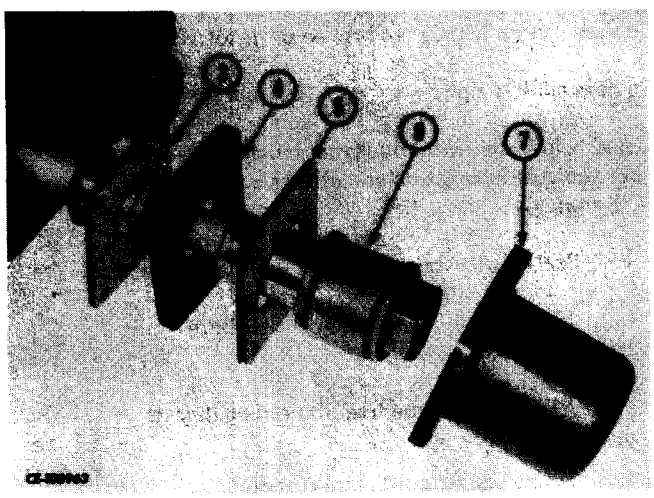


Figure 11-41
Remove Plunger Assembly.

Disassemble plunger assembly as follows:

a. Loosen and remove bolt (6, Fig. 11-42).

b. Slide washer (2), spring (3), spacer (4) and washer (5) off of bolt.

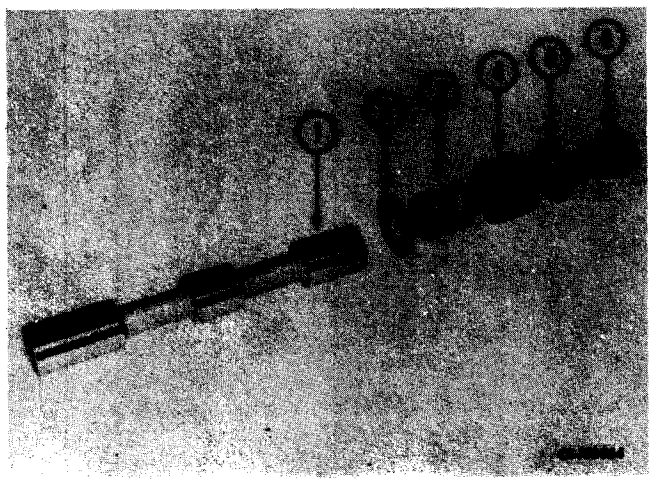


Figure 11-42
Control Plunger.

Remove cap (5, Fig. 11-43) and spring (3). Remove "O" ring (4) from cap. Slide check plunger assembly (2) from valve (1).

(Continued on next page)

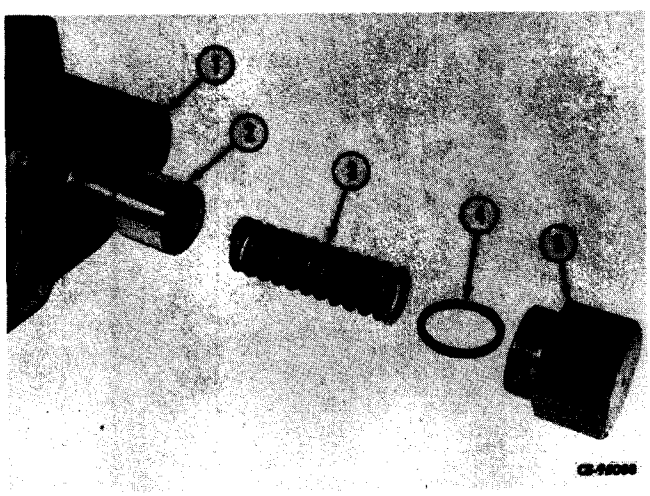


Figure 11-43
Remove Check Plunger.

DISASSEMBLY, INSPECTION AND ASSEMBLY

STEERING VALVE - Continued

Disassembly - Continued

Remove snap ring (5, Fig. 11-44). Slide washer (4), spring (3) and check (2) from plunger (1).

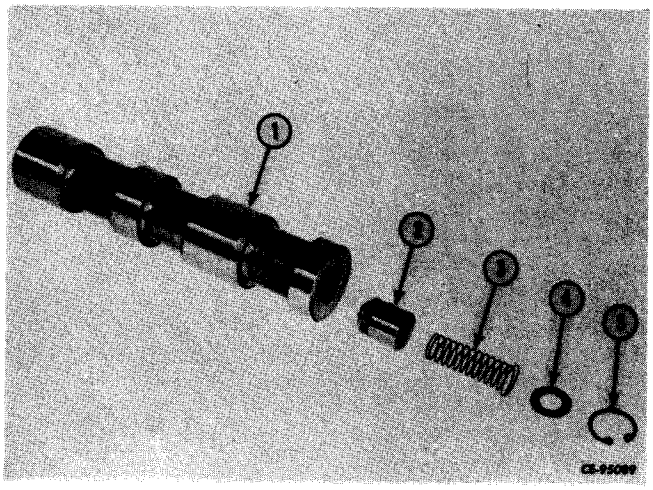


Figure 11-44
Disassemble Plunger.

Remove plug (3, Fig. 11-45) and "O" ring (2) from valve (1).

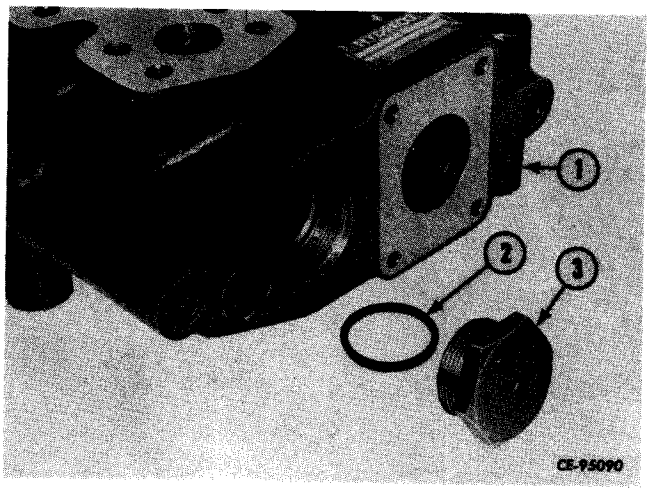


Figure 11-45
Remove Plug.

Remove cap (6, Fig. 11-46), seal ring (5), plug (4) and spring (3). Slide relief valve (2) from body (1). Repeat procedure for opposite side.

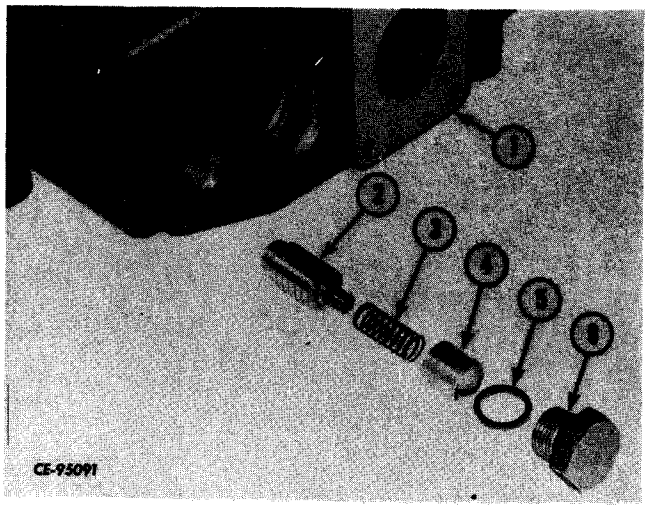


Figure 11-46
Remove Relief Valve.

Inspection

Thoroughly wash all parts in a clean mineral oil solvent. Dry with filtered compressed air and place on clean paper for inspection.

Inspect all surfaces for burrs, scratches, nicks, scores and other abrasions. Stone or lap all burrs. If scoring is deep enough to produce excessive leakage, replace valve assembly. Stone or use crocus cloth on small scores.

All parts with sliding fit must move freely in their bores. All grooves and passages must be free of foreign matter.

Replace springs if they are broken or distorted.

Replace all "O" rings.

Listed below are instructions that must be followed to insure correct installation and effective sealing of "O" rings.

a. Seal counter bores must be thoroughly cleaned.

b. "O" rings, plungers, and counter bores must be lubricated on assembly.

c. "O" rings must be free of molding defects and handling damage.

d. "O" RINGS MUST NOT BE STRETCHED beyond the yield point.

e. EXTREME care must be taken to avoid "ROLLING" the "O" ring into the counter bore. A twisted "O" ring is not likely to straighten itself after installation, and is almost certain to leak.

DISASSEMBLY, INSPECTION AND ASSEMBLY

f. Care in handling of parts and hydraulic system cleanliness cannot be over stressed.

g. Use ONLY the oil type and viscosity ranges specified in the Operator's Manual.

Assembly

Slide relief valve (2, Fig. 11-46) into bore of valve housing (1) after lubricating with hydraulic fluid. Install spring (3) over stem of valve (2). Install plug (4). Lubricate new seal ring (5) and install on cap (6). Install cap. Repeat procedure for other side.

Lubricate new "O" ring (2, Fig. 11-45) and install in groove of plug (3). Install plug in valve (1).

Lubricate check (2, Fig. 11-44) with hydraulic fluid and install in bore of plunger (1). Install spring (3) in check. Install washer (4) and secure with snap ring (5).

Lubricate spool assembly (2, Fig. 11-43) with hydraulic fluid and slide into bore of valve (1). Install spring (3) in spool. Lubricate a new "O" ring (4) and install on cap (5). Install and tighten securely.

Assemble plunger as follows:

Slide washer (5, Fig. 11-42), spacer (4), spring (3) and washer (2) on bolt (6).

Install bolt in plunger and tighten to recommended torque (refer to "SPECIAL TORQUES.")

Torque: _____

Slide shim pack (5, Fig. 11-41), spacer (4), shim pack (3) and back-up ring (2) on plunger assembly (6). Wrap plunger with plastic material such as polyethylene. Lubricate with clean hydraulic oil and carefully install new lip seal (1) on plunger. Remove protective plastic.

Lubricate plunger with hydraulic fluid and slide into valve. Install plunger cap (7) and press seal into its bore by alternately tightening plunger cap screws. Finally, tighten screws to recommended torque (refer to "SPECIAL TORQUES.")

Torque: _____

Lubricate opposite end of plunger and carefully work a new seal over plunger and press into valve bore. Slide wiper (2, Fig. 11-40) and plate(s) (3) over plunger. Secure to valve (1) with cap screws.

Install poppet (2, Fig. 11-39) in bore of relief valve (1). Install spring (3) on poppet stem. Thread adjusting screw (4) into plug bore until it begins to compress spring (3). Place washer (5) over screw and install jam nut (6). Do not tighten nut at this time.

Lubricate new "O" rings (4 and 7, Fig. 11-37) and install on plugs (5 and 6). Lubricate check (2) and slide into bore of valve (1). Install spring (3) in check (2). Install plugs (5 and 6) and tighten.

Lubricate "O" rings (3 and 4, Fig. 11-36) with a heavy grease that is soluble in hydraulic oil and install in relief valve (1). Install pilot (2). Mount relief valve on steering valve (5). Temporarily secure relief valve (2, Fig. 11-35) to steering valve (3) with cap screws (1).

Installation

Mount valve assembly in its original position in tractor. Use all new "O" rings at each flanged connection. When making connection to relief valve, remove one of the cap screws securing the relief valve to steering valve. Install and secure one split flange half. Remove remaining cap screw and install and secure second flange half. Be sure all connections are tight.

Make linkage connections to steering valve. Refer to Section 9, "LINKAGE."

Adjustment

Whenever the steering valve relief valve is disassembled, it must be checked and adjusted to assure proper operation.

With tractor in a straight-ahead attitude, lock frame halves with frame locking bar and pins and shut off engine.

Connect a hydraulic pressure test gauge having a maximum range of 20684 kPa (3000 psi) to the quick disconnect provided at the left hand steering cylinder check valve. Start engine and allow it to run until torque converter temperature gauge reaches "RUN" segment.

With engine running at full throttle, turn steering wheel and read indicated pressure on test gauge. Refer to "SYSTEM PRESSURES" for recommended pressure setting.

Relief valve pressure setting: _____

If adjustment is required, shut off the engine. Loosen jam nut and turn adjustment screw clockwise to raise pressure or counterclockwise to reduce pressure. Tighten jam nut and check pressure again with engine running at full throttle. When correct adjustment is achieved, install washer (2, Fig. 11-38) and crown nut (3) on valve (1). Make sure adjusting screw jam nut is securely tightened before installing acorn nut.

DISASSEMBLY, INSPECTION AND ASSEMBLY

DEMAND VALVE (EARLY MODELS ONLY)

Removal

The demand valve, located on the forward right side of the rear frame, next to the transmission, is quite heavy and must be supported during removal. Thoroughly clean exterior of valve before disconnecting any lines. Tag all lines for reference at installation. Remove hardware securing split flange clamps and lines to valve. Plug lines and valve openings to prevent entry of dirt and foreign material. Remove hardware securing valve to its mounting and remove valve to a clean work area.

Disassembly

Note carefully position and sequence of valve components during disassembly to avoid incorrect assembly.

Use snap ring pliers to remove snap ring (5, Fig. 11-47) from valve bore. Remove orifice (4), check seat (3), check (2) and spring (1).

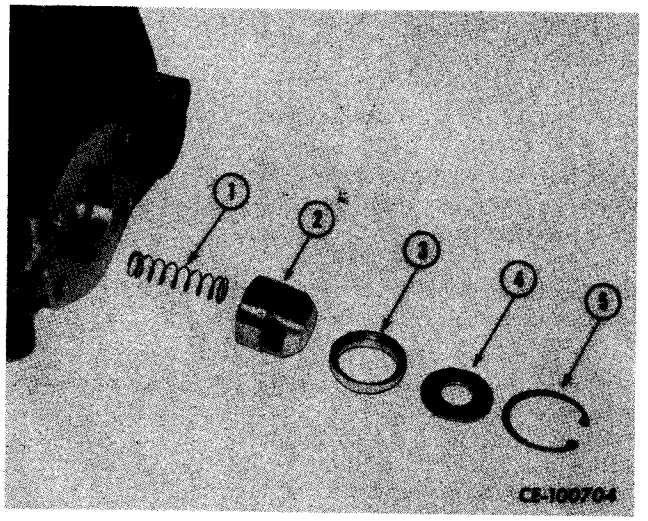


Figure 11-47
Remove Check.

Remove plug (4, Fig. 11-48) spring (2) and check (1) from valve body. Discard seal ring (3) from plug.

Remove plug (1, Fig. 11-49) from valve body. Remove snap ring (3) and orifice (4) from valve bore. Remove and discard seal ring (2) from plug.

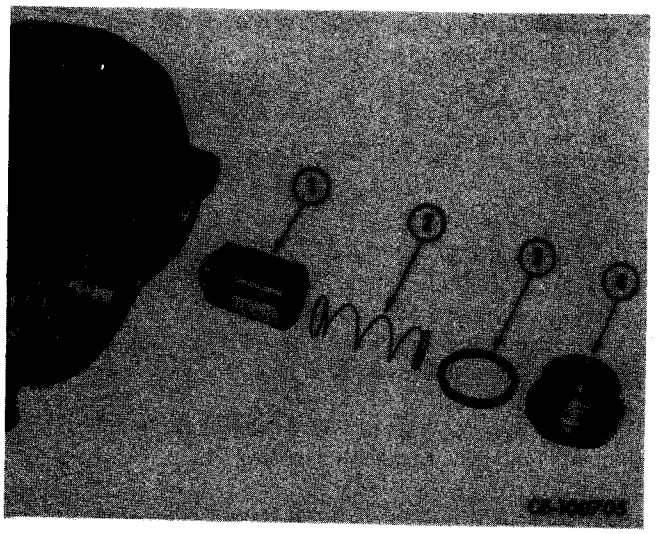


Figure 11-48
Remove Check.

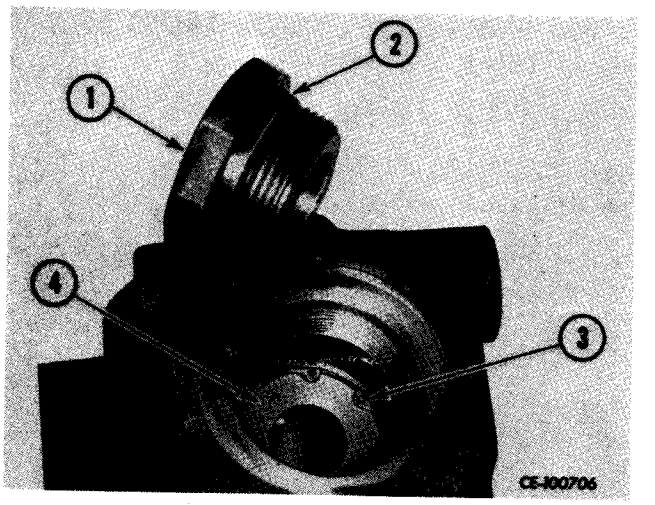


Figure 11-49
Remove Orifice.

Unscrew cap (4, Fig. 11-50) and remove spring (3) from bore of plunger assembly (1). Carefully slide plunger from valve body. Do not allow plunger to cock in valve bore, as damage to plunger or valve bore surfaces may result. Remove retaining ring (2) from plunger and seal ring (5) from cap. Discard used seal ring.

Plunger disassembly is NOT recommended unless absolutely necessary, such as removal of a chip or shaving.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Figure 11-50
Remove Plunger.

Disassemble plunger by immersing it in a heated fluid to soften loctite sealant on cap (1, Fig. 11-51) and allow its removal from bore of plunger (4). DO NOT APPLY DIRECT FLAME HEAT TO PLUNGER, AS DISTORTION OF PLUNGER WILL RESULT. Remove spring (2) and check (3) to complete plunger disassembly.

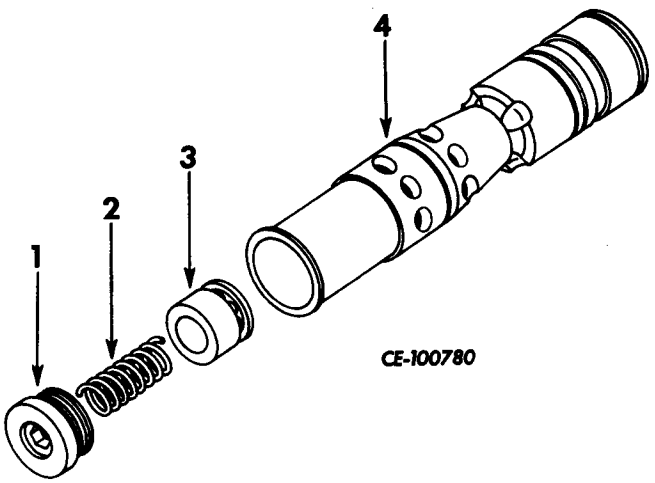


Figure 11-51
Plunger Assembly.

Inspection

Thoroughly clean all metal parts in solvent. Dry with filtered compressed air. Inspect plunger and check surfaces and valve body bores for burrs, nicks, scratches, scores, or other abrasions. Stone or lap all burrs and nicks. If scored deeply enough to leak, replace part. If plunger or plunger bore of valve body are damaged, replace entire valve.

All parts with sliding fit must move freely within their bores. All grooves and passages must be free of foreign matter. Replace all seal rings and broken or distorted springs.

Assembly

Insert check (3, Fig. 11-51) and spring (2) into bore of plunger (4). Spray cap (1) with Locquick Primer Grade T and allow to dry for five minutes. Apply three drops of Loctite Sealant Grade CVV to threads of cap and thread into plunger bore. DO NOT use excessive amount of sealant or apply to areas other than cap threads.

Tighten cap to recommended torque (refer to "SPECIAL TORQUES.")

Torque: _____

Install retaining ring (2, Fig. 11-50) on plunger assembly (1). Coat plunger with clean hydraulic oil and carefully slide plunger into valve bore. Do not force plunger or allow it to cock in valve bore. Lubricate a new seal ring (5) and install in groove of cap (4). Insert spring (3) into plunger bore and place cap over spring. Thread cap into valve bore and tighten securely.

Seat orifice (4, Fig. 11-49) in valve bore and retain with snap ring (3). Lubricate new seal ring (2) and install on plug (1). Thread plug into valve bore and tighten securely.

Lubricate check (1, Fig. 11-48) and new seal ring (3) with clean hydraulic oil. Insert check (1) and spring (2) into valve bore. Seat plug (4) over spring and thread plug into valve bore. Tighten plug securely.

Insert spring (1, Fig. 11-47) into valve bore. Lubricate check (2) and seat it in valve bore, over spring. Insert check seat (3) and orifice (4) into valve bore and retain by installing snap ring (5).

Installation

Mount valve in tractor and tighten mounting hardware securely. Remove plugs from lines and valve openings. Use new "O" rings at all connections when attaching previously tagged lines to valve. Be sure split flange clamps are squarely seated before tightening clamp hardware.

DISASSEMBLY, INSPECTION AND ASSEMBLY

CHECK VALVE

Removal

Each steering cylinder has a check valve. Thoroughly clean exterior of valve, tag connecting lines for installation reference and disconnect lines from valve. Plug and cap lines and valve bores to prevent contamination. Remove check valve.

Disassembly

Observe position and location of valve parts during disassembly to facilitate assembly. Do not disassemble valve unless it is definitely known to be defective, as seat (5, Fig. 11-52) is staked into housing (3) and can only be removed by cutting staking with a small cold chisel.

Remove "O" ring (4) from groove in housing. Cut staking and remove seat (5). Slide check assembly (2) and spring (1) from housing bore.

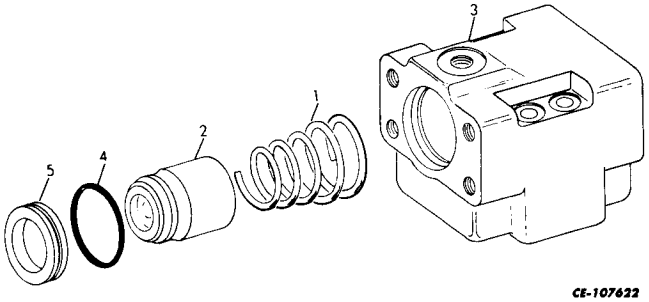


Figure 11-52
Check Valve Assembly.

1. Spring.
2. Valve.
3. Body.
4. "O" ring
5. Seat.

Inspection

Thoroughly wash all parts in a clean mineral oil solvent. Dry with filtered compressed air. Inspect all surfaces for burrs, nicks, scratches, scores, and other abrasions. Stone or lap all imperfections. If scoring is deep, replace valve assembly. All parts with sliding fit must move freely within their bores, and be clean and free of foreign matter.

Assembly

Lubricate check assembly with clean hydraulic oil and slide spring (1) and check assembly into bore of housing. Install seat (5) in housing by staking securely in at least four places. Install new "O" ring in housing groove.

Installation

Mount check valves in their original positions on steering cylinder. Do not tighten mounting hardware until after connecting lines are attached to valve. Make sure connections are tight and mounting bolts are secure.

HYDRAULIC CYLINDERS (EARLY STYLE)

General

To replace packing, cylinder must be disassembled. Drain cylinder to be removed as much as possible. Tape, plug and tag disconnected lines to protect and identify them for assembly. Do not damage pivot bushings or port flanges during removal.

NOTE: The following instructions describe disassembly, inspection and assembly of a typical large hydraulic cylinder. All cylinders employed on the tractor are of identical construction and vary only in size. The earlier style cylinders used packing in place of the present wear rings.

Disassembly

Disassemble cylinder in a clean area as follows:

Remove cap screws and lock washers (9, Fig. 11-53) that secure end cover (11) to cylinder. Slide cover down rod and remove cord ring (12) from cylinder. Push cap assembly (6) in slightly and remove segmented lock ring (8).

Pull rod free of cylinder. Cylinder cap assembly will come out with rod and piston. Disassemble piston halves (17, 18) by removing cap screws (1).

Remove and discard used wear rings (6, Fig. 11-54) and seal assemblies (5) from both piston halves (2, 4).

DISASSEMBLY, INSPECTION AND ASSEMBLY

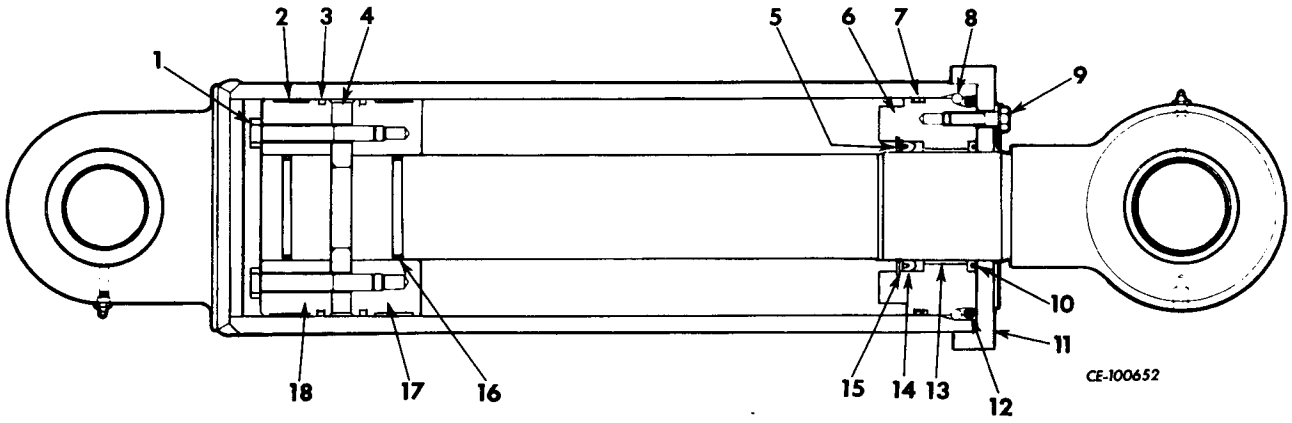


Figure 11-53
Hydraulic Cylinder. (Early Style)

1. Bolt.
2. Wear ring.
3. Seal assembly.
4. Lock ring.
5. Retaining ring.
6. Cap.
7. "O" ring and back-up rings.
8. Segmented lock ring.
9. Bolt and lock washer.
10. "O" ring seal.
11. Cover.
12. Cord ring.
13. Bushing.
14. Packing.
15. Bushing.
16. "O" ring & back-up rings.
17. Piston half.
18. Piston half.

NOTE: Do not discard piston halves (2, 4) or lock ring halves (3).

Remove and discard used "O" rings and retaining rings (16, Fig. 11-53) from rod grooves. Remove retaining ring (5) from bore of cap (6) and slide cap assembly from rod. Remove and discard "O" ring and back-up ring (7). Complete cap disassembly by removing packing (14).

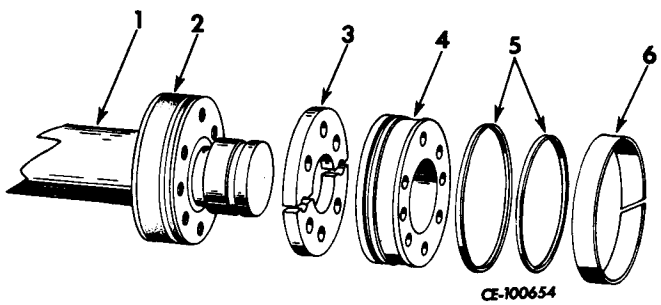


Figure 11-54
Piston Assembly.

Inspection

Wash cylinder and all metal parts in clean solvent. Dry parts with filtered compressed air. Protect components with a light film of oil. Flush cylinder with clean oil to remove all traces of solvent and protect cylinder walls from oxidation.

Check cylinder bore, rod surface and cap bushing for scratches and abrasions. Carefully remove small rough or sharp surfaces with a fine grained stone. The closer these surfaces are to a mirror finish, the more efficiently new packing will operate.

Assembly

Slip cylinder cover (11, Fig. 11-53), cord ring (12) and seal ring (10) on rod. Install new "O" ring and back-up ring (7) on cap (6). Lubricate rod and cap bushing (13) and slide cap onto rod. Install new packing (14) in bore of cap and secure with bushing (15) and lock ring (5).

Install new "O" rings and back-up rings (16) in grooves in piston end of rod. Install new seal rings (3) on piston

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

HYDRAULIC CYLINDERS - Continued

Assembly - Continued

halves (17, 18). Slide piston half (17) having tapped holes on rod, just past lock ring groove. Slide outer piston half (18) onto rod, almost to lock ring groove. Insert one lock ring (4) half between piston halves and align bolt-holes in piston halves and lock ring. Insert two loctite dipped bolts (1) and start them into tapped holes in inner piston half (17). Repeat above procedure for second lock ring half. Install balance of loctite dipped bolts and tighten evenly to recommended torque. Refer to "SPECIAL TORQUES."

For steering cylinders: _____

For breakout cylinder: _____

For boom cylinders: _____

Install new wear rings (2, Fig. 11-53) on piston halves. Coat piston with oil and start piston and rod assembly into cylinder. Do not damage wear rings or seal rings. When piston has fully entered cylinder, carefully push cap assembly into cylinder, being careful not to damage "O" ring and back-up ring (7). Also, be sure "O" ring and back-up ring are properly positioned, i.e., "O" ring inside, back-up ring outside.

Install segmented lock ring (8) in cylinder recess. If required, use a heavy, oil soluble grease to hold lock ring segments in place.

Install cord ring (12) in cylinder. Insert "O" ring (10) in cap recess. Secure end cover (11) to cap with loctite dipped cap screws and lock washers (9).

Manually extend rod sharply several times, driving piston against cap assembly. This will cause the segmented lock ring to seat properly. Tighten cover cap screws (9) to torque recommended in "SPECIAL TORQUES."

Cover cap screw torque: _____

Steering cylinders: _____

Breakout cylinder: _____

Boom Cylinders: _____

After installing cylinder on tractor, start engine and allow hydraulic oil to reach operating temperature. Cycle cylinder several times, then retorque cover cap screws with cylinder under pressure.

DISASSEMBLY, INSPECTION AND ASSEMBLY

HYDRAULIC CYLINDER (LATE STYLE)

Disassembly

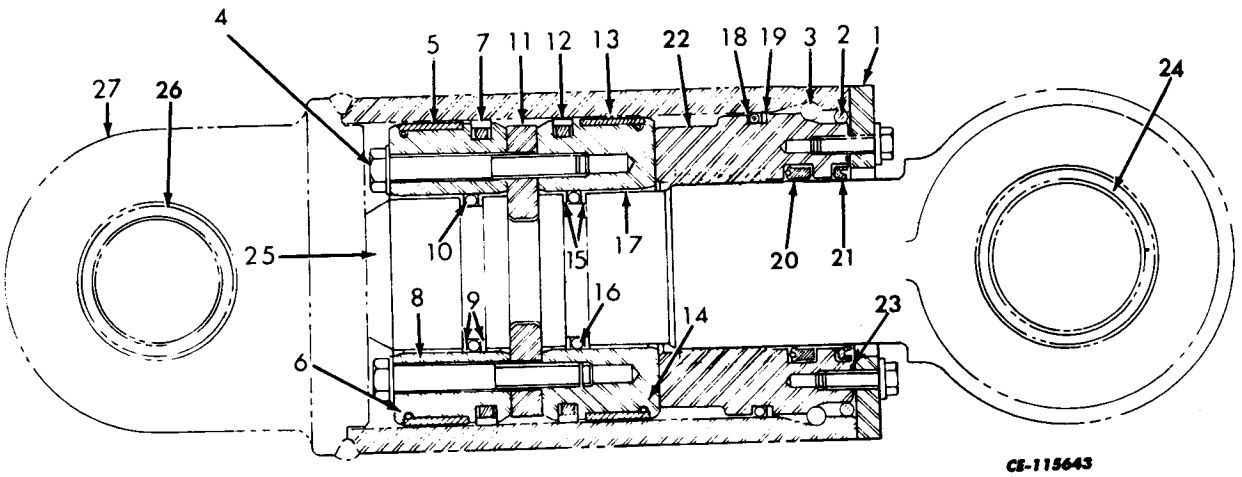


Figure 11-55
Hydraulic Cylinder (Late Style).

1. Cylinder cap.
2. Cord ring.
3. Segmented lock ring.
4. Capscrew.
5. Wear ring.
6. "O" ring.
7. Seal.
8. Piston half.
9. Back-up ring.
10. "O" ring.
11. Lock ring.
12. Seal.
13. Wear ring.
14. "O" ring.
15. Back-up ring.
16. "O" ring.
17. Piston half.
18. "O" ring.
19. Back-up ring.
20. Rod seal.
21. Rod wiper.
22. Gland.
23. "O" ring.
24. Bushing.
25. Piston rod.
26. Bushing.
27. Cylinder.

Disassemble the component parts in the sequence indicated by the reference numbers in Fig. 11-55.

NOTE: Once cap and cord ring are removed, slide cover and cord ring down piston rod, push the gland (22, Fig. 11-55) in slightly and remove the segmented lock ring (3, Fig. 11-55).

HYDRAULIC CYLINDERS (LATE STYLE) - Continued

Inspection

Clean all parts thoroughly.

Check the cylinder bore, piston rod and piston for signs of scratches, burrs or other damage which might cause a failure.

Use a fine stone to remove burrs or small scratches.

Replace any part showing damage or excessive wear.

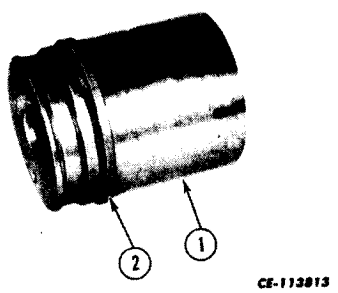


Figure 11-56
Install Seal Ring.

1. Shim Stock
2. Seal Ring.

NOTE: To install the outer portion of seal ring (7 and 12, Fig. 11-56), soak the ring in hot water until it becomes somewhat pliable. Install the inner portion of seal ring and then, using a piece of shim stock (refer to Fig. 11-56), force the outer portion of the seal ring over the shim stock and into the groove of the piston. The seal ring will shrink when cool and nominal effort will install it into the cylinder. Be careful not to cut the seal ring on the cylinder when installing.

Assembly

Assemble the component parts in the reverse order they were disassembled in (Fig. 11-52).

NOTE: Apply loctite to the capscrews mounting the pistons before assembly. Refer to "Special Torques" for tightening information.

NOTE: Install only three evenly spaced capscrews to retain the cylinder cap now. Tighten them securely. Mount the cylinder on the machine and fill the cylinder with oil, purge the system of air and check the oil level in the reservoir. Refer to the Operator's Manual for the procedure.

Once the system is functioning properly, stroke the cylinder to the position with the piston rod fully extended. Do this at half throttle, a couple of times and then leave the rod extended and shut down the machine.

Apply loctite to the remainder of the cap mounting cap screws and install them using the "Special Torques" listed for them. Remove the originally installed capscrews and repeat the procedure with them.

GENERAL

TROUBLE SHOOTING

COMPLAINT	PROBABLE CAUSE	REMEDY
Poor hydraulic system performance or failure.	1. Defective pump.	1. Repair or replace pump.
	2. Dirt in relief valve.	
	3. Relief valve defective.	3. Disassemble, repair and adjust.
	4. Worn cylinders.	
	5. Load too heavy.	
	6. Internal crack.	6. Replace valve assembly.
	7. Plunger not in full stroke.	7. Check movement and linkage.
	8. Reservoir low on oil.	
	9. System filters clogged.	
	10. Restrictions in lines.	

TROUBLE SHOOTING

COMPLAINT	PROBABLE CAUSE	REMEDY
Slow float time.	1. Poppet (34, Figure 11-27) out of place. 2. Pilot valve centering spring for plunger, broken or loose.	1. Disassemble split spool valve and correct. 2. Disassemble valve and correct.
Excessive oil foaming.	1. Improper type or viscosity oil. 2. Excessive by-passing of oil over relief valves.	2. Adjust relief valve per recommendation if pressure adjustment is too low. Repair damaged relief valve. Change operating methods to eliminate long periods of maximum pressure operation.
Excessive oil temperature.	1. Sustained maximum pressure operation with by-passing of oil over relief valves. 2. Incorrect viscosity or type of oil. 3. Worn hydraulic pump.	
Foreign material in reservoir screens.	1. Lint - Worn, frayed or damaged cylinder packing. 2. Chips - Worn pump or damage in cylinders.	
Insufficient pressure build-up.	1. System relief valve set too low. 2. Worn pump components causing internal leakage.	1. Adjust relief valve according to instructions. Refer to "ASSEMBLY-INLET SECTION." 2. Replace pump cartridge.
Low pressure in boom circuit	1. Damaged, worn or improperly adjusted hydraulic relief valve. 2. By-pass in cylinders. 3. Hydraulic pump worn.	1. Refer to "Split Spool Valve" for disassembly and inspection procedures. 2. Replace worn packing and repair as necessary. Refer to "Hydraulic Cylinders."
Low pressure in bucket circuit.	1. Refer to causes 1, 2, and 3 in "Boom Circuit" above.	
Low pressure in steering circuit.	1. Damaged, worn or improperly adjusted steering circuit relief valve. 2. By-pass in steering cylinders. 3. Worn pump.	1. Disassemble, inspect, repair and adjust relief valve.

TROUBLE SHOOTING

CONTROL VALVES

COMPLAINT	PROBABLE CAUSE	REMEDY
Difficult operation or sticking of control valve plungers.	1. Over-heated hydraulic oil.	1. Refer to "Excessive Oil Temperature.
	2. Dirt in valve bores, plungers and/or oil.	
	3. Excessively high pressure in valve.	3. Relief valve stuck or binding.
	4. Leakage binding.	
	5. Plunger bent.	5. Replace valve assembly.
	6. Detent or return spring damaged.	
	7. Spring or detent cap binding.	
	8. Valve not at thermal equilibrium.	
Unable to move plunger in or out.	1. Dirt in valve.	
	2. Plunger cap full of oil.	2. Replace seals.
	3. Bind in linkage.	
Detent control fails to hold.	1. Worn detent cam.	
	2. Spring or ball broken or deformed.	
	3. Excessive vibration.	
	4. Plunger stroke restricted.	
Load drops when plunger moved from neutral.	1. Dirt in check valve.	
	2. Scored check valve poppet or seat.	2. Replace poppet or lap poppet to seat.
Load will not hold.	1. Cylinder leaking or worn.	1. Check cylinders.
	2. Oil by-passing valve plunger.	2. Replace valve assembly.
Leaking seals.	1. Paint on or under seal.	1. Remove and clean.
	2. Excessive back pressure.	2. Open line to reservoir.
	3. Dirt under seal.	3. Remove and clean.
	4. Scored plunger.	4. Replace valve.
	5. Loose seal plates.	5. Clean and tighten.
	6. Cut, scored or worn seal.	6. Replace faulty parts.

TROUBLE SHOOTING

PUMPS

COMPLAINT	PROBABLE CAUSE	REMEDY
Pump does not deliver fluid.	1. Shaft sheared or disengaged. 2. Reservoir-to-pump intake line restricted. 3. Fluid viscosity too heavy to pick up prime. 4. Vane(s) stuck in the rotor slot(s).	2. Check all strainers and filters for foreign material. Clean if necessary.
Pump making noise.	1. Low oil supply. 2. Cavitation in hydraulic pump. 3. Excessive pump speeds. 4. High engine speeds with cold hydraulic oil. 5. Hydraulic oil viscosity too high. 6. Pump components in misalignment.	2. Clean obstruction to pump oil supply. 3. Adjust engine governed speeds.

STEERING CONTROL VALVE

Hard steering when turning slowly.	1. Low fluid level in reservoir. 2. Low oil pressure due to kink in hose. 3. Low oil pressure due to foreign object stuck in hose. 4. Pressure loss in cylinder(s) due to worn piston packing and/or rod packing. 5. Steering control valve leaks. 6. Loose fit of spool in valve body.	
No effort required to turn.	1. Loose or worn valve.	
Poor steering return.	1. Sticky valve spool.	
Tractor leads to one side or the other.	1. Unbalanced or badly worn valve. NOTE: If this is the cause, steering effort will be very light in direction of lead and heavy in opposite direction.	

(Continued on next page)

PRINTED IN UNITED STATES OF AMERICA

TROUBLE SHOOTING

STEERING CONTROL VALVE - Continued

COMPLAINT	PROBABLE CAUSE	REMEDY
Momentary increase in effort required when turning wheel fast.	1. Insufficient oil supply to pump. 2. High internal leakage.	1. Check oil level in reservoir.
Excessive wheel kick-back or loose steering.	1. Air in system.	1. Add fluid to reservoir.

SERVICE INFORMATION

COMPONENT SPECIFICATIONS

Reservoir

Type:
Closed system with controlled pressure and vacuum relief.

Pressure relief valve setting	207 kPa (30 psi)
Relief valve spring, correct adjusted length	76 mm (3 in)
Hydraulic stall	2200 - 2350 rpm
Full stall	1650 - 1850 rpm

SPECIAL TORQUES

Hydraulic Reservoir

Filter retaining plate nuts	14 - 16 N·m (10 - 12 ft lb)
Cover clamp bolts	27 N·m (20 ft lb)

Hydraulic Pump - Main (Vane Type)

Cover retaining cap screws	346 - 373 N.m (255 - 275 ft lb)
Mounting cap screws	217 - 224 N·m (160 - 165 ft lb)
Hydraulic Pump - Main - Gear Type Flange mounting w/oil	203 - 237 N·m (160 - 175 ft lb)

Hydraulic Pump - Switch (Vane Type)

Cover retaining cap screws	115 - 129 N·m (85 - 95 ft lb)
Hydraulic Pump - Switch - Gear Type Stud nuts w/oil	108 - 122 N·m (80 - 90 ft lb)

Split Spool Valve

Relief valve lock nut	41 N·m (30 ft lb)
Socket head cover cap screws	81 N·m (60 ft lb)
Tie rod nuts	142 N·m (105 ft lb)

Pilot Valve

Upper tie rod nuts	45 N·m (33 ft lb)
Lower tie rod nuts	19 N·m (14 ft lb)
Relief valve lock nut	14 N·m (10 ft lb)
Relief valve cap	34 N·m (25 ft lb)

PRINTED IN UNITED STATES OF AMERICA

SPECIAL TORQUES - Continued

Cylinders

Boom cylinder pinlock	271 N·m (200 ft lb)
Bucket cylinder pinlock	271 N·m (200 ft lb)
Steering cylinder pinlock	271 N·m (200 ft lb)
Steering cylinder piston screws	81 N·m (60 ft lb)
Steering cylinder cover cap screws (under pressure)	47 N·m (35 ft lb)
Boom cylinder piston screws	271 N·m (200 ft lb)
Boom cylinder cover cap screws	108 N·m (80 ft lb)
(Under pressure)	115 N·m (85 ft lb)
Breakout cylinder piston screws	271 N·m (200 ft lb)
Breakout cylinder cover cap screws	108 N·m (80 ft lb)
(Under pressure)	115 N·m (85 ft lb)

NOTE: Apply Loctite to the piston and cover cap screws on the late style boom and bucket cylinders.

Steering Control Valve

Plunger cap cap screws	41 N·m (30 ft lb)
Plunger nut	68 - 81 N·m (50 - 60 ft lb)

SYSTEM PRESSURES

Main relief valve	17237 - 17926 kPa (2500 - 2600 psi)
Cylinder relief valves	20684 kPa (3000 psi)
Steering relief valve	13100 - 13789 kPa (1900 - 2100 psi) at 1000 - 1200 rpm
Vacuum: Pressure relief valve	
Pressure, crack	207 kPa (30 psi)
Vacuum, crack	0 - 21 kPa (0 to 0.3 psi)

Adjustment

Switch Pump

The adjustment on the switch pump should be checked whenever the components of the switch pump valve have been disassembled. Adjustment is made to divert the switch pump flow from the steering circuit to the loader circuit. The switch should take place between 1200 - 1600 rpm.

The pump manufacturer recommends a setting of 7 threads exposed above the lock nut on the adjusting screw. This setting is usually sufficient.

To properly adjust the switch point, use the following procedure:

1. With the pump on the machine, install a 20684 kPa (3000 psi) gauge in place of the plug on the opposite end of the valve from the adjusting screw on the 2 and 3 section pumps with the internal valve. If you have the pump with the external mounted valve, the opening to install the gauge is next to the plug which is in the same position as the internal valve pumps.

2. Install the frame locking bar to secure the frames in a straight ahead attitude.

3. If the machine is not equipped with a tachometer, secure one and install for this adjustment.

4. Start the engine and turn the steering wheel until you get a pressure reading on the gauge of 6895 kPa (1000 psi). Hold the wheel to maintain this reading.

5. Accelerate the engine slowly and note at what rpm the pressure starts to drop. Continue to accelerate and note at what prm the pressure reaches 0. The pressure should start to drop at 1200 rpm and be at 0 by the time you reach 1600 rpm.

6. If your pump does not match these figures, turn the adjusting screw "in" to lower the shift point and "out" to increase the shift point.

7. Once the adjustment is complete, tighten the lock nut and install the cover nut on the adjusting screw.

SERVICE INFORMATION

SPECIAL TOOLS

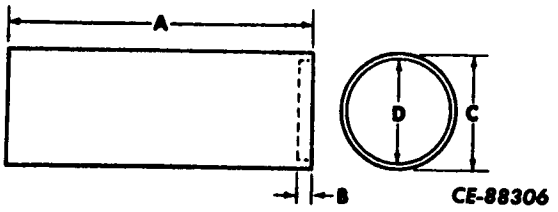


Figure 11-55

SEAL INSTALLATION TOOL

Pump Series	Length A mm (in.)	Undercut B mm (in.)	O.D. C mm (in.)	I.D. D mm (in.)
35V	83 (3-1/4)	6 (1/4)	45 (1-25/32)	43 (1-11/16)
4535	95 (3-3/4)	4 (7/16)	56 (2-7/32)	48 (1-29/32)

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

The electrical circuit used on the 560 series loader is a 24 volt, negative ground system. Electrical energy stored in the batteries is available upon demand to the system components. These components, which include the instruments, headlights, back-up lights, stop and tail lights and cranking motor, are dependent upon battery energy until the engine drives the generator at a speed sufficient to carry the electrical load. Above this predetermined speed, electrical energy produced by the generator supplies the normal demands of the system. A portion of this energy is sent to the batteries to keep them in a state of full charge.

A regulator is installed in the generator to control the output of the generator. By using a regulated control, electrical energy produced by the generator is supplied to the system components on demand.

Two heavy duty, 12 volt batteries, wired in series produce a 24 volt system. One battery is housed in each of the battery boxes located on the left and right hand side of the rear main frame. Hinged tops on the battery boxes provide easy access for servicing.

The system may be divided into two circuits; the cranking circuit, in use during engine starting and the charging circuit, supplying current to the remainder of the system when the engine is operating. In addition, the charging circuit replaces electrical energy drained from the batteries.

Legend for Figure 12-1

1. Driving lamps.
2. Harness - front lights.
3. Engine oil pressure gauge.
4. Instrument jumper.
5. Engine water temperature gauge.
6. Wire - main switch-to-circuit breaker.
7. Brake warning light.
8. Ignition switch.
9. Torque converter temperature gauge.
10. Circuit breaker.
11. Circuit breaker.
12. Air pressure buzzer switch.
13. Buzzer - low air pressure.
14. Ground-to-circuit breaker mounting screw.
15. Option connector.
16. Option connector.
17. Voltmeter.
18. Air pressure gauge.
19. Push-button starter switch.
20. Fuse assembly.
21. Fuel pressure gauge.
22. Fuse assembly.
23. Fuse assembly.
24. Fuel level gauge.
25. Parking brake switch.
26. Connector - shift indicator lights.
27. Connector - windshield wiper switch.
28. Main harness.
29. Stop light harness.
30. Stop light switch.
31. Neutral safety switch harness.
32. Batteries.
33. Rear harness.
34. Neutral safety switch.
35. Engine harness.
36. Torque converter temperature sender.
37. Engine water temperature sender.
38. Engine oil pressure sender.
39. Battery jumper cable.
40. Solenoid relay switch.
41. Cranking motor.
42. Battery jumper cable.
43. Battery-to-cranking motor cable.
44. Option connector.
45. Fuel level sender.
46. Cranking motor ground cable.
47. A.C. Generator.
48. Tail and stop lights.

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

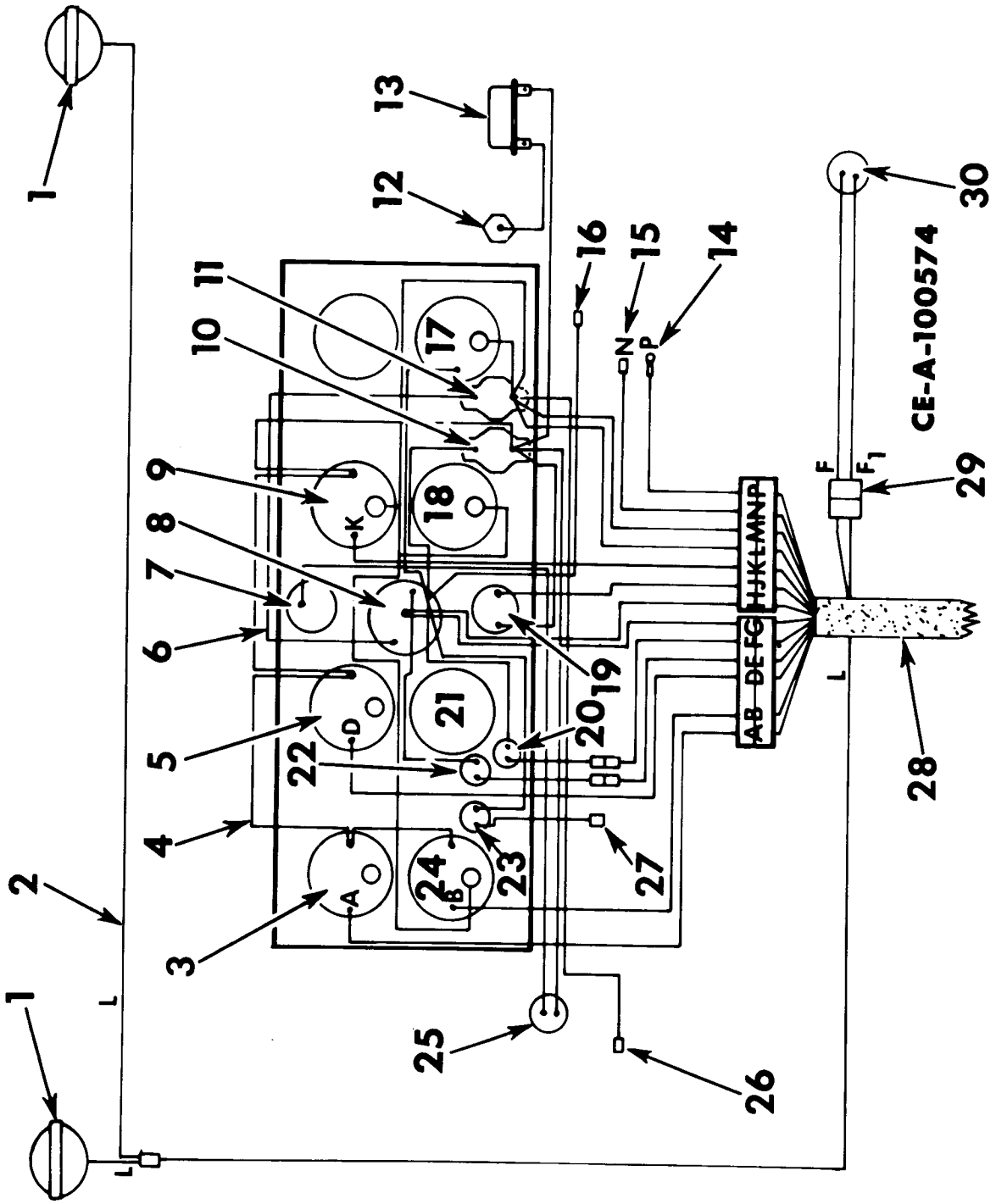
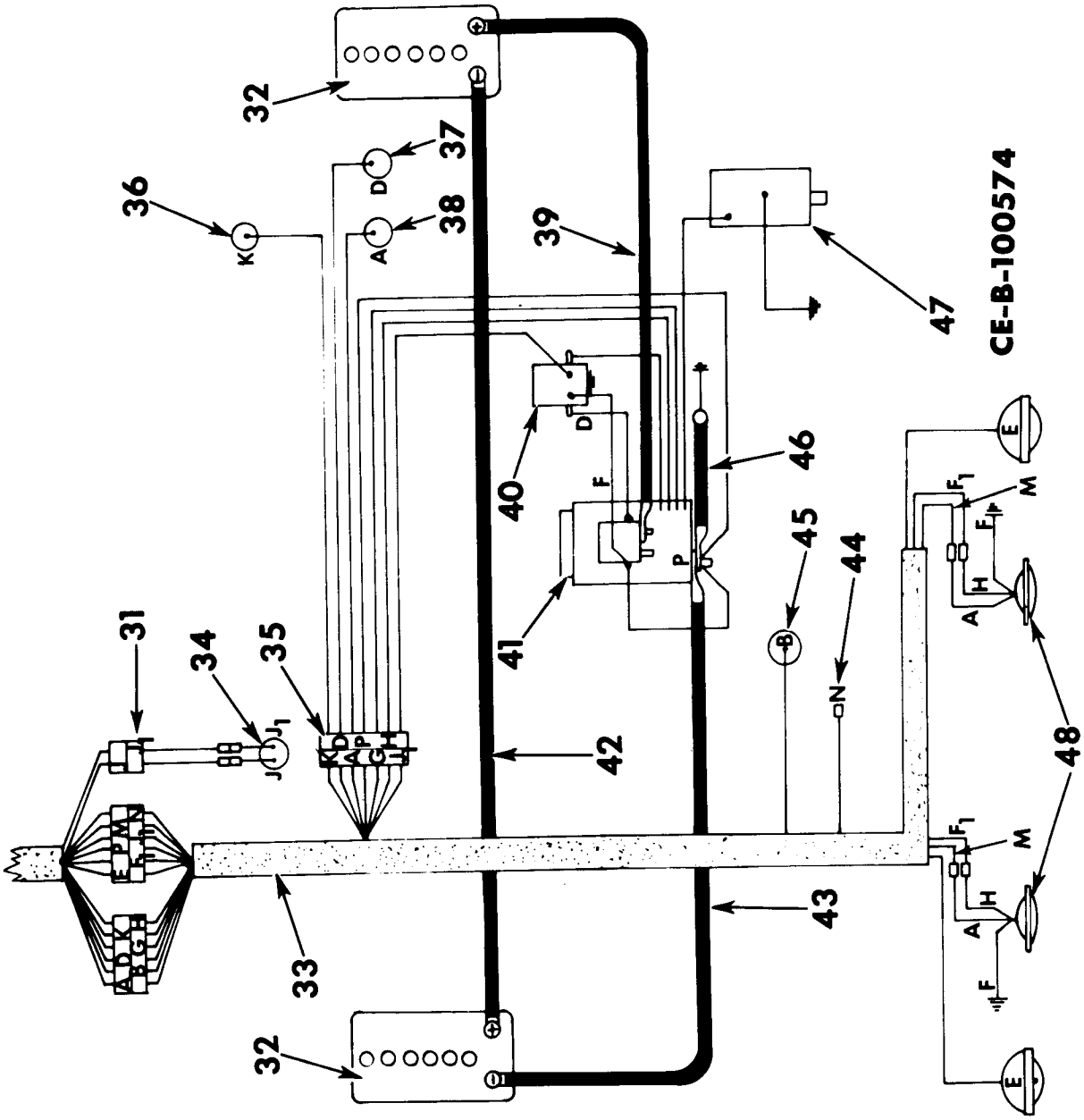


Figure 12-1
Wiring Diagram (Early).

GENERAL INFORMATION



BATTERIES

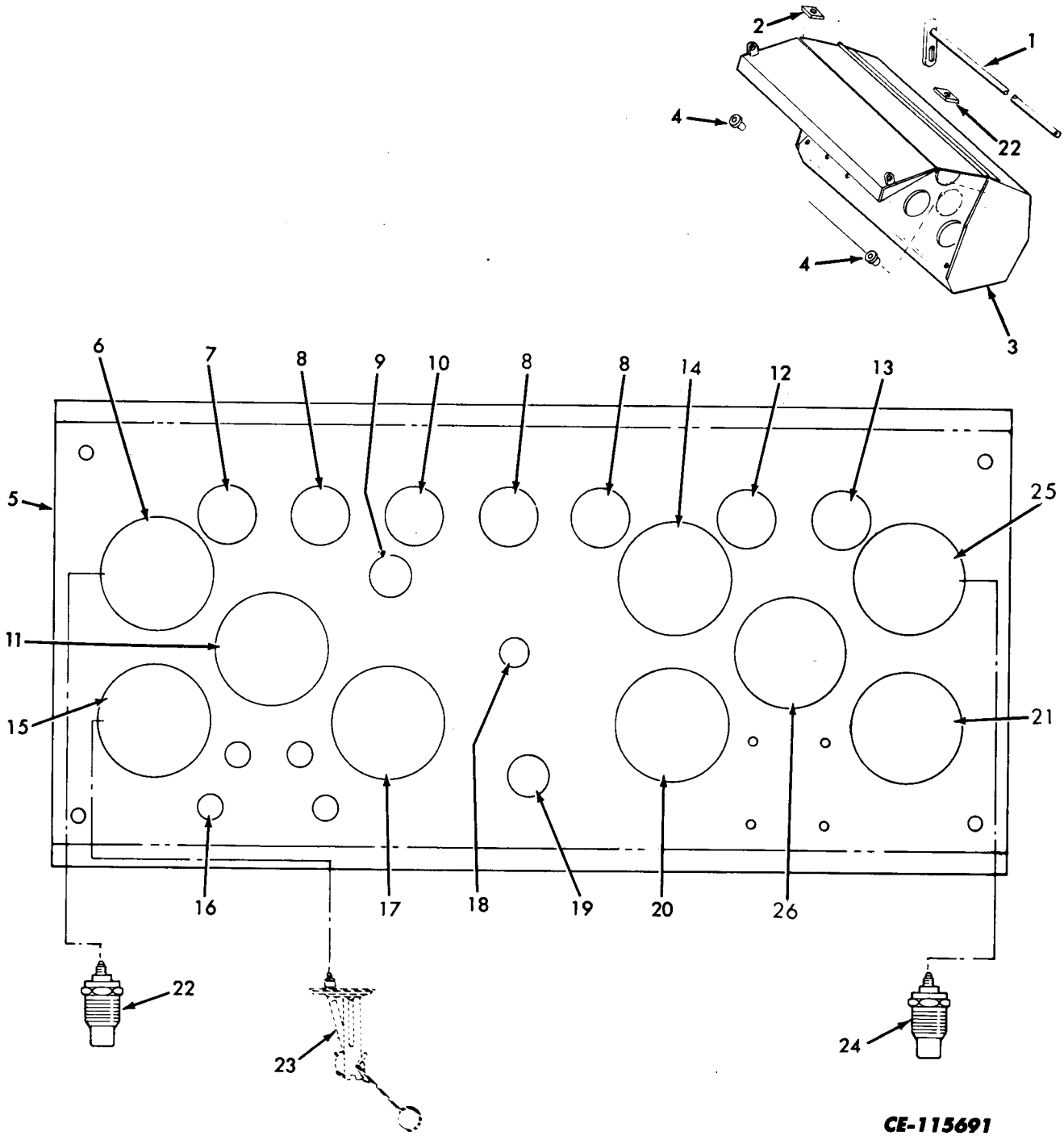


Figure 12-2
Wiring Diagram (Late).

BATTERIES

(Legend for Figure 12-2)

1. Not used.
2. Not used.
3. Instrument panel.
4. Circuit breaker to gauge lights harness.
5. Engine temperature gauge.
6. Wire engine temperature gauge to sender – Brown/Red.
7. Fuel gauge.
8. Wire fuel level sender to gauge – Violet/White.
9. Wire – Circuit breaker to fuel gauge to engine temperature gauge to oil pressure light – Violet.
10. Low water light.
11. Wire – Warning circuit box to low water light – Orange.
12. Wire – Voltmeter to low water light – Red.
13. Voltmeter.
14. Fuse – 10 amp.
15. Wire – Main switch to rear drive lights fuse – Red.
16. Wire – Rear drive lights fuse to rear drive light – Dark Blue.
17. Wire – Tail lights fuse to tail lights – Pink.
18. Wire – Main switch to tail light fuse – Red.
19. Wire – Oil pressure light to oil pressure switch – Brown/Black.
20. Low oil pressure light.
21. Wire – Main switch to stop light fuse – red.
22. Wire – Stop light fuse to stop light switch – Tan.
23. Wire – Main switch and warning box to voltmeter – Red.
24. Main switch.
25. Wire – Main switch to tail light and circuit breaker – Red.
26. Wire – Main switch to positive battery terminal – Red.
27. Wire – Main switch to stop light fuse and circuit breaker – Red.
28. Wire – Push button start switch to neutral safety switch – Red/White.
29. Push button start switch.
30. Wire – Push button switch to magnetic switch – White/Red.
31. Wire – Push button switch to low coolant relay No. 3 terminal – Orange/White.
32. Wire – Main switch to rear drive lights fuse – Red.
33. Wire – Low air light to flasher – Violet.
34. Wire – Low air pressure switch to low air light – Violet.
35. Low air pressure light.
36. Wire – Torque converter temperature light to torque converter temperature switch – Light Blue/Black.
37. Wire – Torque converter gauge to torque converter sender – Black/White.
38. Torque converter temperature gauge.
39. Torque converter oil temperature light.
40. Wire – Circuit breaker to hourmeter – Violet.
41. Hourmeter.
42. Wire – Hourmeter to torque converter temperature gauge – Violet.
43. Wire – Torque converter temperature gauge to torque converter light – Violet.
44. Wire – Hourmeter to oil pressure switch – Light Green.
45. Circuit breaker – 25 amp.
46. Wire – Instrument panel ground to engine ground and low coolant relay – Black.
47. Wire – Circuit breaker to main switch – Red.
48. Wire – Circuit breaker to fuel level gauge and flasher – Violet.
49. Circuit breaker – 20 amp.
50. Wire – Circuit breaker to main switch – Red.
51. Wire – Circuit breaker to front drive lights – Pink.
52. Wire – Main switch to air conditioner feed – Black/Red.
53. Wire – Air conditioner switch to air conditioner clutch – Orange/Black.
54. Wire – Brake fail warning light to switch – Tan/White.
55. Wire – Water temperature light to switch – Yellow/Red.
56. Wire – Ether start button to ether valve – White/Red.
57. Warning circuit control box.
58. Wire – Warning circuit box to low level light – Orange.
59. Wire – Warning circuit box to voltmeter – Red.
60. Wire – Warning circuit box to low coolant relay – White.
61. Wire – Low coolant relay to warning circuit box – Black.
62. Field relay.
63. Wire – Warning circuit box to low coolant probes – Dark Blue/red.
64. Wire – push button to low coolant relay – Orange/White.
65. Air pressure gauge.
66. Air pressure switch.
67. Wire – Circuit breaker to shifter lights – Gray.
68. Wire – Ground driven steering switch to flasher to light – Black/White.
69. Wire – Circuit breaker to flasher – Violet.
70. Wire – Low air light to flasher – Violet.
71. Wire – Buzzer to low air pressure switch – Violet.
72. Low air and parking brake flasher.
73. Wire – Flasher to parking light – Violet.
74. Parking brake "ON" light.
75. Wire – Parking brake light to parking brake switch – Violet.
76. Parking brake switch.
77. Wire – Parking brake switch to buzzer – Violet.
78. Parking brake warning buzzer.
79. Wire – Circuit breaker to front drive lights – Pink.
80. Wire – Brake fail warning light to brake fail switch – Tan/White.
81. Instrument panel harness.
82. Wire – Stop light switch to stop lights and stop light fuse – Tan.
83. Stop light switch.
84. Wire – Ground driven steering switch to circuit breaker and flasher to light – Black/White.
85. Battery.
86. Master ground switch.
87. Battery cable – Negative to master ground switch.
88. Master ground switch to starter ground cable.
89. Battery jumper cable.

(Continued on next page)

BATTERIES

(Legend for Figure 12-2 - Continued)

90. Battery cable – Positive to starter.
91. Disconnect tool.
92. Wire – Reverse actuated pressure switch to starter solenoid – Dark Blue/White.
93. Wire – Reverse actuated pressure switch to back-up alarm – Dark Blue/White.
94. Neutral safety switch harness.
95. Neutral safety switch.
96. Torque converter temperature sender.
97. Rear light harness.
98. Wire – Torque converter gauge to torque converter sender – Black/White.
99. Engine harness.
100. Wire – Ether start button to ether valve – White/Red.
101. Wire – Water temperature switch to starter ground – Black.
102. Engine oil pressure switch.
103. Wire – Oil pressure switch to hourmeter – Light Green.
104. Wire – Oil pressure switch to starter ground – Black.
105. Wire – Oil pressure switch to oil pressure light – Brown/Black.
106. Torque converter temperature switch.
107. Wire – Torque converter temperature switch to torque converter light – Light blue/Black.
108. Alternator.
109. Wire – Alternator ground to starter ground – Black.
110. Wire – Alternator battery terminal to starter battery terminal – Red.
111. Wire – Water temperature switch to water temperature light – Yellow.
112. Wire – Engine temperature sender to water temperature gauge – Brown/Red.
113. Engine water temperature sender.
114. Magnetic switch.
115. Bar.
116. Wire – Magnetic switch to starter ground – Black.
117. Wire – Starter battery terminal to magnetic switch – Red.
118. Wire – Starter solenoid to magnetic switch – White/Red.
119. Wire – Magnetic switch to push button switch – White/Red.
120. Starter solenoid.
121. Wire – Starter solenoid to magnetic switch – White/Red.
122. Wire – Starter solenoid to reverse actuated pressure switch – Dark Blue/White – to alternator battery terminal – Red – and magnetic swtich – Red.
123. Wire – Ground wire to starter, alternator, oil pressure switch, instrument panel, magnetic switch and water temperature switch – Black.
124. Starter to frame ground cable.
125. Wire – Fuel level sender to fuel gauge – Violet/White.
126. Fuel level sender.
127. Wire – Air conditioner clutch to air conditioner switch – Orange/Black.
128. Wire – Warning circuit box to low coolant probes – Dark Blue/Red.
129. Coolant loss probes.
130. Radiator top tank.
131. Wire – Rear driving lights to rear driving light fuse – Dark Blue.
132. Rear driving light.
133. Wire – Stop lights to stop light switch – Tan.
134. Wire – Stop and tail light – White.
135. Wire – Stop and tail light – Red.
136. Wire – Tail lights to tail light fuse – Pink.
137. Wire – Stop and tail light – Black.
138. Tail and stop light.
139. Wire – Back-up alarm to reverse actuated pressure switch – Dark Blue/White.
140. Front light harness.
141. Front light cable.
142. Front driving light.
143. Resistor to buzzer cable.
144. Resistor.
145. Wire – Circuit breaker to starter solenoid – Red.
146. Wire – Alternator ground to starter ground.
147. Alternator harness.
148. Wire – Alternator to circuit breaker.
149. Circuit breaker.
150. Main switch to circuit breaker cable.
151. Circuit breaker.
152. Circuit breaker to main switch cable.
153. Auxiliary head light main switch.
154. Switch to auxiliary head light switch cable.

ALTERNATOR

For alternator service, refer to Delco-Remy Service Manual 1.2.

CRANKING MOTOR

For cranking motor service refer to Delco-Remy Service Manual 1.2.

PRINTED IN UNITED STATES OF AMERICA

TROUBLE SHOOTING

The electrical system, as previously mentioned, may be divided into two circuits, the cranking circuit and the charging circuit. To troubleshoot the system, a primary analysis should be made to determine which circuit is at fault.

COMPLAINT	PROBABLE CAUSE	REMARKS
Charge too low or no charge at all.	1. Defective battery. 2. Slipping generator or alternator drive belt. 3. Defective generator or alternator. 4. Malfunctioning regulator (old models).	
Charge too high; overcharged battery.	1. Malfunctioning regulator (old models). 2. Incorrect pulley used on generator or alternator.	1. Replace regulator.
Battery uses an excessive amount of water.	1. Charging rate too high. 2. Incorrect pulley used on generator or alternator.	1. Replace regulator (old models).
Rapid burn out of light bulbs.	1. Charging rate too high. 2. Incorrect pulley used on generator or alternator.	
Cranking motor operates slowly or not at all.	1. Battery discharged. 2. Defective cranking motor. 3. Corroded, loose or defective cables. 4. Defective solenoid.	
Low or intermittent generator or alternator output	1. Slipping drive belt. 2. Malfunctioning regulator (generator models).	
Lights dim.	1. Batteries low. 2. Poor ground. 3. Loose connections.	
One electrical gauge not operating.	1. Bad connection at guage, connector plug or sender. 2. Sender defective. 3. Gauge defective.	
Ignition "ON" – no gauges or lights working.	1. Dead battery. 2. Blown fuse. 3. Defective circuit breaker.	

(Continued on next page)

TROUBLE SHOOTING

COMPLAINT	PROBABLE CAUSE	REMARKS
Ignition "ON" - no gauges or lights working. (Cont)	4. Loose connection. 5. Broken wire.	
Ignition "ON" - no electrical gauges working or lights operating.	1. Bad connection between fuse, circuit breaker or ignition switch to gauges. 2. Blown fuse.	
All electrical gauges working. No lights.	1. Loose connection between fuse, circuit breaker or ignition switch. 2. Blown fuse. 3. Bad main switch.	

Contents Page

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

DESCRIPTION

This section has been prepared for convenient reference to information on the Brake System. It presents a description of the Brake System, its operation, maintenance and repair, also operation and repair of brake components.

The brake system is a combination air over hydraulic type. An engine driven compressor (1, Fig. 13-1) supplies compressed air for the system. The compressed air is stored in air reservoirs (17, 20, 21, Fig. 13-2), located under the operator's compartment deck. Air compressor output is regulated by a governor (9, Fig. 13-1) which is located between the compressor and the reservoir. Brake operation is controlled by two brake treadle valves (26 and 27, Fig. 13-2). When a brake treadle is depressed, a flow of compressed air is directed from the secondary reservoir (21) to the power clusters (14, 22 and 3, 7, Fig. 13-1). The air cylinders in the power clusters then act upon the hydraulic cylinder portions directing a flow of hydraulic fluid to the wheel cylinders in each brake assembly, applying the wheel brakes.

The system is equipped with a pair of automatic safety devices. If brake system air pressure drops to 414 kPa (60 psi), an audible warning will sound. If system pressure drops to 345 kPa (50 psi), the brakes will automatically apply.

(Continued on next Page)

DESCRIPTION - Continued

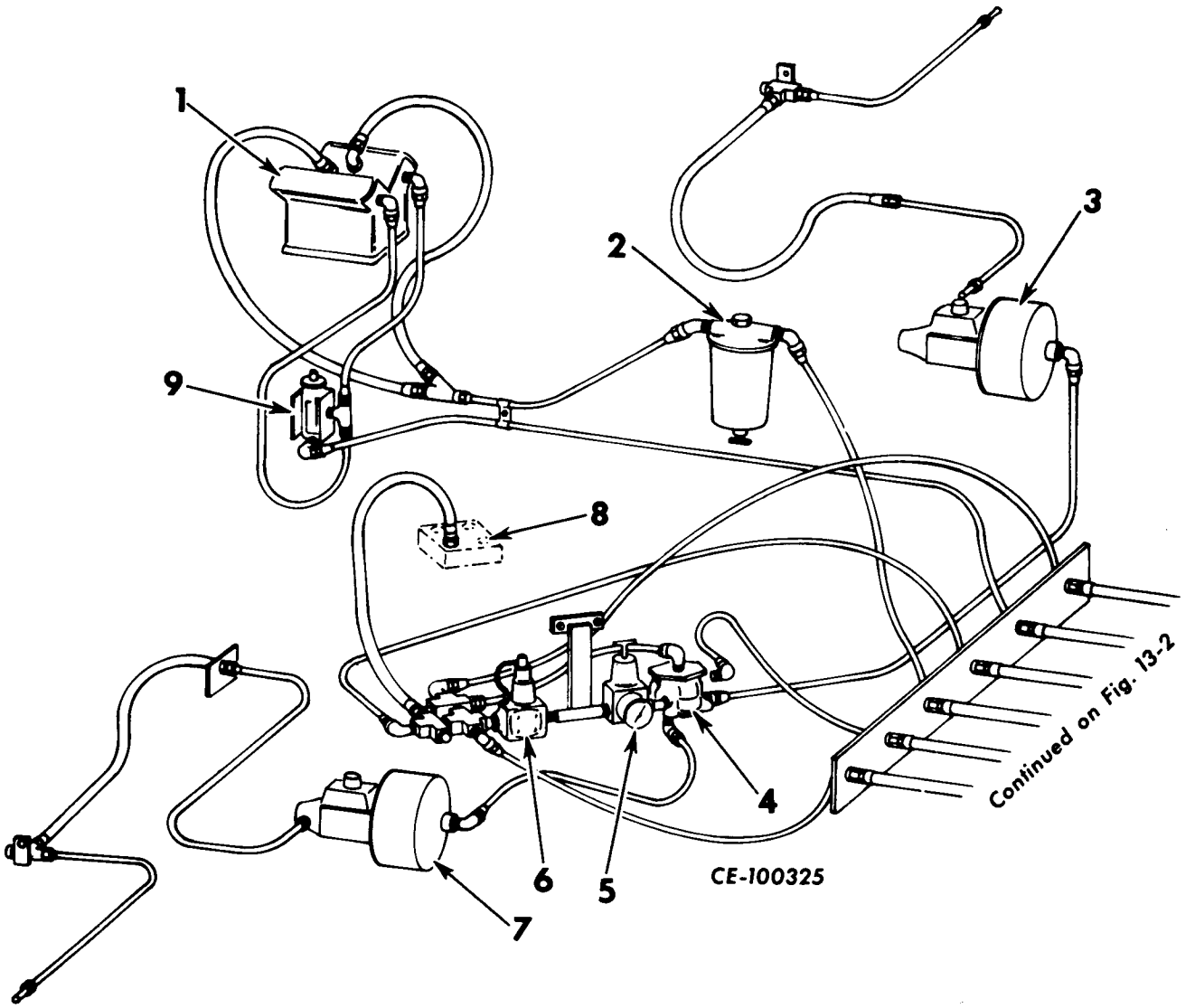


Figure 13-1
Rear Frame Air and Brake Lines (Early).

1. Air compressor.
*2. Alcohol injector.
3. Power cluster.
4. Relay valve.
5. Pressure regulator.
6. Solenoid valve.
7. Power cluster.
8. Transmission disconnect.
9. Governor.
10. Boom kickout valve.
11. Air horn valve.
12. Air pressure gauge.
13. Air horns.
14. Power cluster.
15. Safety valve.
16. "Wet" air reservoir.
17. Reservoir mounting "U" bolt.
18. Moisture ejector valve.
19. Reservoir drain cocks.
20. "Primary" air reservoir.
21. "Secondary" air reservoir.
22. Power cluster.
23. Relay valve.
24. Main valve boom spool.
25. Bucket leveler air supply.
26. Right treadle valve.
27. Left treadle valve.

* Optional

GENERAL INFORMATION

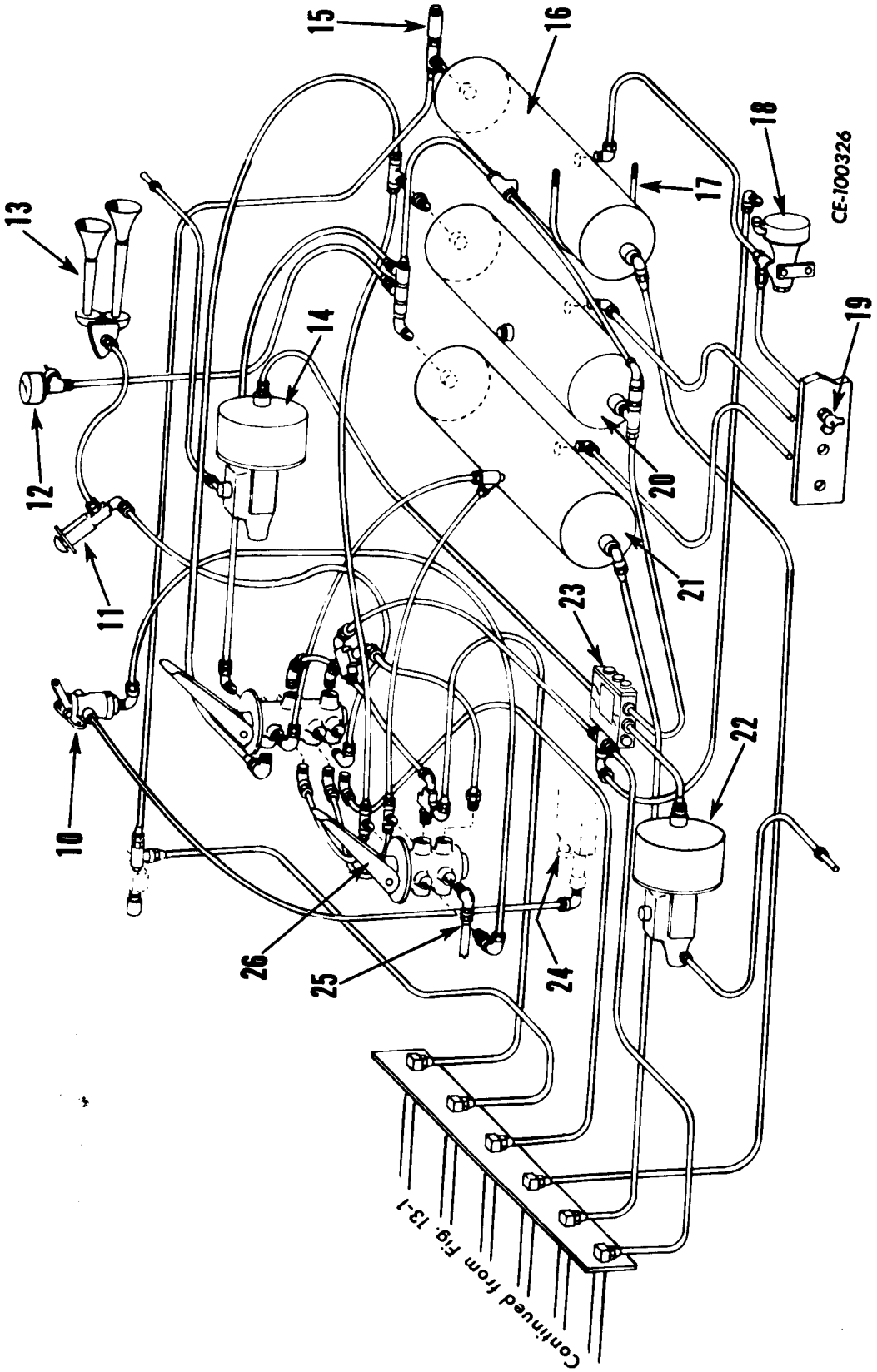


Figure 13-2
Front Frame Air and Brake Lines (Early).

GENERAL INFORMATION

DESCRIPTION - Continued

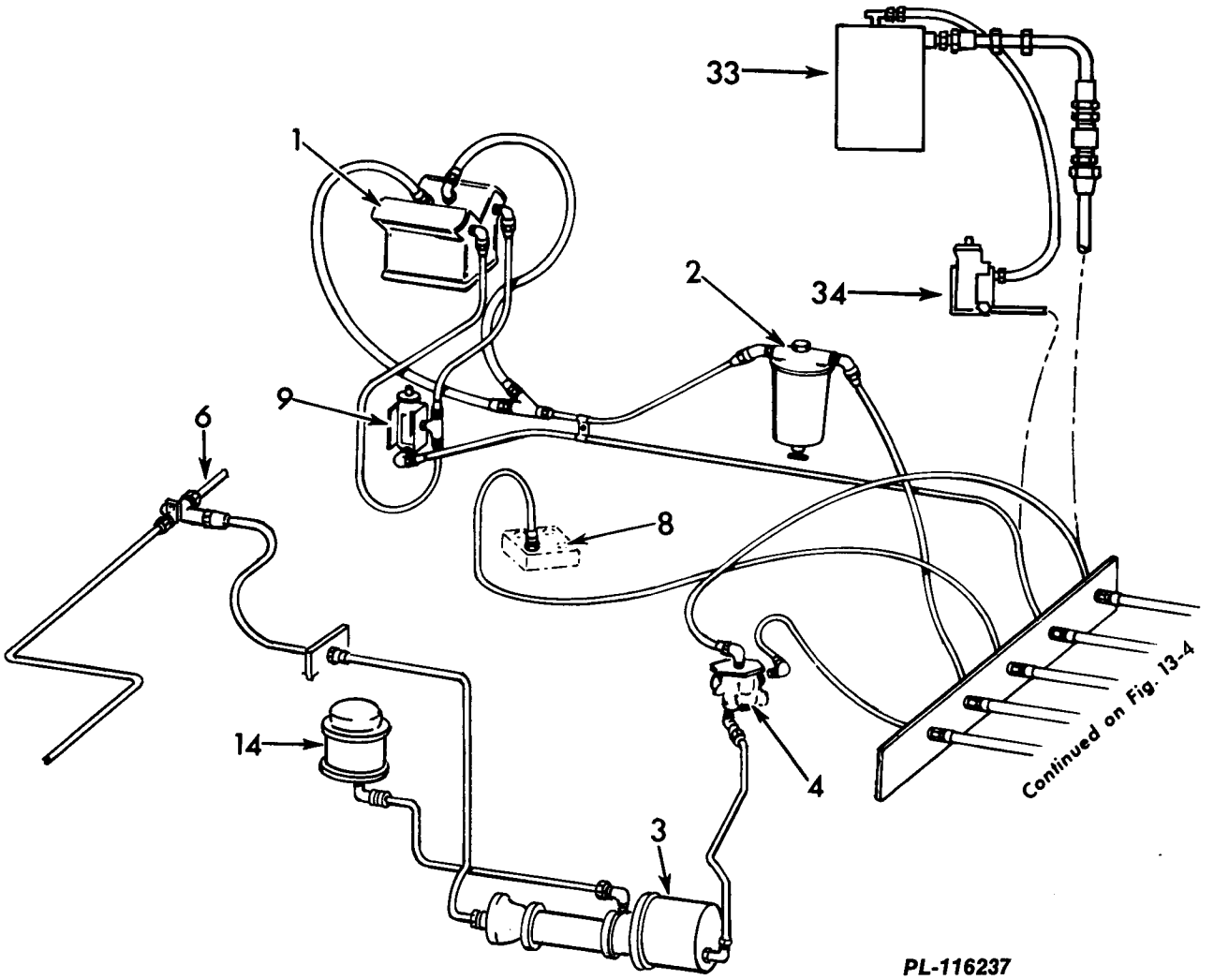


Figure 13-3
Rear Frame Air and Brake Lines (Late).

1. Air compressor (I.H.).
*2. Alcohol injector.
3. Power cluster.
4. Relay valve.
5. Check valve.
6. Line to axle brakes (rear).
7. Line to axle brakes (front).
8. Transmission disconnect.
9. Governor.
10. Boom kickout valve.
11. Air horn valve.
12. Air pressure gauge.
13. Air horns.
14. Power cluster reservoirs.
15. Safety valve.
16. "Wet" air reservoir.
17. Reservoir mounting "U" bolt.
18. Moisture ejector valve.
19. Reservoir drain cocks.
20. "Primary" air reservoir.
21. "Secondary" air reservoir.
22. Power cluster.
23. Relay valve.
24. Main valve boom spool.
25. Bucket leveler air supply.
26. Right treadle valve.
27. Left treadle valve.
28. Parking brake cylinder.
29. Parking brake valve.
30. Holding valve.
31. Transmission disconnect valve.
32. Parking brake light switch.
33. Cummins air compressor.
34. Cummins governor.

* Optional

GENERAL INFORMATION

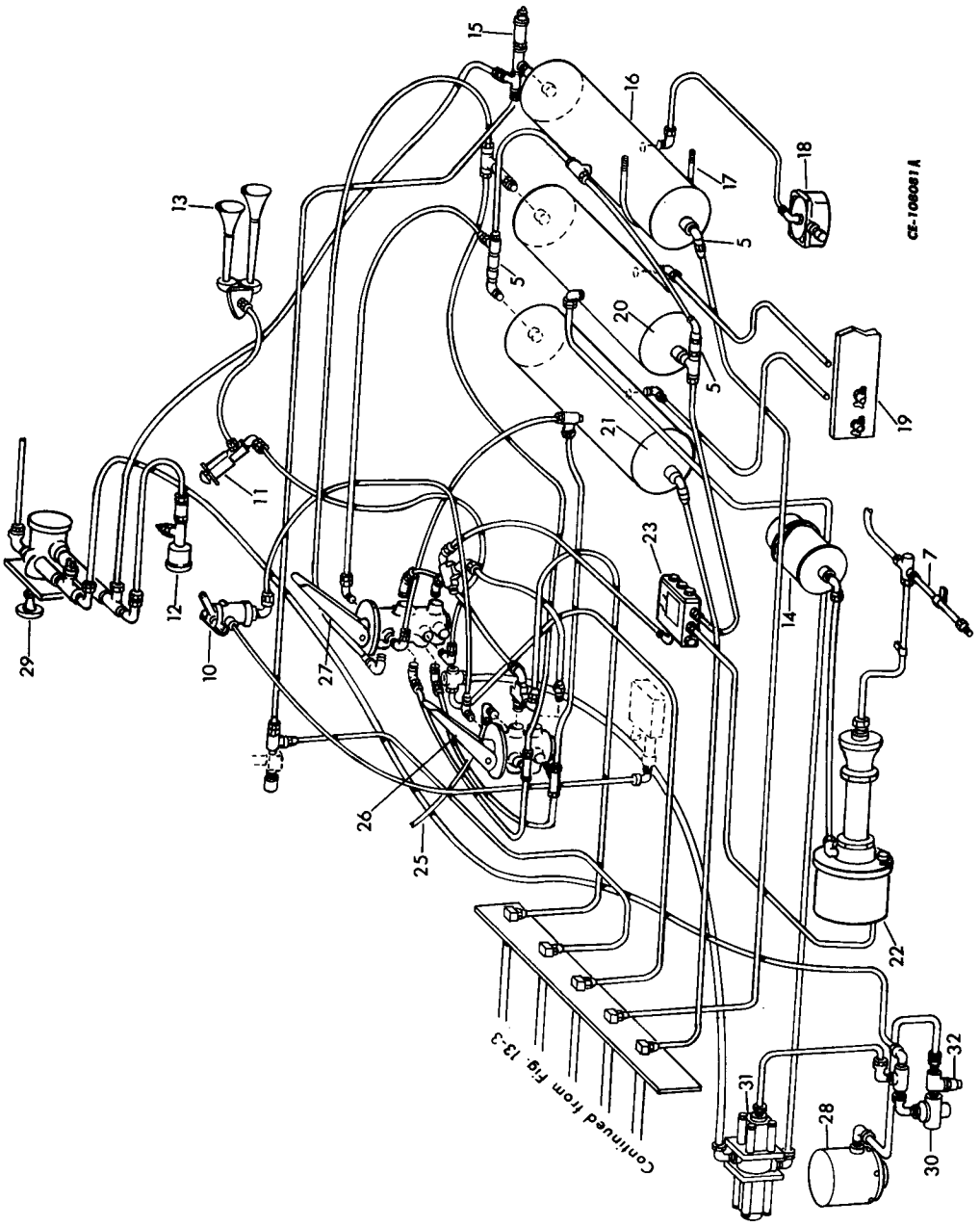


Figure 13-4
Front Frame Air and Brake Lines (Late).

DISASSEMBLY, INSPECTION AND ASSEMBLY

GENERAL

Disassembly, inspection, and assembly instructions for the tractor brake system are given in this section.

Before servicing any portion of the brake system, park the tractor on a level surface, preferably in an enclosure, and set the parking brake. The tractor wheels should also be blocked to prevent the tractor from rolling. Lower the bucket to ground level and shut down the engine. Release the air from the system by opening the reservoir drains.

GOVERNOR

Removal

The air system governor is mounted on the intercooler, just forward of the compressor, on the left side of the machine.

Disconnect and tag all air lines at governor. Remove mounting hardware and remove governor to a clean workbench for disassembly.

Disassembly

Clean governor exterior with a good cleaning solvent.

Remove pipe plugs and fittings from governor body.

Unscrew cover (3, Fig. 13-5). Using snap ring pliers, remove retaining ring (2) from governor body (4). Slide adjusting screws and spring assembly (1) from body.

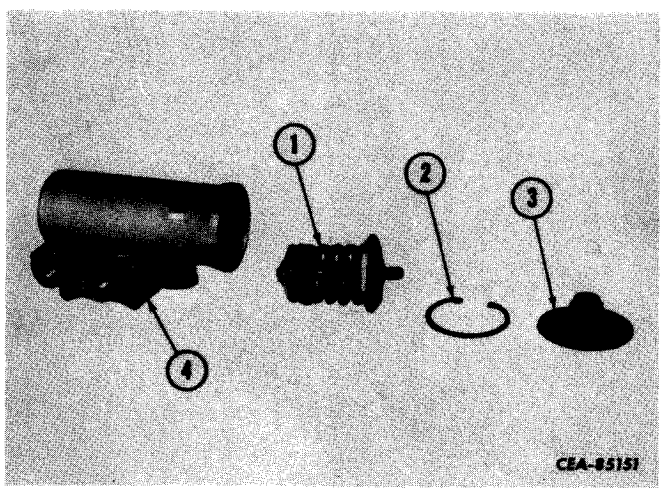


Figure 13-5
Remove Spring Assembly.

Remove lock nut (7, Fig. 13-6) from adjusting screw (1). Unscrew adjusting screw (1) from upper spring seat (6). Remove spring (5), lower spring seats (2 and 4), and guide (3).

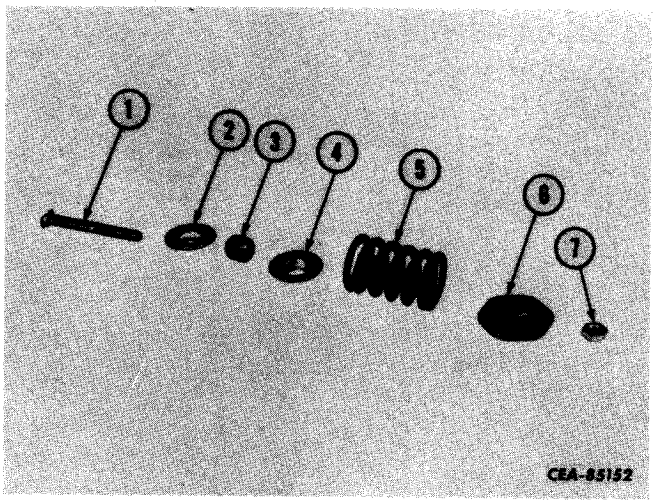


Figure 13-6
Spring Assembly.

Slide piston assembly (1, Fig. 13-5) out of governor body (2).

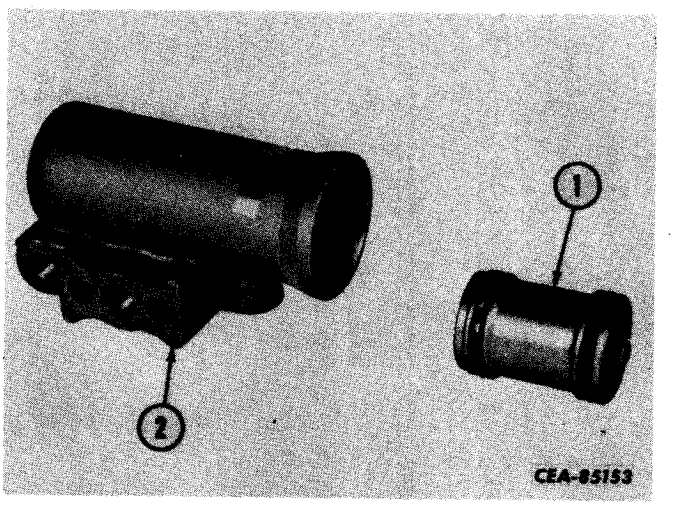


Figure 13-7
Remove Piston Assembly.

Remove "O" rings (1, Fig. 13-8) from piston (4). Remove spring (2) and valve (3). Slide exhaust stem (8), and spring (7) out of piston. Remove washer (6) and "O" ring (5).

DISASSEMBLY, INSPECTION AND ASSEMBLY

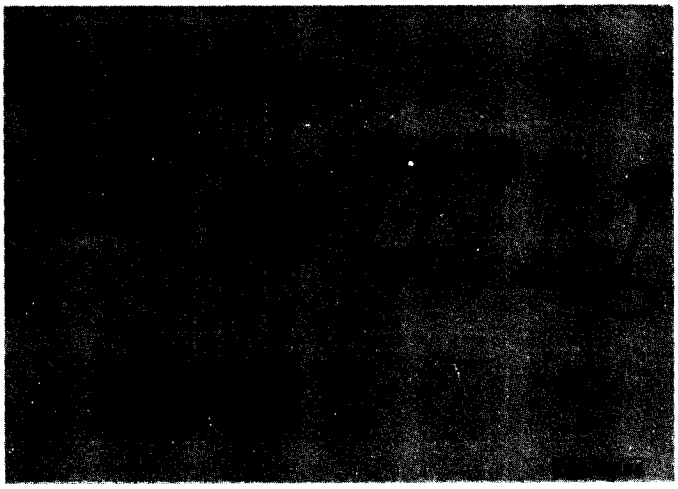


Figure 13-8
Piston Assembly.

Remove filter screens (1, Fig. 13-9) from ports (2) in governor body.

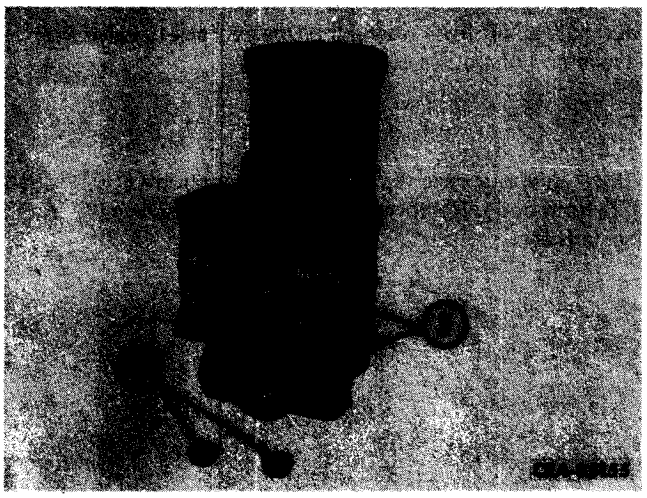


Figure 13-9
Remove Filter Screens.

Inspection

Clean and inspect all parts as follows:

a. Wash all metal parts in good cleaning solvent. Use compressed air to dry parts.

b. Inspect all parts for wear or damage. Check governor body for cracks or other damage. Be certain that all air passages in the body, piston, and exhaust stem are clean. Check springs for cracks or distortion. Replace all parts found to be worn or damaged.

c. Replace all "O" rings in the governor.

Assembly

Prior to assembly, lubricate lower body bore, top of piston, "O" rings, spring guide and adjusting screw with a good barium base grease.

Install exhaust stem "O" ring (5, Fig. 13-8) in piston (4) and cover with washer (6). Drop valve (3) into piston and install spring (2) with its small end towards valve (3). Press spring (2) in until its large coiled end snaps into groove in piston. Place exhaust stem spring (7) on stem (8) and install in piston. Place "O" rings (1) on piston.

Install piston assembly (1, Fig. 13-7) in governor body (2).

Install lower spring seat (2, Fig. 13-6), guide (3), and spring seat (4) on adjusting screw (1). Place spring (5), upper spring seat (6), and lock nut (7) on adjusting screw.

Screw upper spring seat down until dimension between adjusting screw head and upper spring seat is approximately 48 mm (1-7/8 in) (Fig. 13-10).

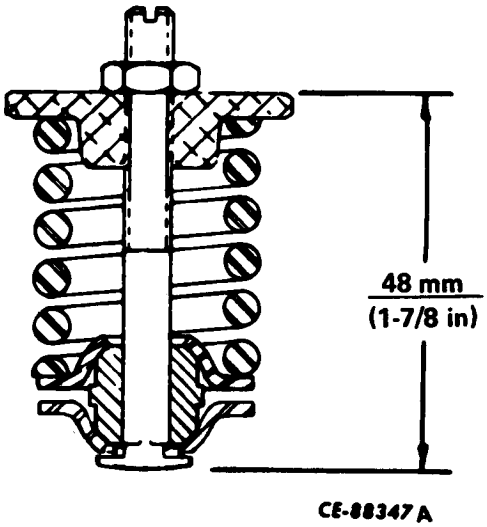


Figure 13-10
Governor Spring Adjustment.

Insert adjusting screw and spring assembly (1, Fig. 13-5) into governor body (4). Install retaining ring (2) with snap ring pliers. Screw cover (3) in place.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

GOVERNOR - Continued

Assembly - Continued

Install new filter screens (1, Fig. 13-9) in unloader and reservoir ports (2) in governor body. Screens can be inserted with blunt end of a pencil.

Install pipe plugs and fittings in proper ports in governor body. Coat pipe plugs with a small amount of Mar-Seal or a similar sealant before installing.

Installation

Install governor and secure with cap screws, lock washers and nuts. Attach air lines to port fittings as previously tagged.

Make final adjustments to governor as described under "ADJUSTMENT."

Adjustment

Temporarily install test gauge in place of instrument panel gauge.

Start tractor engine and build up air system pressure. Note pressure at which the governor cuts out. This pressure should be as listed in "SPECIFICATIONS." If cutout pressure is incorrect, shut down engine, remove governor cover, loosen coil nut and use a screwdriver to turn adjusting screw.

Turn adjusting screw clockwise to lower setting, and counter-clockwise to raise it. When proper adjustment is obtained, tighten lock nut and reinstall cover. Remove test gauge and connect panel gauge.

RESERVOIRS

Removal

Three air reservoirs (one "wet" and two "dry") are attached to the front bulkhead of the front frame by "U" bolts. With engine shut down, exhaust all air from system by opening reservoir drain-cocks located on lower edge of front frame right side-plate.

◆ CAUTION: DO NOT ALLOW DRAINING AIR TO STRIKE BARE SKIN.

Disconnect and tag all air line connections to reservoirs. Remove "U" bolts and lock nuts that secure reservoirs to frame.

Inspection

Clean and inspect reservoirs as follows:

a. Clean exterior and interior of reservoirs with hot water and steam.

b. Inspect exterior of reservoirs for damage or corrosion. A badly damaged reservoir should be replaced. Keep exterior of reservoir painted to retard corrosion.

c. Use water pressure to test air reservoirs for leaks, if tests are to be made at pressures higher than normal.

Installation

Attach reservoirs to frame with "U" bolts and new lock nuts. Connect previously tagged air lines to reservoirs. Be sure all connections are tight and leak-free.

SAFETY VALVE

Removal

Exhaust all air from reservoirs. Unscrew safety valve from tee at end of wet reservoir.

Disassembly

Unscrew spring cage (5, Fig. 13-11) from body (1). Lift ball (2) from body. Remove release pin (3) and spring (4) from spring cage.

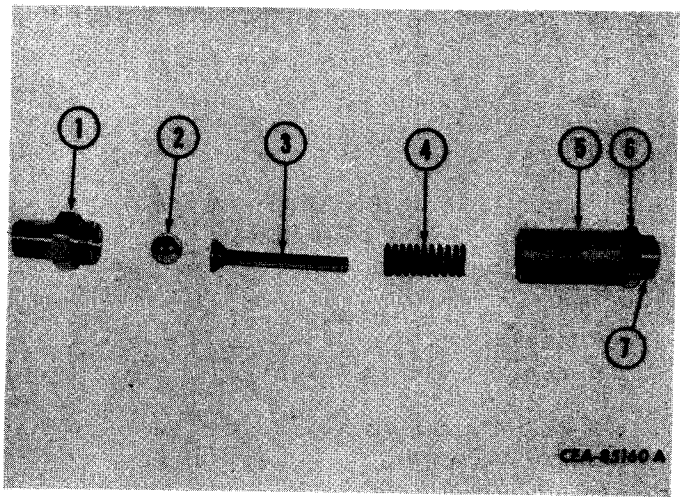


Figure 13-11
Spring Cage Assembly.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Inspection

Clean and inspect safety valve as follows:

a. Wash all parts in a good cleaning solvent. Use compressed air to dry parts.

b. Inspect ball for signs of pitting or scratches. If ball is damaged it should be replaced. Clean ball seat thoroughly.

c. Inspect body and spring cage for cracks, and replace if any are found.

d. Check that exhaust port in spring cage is not plugged.

NOTE: Special Torque, Pressure etc. recommendations are listed under "SERVICE INFORMATION." This simplifies revision when necessary. To eliminate constant referral, blank spaces are provided at points where special information is required. These may be filled by the manual holder, in pencil, and revised when necessary.

Assembly

Place spring (4, Fig. 13-11) on release pin (3) and insert them into spring cage (5). Place ball (2) in body (1). Position spring cage, release pin and spring over ball and screw cage into body. Tighten to recommended torque. (Refer to "SPECIAL TORQUES.")

Torque: _____

Adjustment

Using the necessary equipment, test and adjust safety valve as follows:

a. Pull on exposed end of safety valve release pin. This removes spring load from ball and permits valve to exhaust.

b. If valve does not "blow off" when this is done, ball is stuck on its seat. The valve should be removed and cleaned.

c. Coat exhaust port in spring cage with soap suds to test leakage. Leakage should not exceed a one inch soap bubble in five seconds at 621 kPa (90 psi).

d. The safety valve should be set to "blow off" at approximately 1034 kPa (150 psi). The setting may be adjusted by loosening lock nut (6, Fig. 13-10) and turning adjusting screw (7).

e. Turn adjusting screw clockwise to raise pressure setting. Turn adjusting screw counterclockwise to lower setting.

f. Tighten lock nut after each adjustment.

Installation

Screw safety valve into tee in reservoir.

TREADLE VALVES

Removal

Completely exhaust all air from reservoirs. Disconnect all air line connections to treadle valve (26, 27, Fig. 13-2). Tag all lines so they will connect properly at installation.

Disconnect any treadle fittings that would prevent treadle removal through cut-out in floorboard. Remove hardware securing treadle to floorboard. Remove treadle valve.

NOTE: Treadle valve furthest to left of operator has one section more than right hand valve. This extra "Tandemergency" section provides for automatic application of vehicle brakes in case of air failure. The following disasembly instructions up to and including removal of plunger boot (Fig. 13-14) are applicable for both valves.

Disassembly

Clean outside of treadle valve with a good grade cleaning solvent.

Place treadle valve on a clean workbench.

Remove cotter pin from fulcrum pin (2, Fig. 13-12). Drive out fulcrum pin securing treadle (1) to mounting plate (3). Remove treadle assembly.

(Continued on next page)

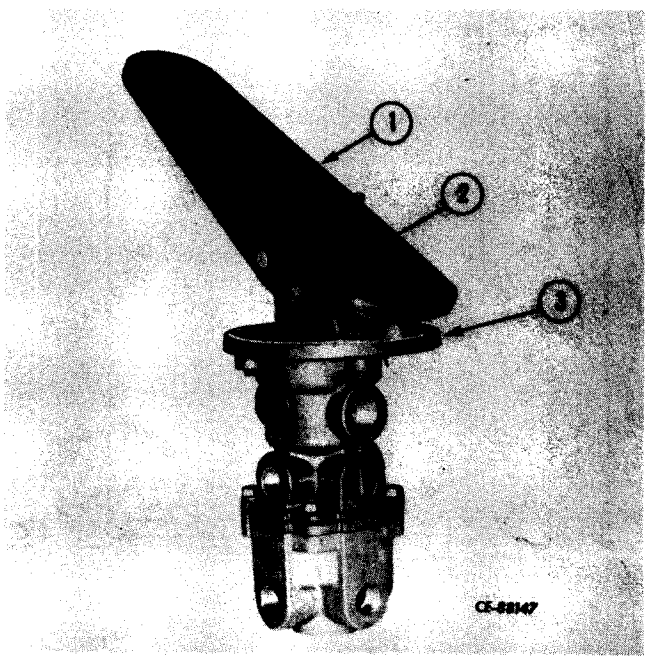


Figure 13-12
Remove Treadle.

DISASSEMBLY, INSPECTION AND ASSEMBLY

TREADLE VALVES - Continued

Disassembly - Continued

Remove cotter pin (2, Fig. 13-13) from roller pin (3). Remove roller pin from treadle (1). Remove roller (3).

Figure 13-13
Treadle Assembly.

Remove rubber boot (1, Fig. 13-14) from plunger (2) and mounting plate (4). Remove treadle stop nut and set screw (3) from mounting plate.

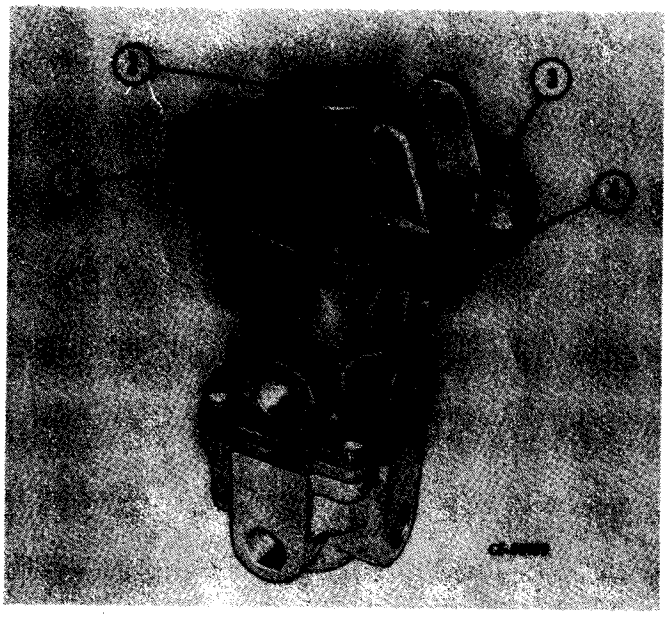


Figure 13-14
Remove Boot.

RIGHT TREADLE VALVE - Remove plunger (2, Fig. 13-15) from mounting plate(1).

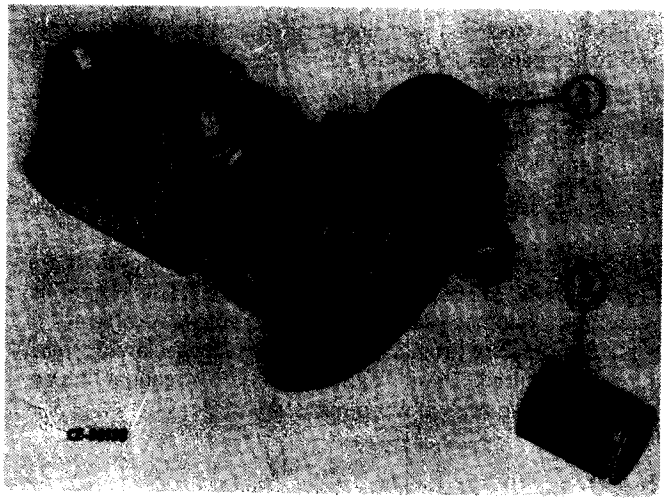


Figure 13-15
Remove Plunger.

BOTH VALVES - Punch mark mounting plate (2, Fig. 13-16) and body (1) for reference at assembly.

Remove screws (3) that secure mounting plate (2) to body (1). Remove mounting plate.

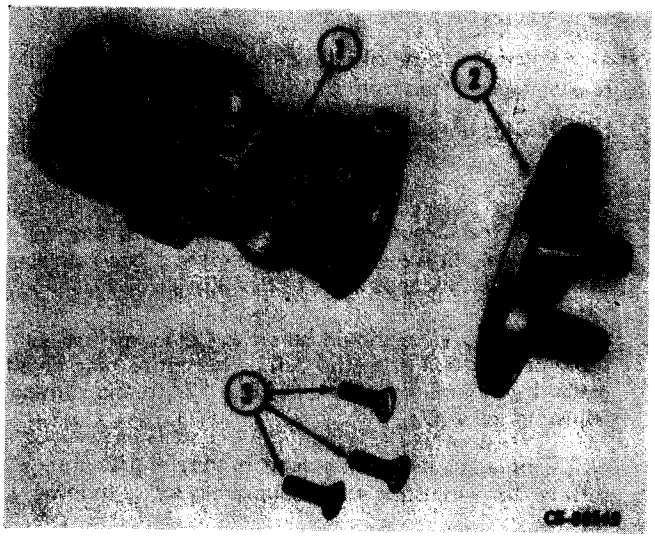


Figure 13-16
Remove Mounting Plate.

LEFT TREADLE VALVE - The following instructions are for the extra "Tandemergency" section only.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Punch mark section and body for assembly reference. Carefully remove hardware (4, Fig. 13-17) securing section (3) to body (1). Remove gasket (2).

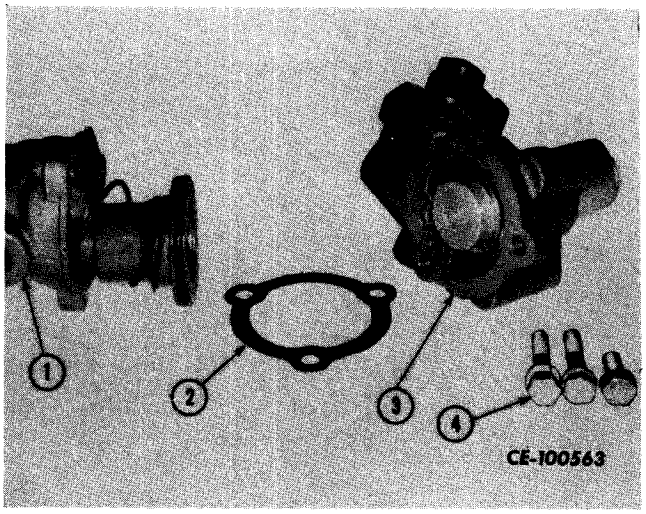


Figure 13-17
Remove Section.

Remove plugs (5, Fig. 13-18) from section (1). Do not damage copper washers (3). Remove screens (4) and springs (2) from plugs. Remove snap ring (6) with snap ring pliers. Spring (8) and seat (7) will pop out.

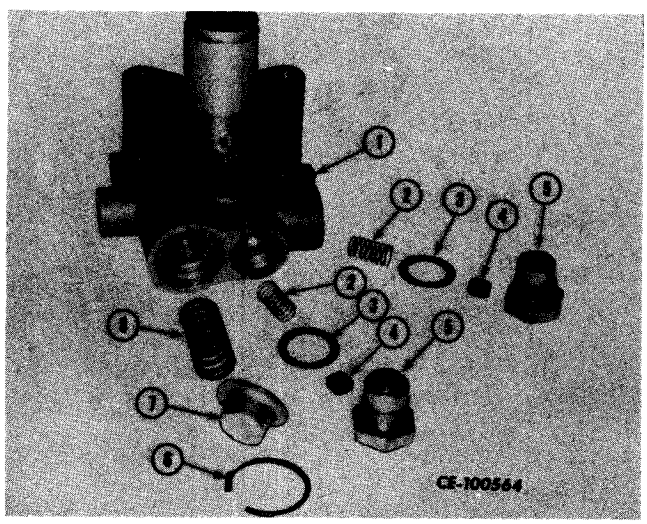


Figure 13-18
Section Assembly.

Push plunger (2, Fig. 13-19) down through section (1) to remove. Remove and discard seal ring from plunger. Tap section sharply on wooden block to pop valve (3) out of section. Discard valve "O" rings (4).

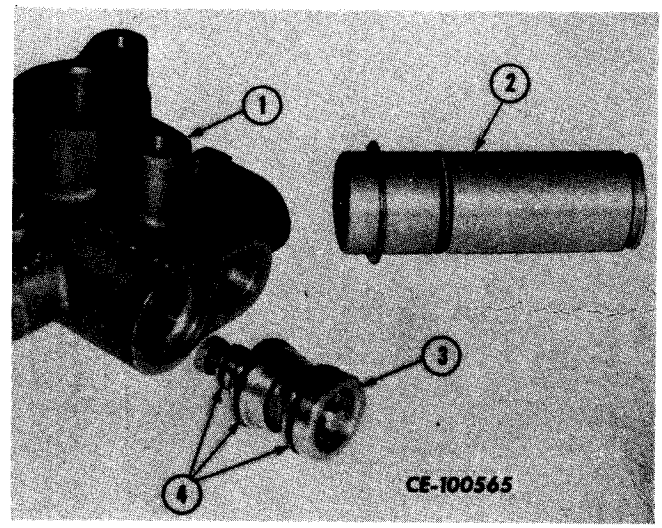


Figure 13-19
Remove Valve.

BOTH VALVES - Depress primary piston assembly (3, Fig. 13-20) and remove retaining ring (4). Remove piston assembly and spring (2) from upper body (1).

NOTE: Retaining ring (4) not used in "Tandemergency" valve.

(Continued on next page)

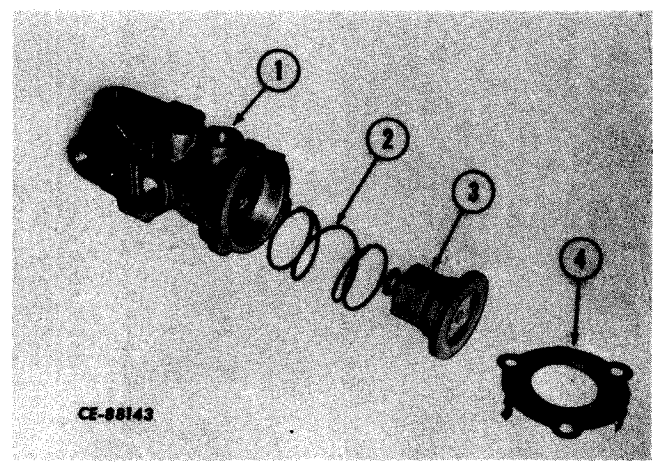


Figure 13-20
Remove Piston Assembly.

DISASSEMBLY, INSPECTION AND ASSEMBLY

TREADLE VALVES - Continued

Disassembly - Continued

Using snap ring pliers, remove retaining ring (5, Fig. 13-21). Remove spring retainer (4) and spring (3) from piston (1). Discard "O" ring (2) from groove in piston.

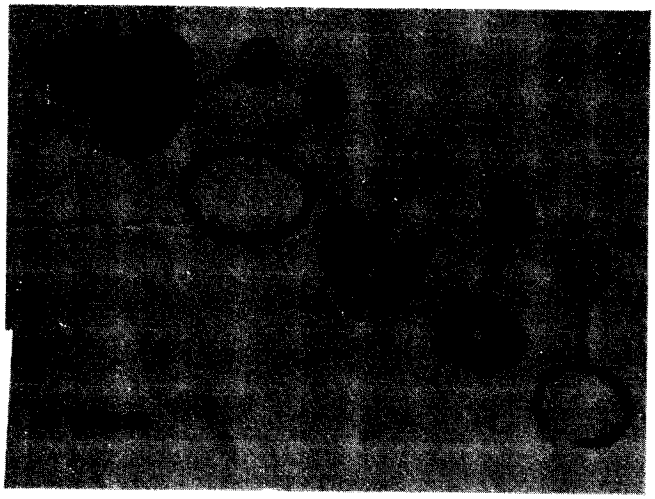


Figure 13-21
Piston Assembly.

Punch mark upper and lower body for assembly reference. After removing cap screws (6, Fig. 13-22) separate upper valve body (5) from cover (2) and lower valve body (1). Remove push rod (3) and push rod guide (4).

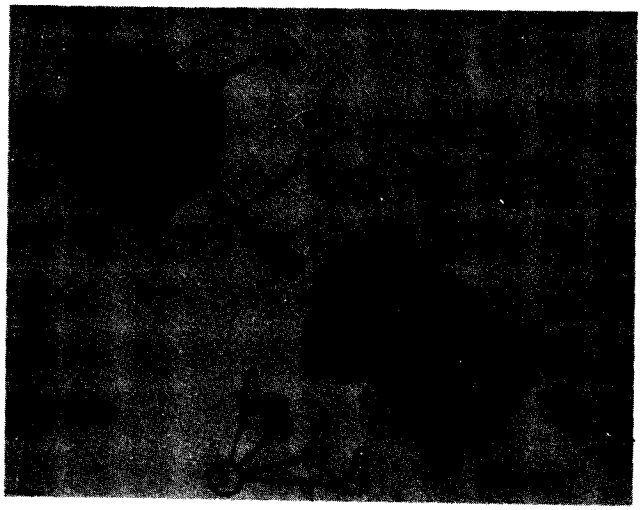


Figure 13-22
Separate Bodies.

Having removed and separated push rod (7, Fig. 13-23) and push rod guide (6), remove primary inlet valve guide (5) from upper valve body (1). Discard seal (4) from outer groove of valve guide (5) and packing from inner groove. Separate primary inlet spring (3) and valve (2).

Figure 13-23
Remove Valve.

Punch mark valve body (1, Fig. 13-24) and cover (7). Remove cover (7) from lower valve body (1). Discard seal (6) from groove in cover. Remove secondary piston (4) from body. Discard small "O" ring (5) and large "O" ring (3) from grooves in piston. Remove spring (2) from body.

Figure 13-24
Remove Piston.

Using snap ring pliers, remove retaining ring (1, Fig. 13-25). Remove exhaust shield (2) and inlet and exhaust valve assembly (3) from lower body (4).

DISASSEMBLY, INSPECTION AND ASSEMBLY

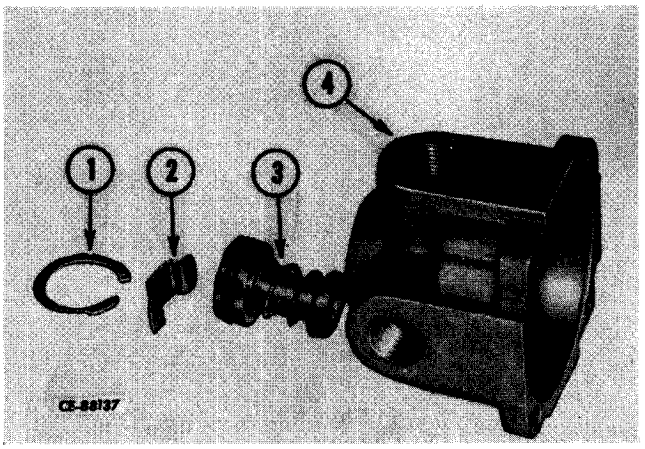


Figure 13-25
Remove Valve.

Disassemble valve assembly (3, Fig. 13-25) by removing inlet valve (6, Fig. 13-26), spring (5), valve guide (4) and seal (3) from shield retainer (1). Remove vee packing (2) from groove in retainer. Discard seal (3).

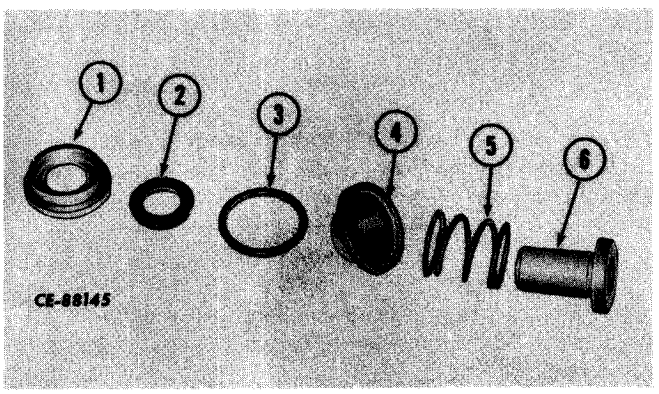


Figure 13-26
Valve Assembly.

Inspection

Clean and inspect the treadle valves as follows:

a. Clean all parts in good cleaning solvent using compressed air to dry parts.

b. Wipe all rubber parts clean.

c. Inspect valve seats for nicks and burrs.

d. Check springs for cracks, distortion or corrosion.

e. Check exhaust valve diaphragm for flexibility, wear, and deterioration.

f. Replace all "O" rings, seals, gaskets and parts found to be worn or damaged.

Assembly

Lightly lubricate piston, valve bores, and "O" rings prior to assembly.

Install vee packing (2, Fig. 13-26) in groove of shield retainer (1). Install a new seal (3) and guide (4) on retainer. Insert inlet valve (6) into spring (5), guide and retainer.

Insert inlet and exhaust valve assembly (3, Fig. 13-25) and exhaust shield (2) into lower body (4) and secure with retaining ring (1).

Install a new large "O" ring (3, Fig. 13-24) and a new small "O" ring (5) on secondary piston (4). Install new seal (6) on cover (7). Insert spring (2), piston and cover into lower body (1). Match previously made punch marks.

Install new seal (4, Fig. 13-23) in outer groove and packing in inner groove of valve guide (5). Insert primary inlet valve (2) into spring (3) and valve guide (5) and insert into upper valve body (1). Slip push rod guide (6) and push rod (7) into valve in upper valve body.

Align previously made punch marks and secure lower body (1, Fig. 13-22), cover (2) and upper body (5) with cap screws and lock washers (6).

Install a new "O" ring (2, Fig. 13-21) in groove on primary piston (1). Insert spring (3) and retainer (4) into piston and secure with retaining ring (5).

RIGHT TREADLE VALVE - Insert spring (2, Fig. 13-20) and primary piston assembly (3) into upper body (1) and secure with retaining ring (4).

LEFT TREADLE VALVE - The following is for the "Tandemergency" section only.

Install new "O" rings (4, Fig. 13-19) on valve (3) and carefully insert into bore of section (1). Install new seal ring on plunger (2) and slide plunger into section, from bottom up. Replace plunger snap ring if required.

Insert screens (4, Fig. 13-18) into plugs (5). Seat them with a blunt stick or pencil eraser. Slip copper washers (3) over plugs. Seat springs (2) in plugs and install in proper bores

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

TREADLE VALVES - Continued

Assembly - Continued

in section (1). Tighten plugs securely. Slide spring (8) onto spring seat of valve. Place spring seat (7) over spring and compress spring and seat. Install snap ring (6) while holding compressed spring and seat. Install spring (2, Fig. 13-20) and primary piston assembly (3) into valve body (1, Fig. 13-17). Position new gasket (2) on body. Align punch marks on body and section (3), compress spring and install hardware (4). Tighten cap screws evenly and securely.

BOTH VALVES - Place mounting plate (2, Fig. 13-16) on valve body (1), aligning punch marks made at disassembly, and secure with screws (3).

Insert plunger (2, Fig. 13-15) into mounting plate (1) of right-hand treadle valve.

Install treadle stop nut and set screw (3, Fig. 13-14) in mounting plate (4). Install rubber boot (1) over plunger (2).

Place roller (3, Fig. 13-13) in treadle (1). Insert roller pin (4) through treadle and roller and secure with cotter pin (2).

Place treadle assembly (1, Fig. 13-12) on mounting plate (3) and insert fulcrum pin (2). Align holes in treadle and fulcrum pin and insert cotter pin.

Installation

Install treadle through opening in floorboard and secure with cap screws and nuts.

Install pipe plugs and pipe fittings in treadle valve ports from which they were removed.

Connect air lines to proper ports on valve.

DOUBLE CHECK VALVES

Removal

Completely exhaust all air from reservoirs. Disconnect and tag air lines at double check valves, located at both treadle valves, the front relay valve and pipe cross at the air solenoid valve.

Unscrew valves from components. Remove reducing nipples from valves.

Disassembly

Remove cap (4, Fig. 13-27) and gasket (3). Slide seat (?) from body (1). Remove plug (5). Discard gasket (3).

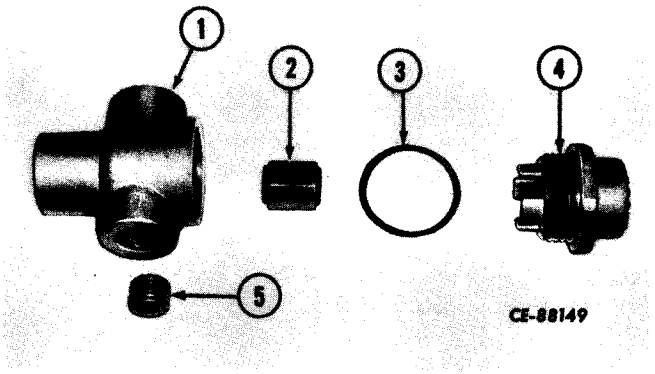


Figure 13-27
Check Valve.

Inspection

Clean and inspect double check valve as follows:

a. Wash all metal parts in good cleaning solvent. Use compressed air to dry parts.

b. Inspect seat for damage.

c. Inspect body and end cap for signs of wear or damage.

d. Replace gasket and any parts found to be damaged.

Assembly

Lightly oil seat (2, Fig. 13-31) prior to assembly. Insert seat in body (1). Place new gasket (3) on cap (4) and install in body (1). Install plug (5) in body.

Installation

Thread nipples into valves and then into their mounting components. Connect previously tagged air lines. Be sure all connections are tight.

MOISTURE EJECTOR VALVE (EARLY MODELS ONLY)

Removal

Completely exhaust all air from reservoirs. Disconnect and tag air lines at moisture ejector valve (18, Fig. 13-2) located on inside of lower right front frame below reservoirs. Remove hardware securing valve to bulkhead. Place valve on a clean workbench.

Disassembly

Remove cap (6, Fig. 13-28), gasket (7), spring (8) and valve (9). Remove cap screws (3) and lock washers (2). Separate body (1), diaphragm (4), body (5) and diaphragm (13) from the main body (10). Remove nut (11), push rod (14) and two washers (12) from diaphragm (13).

DISASSEMBLY, INSPECTION AND ASSEMBLY

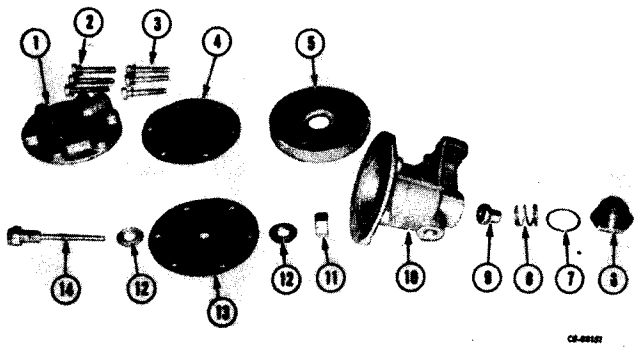


Figure 13-28
Moisture Ejector.

Inspection

Clean and inspect valve as follows:

a. Wash all metal parts in a good grade cleaning solvent. Use compressed air to dry parts.

b. Inspect diaphragms for signs of wear or damage.

c. Check valve (9) and spring (8) for wear or damage.

d. Replace gasket and any parts found to be damaged.

Assembly

Install washer (12, Fig. 13-28), diaphragm (13), washer (12) and nut (11) on push rod (14). Place diaphragm (13), body (5), diaphragm (4) and body (1) on main body (10). Secure in place with cap screws (3) and lock washers (2). Install valve (9), spring (8), gasket (7) and cap (6) in top of body (10).

Installation

Secure valve to frame sidewall with appropriate hardware. Connect previously tagged lines to valve. Be sure all connections are tight.

POWER CLUSTERS (WAGNER ELECTRIC)

Removal

Completely exhaust all air from reservoirs. Disconnect air and hydraulic lines from cluster to be removed. If right front unit is to be removed, remove stop light switch wires.

Remove hardware securing power cluster to mounting and remove unit to a clean workbench.

Disassembly

Remove hydraulic cylinder filler cap and drain hydraulic fluid.

Wash exterior of power cluster with a good grade cleaning solvent.

Remove cap screws and lock washers (2, Fig. 13-29) that attach hydraulic cylinder (1) to bracket (3).

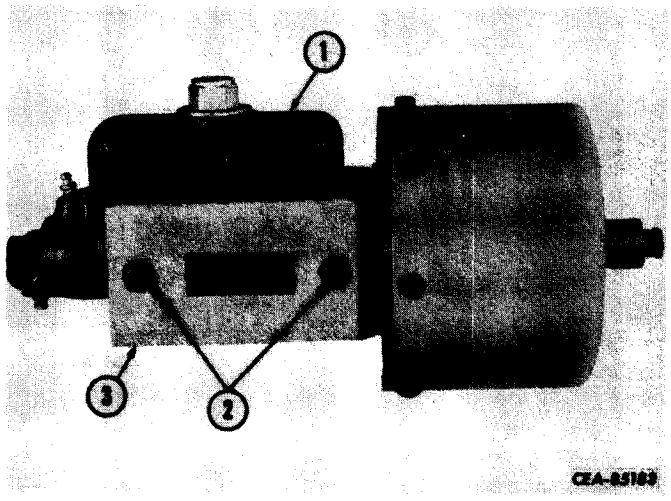


Figure 13-29
Power Cluster Mounting.

Remove mounting studs (3, Fig. 13-30) that attach hydraulic cylinder (2) to bracket (1). Remove hydraulic cylinder.

(Continued on next page)

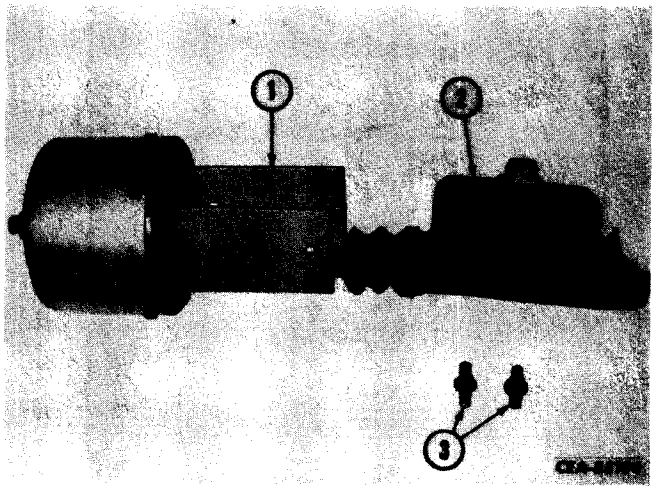


Figure 13-30
Remove Cylinder.

DISASSEMBLY, INSPECTION AND ASSEMBLY

POWER CLUSTERS (WAGNER ELECTRIC) - Continued

Disassembly - Continued

Remove cap screws and lock washers (2, Fig. 13-31) that secure bracket (1) to air cylinder (3). Remove bracket.

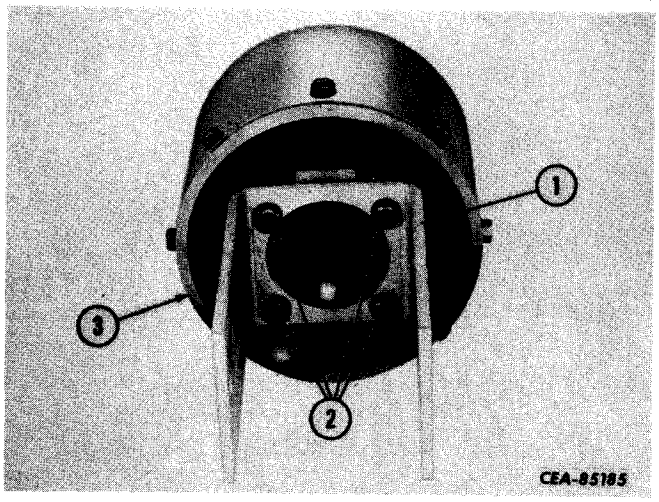


Figure 13-31
Remove Bracket.

Remove cap screws and lock washers (4, Fig. 13-32) that fasten shell (1) to head (3). Remove head and piston return spring (2).

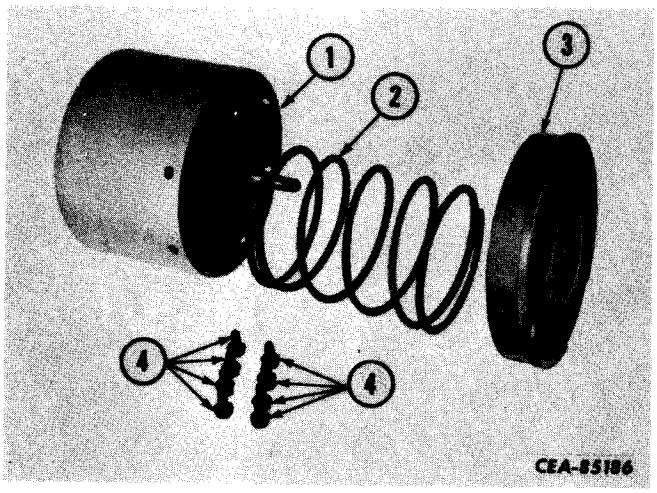


Figure 13-32
Remove Head.

Slide piston and rod assembly (2, Fig. 13-33) out of shell (1).

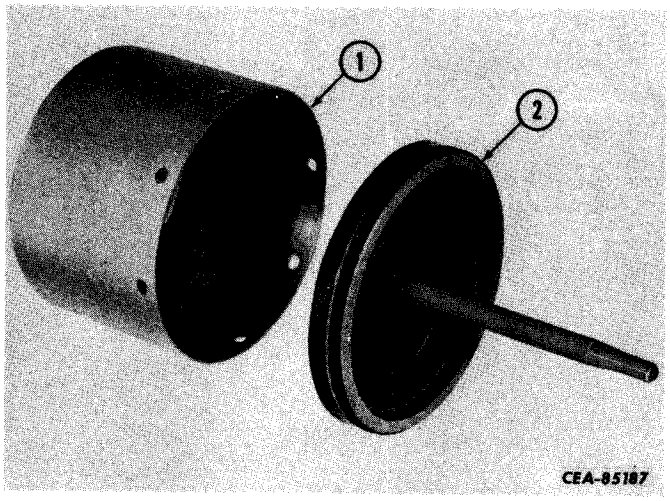


Figure 13-33
Remove Piston.

Remove air cylinder piston cup (3, Fig. 13-34) and wiper (2) from piston (1).

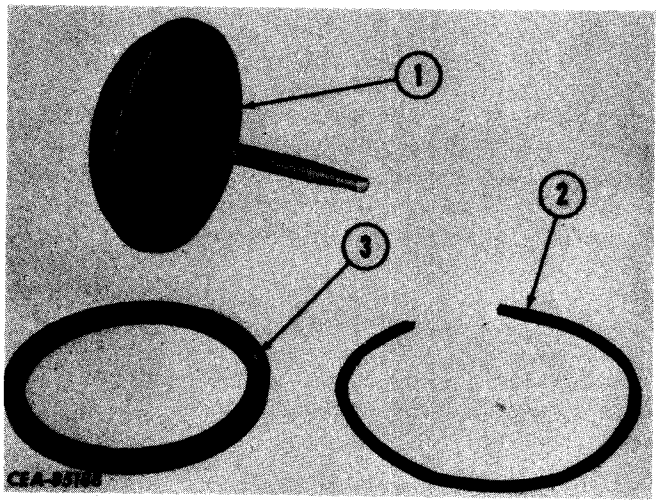


Figure 13-34
Dismantle Piston.

Separate piston rod boot (2, Fig. 13-35) from hydraulic cylinder (1).

DISASSEMBLY, INSPECTION AND ASSEMBLY

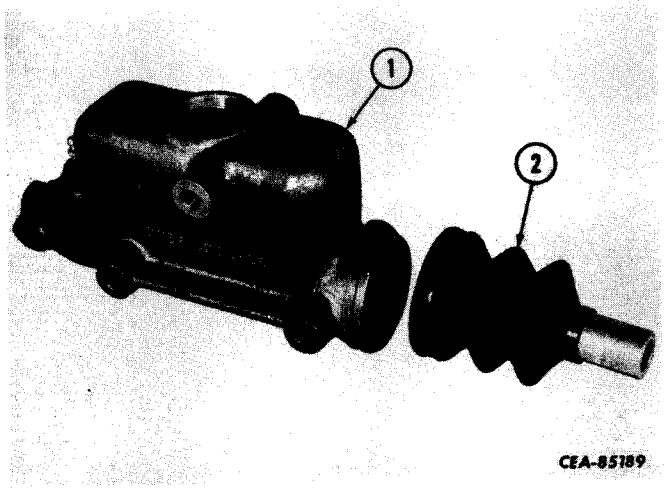


Figure 13-35
Remove Boot.

Using snap ring pliers, remove snap ring (7, Fig. 13-36). Slide piston stop plate (6), piston (5), primary cup (4), and piston return spring (3) out of body (1). Check valve (2) will come out with return spring.

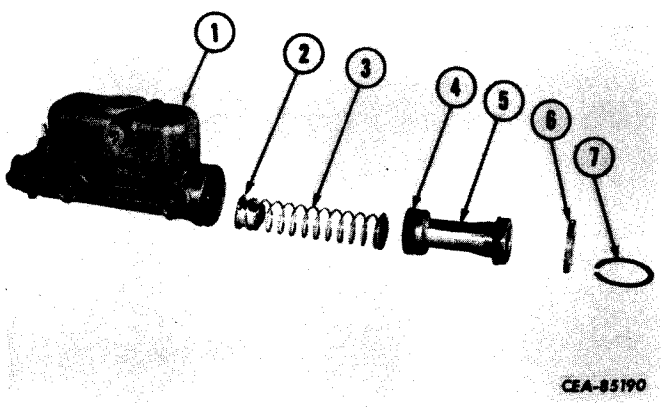


Figure 13-36
Remove Piston.

Remove secondary cup (1, Fig. 13-37) from piston (2).

Separate check valve and seat (1, Fig. 13-38) and spring (2) from valve retainer (3).

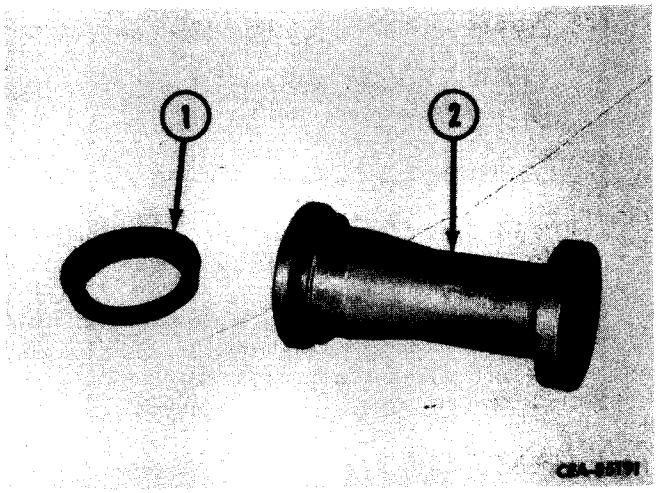


Figure 13-37
Piston Assembly.

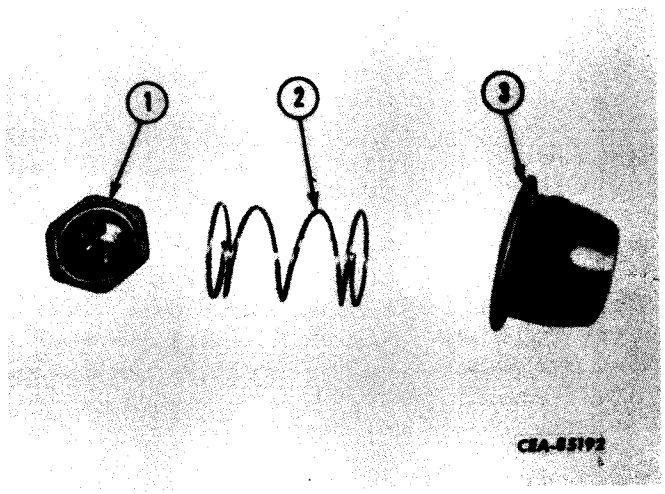


Figure 13-38
Check Valve.

Inspection

Clean and inspect power cluster as follows:

a. Clean all air cylinder metal parts in a good grade cleaning solvent. Use compressed air to dry parts.

b. Inspect air cylinder piston cup and felt for wear or deterioration. Replace as necessary.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

POWER CLUSTERS (WAGNER ELECTRIC) - Continued

Inspection - Continued

c. Clean hydraulic cylinder parts in alcohol.

d. Inspect cylinder bore to be certain that it is smooth. It may be necessary to hone cylinder to obtain a smooth finish.

e. After honing cylinder, wash cylinder in clean alcohol. Check that compensating port (smaller hole in bottom of reservoir) is open by inserting a wire through it.

f. Check filler cap gasket for wear or damage.

g. Replace screens and filter in air cylinder head if necessary. Use a drift to drive old screens and filter out of head. Insert a new inner screen, filter, and a new outer screen in head.

Assembly

Before assembling hydraulic cylinder parts, they should be dipped in hydraulic brake fluid.

Place spring (2, Fig. 13-38) in valve retainer (3). Insert check valve and seat (1) into retainer.

Install secondary cup (1, Fig. 13-37) on piston (2).

Install check valve assembly (2, Fig. 13-36) in end of piston return spring (3). Insert spring into body (1). Place primary cup (4) on opposite end of spring. Place spring check valve and cup in body (1). Insert piston (5), cup end first, into body. Install stop plate (6) and snap ring (7).

Attach boot (2, Fig. 13-35) to end of cylinder body (1).

Lubricate air cylinder cup (3, Fig. 13-34) and wiper (2) with light oil and install them on the piston and rod assembly (1).

Insert piston and rod assembly (2, Fig. 13-33) into shell (1).

Place piston return spring (2, Fig. 13-32) in shell (1). Insert head (3) into shell and secure with cap screws and lock washers (4).

Place bracket (2, Fig. 13-39) on shell (1) and secure with cap screws and lock washers (3).

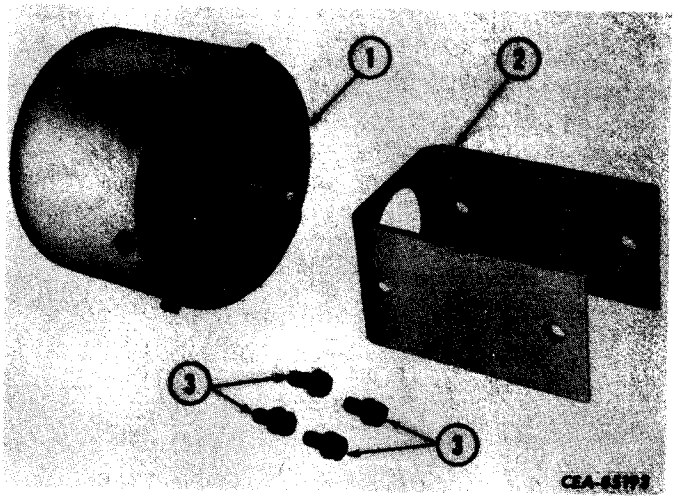


Figure 13-39
Install Bracket.

Place hydraulic cylinder (2, Fig. 13-30) in bracket (1). Be certain that plunger on air cylinder fits in metal grommet in boot on hydraulic cylinder. Install and tighten mounting studs (3).

Install and tighten cap screws and lock washers (2, Fig. 13-29) that secure hydraulic cylinder (1) to bracket (3).

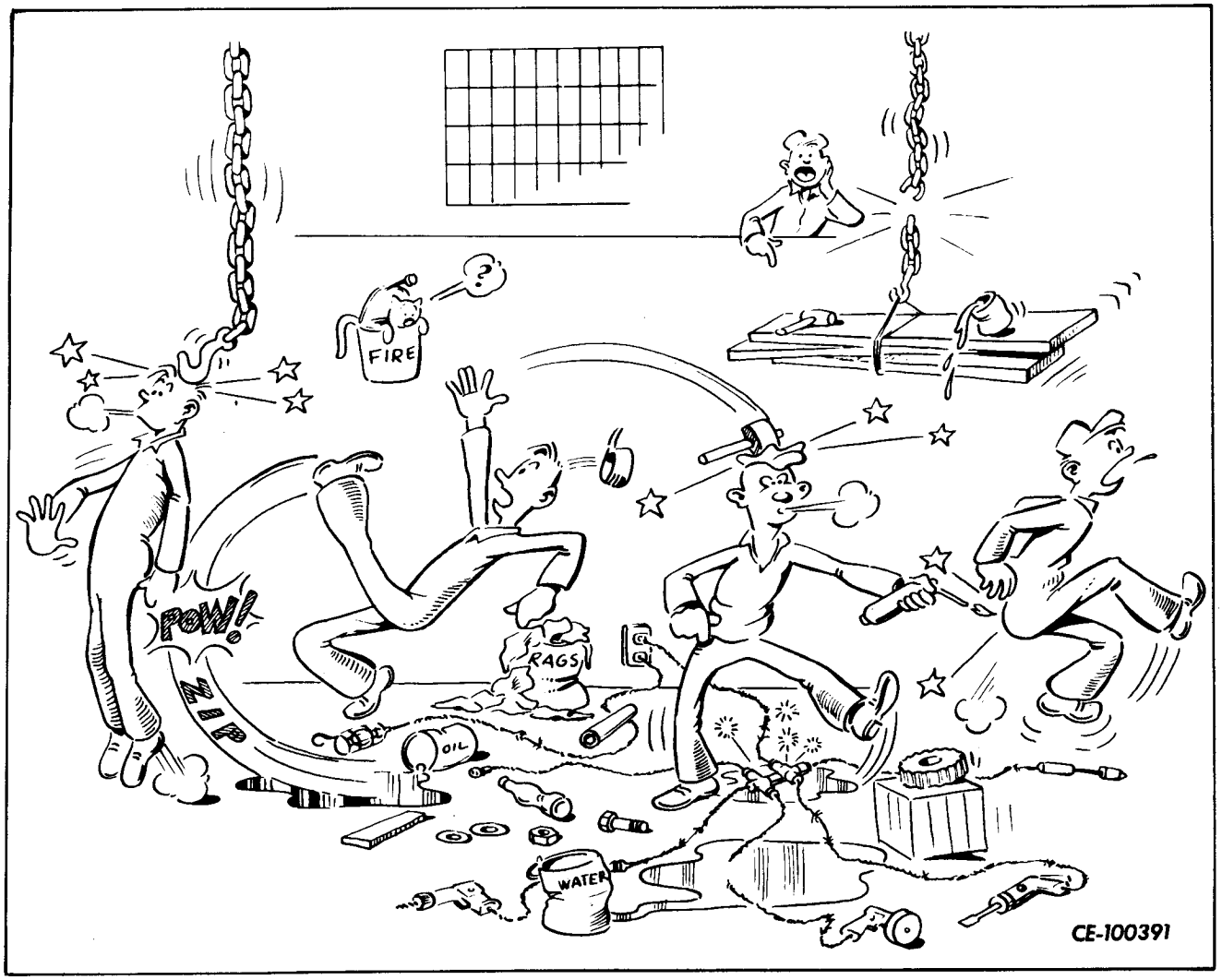
Installation

Place power cluster on tractor frame and fasten with mounting hardware. Connect air line and hydraulic line to power cluster.

If the right front power cluster was removed, connect stop light switch wires.

Fill power cluster reservoir with hydraulic fluid. Bleed hydraulic circuit as described in this section under "BLEED HYDRAULIC BRAKE CIRCUIT."

DISASSEMBLY, INSPECTION AND ASSEMBLY



"SAFETY IS EVERYONE'S BUSINESS."

Figure 13-40

POWER CLUSTERS (MIDLAND-ROSS)

Removal

Open the air line to the power duster slightly and allow the air present to discharge.

Disconnect the air line.

Disconnect the line to the brake cylinders.

Disconnect the line from the reservoir and catch the hydraulic fluid in a clean container for reuse if desired.

Remove the mounting hardware and remove the power cluster from the machine.

Disassembly

Disassemble the component parts in the sequence indicated by the reference numbers in Figure 13-41.

(Continued on next page)

POWER CLUSTERS (MIDLAND-ROSS) - Continued

Disassembly - Continued

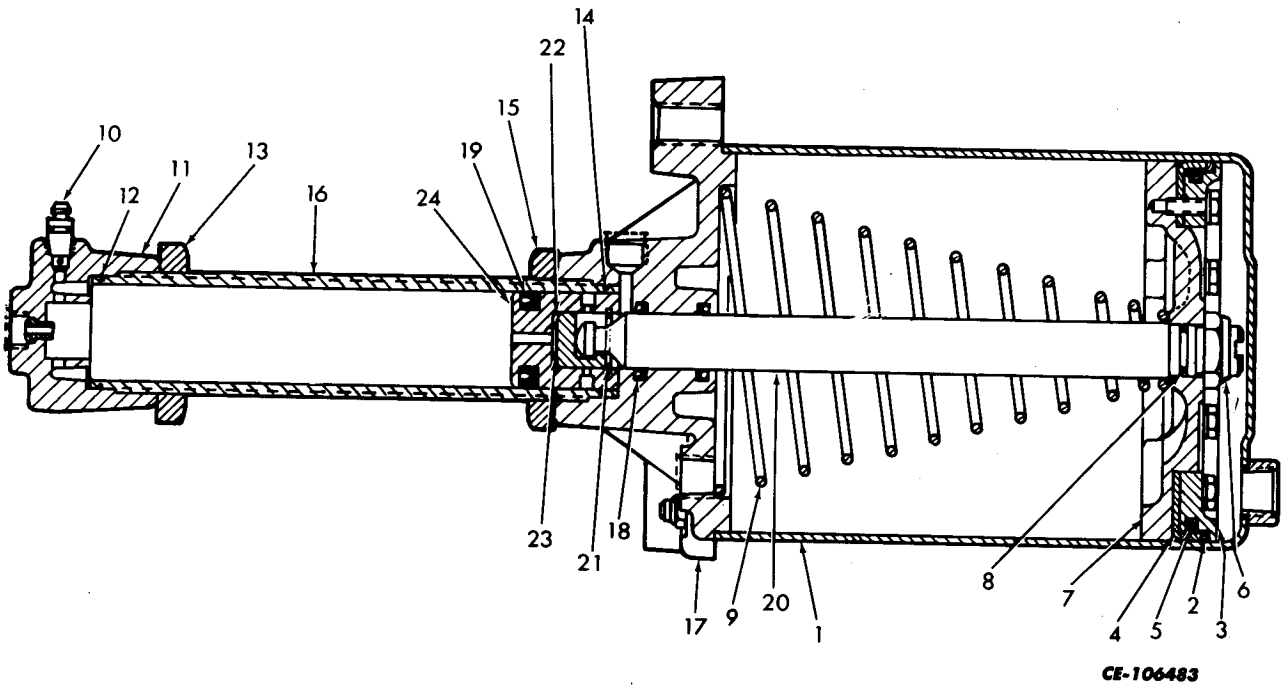


Figure 13-41

1. Air Cylinder.
2. Air piston felt.
3. Piston follower.
4. Piston cup.
5. Expander ring.
6. Stop nut.
7. Air cylinder piston.
8. "O" ring.
9. Return spring.
10. Bleeder screw.
11. End cap.
12. "O" ring.
13. Nut.
14. "O" ring.
15. Nut.
16. Hydraulic cylinder.
17. End cover.
18. Seal.
19. Seal.
20. Piston rod.
21. Snap ring.
22. Hydraulic valve.
23. Valve insert.
24. Hydraulic piston.

Inspection and Repair

Inspect the pistons, cylinders, shaft and seals for signs of excessive wear, grooving, cuts or deterioration. Replace all seals and "O" rings.

Reassembly

Before reassembling coat the inside of the air cylinder and the mating surface of the air chamber piston and piston cup with a light coat of all purpose chassis grease. Dip all the seals and "O" rings of the hydraulic cylinder in brake fluid before assembling (use type fluid recommended by Operator's Manual).

Reassembly the component parts in the opposite sequence indicated by the reference numbers in Figure 13-41.

NOTE: Refer to Specifications for special torques for reassembly.

DISASSEMBLY, INSPECTION AND REPAIR

Installation

Secure the power cluster to the frame.

Install the air line, and hydraulic lines.

Fill the reservoir. Refer to Operator's Manual.

Bleed the Brake System

The hydraulic portion of each power cluster and wheel brake assembly must be "BLED" when it is suspected that air is present in the brake fluid, such as after overhaul.

Manually bleed the hydraulic lines of power clusters as described below:

a. Start and run engine to charge compressed air portion of brake system. Shut down engine.

b. Remove fill cap and fill reservoir with type fluid recommended. Keep reservoir full during entire bleeding operation.

c. Attach a bleeder hose, if available, to bleeder screw at power cluster. Submerge opposite end of hose in a jar partially filled with brake fluid.

d. Open bleeder screw one turn and slowly apply one of the treadle valves. Make additional treadle applications until no bubbles escape from bleeder hose. If bleeder hose is not used, close bleeder screw each time before releasing treadle valve.

e. Close bleeder screw and remove bleeder hose. Then bleed wheel cylinders.

NOTE: Bleed wheel cylinder farthest from power cluster first.

Fill reservoir to within 1/2" to 3/8" of top.

RELAY VALVES

Disassembly

Remove cap screws and lock washers (1, Fig. 13-42) that fasten cover (2) to body (3).

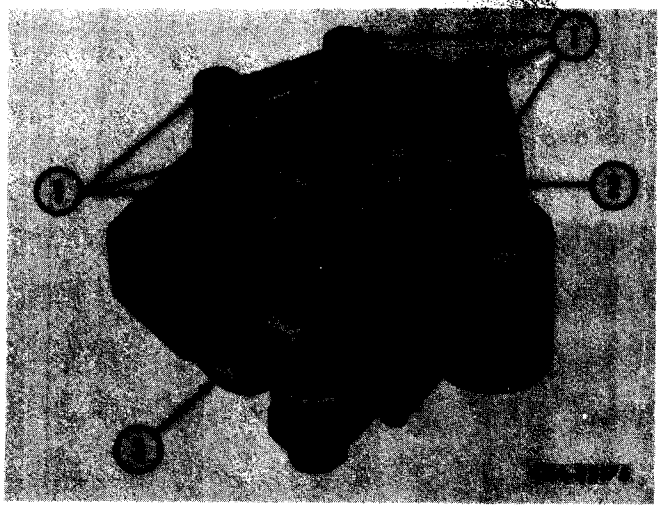


Figure 13-42
Remove Cover.

Remove cover (4, Fig. 13-43), diaphragm (3), and diaphragm ring (2) from body (1).

(Continued on next page)

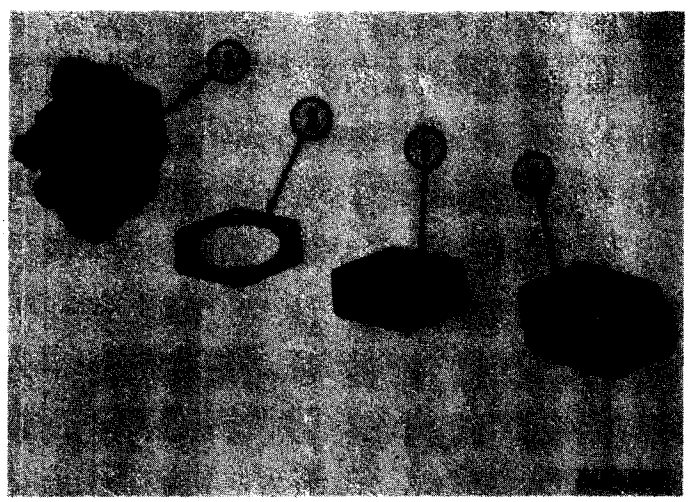


Figure 13-43
Remove Diaphragm.

DISASSEMBLY, INSPECTION AND ASSEMBLY

RELAY VALVES - Continued

Disassembly - Continued

Slide diaphragm guide (2, Fig. 13-44) out of body (1).

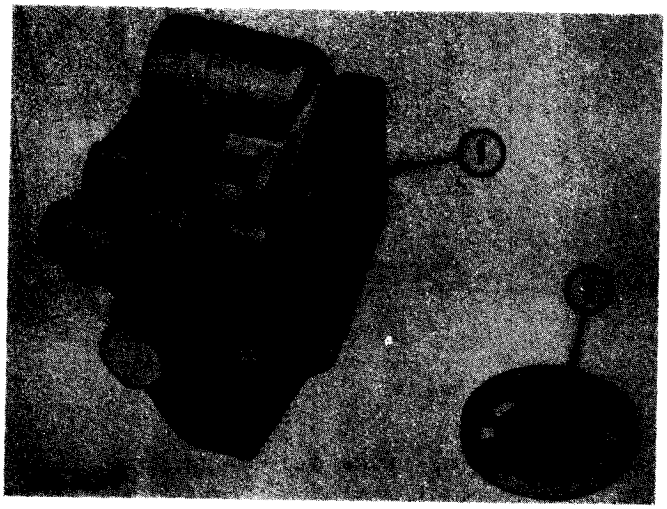


Figure 13-44
Remove Guide.

Remove cap screws and lock washers (3, Fig. 13-45). Remove cap assembly (2) from body (1).

Figure 13-45
Remove Cap Assembly.

Remove retaining ring (5, Fig. 13-46) from cap (3). Separate inlet valve (1) from cap and remove spring (2). Remove "O" ring (4) from cap and "O" ring (6) from inlet valve.

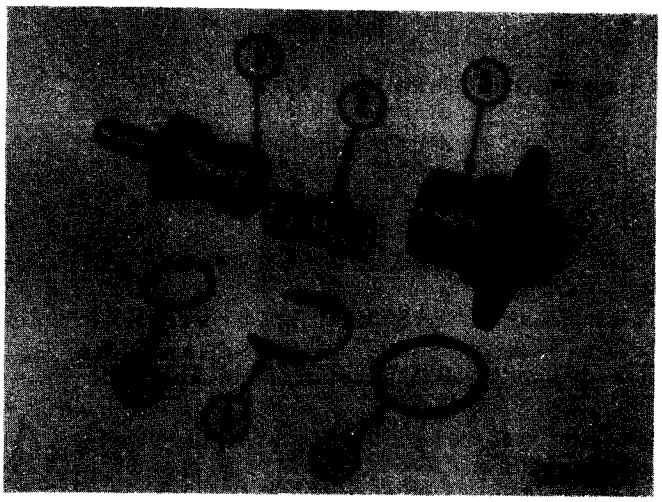


Figure 13-46
Cap Assembly.

Remove cap screw (4, Fig. 13-47) and washer (3) that hold exhaust diaphragm (2) to body (1).

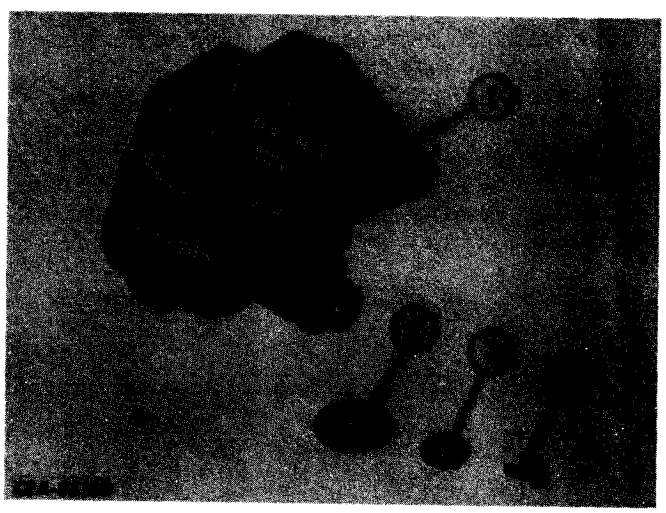


Figure 13-47
Remove Exhaust Diaphragm.

Inspection

Clean and inspect relay valve as follows:

a. Clean all metal parts in a good grade cleaning solvent. Use compressed air to dry parts.

b. Inspect diaphragm guide for signs of wear or damage.

c. Check inlet valve and cap for wear or distortion.

DISASSEMBLY, INSPECTION AND ASSEMBLY

d. Replace all "O" rings, diaphragm, and exhaust diaphragm.

Assembly

Place exhaust diaphragm (2, Fig. 13-47) in exhaust port in body (1) and fasten in place with washer (3) and cap screw (4).

Place "O" ring (6, Fig. 13-46) on inlet valve (1). Place spring (2) in inlet valve. Slide inlet valve into cap (3) and install retaining ring (5). Install "O" ring (4) on cap.

Place cap assembly (2, Fig. 13-42) in body (1) and secure with cap screws (3).

Place diaphragm guide (2, Fig. 13-41) in body (1).

Place diaphragm ring (2, Fig. 13-40), diaphragm (3) and cover (4) on body (1). Install and tighten cap screws and lock washers (1, Fig. 13-39) to recommended torque (refer to "SPECIAL TORQUES.")

Torque: _____

Installation

Mount valve in original location in tractor. Connect previously tagged lines to their proper ports. Be sure all connections are tight.

AIR COMPRESSOR (Ref. No's. Refer to Fig. 13-48)

The disassembly, inspection and assembly of the compressor is shown with the engine in the engine service manual ISS-1519. This publication covers the removal and installation of the compressor on the finished machine.

Removal

Drain the air system. Refer to Operator's Manual.

Disconnect the air supply lines (1) from the compressor.

Disconnect the governor lines (2).

Disconnect and cap the water lines (3) to prevent the coolant from draining.

Disconnect the oil lines (4).

Disconnect the air inlet line (5).

Remove the compressor mounting hardware, remove the drive belt and then the compressor.

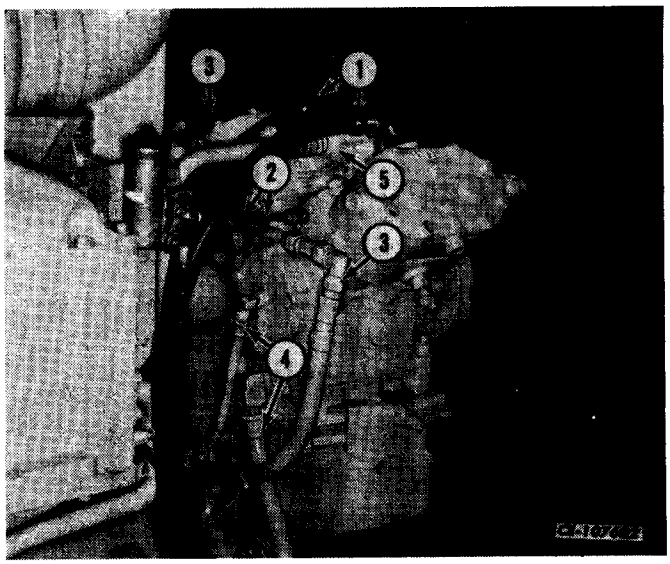


Figure 13-48
Compressor Disconnects.

Installation

Install compressor on mounting bracket, install drive belts and adjust drive belt tension per the Operator's Manual.

Install the water lines, air inlet and outlet lines, oil line and governor lines.

Start the engine and check the air pressure gauge to assure that the air compressor is working

Check for leaks and correct if found.

ALCOHOL INJECTOR

Removal

Exhaust all air from system and reservoirs. Disconnect air inlet and outlet lines from alcohol injector. Remove hardware securing injector. Remove injector.

Disassembly

Remove cap screws (1, Fig. 13-49). Remove mounting bracket (6) and cover assembly (2). Remove seal (3) from cover and drain (5) from reservoir (4).

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

ALCOHOL INJECTOR - Continued

Disassembly - Continued

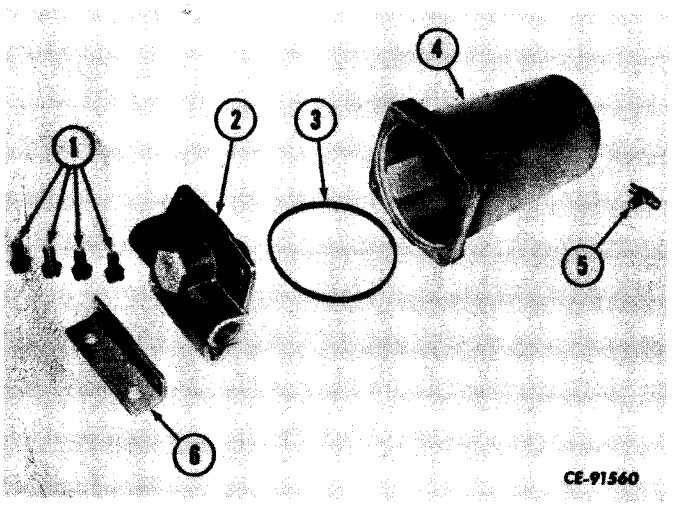


Figure 13-49
Injector Assembly.

Using snap ring pliers, remove retainer (1, Fig. 13-50) and slide spring (2) and valve (3) from cover (6). Use snap ring pliers to remove retainer (12). Slide valve seat (10), valve (9), disc (8) and spring (7) from cover. Unscrew plug (5). Remove seal (4) from plug. Remove "O" ring (11) from seat.

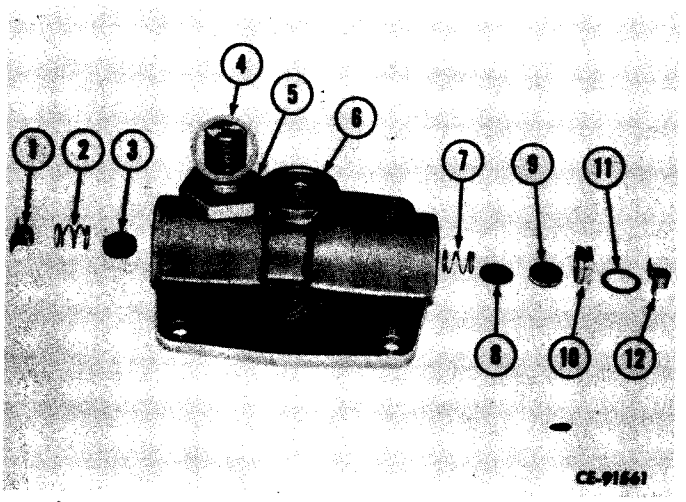


Figure 13-50
Remove Valves.

Inspection

Clean and inspect alcohol injector as follows:

a. Clean all metal parts in a good cleaning solvent. Use compressed air to dry parts.

b. Inspect all parts for wear or damage.

c. Replace valves, springs and seals with a service kit.

Assembly

Install new "O" ring (11, Fig. 13-50) on valve seat (10). Slide spring (7), disc (8), valve (9) and seat into inlet of cover (6). Secure with retainer (12). Slide valve (3) and spring (2) into outlet of cover. Secure with retainer (1). Install seal (4) on plug (5) and plug in cover.

Install drain (5, Fig. 13-49) in reservoir (4). Install seal (3) in groove of reservoir. Install cover (2) on reservoir. Position bracket (6) on cover and install cap screws (1).

Installation

Mount injector unit in tractor and secure with proper hardware. Connect air lines to inlet and outlet ports.

WHEEL BRAKES

Removal

Wheel brakes may be serviced without removing or disassembling wheel hub.

Park tractor on a level surface. Lower bucket to ground and install frame locking bar in straight ahead attitude. Jack up and securely block axle to be serviced. Block other wheels. Remove wheel and tire from axle hub.

Remove dust shields.

Apply tractor service brakes. With brakes applied, position hardwood or steel blocks between brake shoes and axle flange to block brake shoes in the applied position. Release brake pedal.

Disconnect hydraulic brake line from wheel cylinder. Remove hardware securing plunger housing to axle flange and remove plunger housing and cylinder assembly. Care must be exercised during removal to protect plunger detents from damage.

Remove blocking and allow brake shoes to retract. Remove brake shoe return spring. Remove hardware securing anchor pin retainer plate. Remove retainer plate, seal assemblies, anchor pins and brake shoes.

DISASSEMBLY, INSPECTION AND ASSEMBLY

Disassembly

Loosen set screw (2, Fig. 13-51) and unscrew cylinder (1) from plunger housing (3). Remove bleeder screw from cylinder.

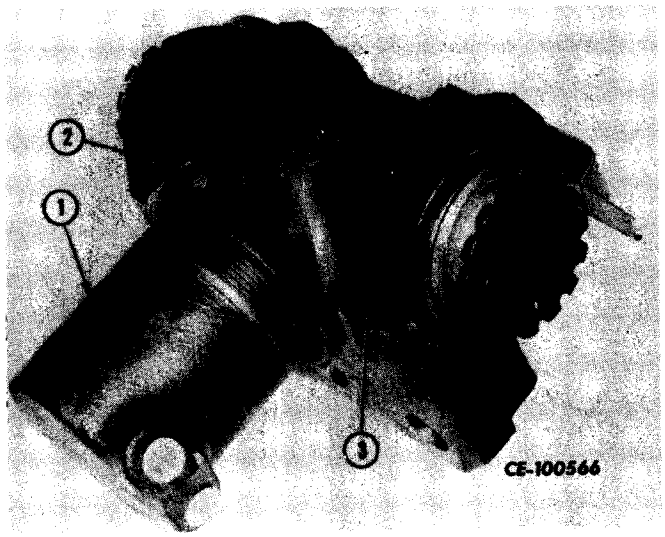


Figure 13-51
Wheel Cylinder and Plunger Housing.

Slide piston (6, Fig. 13-52) from cylinder (1). Remove back-up pad (5), cup (4), plug (3) and spring (2). Remove seal rings (7) from piston.

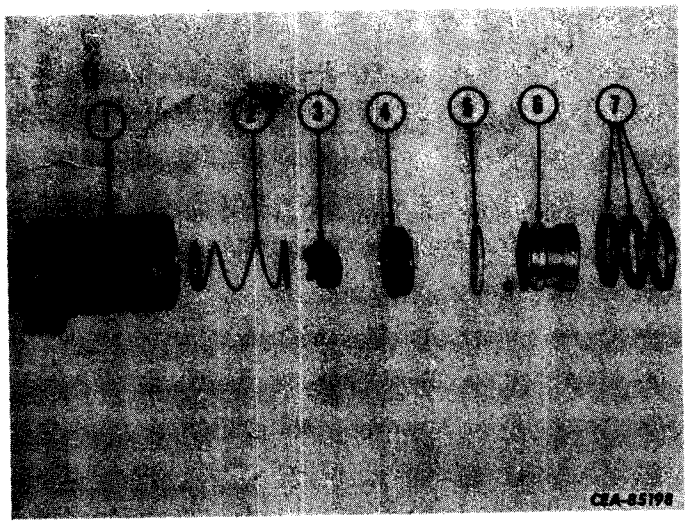


Figure 13-52
Cylinder Assembly.

Remove wedge and roller assembly from body. Compress spring (3, Fig. 13-53) and remove E-washer (7) and flat washer (4). Slide spring (3) and retainer (6) off wedge (1). Remove rollers (2) from cage (5) by inserting a thin-bladed screwdriver between one flat on the wedge head and roller cage and spreading open just far enough to remove rollers. Slide roller cage off wedge shaft.

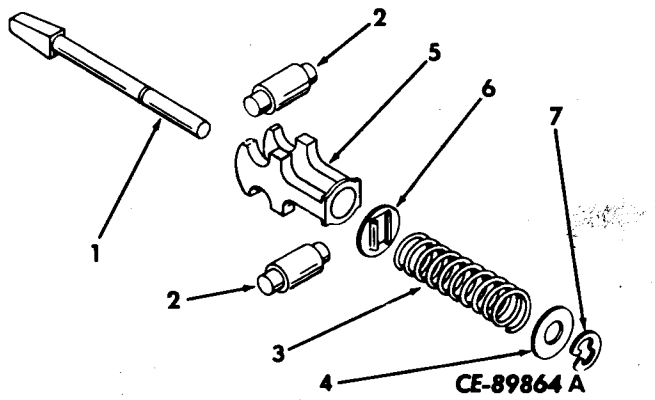


Figure 13-53
Wedge Assembly.

Bend back cap screw lock (2, Fig. 13-54) and remove guide cap screw (3) and detent lock (1).

(Continued on next page)

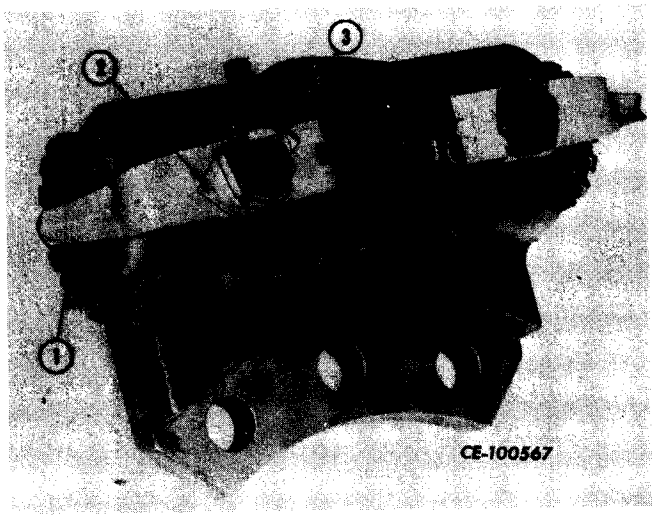


Figure 13-54
Remove Detent Lock.

DISASSEMBLY, INSPECTION AND ASSEMBLY

WHEEL BRAKES - Continued

Disassembly - Continued

Remove adjustment bolt (1, Fig. 13-55) from plunger (3). Carefully remove seal (2) from housing. Slide plunger from housing.

Drill or punch out rivets securing brake lining to shoes. Remove and discard old lining.

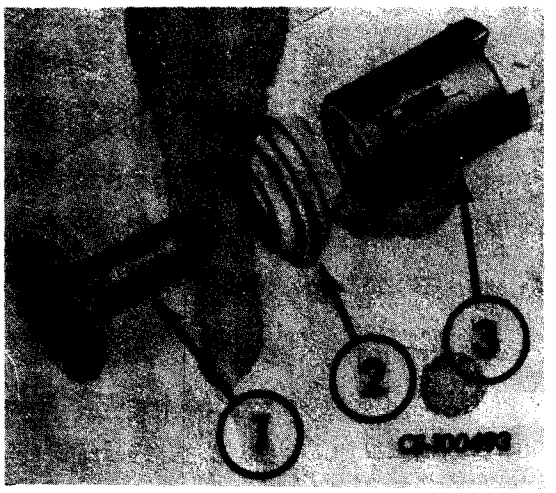


Figure 13-55
Adjustment Bolt.

Inspection

Clean and inspect brake assembly parts as follows:

a. Clean all metal parts in a good grade cleaning solvent. Use compressed air to dry parts.

b. Inspect wheel cylinder cup and plug for signs of wear or cracking. Replace any defective parts. Inspect bleeder screw for defects.

c. Inspect wheel cylinder for scoring or damage. Hone cylinder if scored.

d. Inspect parts of wedge and roller assembly and plunger assembly for signs of wear or damage. Replace any defective parts.

e. Inspect plunger seal. Replace if defective.

f. Inspect anchor pins for wear or misalignment. Inspect brake shoes for wear at anchor pin holes.

g. Examine brake shoe return springs for signs of impending failure. Replace if required.

h. Brake air and hydraulic lines should be inspected periodically for signs of wear or damage. Inspect tube fittings for leakage. Replace any lines or fittings found to be defective. Care should be taken when installing brake lines that they are not crimped or bent too sharply.

Assembly

NOTE: Special Torque, Pressure, etc. recommendations are listed under "SERVICE INFORMATION." This simplifies revision when necessary. To eliminate constant referral, blank spaces are provided at points where special information is required. These may be filled in by the manual holder, in pencil, and revised when necessary.

NOTE: When relining brake shoes, it is recommended that linings be bonded to shoes locally and rivets installed as shown in (Fig. 13-57). Complete shoe and lining assemblies are available through your I.H. Distributor.

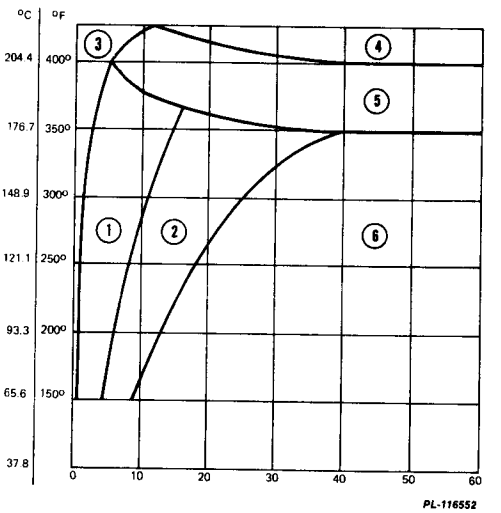


Figure 13-56
Time - Temperature Cure Chart.

1. Zone 1.
2. Zone 2.
3. Temperature rise too rapid.
4. Temperature too hot.
5. Bonding zone.
6. Temperature rise too slow.

Measure the bond line temperature at convenient time intervals beginning when the temperature reaches 37.8°C (100°F). Plot these readings on the chart.

A satisfactory cure curve:

1. Must rise entirely within either Zone 1 or Zone 2. Once the curve starts into one of these two zones, it should stay within that zone all during its temperature rise.

2. Must have its peak in the Bonding Zone.

3. Must not reach the "Temperature Too Hot" area.

4. Must not be cooled faster than 14°C (25°F) per minute from the peak temperature to 135°C (275°F).

BONDING (LINING TO BRAKE SHOE)

A. **Shoe Preparation:**

The brake shoe bonding surface must be free of rust,

DISASSEMBLY, INSPECTION AND ASSEMBLY

corrosion, oil, grease and plating. The following surface preparations are recommended:

1. Shoes may be cleaned by belt sanding or dry milling operation but surface is NOT to be polished. Belt must cut free and not over-heat shoe. Surface must be solvent cleaned.
2. Shoes may be sand-blasted, but surface must be solvent cleaned and all grit removed.
3. Shoes may be cleaned by wire brushing followed by a solvent cleaning.
4. Steel and iron shoes may be prepared by immersing in an alkaline bath, rinsing in cold water, immersing in an acid pickling solution, followed by a second cold water rinse, rinsed in hot water and air dried. Spray treatment may be used instead of immersion bath. If bonding is not done immediately following the above treatment, the shoes must immediately be given a phosphatizing treatment or a coating of synthetic varnish which can serve as a final finish for shoes as well as a primer for the adhesive.

B. **Curing of Adhesive:**

After the shoe and lining with pre-cemented bonding material have been properly clamped together, they shall be cured in the following manner:

OVEN METHOD: Cure assembly a minimum of twenty minutes in oven at 176.7 - 218.3°C (350 - 425°F) at bond line under clamping pressure of not less than 14.5 kPa (100 psi) of lining area maintained through the cycle time. Refer to Fig. 13-56 for time - temperature cure. Do not force cooling of bonding assembly.

Clamp new brake lining on cleaned brake shoe face with "C" clamps. Align rivet holes and install new rivets of correct size, shape and material. Drive rivets squarely into holes with a flat head drift of proper size. Form rivet heats with correct rivet set, following numerical sequence shown in (Figure 13-57).

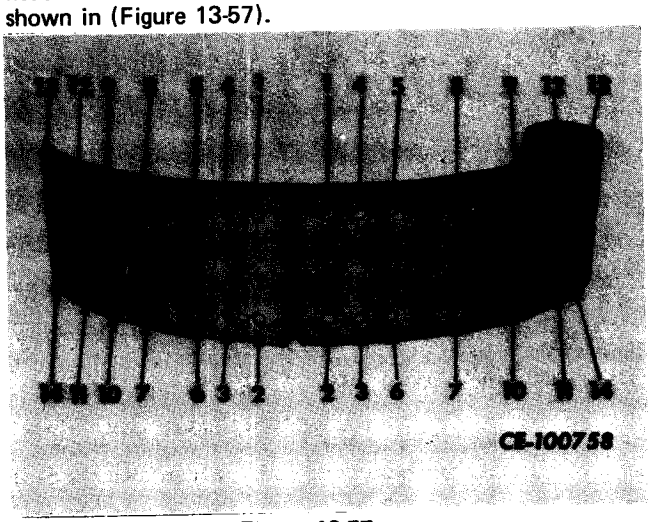


Figure 13-57
Rivet Installation Sequence.

Insert wedge shaft (1, Fig. 13-53) into roller cage (5) so angled faces are exposed.

Spread roller cage open just far enough to insert rollers (2) without forcing. Install retainer (6) over wedge shaft and position it centrally on cage and roller assembly. Install spring (3) over wedge shaft, large coil diameter first. Add spring washer (4) and compress spring until "E" washer (7) can be installed. Install wedge assembly into body.

Lubricate cylinder parts (Fig. 13-52) with clean hydraulic fluid. Install new seal rings (7) on piston (6). Install spring (2) and plug (3) in cylinder (1). Carefully install cup into cylinder bore, entering lip of cup into bore, flat side of cup out. Insert back-up pad (5) and piston assembly, flat end first into cylinder and push piston and cup down to bottom of bore. Screw cylinder unit into body (3, Fig. 13-51) until it bottoms. Install bleeder screw and set screw (2). Refer to "INSTALLATION" for lockscrew torque recommendations.

Apply film of grease to inside surface of seals (2, Fig. 13-55).

NOTE: DO NOT assemble seals into housing first. This will result in a complete lack of sealing of internal plunger parts. Carefully push inner seal lip over threaded bore end of plunger (3) until lip enters plunger seal groove.

Coat plunger bores with grease. Coat entire plunger with grease, packing cavity behind seal. Insert plunger and seal into plunger housing with plunger key slot aligned with guide bolt (3, Fig. 13-54) hole. Be certain plunger goes all the way into plunger bore and seats on wedge assembly rollers. Seat plunger seal in housing.

Coat adjusting bolt (1, Fig. 13-55) with grease and turn into plunger by carefully working through outer seal flap. Do not pinch seal on both threads. Turn bolt in just short of seal. Do not bottom bolt on seal. Install detent lock (1, Fig. 13-54), cap screw lock (2) and guide cap screw (3). Refer to "SPECIAL TORQUES" for recommended guide cap screw torque.

Torque: _____

Installation

Secure brake shoes to axle housing mount with lubricated anchor pins coated with "never cease" and new felt seals. Install anchor pin retainer plate and secure with appropriate hardware. Install brake shoe return spring. Using a pry bar force brake shoes, one at a time, against brake drum and install blocking between brake shoe and axle flange to keep brake shoes in the applied position.

Position cylinder and plunger assembly on axle housing flange and secure with bolts and lock washers. Tighten bolts to recommended torque (refer to "SPECIAL TORQUES.")

Torque: _____

Remove brake shoe blocking.

If necessary, loosen set screw (2, Fig. 13-51) and back cylinder (1) off NOT MORE than one turn to position bleeder screw in a vertical position. When properly positioned,

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

WHEEL BRAKES - Continued

Installation - Continued

tighten set screw to initial torque (refer to "SPECIAL TORQUES.")

Initial Torque: _____

Loosen set screw and retorque to final torque (refer to "SPECIAL TORQUES.")

Final Torque: _____

Connect hydraulic brake line to cylinder.

Install dust shield.

Adjust Brakes

Clearance between brake lining and drum should not exceed 1,27 mm (.050 in). Rotate adjuster bolt for each brake shoe until brake lining contacts drum. Back off adjuster one click for new brakes and seven clicks for used brakes.

Mount wheel and tire on axle. Remove axle blocking.

Bleed Hydraulic Brake Circuit

The hydraulic portion of each power cluster and wheel brake assembly must be "bled" when it is suspected that air is present in the brake fluid, such as after overhaul.

Manually bleed hydraulic lines of a power cluster as described below:

a. Start and run engine to charge compressed air portion of brake system. Shut down engine.

b. Remove fill cap and fill power cluster reservoir. Keep reservoir full during entire bleeding operation.

c. Attach a bleeder hose, if available, to bleeder screw at power pack. Submerge opposite end of hose in a jar partially filled with brake fluid.

d. Open bleeder screw one turn and slowly apply one treadle valve. Make additional treadle applications until no bubbles escape from bleeder hose. If a bleeder hose is not used, close bleeder screw each time before releasing treadle valve.

e. Close bleeder screw and remove bleeder hose. Then bleed wheel cylinders.

NOTE: Bleed wheel cylinder farthest from power cluster first.

Fill power cluster reservoir to within 13 - 10mm (1/2 to 3/8 in) of fill hole.

Master cylinder stroke should not exceed 13 mm (1/2 in).

Restore frame locking bar to carry position.

"Run in" or seat the new brake shoe linings before operating the machine in the following manner.

With the engine running and air pressure at normal, apply the brakes fully and drive machine in first gear for a distance of 427 metres (1400 ft). Allow the brakes to cool. Apply the brakes fully, drive the machine in second gear with wide open throttle. Machine should stall or creep a maximum of 3 metres (10 ft). If tractor fails to stall or stay within the 3 metres (10 ft) crawl area, repeat the first step again.

Failure to stall the tractor in second gear after repeating the first step twice indicates a malfunction in the braking system.

PARKING BRAKE

General

Prepare tractor for disassembly of parking brake as follows:

a. Park tractor on a level surface, bucket on ground.

b. Install safety pins to lock tractor halves in a full turn position.

c. Block tractor wheels to prevent tractor from rolling.

Disassembly

Remove cap screws (1, Fig. 13-58) that secure transmission-to-transfer drive shaft (2) to transfer drive yoke (3). Remove drive shaft from yoke.

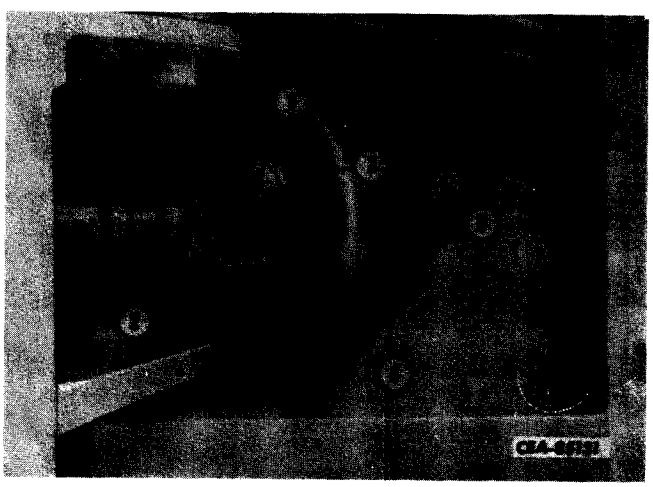


Figure 13-58
Parking Brake.

Disconnect parking brake linkage (5) from operating cam lever (4).

Remove cap screws (4, Fig. 13-59), retainer (5) and seal washer (6), from bore of yoke.

Remove lock nut (1), retainer (2), and seal washer (3) that secure yoke and drum assembly (7) to transfer drive shaft (8).

Remove yoke and drum assembly.

DISASSEMBLY, INSPECTION AND ASSEMBLY

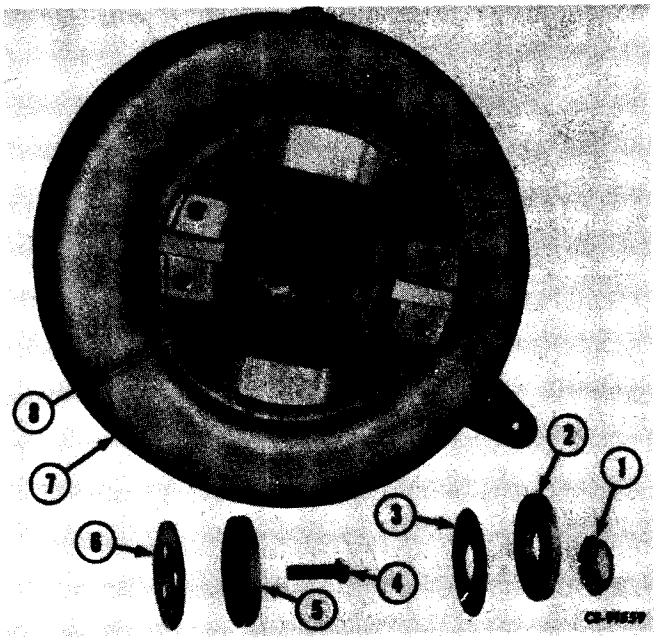


Figure 13-59
Washer Assembly.

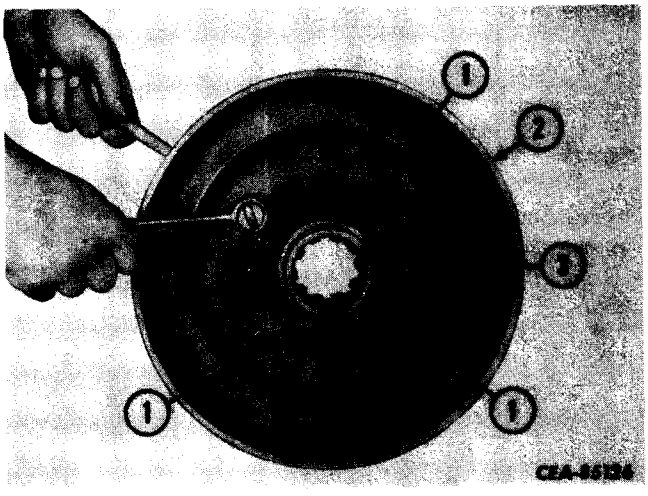


Figure 13-60
Remove Drum.

Remove cap screws and lock nuts (1, Fig. 13-60) that secure drum (2) to yoke (3). Separate drum and yoke.

Using brake spring pliers, remove brake springs (1, Fig. 13-61) from brake shoes (2) as shown.

Remove brake shoes from backing plate (3).

Remove operating cam lever (2, Fig. 13-62) and roller (1) from pawls (3 and 4) on backing plate.

Remove cap screws and lock washers (1, Fig. 13-63) that secure backing plate (2) to transfer drive housing. Remove backing plate.

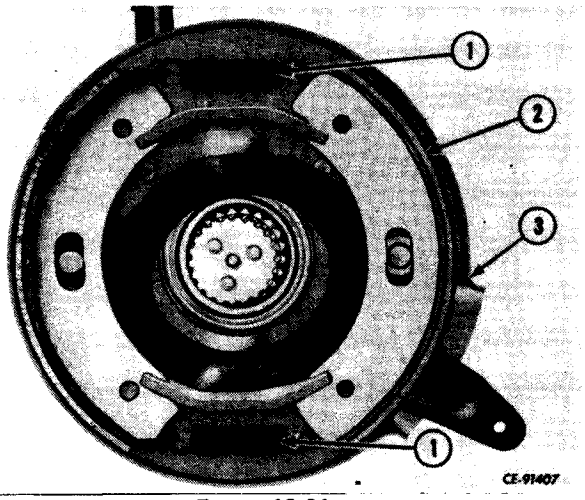


Figure 13-61
Remove Shoes.

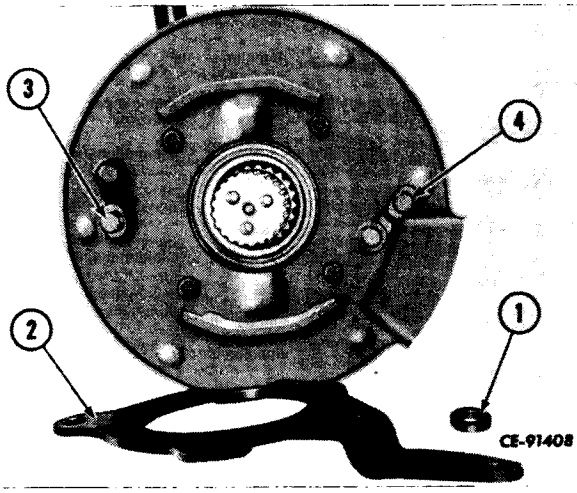


Figure 13-62
Remove Cams.

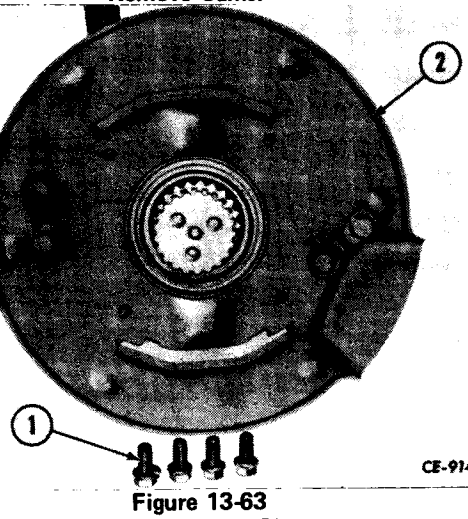


Figure 13-63
Remove Backing Plate.

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

PARKING BRAKE - Continued

Inspection

Clean and inspect all parts as follows:

a. Inspect brake linings and drum for wear. Replace worn linings as described under "BRAKE RELINING."

b. Clean all parts in solvent. Use compressed air to dry parts.

c. Lubricate actuating parts of the brake (operating cam lever, roller, pawls) with chassis grease.

d. Inspect parking brake parts for signs of wear or damage. Replace any parts found to be defective.

NOTE: Special Torque, Pressure etc. recommendations are listed under "SERVICE INFORMATION." This simplifies revision when necessary. To eliminate constant referral, blank spaces are provided at points where special information is required. These may be filled in by the manual holder, in pencil, and revised when necessary.

Brake Relining

Reline parking brake shoes as follows:

a. Punch out rivets and remove old lining from shoe.

b. Clamp new lining to shoe so that rivet holes in both pieces are in alignment. Use a C-clamp and locate it as near rivet holes as possible.

NOTE: Lining and shoe contact faces should be clean before assembling. Rivets of correct size and shape should be used.

c. Using a rivet press, install rivets following sequence shown in Fig. 13-64.

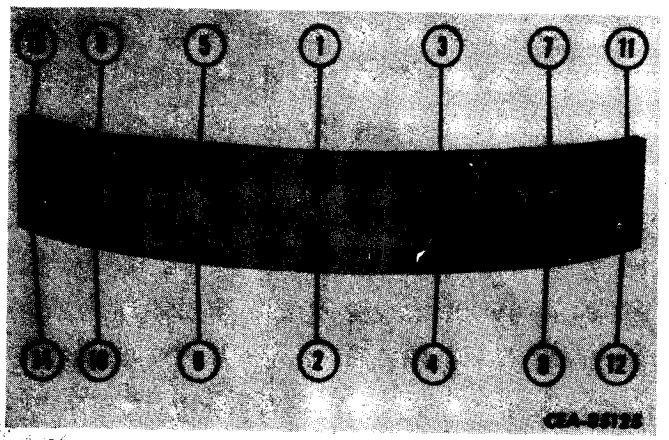


Figure 13-64
Rivet Installation Sequence.

Assembly

Install backing plate (2, Fig. 13-63) on transfer drive housing and secure with cap screws and lock washers (1). Torque cap screws. Refer to "SPECIAL TORQUES."

Torque: _____

Plate roller (1, Fig. 13-62) on pawl (4) on backing plate. Install operating cam lever (2) on left pawl (3) and under roller (1).

Install brake shoes (2, Fig. 13-61) on backing plate. Install brake springs (1) on shoes using brake spring pliers. Be sure springs are installed in rear holes.

Plate yoke (3, Fig. 13-60) in drum (2) and secure with cap screws and lock nuts (1). Torque lock nuts. Refer to "SPECIAL TORQUES."

Torque: _____

Install yoke and drum assembly (7, Fig. 13-59) on shaft (8). Place a new seal washer (3) and retainer (2) on shaft and secure with lock nut (1). Tighten lock nut to recommended torque (refer to "SPECIAL TORQUES").

Torque: _____

Install new seal washer (6) and retainer (5) in bore of yoke and secure with cap screws (4). Tighten cap screws to recommended torque. Refer to "SPECIAL TORQUES."

Torque: _____

Connect parking brake linkage (5, Fig. 13-58) to operating cam lever (4).

Install drive shaft (2) in yoke (3) and secure with cap screws (1).

Tighten cap screws to recommended torque. Refer to "SPECIAL TORQUES."

Torque: _____

Adjust parking brake linkage as described under "PARKING BRAKE LINKAGE" in Section 9, "LINKAGE."

After relining parking brake, complete the following run-in procedure:

Drive machine forward in 1st range until full throttle is obtained, apply parking brake and continue to drive for 3 - 5 metres (10 - 15 feet).

Release brake and allow it to cool for a period of 3-5 minutes.

Repeat the above steps for a total of six brake applications.

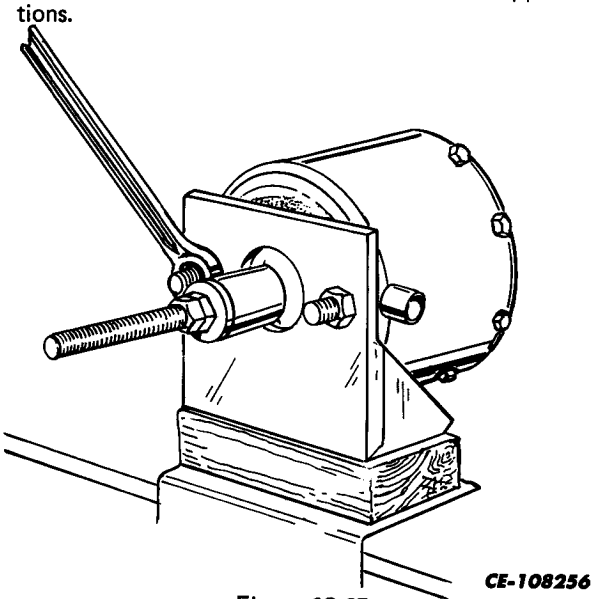


Figure 13-65
Actuator Holder Tool.

DISASSEMBLY, INSPECTION AND ASSEMBLY

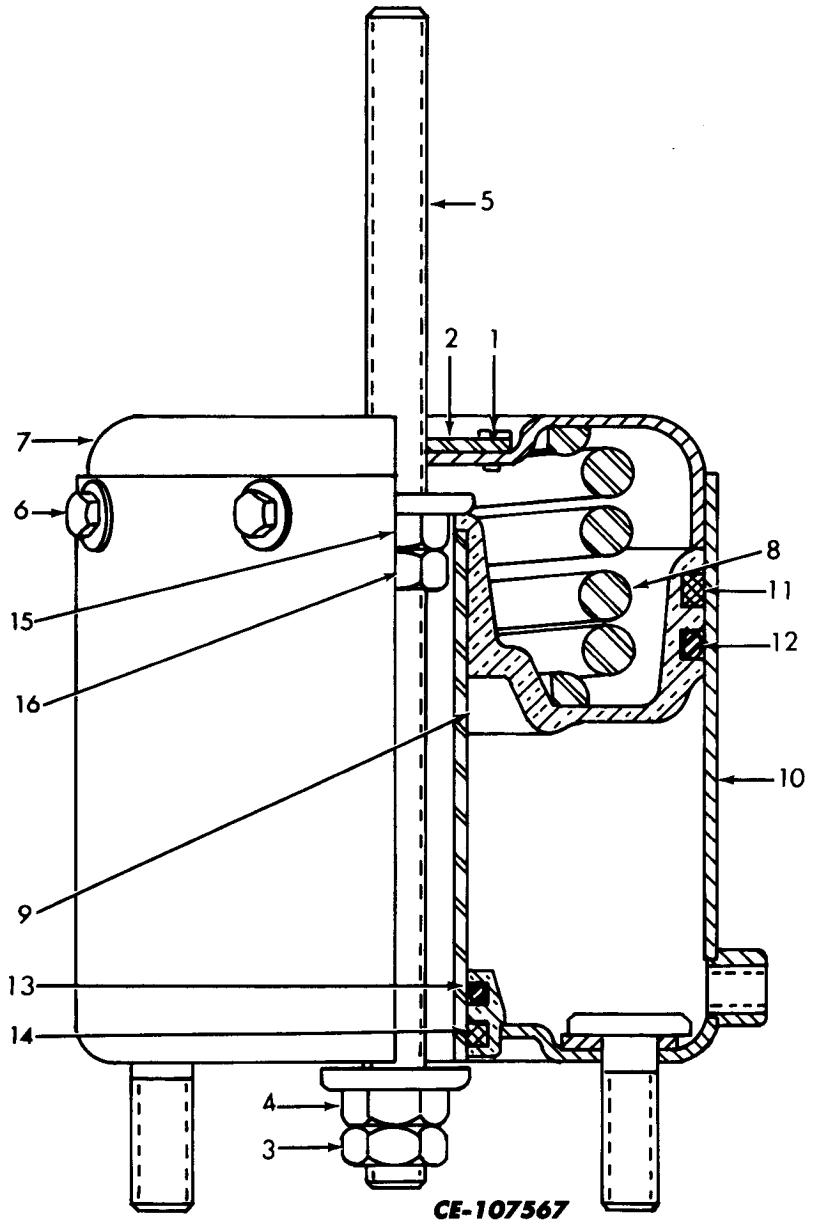


Figure 13-66
Actuator Assembly.

ACTUATOR (Ref. Nos. Refer to Fig. 13-66)

The disassembly and assembly is covered in this section for the actuator itself. The "REMOVAL, INSTALLATION AND ADJUSTMENT" of the actuator is covered in Section 9 Parking Brake Linkage).

Disassembly

Mount actuator to holder tool and secure with stud nuts. Refer to Figure 13-65. To make tool, refer to "SPECIAL TOOLS."

Remove cap screws (1) and cover plate (2).

Remove jam nut (3) and flange nut (4) and pull push rod (5) from unit. Remove jam nut (16) and flange nut (15).

Insert spring removal tool (Figure 13-71) thru unit so threaded rod protrudes out the same end as the studs. Insert a large flat washer or sleeve and nut on the rod and tighten down until tool is firmly against the spring support (7).

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

ACTUATOR (Ref. Nos. Refer to Fig. 13-66) - Continued

Disassembly - Continued

Remove the cap screws (6) and by loosening the nut on the threaded rod, remove the spring support (7) and spring (8).

Drive the piston (9) from the cylinder (10).

Remove the wiper (11) and "O" ring (12).

Remove "O" ring (13) and bushing (14).

Clean, Inspect and Repair

Clean all metal parts in cleaning solvent.

Check the cylinder bore for rust, scoring or dents. Check for damaged or worn studs and center bushing wear. This is a good indication of impending failure if found.

Remove all nicks and scratches from the piston skirt.

The piston neck is chrome plated and if shows signs of corrosion, scoring or notching, take special care to prevent further damage. Lubricating the piston neck with TR-3 provided in the repair kit available for the actuator.

NOTE: Do not paint the piston neck.

Clean the spring, spring support and push rod and coat with a Rust Inhibitor Compound.

Fill inside center boss groove with TR-3.

Lightly coat the inside of the cylinder with TR-3.

Fill the "O" ring groove on the piston half full of TR-3.

Assembly

Install "O" ring (13) and bushing (14).

Install "O" ring (12) and wiper (11).

Install piston (9) into cylinder (10).

Assemble spring support (7) and spring (8) onto tool and insert tool thru piston. Run on washer and nut on threaded rod and tighten nut until holes in spring support and cylinder line up.

Install cap screws for spring support.

Remove tool.

Install jam nut (16) and flange nut (15) so when the push rod is inserted into the piston neck fully, the amount of push rod that protrudes above the piston neck is only what is required to install the jam nut (3) and flange nut (4) plus 6 mm (1/4 in).

When this dimension is accomplished, install the flange nut so there is 1.58 to 3,17mm (1/16 to 1/8 in) gap between the bottom of the flange nut and the piston neck. Lock it in place with the jam nut.

Install the cover plate (2) and cap screws (1).

DISASSEMBLY, INSPECTION AND ASSEMBLY

DISCONNECT VALVE

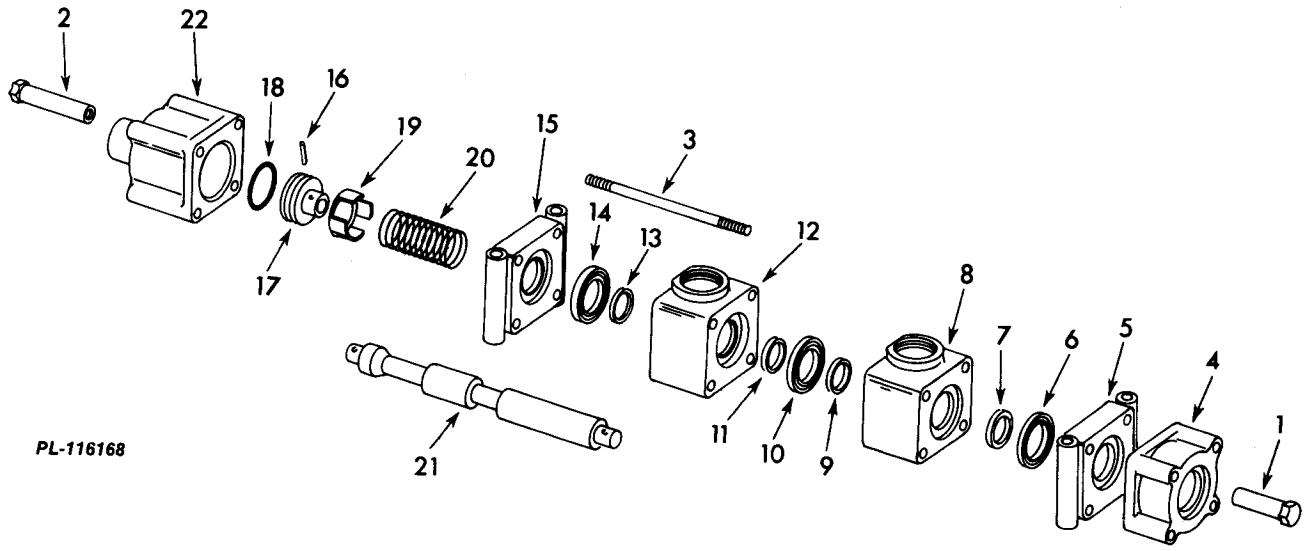


Figure 13-67
Parking Brake Transmission Disconnect Valve.

1. Short adapter nut.
2. Long adapter nut.
3. Stud.
4. Short housing.
5. Cover.
6. Packing ring.
7. Retainer.
8. Body.
9. Retainer.
10. Packing ring.
11. Retainer.
12. Body.
13. Retainer.
14. Packing ring.
15. Cover.
16. Roll pin.
17. Piston.
18. Packing ring.
19. Spring retainer.
20. Spring.
21. Plunger.
22. Pilot cylinder w/orifice.

DISCONNECT VALVE - Continued

Removal

Drain the air system. Refer to the Operator's Manual for the procedure.

Disconnect the lines from the valve.

Remove the mounting hardware, then the valve.

Disassembly
(Reference Nos. Refer to Fig. 13-67)

Scribe each section to the next one so you can reassemble each section in its original position.

Loosen the adapter nuts (1 and 2) and carefully remove the stud (3) with one of the nuts.

Disassemble the rest of the component parts in the sequence indicated by the reference numbers in Fig. 13-67.

Inspection

Clean all metal parts in kerosene and all seals in soap and water.

Check all seals for signs of cracks or signs of wear.

Check all metal parts for signs of cracks, excessive wear or other damage.

Check the plunger and all the retaining rings for burrs, scratches or roughness on the polished surfaces.

Small burrs or nicks can be removed with a smooth stone.

Replace all rubber parts.

Be sure the orifice in the end of the pilot cylinder (22) is open.

Assembly

Lubricate all friction surfaces and seals with a graphite grease before assembly.

NOTE: The stenciled end of the stem (21) goes at the same end of the valve as the name plate.

Assemble the component parts in the reverse order they were disassembled in Fig. 13-67.

DISASSEMBLY, INSPECTION AND ASSEMBLY

HORN VALVE

Disassembly
(Refer to Fig. 13-68)

Remove cotter pin (2).

Remove button (1).

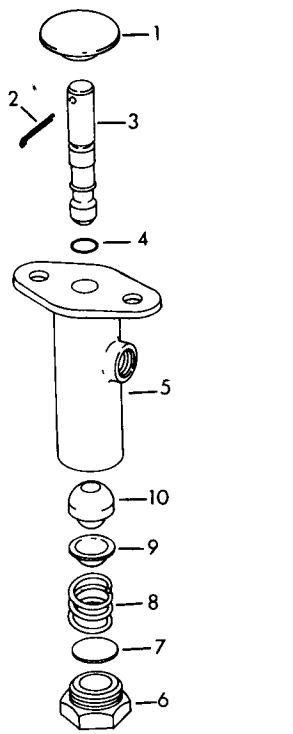


Figure 13-68
Horn Valve.

1. Button
2. Cotter pin.
3. Stem.
4. Seal.
5. Valve body
6. Cap.
7. Strainer.
8. Spring.
9. Spring seat.
10. Inlet valve.

Remove cap (6), strainer (7), spring (8) and spring seat (9).

Push stem (3) out of the housing (5). Push the stem from the mounting flange end into the housing, out the same end as the spring was removed.

Remove valve (10) and seal (4).

Inspection

Clean and dry all parts thoroughly.

Inspect all parts for visual damage.

Inspect the stem for signs of scoring.

Inspect the housing for signs of scoring.

Replace all seals.

Clean the strainer thoroughly.

Assembly

Lubricate the stem with grease before assembling. (Not the end which enters the valve (10).)

Install the seal (4) and valve (10) on the stem (3).

Install the stem into the housing from the large opening end.

Install the button (1) and cotter pin (2).

Install the spring seat (9).

Install the spring (8).

Install the strainer (7).

Install the cap (6).

DISASSEMBLY, INSPECTION AND ASSEMBLY

CLOSED RELAY VALVE

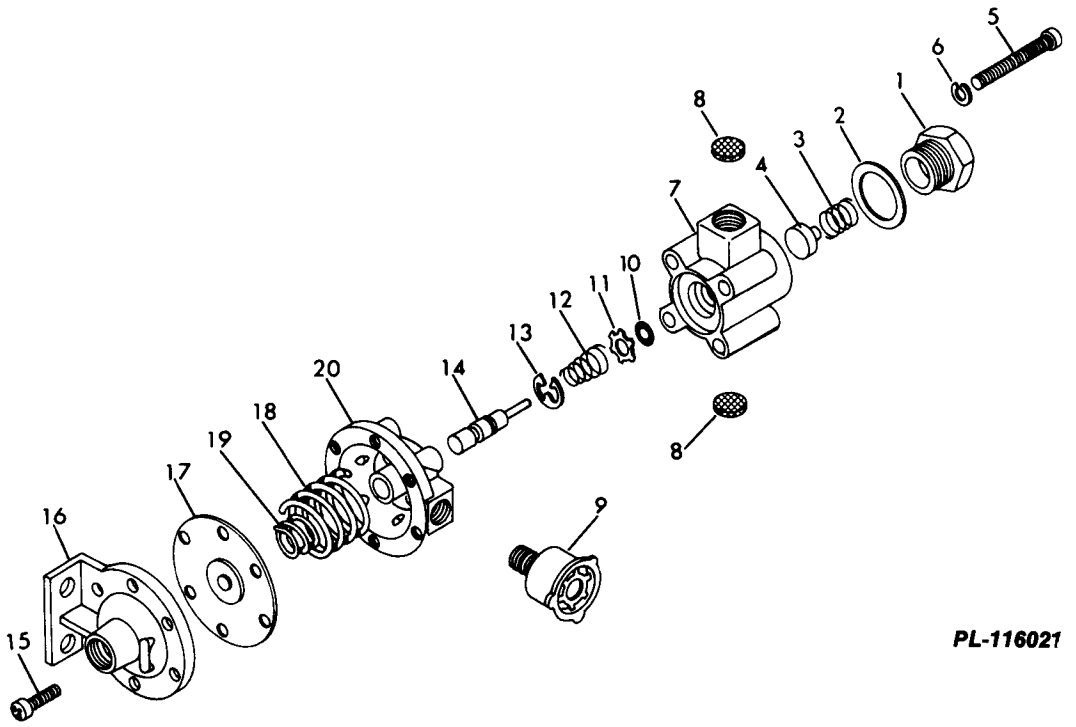


Figure 13-69
Closed Relay Valve.

1. Cap nut.
2. Gasket.
3. Spring.
4. Poppet.
5. Screw.
6. Washer.
7. Lower body.
8. Screen.
9. Air cleaner.
10. "O" ring.
11. Retainer ring.
12. Stem return spring.
13. Retaining ring.
14. Stem.
15. Screw.
16. Inlet body.
17. Diaphragm.
18. Spring.
19. Spring.
20. Center body.

Disassembly

Disassemble the component parts in the sequence indicated by the reference numbers in Fig. 13-69.

Inspection

Clean all parts thoroughly.

Check all metal parts for nicks or burrs.

Check diaphragm and "O" ring for flexibility, wear and deterioration.

Check springs for cracks, distortion or corrosion.

Assembly

Assembly the component parts in the reverse order they were disassembled in Fig. 13-69.

TROUBLE SHOOTING

GENERAL

COMPLAINT	PROBABLE CAUSE	REMARKS
Inadequate braking.	1. Brakes need adjusting. 2. Brake linings worn. 3. Low fluid level in power clusters. 4. Wheel cylinders defective. 5. Low air system pressure due to: a. Air leaks. b. Faulty governor. c. Faulty compressor. 6. Brake treadle valve delivery pressure too low. 7. Defective power cluster. 8. Defective relay valve. 9. Restricted air or hydraulic lines.	6. Clean, lubricate, or repair treadle valves.
Brakes apply too slowly.	1. Brakes need adjusting. 2. Low air pressure in brake system. 3. Brake treadle valve delivery pressure is too low. 4. Leakage in air system. 5. Restricted air or hydraulic lines.	3. Clean, lubricate, or repair treadle valves.
Brakes will not apply.	1. No air pressure in brake system. 2. Defective brake treadle valve. 3. Defective power cluster. 4. Defective wheel cylinders. 5. Low fluid level in power cluster.	
Brakes release too slowly.	1. Brake shoe return springs broken. 2. Defective wheel cylinders. 3. Brake treadle valve not returning to fully released position.	3. Clean, lubricate, or repair treadle valves.

(Continued on next page)

TROUBLE SHOOTING

GENERAL - Continued

COMPLAINT	PROBABLE CAUSE	REMEDY
Brakes release too slowly. (Cont)	4. Brake treadle valve exhaust port plugged. 5. Defective power cluster. 6. Restricted air or hydraulic lines.	
Brakes do not release.	1. Brake shoe return springs broken. 2. Defective wheel cylinders. 3. Brake treadle valve not returning to fully released position. 4. Defective power cluster. 5. Restricted air or hydraulic lines. 6. Low system air pressure.	3. Clean, lubricate, or repair treadle valves. 6. Brakes automatically apply at 50 psi.
Brakes grab when applied.	1. Grease on lining. 2. Brake drum out of round. 3. Defective brake treadle valve.	1. Reline brakes. 3. Repair or replace treadle valve.
Brakes pull when applied.	1. Brakes need adjusting. 2. Low fluid level in power clusters. 3. Brake linings worn. 4. Defective wheel cylinders. 5. Grease on brake lining. 6. Brake return spring broken. 7. Defective power cluster. 8. Brake drum out of round.	
Air pressure will not rise to normal reading.	1. Defective air pressure gauge. 2. Excessive leakage in air system. 3. Air reservoir drain open. 4. Governor out of adjustment. 5. Defective compressor.	

TROUBLE SHOOTING

COMPLAINT	PROBABLE CAUSE	REMEDY
Air pressure rises to normal reading too slowly.	1. Excessive leakage in air system. 2. Engine speed too slow. 3. Compressor discharge valves leaking. 4. Defective compressor. 5. Excessive carbon in compressor discharge line or cylinder head.	
Air pressure rises above normal reading.	1. Defective air pressure gauge. 2. Governor out of adjustment. 3. Defective governor. 4. Restricted line from governor and compressor unloading mechanism. 5. Compressor unloading cavities and passages blocked with carbon.	
Air pressure drops too quickly with engine stopped and brakes released.	1. Leaking brake treadle valve. 2. Leaking hoses or lines. 3. Compressor discharge valve leaking. 4. Governor leaking. 5. Leaking reservoir.	
Air pressure drops too quickly with engine stopped and brakes applied.	1. Leaking power cluster. 2. Leaking brake treadle valve. 3. Leaking hoses or lines.	
Noisy compressor.	1. Worn bearings. 2. Excessive carbon deposits in compressor. 3. Inadequate lubrication. 4. Compressor worn excessively.	3. Check oil supply line.
Safety valve "blows off."	1. Safety valve adjustment. 2. Air pressure in system too high.	1. Adjust. 2. Check and correct.
Excessive water or oil in system	1. Reservoirs not drained often enough. 2. Compressor passing excessive oil. 3. Alcohol injector reservoir empty.	1. Drain daily. 2. Repair or replace.

TROUBLE SHOOTING

PARKING BRAKE

COMPLAINT	PROBABLE CAUSE	REMEDY
Lever will not operate.	1. Incorrect linkage or lever adjustment.	
	2. Lever joints frozen or binding.	2. Lubricate or free joints.
	3. Brake mechanism frozen or rusted.	3. Clean and lubricate brake mechanism.
Brake will not hold.	1. Incorrect linkage or lever adjustment.	
	2. Broken linkage.	
	3. Broken drum.	
	4. Defective brake mechanism.	4. Repair or replace brake mechanism.

SERVICE INFORMATION

SPECIFICATIONS

GOVERNOR
Pressure Range . . . . . Cut-In: 655-724 kPa (95-105 psi)
Cut-Out: 724-862 kPa (105-125 psi)

SAFETY VALVE
Pressure Setting . . . . . 1034 ± 34 kPa (150 ± 5 psi)

AUDIBLE WARNING
Warning sounds . . . . . 414 kPa (60 psi)
Brakes apply . . . . . 345 kPa (50 psi)

SPECIAL TORQUES

Safety valve cage torque . . . . . 11-18 N·m (100-160 in lb)
Relay valve cover cap screws . . . . . 6-8 N·m (50-70 in lb)
Plunger housing retaining bolts . . . . . 380 N·m (280 ft lb)
Wheel cylinder guide cap screw . . . . . 20-34 N·m (15-25 ft lb)
Wheel brake cylinder lock screw . . . . . Initial 20-23 N·m (175-200 in lb)
Final 6 N·m (50 in lb)
Drive shaft mounting . . . . . 108 N·m (80 ft lb)
Input yoke retainer cap screws . . . . . 108-122 N·m (80-90 ft lb)
Input yoke retainer lock nut . . . . . 407 N·m (300 ft lb)
Parking brake backing plate mounting cap screws . . . . . 102-115 N·m (75-85 ft lb)
Transfer drive input yoke to parking brake drum lock nuts . . . . . 61-75 N·m (45-55 ft lb)
Air cylinder cap screws (piston to follower) . . . . . 10-11 N·m (85-100 in lb)
Air cylinder stop nut . . . . . 169 N·m (125 ft lb)
Treadle valve stem nut . . . . . 16,95-22,60 N·m (150-200 in lb)

Power Cluster, Fig. 13-41

Item (13 and 15) . . . . . 81 N·m (60 ft lb)
Item (6) . . . . . 122-183 N·m (90-135 ft lb)
Stop nut retaining, item (17) . . . . . 27-42 N·m (20-31 ft lb)
Capscrew retaining, item (7) . . . . . 115-136 N·m (85-100 ft lb) and set for 1 hour, repeat torque operation

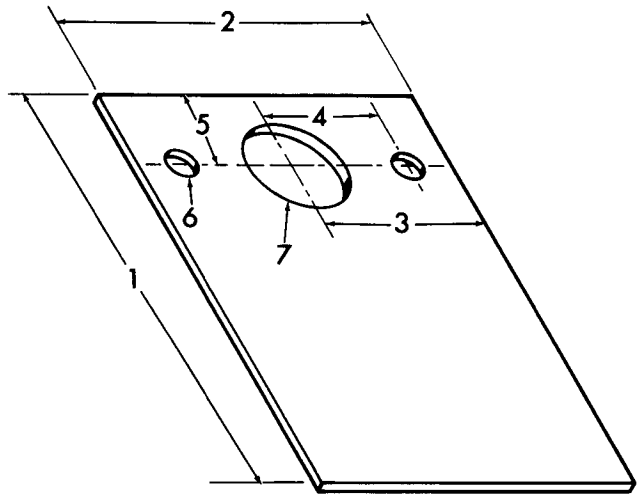
PRINTED IN UNITED STATES OF AMERICA

SERVICE INFORMATION

SPECIAL TOOLS

SPRING TENSION CHART

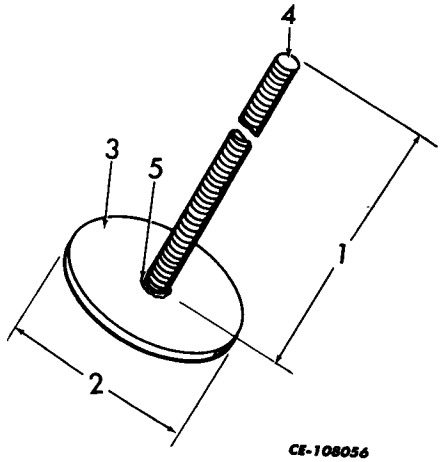
Air Horn Valve	From 15,08mm (19/32 in) to 8.73mm (11/32 in), the load must increase 27 N (6 lb) max -- 22 N (5 lb) min.
Governor (5, Fig. 13-6)	At 31 mm (1-7/32 in) height, should be 302 N (158 lb) Max. – 231 N (142 lb) Min.
Governor (7, Fig. 13-18)	0,175 N/mm (1 lb per in) ±(1-1/2 oz)
Governor (2, Fig. 13-68)	From 6,35mm (1/4 in) to 3.57mm (9/64 in), the load must increase 4,726 N (1 lbf, 1 ozf) max. to 3,902 N (14 1/2 ozf) min.
Relay Valve	From 25 mm (63/64 in) to 18 mm (45/64 in), the load must increase 25,577 N (5-3/4 lbf) Max. – 21,129 N (4-3/4 lbf) Min.



CE-108052

Figure 13-70
Actuator Holding Tool (6 mm (1/4 in) stock).

1. 241 mm (9-1/2 in).
2. 178 mm (7 in).
3. 89 mm (3-1/2 in).
4. 60 mm (2-3/8 in).
5. 38 mm (1-1/2 in).
6. 19 mm (3/4 in).
7. 64 mm (2-1/2 in).



CE-108056

Figure 13-71
Spring Removal Tool.

1. 229 mm (9 in).
2. 89 mm (3-1/2 in).
3. 6,35 mm (1/4 in) stock.
4. 12,7 mm (1/2 in).
5. Weld.

CONTENTS

PRINTED IN UNITED STATES OF AMERICA

GENERAL INFORMATION

DESCRIPTION

Change of direction while the tractor is in motion is an undersirable operating technique. The Electronic Brake Modulator was designed to protect the tractor from damage resulting from directional shifting while the tractor is in motion.

PRINCIPLES OF OPERATION

GENERAL

A magnetic pickup is attached to the transmission. Rotation of a transmission gear (in proximity to the magnetic pickup) causes an A.C. signal to be generated. This A.C. signal is conducted to a control "wafer" mounted on a crossmember of the rear main frame. The "wafer" control consists of the electronic components of the modulator system in an encapsulated form. Components of the "wafer" are not separately serviceable. The "wafer" controls an air solenoid valve.

When the tractor is in motion and is shifted to a reverse direction, the air solenoid valve is actuated and automatically applies the brakes and disconnects the transmission through the transmission disconnect valve.

When the tractor speed has been reduced to the point where the magnetic pickup no longer generates a signal strong enough to energize the control wafer, the air solenoid valve is deactuated. This releases the brakes and engages the transmission, which allows the tractor to now move in reverse of its original direction.

The optimum tractor speed at which the shift modulator system becomes effective has been factory pre-set and should not require further adjustment.

The magnetic pickup is threaded into a bushing in the side of the transmission case. The bushing has two lock screws which are used to firmly lock the pickup in place. In the event that an adjustment is required to bring the shift modulator into operation at a lower or higher tractor speed, it can be accomplished by loosening the lock screws in the bushing and either threading the pickup in, toward the transmission gear, to increase the sensitivity of the system, or turning the pickup out, away from the transmission gear, to decrease the sensitivity.

Increasing the sensitivity causes the system to become operative at a slower tractor speed. Decreasing the sensitivity causes the system to become operative at a higher tractor speed.

ELECTRICAL SENSING SYSTEM

The function of the electrical sensing system is to register vehicle speed and direction and thereby to energize the air solenoid valve (part of the air control system which allows air pressure to active the transmission disconnect valve and service brakes) when a high-speed directional shift occurs.

The sensing system consists of (1) a control assembly (2) a magnetic sensor which is placed near a transmission gear having a rotating speed proportional to vehicle ground speed, and (3) pressure sensitive switches in the directional valve and in the torque converter and air pressure gauge lines. Operation of the sensing system is best understood by observing system changes as the transmission directional lever is moved through its three positions.

Directional lever in "NEUTRAL," engine at low idle:

When the engine is started and idling, pressure builds up in the torque converter and air pressure gauge lines. Pressure build-up in these lines mechanically closes the contacts in the "SAFETY" switch (air pressure line). With these contacts closed, current from the battery is allowed to flow through the switch to the "wafer" and the switching transistor within it. The switching transistor, however, will not be activated by the small flow of current with the engine at low idle.

(Continued on next page)

PRINCIPLES OF OPERATION

ELECTRICAL SENSING SYSTEM - Continued

NOTE: System air pressure must be at least 517 kPa (75 psi) before the "SAFETY" switch will close. If the vehicle air system should fail and the service brakes cannot be used to stop the vehicle, the switch will open and shut off current flow to the "wafer" (thus making the shift modulator inoperative). With the modulator inoperative, the vehicle can be stopped by directional shifting the transmission.

Directional lever in "FORWARD," vehicle beginning to move forward:

When the directional lever is moved to "FORWARD," oil pressure in the directional valve mechanically closes the contact in the forward clutch pressure switch. As the vehicle begins to move forward, the spinning transmission gear and the magnetic sensor serve as an alternator to create a small A.C. signal. This signal is transmitted through the sensor and "wafer" and is converted to direct current. (Fig. 14-1.)

This D.C. current flows through the D.C. amplifier to the switching transistor. When the switching transistor is energized, the battery current is allowed to flow to the forward logic thyristor. With the forward clutch switch contact closed by oil pressure in the directional valve, current is allowed to flow through the forward logic thyristor. It is now possible to remove the current from the forward clutch switch by moving the directional lever to "NEUTRAL" and yet keep the forward logic thyristor energized by the holding resistor. The directional lever can thus be moved at will between "FORWARD" and "NEUTRAL" without activating the shift modulator.

Directional lever moved to "REVERSE," vehicle traveling forward above 1,6 Kmph (1/4 mph).

As the directional lever is moved to "REVERSE" (vehicle traveling forward at a speed of 1,6 Kmph (1/4 mph) or above) the oil pressure in the directional valve mechanically closes the contact in the reverse clutch pressure switch while a pressure drop at the forward clutch pressure switch causes its contact to open.

Current is now allowed to flow from the switching transistor through the reverse logic thyristor, the air solenoid valve and forward logic thyristor to ground.

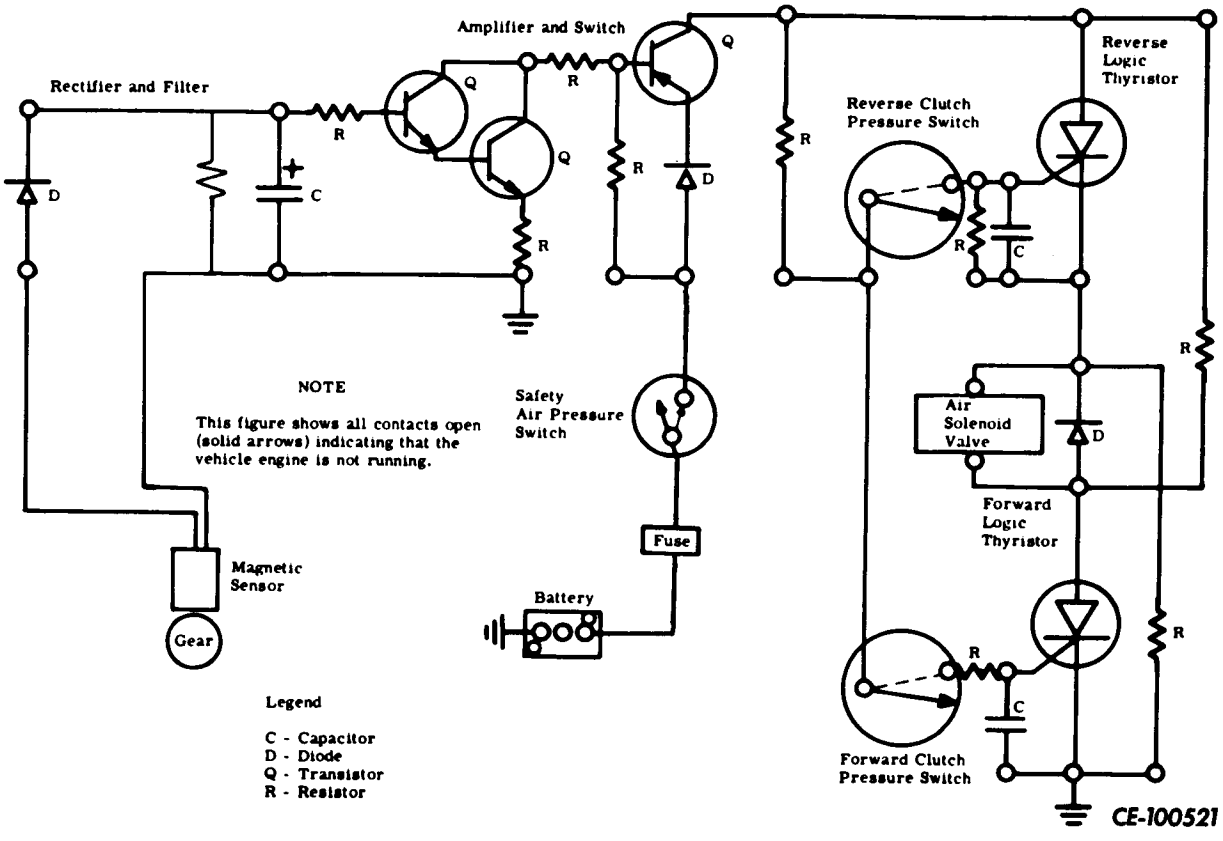


Figure 14-1
Electrical Sensing System.

PRINCIPLES OF OPERATION

Completion of this circuit activates the air solenoid valve. The air solenoid valve allows regulated air pressure to activate the service brakes and transmission disconnect valve until the signal from the magnetic sensor is no longer strong enough to energize the switching transistor. At this speed, the switching transistor opens and cuts off current flow to the modulator sensing system. The air solenoid valve then deactivates, releasing brakes and allowing the transmission to engage. Conversely, the air solenoid valve will be energized when a high speed directional shift occurs from reverse to forward - the only difference being the order in which the sensing system components are energized.

AIR CONTROL SYSTEM

The modulator air system (refer to Fig. 14-2), consists of (1) a pressure regulator which reduces system pressure from 724-483 kPa (105-70 psi), (2) and air solenoid valve which controls air flow from the pressure regulator, and (3) a relay valve which channels air flow to the double check valve on the right treadle (for brake application) and to the transmission disconnect valve. A third air line between the double check valve and a top port on the left treadle allows (upon full application of either left or right treadle) full system air pressure 724 kPa (105 psi) to override the modulator application 483 kPa (70 psi) of the brakes and transmission disconnect valve.

Refer to "ADJUSTMENTS" for pressure regulator checks and adjustment.

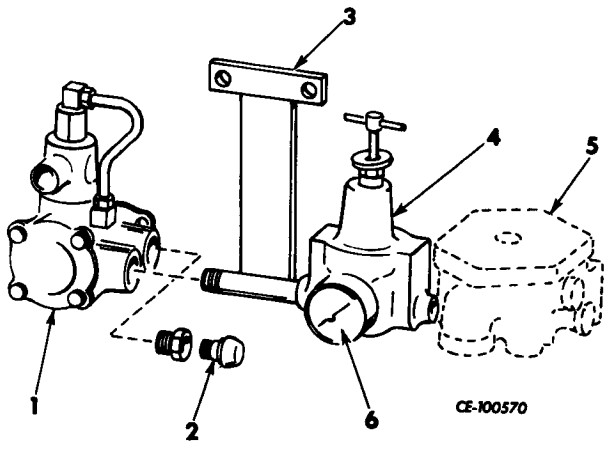


Figure 14-2 -
Air Control System Components.

1. Solenoid valve.
2. Breather.
3. Support bracket.
4. Pressure regulator.
5. Relay valve (refer to Section 13).
6. Pressure gauge.

DISASSEMBLY, INSPECTION AND ASSEMBLY

GENERAL

The brake modulator air control system components are mounted on a tee-shaped bracket which is secured to the right rear frame upper pivot tongue. Removal of the bracket and its attached components as a unit, rather than removing each component individually, is suggested for ease in servicing.

REMOVAL

Exhaust all air from system and reservoirs. Tag and disconnect all lines and electrical connections. Remove hardware securing btacket and remove bracket and components to a clean work bench. Separate components from bracket and from each other.

DISASSEMBLY, INSPECTION AND ASSEMBLY

PRESSURE REGULATOR

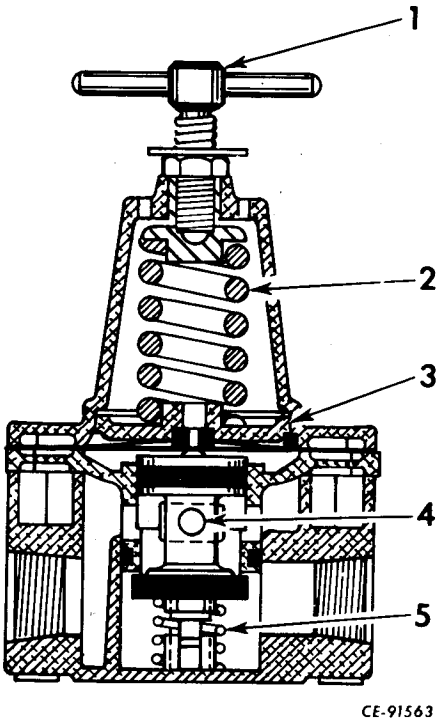


Figure 14-3
Cutaway of Pressure Regulator.

1. Adjusting screw.
2. Control spring.
3. Diaphragm.
4. Cartridge.
5. Compensating spring.

Disassembly

Remove air pressure gauge (6, Fig. 14-2) from regulator body.

Loosen lock nut (3, Fig. 14-4) and unscrew adjusting screw (1). Remove screws (4). Separate bonnet (5), spring seat (6), spring (7) and diaphragm (8). Remove cartidge assembly from body (11). Remove nut (15) and poppet (16). Slide piston (17) out of cartridge (9). Remove piston seal (18) from piston. Remove "O" ring (10). Remove compensating spring (14), gauge port shield (13) and gasket (12) from body.

Inspection

Clean and inspect valve as follows:

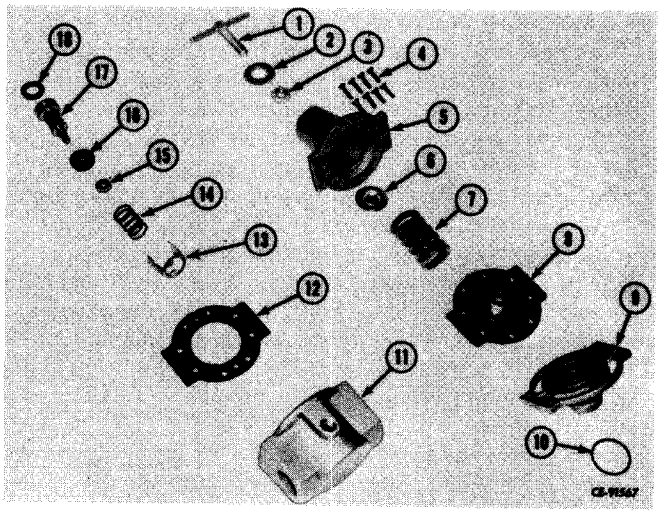


Figure 14-4
Regulator Assembly.

Clean all metal parts in a good grade cleaning solvent. Use compressed air to dry parts.

Replace diaphragm, "O" ring, gasket, poppet and piston seal with a service kit.

If any other part shows wear or damage, replace complete regulator assembly.

Assembly

Install shield (13, Fig. 14-4) and spring (14) in body (11) and gasket (12) on body. Install seal (18) on piston. Slide piston in cartridge (9) and install poppet (16) on it. Secure with nut (15).

Install "O" ring (10) on cartridge; slip cartridge assembly in body. Position diaphragm (8), spring (7), seat (6) and bonnet (5) over body assembly and align holes. Install and tighten screws (4). Thread screw (1) into bonnet until it engages spring seat.

Thread air pressure gauge (6, Fig. 14-2) into regulator body.

AIR SOLENOID VALVE

Disassembly

Unscrew nuts (2, Fig. 14-5) and remove tube (3). Remove elbow (1).

Remove adapter (1, Fig. 14-6), seal (2) and nut (3).

DISASSEMBLY, INSPECTION AND ASSEMBLY

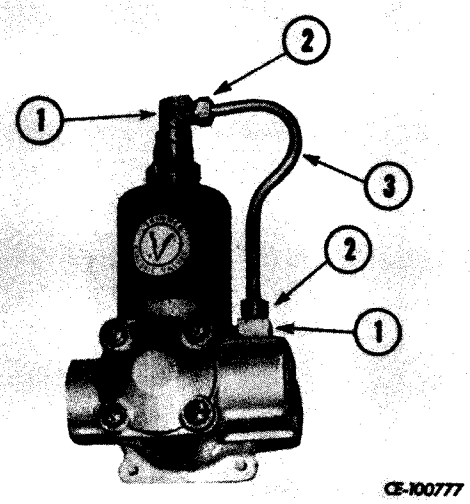


Figure 14-5
Remove Line.

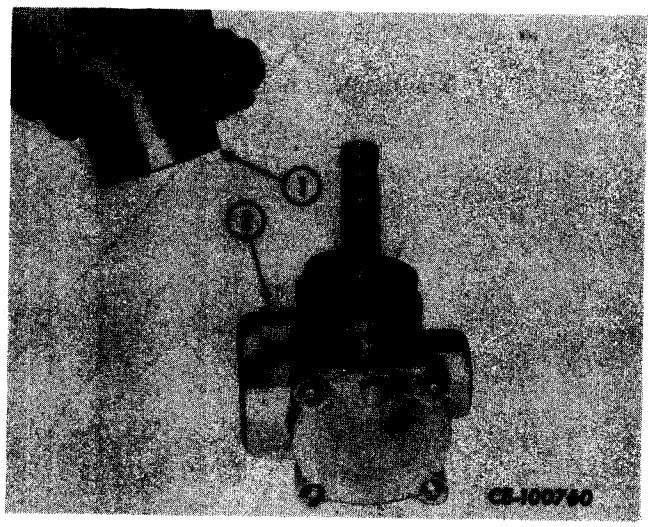


Figure 14-7
Remove Elbow.

Lift off housing and coil (1, Fig. 14-7). Remove tubing elbow (2).

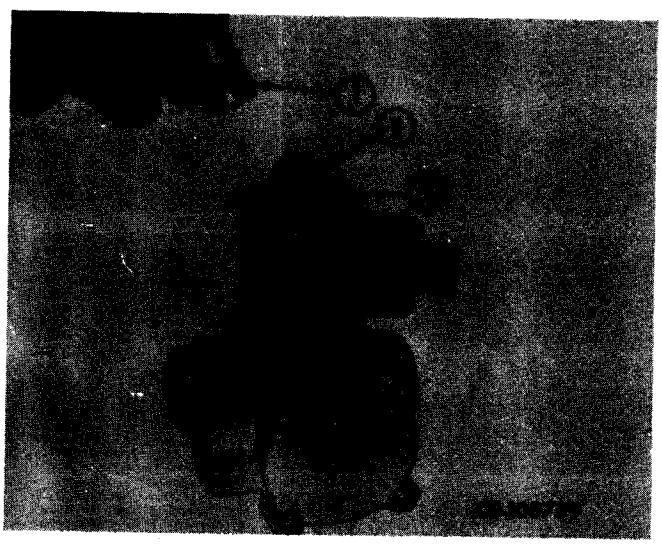


Figure 14-6
Remove Adapter.

Slide flux plate (1, Fig. 14-8) and spring washer (3) from sleeve (2).

(Continued on next page)

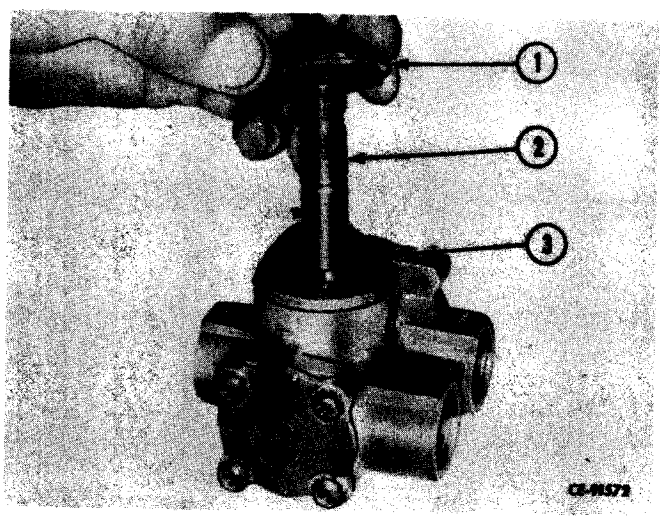


Figure 14-8
Remove Washer.

DISASSEMBLY, INSPECTION AND ASSEMBLY

AIR SOLENOID VALVE - Continued

Disassembly - Continued

Using the special tool (refer to "SPECIAL TOOLS") (2, Fig. 14-9), unscrew sleeve (1) from body (3).

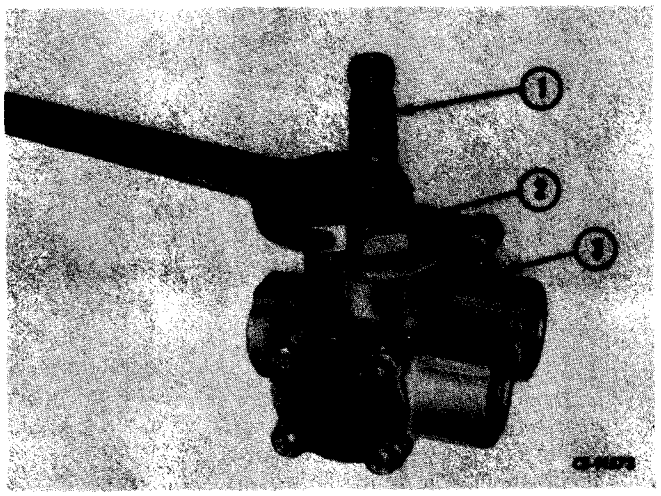


Figure 14-9
Remove Sleeve.

Remove flange seal (3, Fig. 14-10), plunger spring (1) and plunger (2) from body (4).

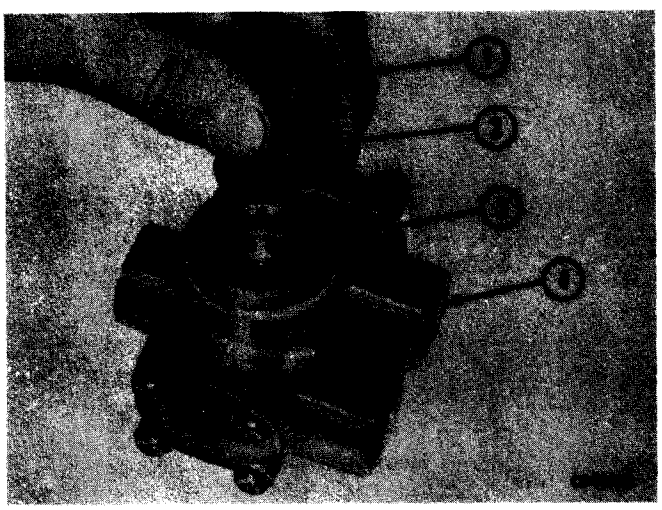


Figure 14-10
Remove Plunger.

Remove screws (4, Fig. 14-11) securing small cover (1). Remove cover and spring (3). Remove "O" ring (2) from cover.

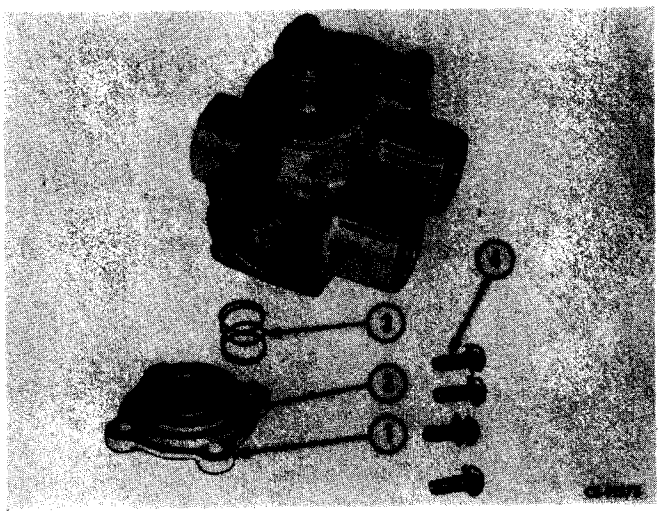


Figure 14-11
Remove Small Cover.

Remove screws (1, Fig. 14-12) securing large cover (2). Remove cover.

Hold nut (1, Fig. 14-13) on diaphragm end of spindle and remove nut (4) from other end. Remove seal retainer (3) and seal (2) from spindle. Slide spindle and diaphragm from body.

Figure 14-12
Remove Large Cover.

DISASSEMBLY, INSPECTION AND ASSEMBLY

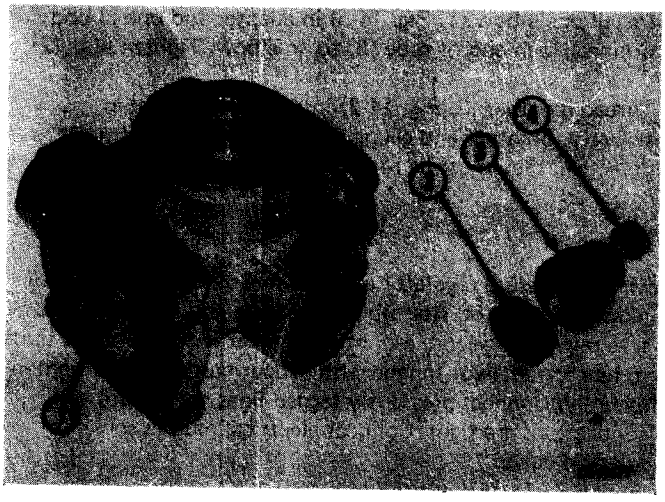


Figure 14-13
Remove Retainer.

Remove nut (1, Fig. 14-14) while holding spindle (6). Slide diaphragm retainer (2), diaphragm (3), seal retainer (4) and seal (5) from spindle.

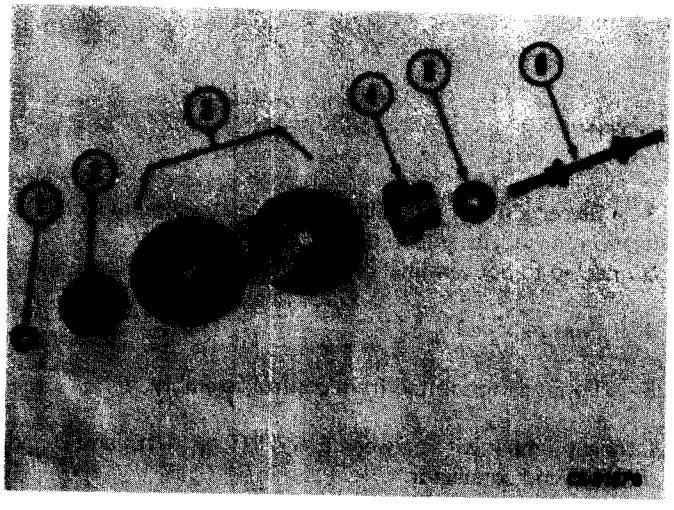


Figure 14-14
Diaphragm Assembly

Inspection

Clean and inspect air solenoid valve as follows:

Clean all metal parts in a good cleaning solvent.

Clean plunger assembly, diaphragm seals and "O" ring in kerosene.

Use filtered compressed air to dry parts.

Inspect seals, "O" ring and plunger ends for excessive wear or damage.

Inspect diaphragms for tears or abrasion.

Check spindle and springs for wear or damage.

Check coil for continuity. Replace coil if it has an open or shorted circuit.

Replace any parts found to be damaged.

Assembly

Slide seal (5, Fig. 14-14) and seal retainer (4) on longer end of spindle (6).

NOTE: The diaphragm assembly (3) is composed of three parts. They are: a diaphragm with a locating tube hole, a diaphragm with a locating tube hole and a bleed hole and a diaphragm spacer.

Install diaphragm assembly on spindle as follows:

Place diaphragm with bleed hole, diaphragm spacer and remaining diaphragm, in that order, on spindle.

Align locating tube holes in diaphragms. Press center of diaphragm assembly over shoulder diameter of seal retainer. Inner diaphragm area should be pushed downward into undercut of retainer. This insures metal-to-metal contact between diaphragm retainer and seal retainer shoulder.

While maintaining alignment, install retainer (2) (rounded edge to diaphragm) and secure with spindle nut (1). Tighten nut to recommended torque. Refer to "SPECIAL TORQUES" in this section.

Torque: _____

Slide spindle assembly into bore of body with locating hole in diaphragm over locating tube in body. Hold nut (1, Fig. 14-13) on diaphragm end and install seal (2), seal retainer (3) and nut (4). Tighten nut to recommended torque. Refer to "SPECIAL TORQUES" in this section.

Torque: _____

While holding spindle from small cover end to keep diaphragms smooth, install large cover (2, Fig. 14-12). Install and tighten cover retaining screws (1). Refer to "SPECIAL TORQUES" in this section.

Torque: _____

(Continued on next page)

DISASSEMBLY, INSPECTION AND ASSEMBLY

AIR SOLENOID VALVE - Continued

AAssembly - Continued

Install "O" ring (2, Fig. 14-11) in groove of cover (1). Hold one end of spring (3) against seal retainer and position cover over other end. Install cover and secure with retaining screws (4). Refer to "SPECIAL TORQUES" in this section.

Torque: _____

Position flange seal (3, Fig. 14-10), plunger (2) and plunger spring (1) in body (4).

Slide sleeve (1, Fig. 14-9) over plunger and thread it into body (3) hand tight. Using special tool (2), tighten sleeve. (Refer to "SPECIAL TOOLS.")

Install spring washer (3, Fig. 14-8) and flux plate (1) over sleeve (2).

Install nut (3, Fig. 14-6), seal (2) and adapter (1).

Install one elbow (1, Fig. 14-5) in adapter and one in body. Connect each end of tube (3) to an elbow. Tighten nuts (2).

Thread breather (2, Fig. 14-2) into valve and tighten securely. Breather and gauge are not serviceable items. If defective, they must be replaced in their entirety.

Installation

Thread pressure regulator and solenoid valve onto nipple of mounting bracket. Assemble relay valve and nipple to pressure regulator. Secure mounting bracket with assembled units to rear frame pivot tongue with proper hardware and tighten securely. Connect previously tagged lines, being sure all connections are tight. Connect electrical plug to socket of solenoid valve.

SENSOR AND CONTROL ASSEMBLY

General

If a malfunction of either the magnetic sensor or control "wafer" occurs, the entire unit must be replaced. Due to their construction, neither of these units can be disassembled.

TROUBLE SHOOTING

SOLENOID VALVE

Test conditions:

1. Engine off.
2. Main air pressure within "RUN" segment of air pressure gauge.
3. Be certain that 24 volts is available at loom power connection (on starter solenoid switch). Be sure orange wire is connected to hot terminal of starter solenoid.
4. Fuse removed.
5. Loom disconnected from control assembly.

Connect jumper wire between E and I (Fig. 14-15) and D and G on loom end connector.

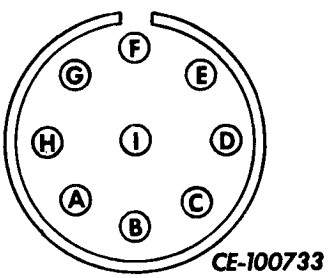


Figure 14-15
Loom End Connector.

Install fuse. Solenoid valve should apply the brakes. If brakes have been applied, air will be heard exhausting from solenoid valve breather when fuse is removed.

If brakes do not apply, replace following parts in order given, retesting after each new component is installed.

1. Fuse.
2. Air pressure switch.
3. Solenoid valve.
4. Wire loom.

TROUBLE SHOOTING

DIRECTIONAL PRESSURE SWITCHES

Test conditions:

1. Engine off.

2. Main air pressure within "RUN" segment of air pressure gauge.

3. Determine that 24 volts is available at loom power connection.

4. Fuse removed.

5. Loom disconnected from control assembly.

Connect jumpers between E and I (Fig. 14-15), G and B, C and D, and F and D on loom end connector.

Disconnect wire connectors on both vertical directional pressure switches.

A. Install fuse. Block each wheel, front and back, and lower bucket to ground to prevent vehicle movement.

B. Start engine, place range selector lever in third range and directional lever in forward. If brakes do not apply, replace "forward" switch. Place directional lever in reverse. If brakes do not apply, replace "reverse" switch.

C. Stop engine. Connect wire connectors on both vertical pressure switches and disconnect wire connectors on both horizontal switches.

D. Repeat step "B."

SPEED SENSING CIRCUIT

Test conditions:

1. Engine off.

2. Main air pressure within "RUN" segment of air pressure gauge.

3. Fuse removed.

4. Loom connected to control assembly.

Disconnect wire connectors from both vertical directional pressure switches. Connect jumper wires from "A" to "B" (Fig. 14-16) on both connectors.

CE-100734

Figure 14-16
Pressure Switch Connector.

Remove magnetic sensor from transmission and reconnect it to loom. Install fuse. Quickly move a screwdriver or other ferrous object toward and then away from sensor tip. (Metal object should actually come in contact with tip.) This should cause brakes to apply and then release.

If brakes do not apply, replace following parts in order given, retesting after each new component is installed.

1. Fuse.

2. Magnetic sensor.

3. Control assembly.

4. Wire loom.

SERVICE INFORMATION

ADJUSTMENT

Pressure Regulator Check and Adjustment

(Refer to Fig. 14-2). The pressure regulator has an air pressure gauge in the body of the regulator. The gauge should not read over 483 kPa (70 psi). If the pressure indicated is below 483 kPa (70 psi), loosen the lock nut and turn the adjusting screw clockwise to raise the pressure. If the pressure is above 483 kPa (70 psi), apply a brake treadle several times till the air pressure is below 483 kPa (70 psi). Then back off the adjusting screw until compression is released from pressure spring. Readjust pressure by turning adjusting screw clockwise until the 483 kPa (70 psi) pressure is reached. Tighten the lock nut.

Magnetic Sensor Check and Adjustment

The magnetic sensor is located on the rear of the transmission just above and to the right of the output shaft. It is protected by a steel tube and locked in place by a lock nut plus two setscrews threaded through the tube.

Turning the magnetic sensor clockwise increases the sensitivity. This causes the system to become operative at lower tractor speeds and holds the brakes "on" down to lower tractor speeds.

The following adjustment procedure will establish a median operating speed within the recommended RPM range.

ADJUSTMENT PROCEDURE

1. Make temporary engine tachometer installation so that tachometer can be read from operator's seat.

2. Initial gear to sensor tip clearance should be 0,813 mm (.032 in). Remove inspection cover and magnetic sensor tube guard to make initial adjustment. Keep sensor housing pushed into pilot bore when checking sensor-to-gear clearance. Replace inspection cover and connect cable to magnetic sensor.

3. Operate tractor in first gear forward at a stabilized 1200-1250 RPM on dry level ground. Shift into reverse. If brake modulator fails to operate (brake lights do not come on or air release at solenoid valve is not heard), shut down engine. Turn magnetic sensor clockwise so that it moves closer to gear. Repeat this procedure until modulator will operate at a stabilized 1200-1250 RPM.

4. Operate tractor in first gear forward at a stabilized 1100-1150 RPM on dry level ground. Shift into reverse. If modulator does operate, shut down engine. Turn magnetic sensor counterclockwise. Repeat this procedure until modulator will not operate at 1100-1150 RPM.

5. Recheck to make sure step #3 is still satisfied.

NOTE: After adjustment is complete, make sure:

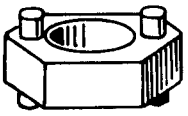
1. Magnetic pickup lock nut is tight.

2. Magnetic pickup steel tube protector is replaced with shim washers underneath to insure drainage.

3. Two setscrews in protector are tight on magnetic pickup.

4. Inspection cover cap screws are tight.

SPECIAL TOOLS



CE-100275

Figure 14-17
Air Solenoid Valve Special Nut Tool.
Hough Part #884368C1

SPECIFICATIONS

PRESSURE REGULATOR
Pressure Setting . . . . . 483 kPa (70 psi)

RELAY VALVE
Refer to Section 13.

SPECIAL TORQUES

NOTE: Threads lubricated with oil or grease.

Air solenoid valve cover retaining screw	24 N·m (18 in lb)
Air solenoid valve spindle nuts	24 N·m (18 in lb)