SERVICE AND REPAIR MANUAL

FOR

TORQUE CONVERTER

and

RESERVOIR ASSEMBLY

AS USED IN

Model HA - HAH - HF - HR - HU - HH

"PAYLOADER" Unit

FORM SD-20

MANUFACTURED BY

THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

LITHO. IN U. S. A.

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I. INTRODUCTION

In the past few years, the name torque converter has begun to play an increasingly important part in the industrial and construction equipment fields. Today, "PAYLOADER" units equipped with torque converters are doing more work faster with less effort on the part of the operator.

THE FRANK G. HOUGH CO. is now producing a hydraulic power take-off unit which includes a torque converter manufactured by Borg & Beck, a division of the Borg-Warner Corporation. This P.T.O. is currently used on the following "PAYLOADER" units:

HA - S/N 26900 thru S/N 27349
S/N 2A-27401 and up
HAH - S/N 51929 thru S/N 52100
S/N 4A-1003 and up
HF - S/N 85061 and up
HR - S/N 43800 and up
HU - S/N 14A-1001 thru S/N 14A-1363
S/N 15A-1001 thru S/N 15A-1119
HH - S/N 18A-1001 thru S/N 18A-1448
S/N 19A-1001 thru S/N 19A-1133

Basically, the P.T.O. assembly is the same for all of these models. We feel, therefore, that one service manual will cover all units.

The purpose of the hydraulic torque converter is to multiply, within itself, the torque generated by the engine, and transmit this increased torque through the transmission and into the final drive. Further, it reduces shock normally imposed upon the gear train by sudden surges of power required to overcome increased work loads.

II. DESCRIPTION

A. Design

The torque converter is a simple, three-element type, normally consisting of a converter impeller (pump A), a converter runner (turbine B), and a reaction runner (stator C). These parts, with the necessary bearings and seals, are coupled to an oil reservoir housing by means of the converter runner shaft (D) as shown in Fig. No. 1.

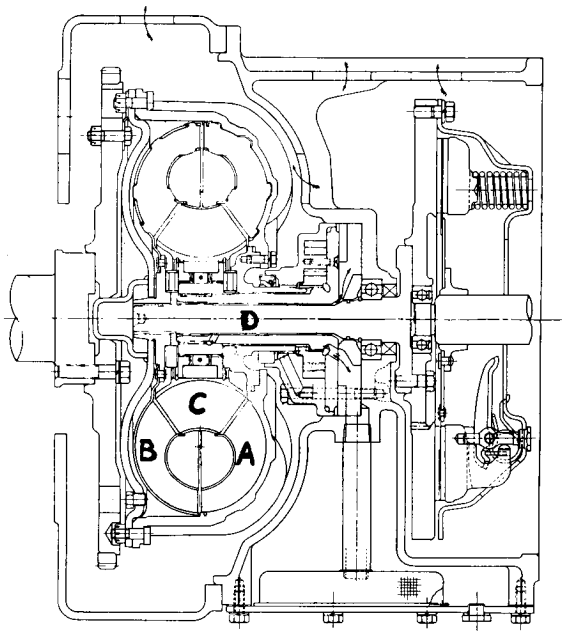


Fig. No. 1
Typical Converter Installation

This torque converter assembly has its own hydraulic system. The casting between the clutch housing and the engine flywheel housing includes a hydraulic reservoir, strainer, pump and relief valve. A filter and cooler (with the exception of HAC and HAH S/N 51929 through S/N 52100), are also a part of this system, though not contained within the housing.

B. Installation

Fig. No. 2 shows a view of the side of the unit which is on the right side of the "PAYLOADER". Just below the center of this side of the housing is a fitting which is an outlet from the pressure side of the pump. The pump is contained within the housing. The line from this fitting carries high pressure (40 - 50 P.S.I.) oil to the relief valve fitting which can be seen extending above the housing on the far side.

The other fitting shown on this side is the outlet fitting for oil leaving the converter and on its way to the filter and cooler. The electrical "sending" devices are for the oil temperature gauge and for the high temperature warning horn.

When the oil temperature exceeds 265° - 285°, safe working temperature, the "PAYLOADER" horn will blow until the temperature returns to the safe operating range.

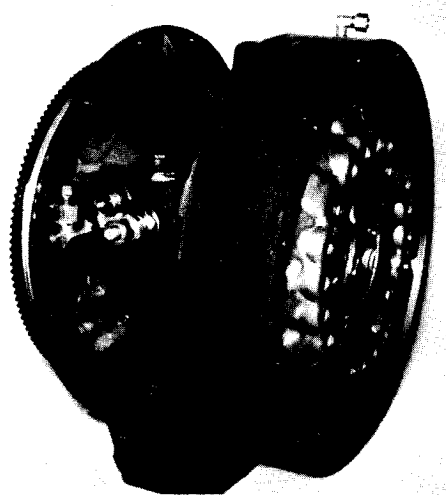


Fig. No. 2
R.H. Side of Converter & Reservoir

In this picture you can also see the clutch cover assembly which is bolted to the clutch flywheel in the conventional manner.

In Fig. No. 3 you see the inlet to the pressure relief valve at the top and the inlet to the orifice plate cover in the center of the left side housing cover.

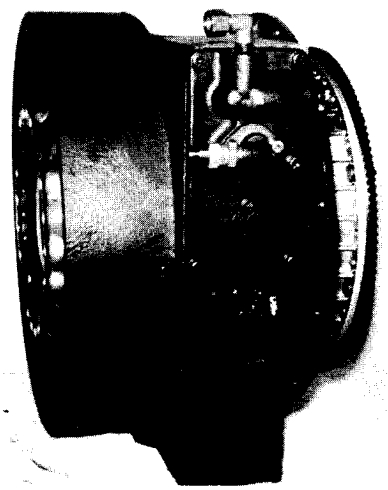


Fig. No. 3
L.H. Side of Converter & Reservoir

Just below the orifice inlet is a 1/8" pipe plug. This plug indicates the proper oil level in the reservoir for Model HAH "PAYLOADER" only.

Reading from left to right in Fig. No. 4 are the output shaft, "O" ring for pump, collector block and pump assembly.

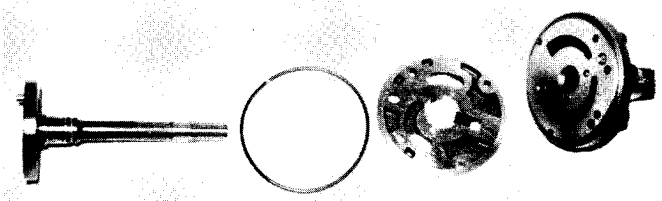


Fig. No. 4
Output Shaft and Pump Group

C. Operation

In operation, the converter impeller is driven directly from the engine crankshaft, and draws oil into itself and forces this oil, by centrifugal action, against the turbine and stator. Under load, the action of the oil against the turbine and stator multiplies the engine torque and causes the turbine to transmit power to the gear train. At a constant engine torque input, the torque multiplication of the converter varies with the load imposed upon the tractor. As the tractor load diminishes, the torque multiplication is inversely proportional to the speed ratio until the free wheel point is reached.

D. Oil Flow

Fig. No. 5 shows the oil flow throughout the entire torque converter hydraulic system. NOTE: The filter is used on all models. Model HAC and HAH S/N 51929 through S/N 52100 do not use the cooler.

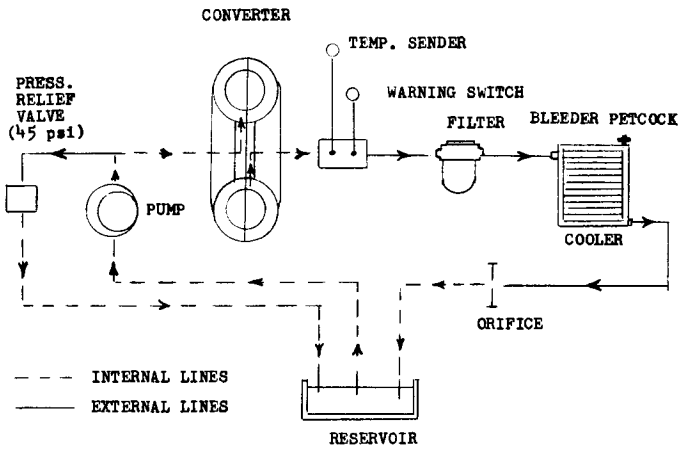


Fig. No. 5
Oil Flow Diagram

Oil is fed to the converter whenever the engine is running by the eccentric gear type pump which is within the housing driven by the converter impeller. The oil is pulled through a strainer in the reservoir before it enters the pump.

A part of the oil on the outlet side of the pump is diverted by the collector block to an external copper tube which leaves the housing at the lower fitting on the right side and re-enters at the pressure relief valve on the top of the left side of the housing. Oil passes through this line only when the relief valve pressure is exceeded and the valve is open. This pressure is about 40 - 50 P.S.I. It is not critical; it simply maintains adequate supercharging of the torque converter. The relief valve is not adjustable. The other portion of the pump output oil is directed to the torque converter through the hollow input shaft.

Oil leaves the converter housing through the upper outlet on the right side and is carried to the filter, the cooler and back to the reservoir through the orifice plate. On the HA and HAH, no cooler is required. Oil on the return side of the converter is under a little less pressure, usually varies from 25 to 30 P.S.I. The orifice plate provides a flow restriction which insures a back pressure on the converter, filter and cooler.

E. Operating Technique

The operation of loading the bucket with machines fitted with torque converters differs in the technique used with ordinary machines of this type.

The torque converter increases the normal thrust on the drive wheels, thereby crowding the bucket in the bank or face of the cut with a greater force than can be overcome by the hydraulic power generated to raise the bucket out of the cut. This is especially true when the bucket is held near ground level while loading hard or heavy material.

To overcome this crowding or "wedging" action imparted to the bucket, by the multiplied thrust of the drive wheels, the operator should decrease pressure on the foot pedal. Less pressure on the accelerator will diminish torque output resulting in less drive thrust.

Keep the clutch engaged throughout the loading operation. Habitual intermittent declutching to govern the rate of advancement into the stock pile defeats the purpose of the torque converter, and causes unnecessary wear on the clutch. Control the speed of the tractor into the stock pile by manipulation of the accelerator pedal, and in conjunction, operate the valve lever to fill the bucket completely in a single steady pass into the stock pile. This will avoid spinning the drive wheels or needing a series of successive short thrusts to obtain a full payload.

The technique used to load the bucket on 1955 Model HA, HU, HH "PAY-LOADER" units varies considerably from the technique used on earlier models.

Basically, the bucket on the 1955 units is loaded through a breakout action controlled by the bucket lever in the operator's compartment. This special action eliminates the need to raise the boom in order to fill the bucket as required on earlier models. In the case of the 1955 models, the boom is used mainly to raise the loaded bucket to dumping position.

III. SERVICE AND MAINTENANCE

A. Periodic Service of the Torque Converter and Reservoir Assembly

Type "A" transmission fluid is recommended for use in the torque converter system and should be changed every 2,000 hours of operation. The converter filter element should be changed every 500 hours.

B. Location of Service Points

1. Drain Plug - On the Model HA, this service point is located at the lower left corner on the front side of the converter housing. The drain plug on Models HAH, HF, HR, HU and HH is located at the lower right corner on the back side of the housing.

2. Oil Cooler Breather Petcock - located at the top corner and on the left side of the cooler. NOTE: The cooler is used only on Models HAH S/N 4A-1001 and Up, HF, HR, HU and HH.

3. Oil Cooler Drain Plug - Located at the lower corner on the right side of the cooler.

4. Inlet Tube Assembly - Used on Models HA, HAH, HF, HR, HU and HH and located on the inside of the converter housing and above the bottom cover plate.

5. Filter - This serviceable item is located under the operator's seat on Models HA and HAH and is mounted to the main frame on the right side of the engine in Models HF, HR, HU and HH.

6. Filler Plug - to fill the converter on Model HA, remove the breather cap located at the left side and on top of the housing. The filler plug for Models HAH, HF, HR, HU and HH is located in the upper left corner on the back of the converter housing.

7. Level Plug - The oil level in the HA converter is measured with a dip stick instead of a level plug. The dip stick is an integral part of the breather cap located at the left side and on top of the housing. NOTE: When the oil in the converter is cold it should reach 1/4" above the bottom of the dip stick. With the engine shut off and the oil temperature at 120° F, the oil should reach near the high mark on the dip stick.

A 1/8" pipe plug is used to check the converter oil level on Model HAH. This plug is located below the orifice flange cover on the left side of the housing.

A 1-1/2" pipe plug on top left rear side of the housing is used both as a filler plug and oil level plug for Model HF, HR, HU and HH "PAY-LOADER" units.

C. Draining the Torque Converter & Reservoir Assembly

CAUTION: Do not drain oil from any part of the torque converter system unless the oil temperature is below 150° F.

Open all breather petcocks and remove filler plug before removing the oil cooler and converter drain plugs. Let all the oil drain from the housing and cooler, then start the engine, letting it run momentarily about (1) one minute, to pump out the oil in the converter element. Then shut off engine. Next remove the inlet tube assembly from the underside of the housing and clean out the sludge and dirt caught in the assembly and bottom of reservoir. Replace the inlet tube assembly and bottom cover plate and the oil cooler and converter drain plugs securely after cleaning. Be sure the cover gasket is in place and does not leak. Change the converter filter element when draining the converter housing.

D. Filling the Torque Converter and Reservoir Assembly

Pour approximately 13 quarts of Type "A" transmission fluid into the converter housing at the filler plug.

Then start the engine and lock the parking brake. Shift the transmission gears in the lowest speed range and engage the clutch. Open the throttle to full open position and maintain this operation until the torque converter oil temperature reaches 120° F. Bleed the air from the oil cooler while the engine is running. See Z, page 6. Then shut off engine and add oil to the converter housing until it begins to run out of the 1/8" oil level hole (Model HAH) or is near the high mark on the dipstick (Model HA), or the 1-1/2" pipe plug on Models HF, HR, HU and HH. The oil level plug and filler plug or breather cap may now be replaced.

NOTE: When refilling and checking the converter oil level always be sure that the oil temperature is 120° F. for accurate checking.

E. Torque Converter & Reservoir Assembly Oil Filter

Change the torque converter filter element every 500 hours of operation or at least once every four (4) months. The engine must be shut off and the torque converter oil temperature must be below 150° F. when changing the filter element. Add one (1) quart of Type "A" transmission fluid after the element is changed.

Change the filter element according to the instructions on the box from which the element was removed and replace the filter cover tightly. Then start the engine letting it run at idle speed for about 10 minutes to fully saturate the new element with oil. Then shut off the engine, let it stand until the converter oil temperature is below 150° F. for safety. Check the oil level in the converter housing to be sure it is up to correct height when the converter oil temperature is 120° F. This is necessary as oil will be retained in the filter container, thereby reducing the oil level contained in the converter. Check the filter cover, hoses and connections for leaks before putting the machine to work.

F. Oil Capacities

The oil capacities of the hydraulic torque converter systems are listed below. Always use a good grade of Type "A" transmission fluid.

MODELS	CAPACITIES
HA	14-1/2 qts.
HAH	15 qts.
HF	17 qts.
HR	17 qts.
HU	17 qts.
HH	17 qts.

G. Pre-Delivery Service

Too little emphasis on thoroughly checking a "PAYLOADER" before it is delivered to the customer can be disastrous. Therefore, we recommend that the following checks be made on the torque converter and reservoir housing assembly as well as the checks outlined in the "PAYLOADER" PRE-DELIVERY SERVICE CHECK LIST, Form No. SD-9.

1. Be certain that the oil level in the reservoir is correct.
2. Check and adjust engine R.P.M.
3. Run the engine until the water temperature is 150°F-180°F, engage the emergency brake, put the directional lever in forward position, put the range lever in high position and run engine at full R.P.M. for approximately 10 minutes. Check for oil leaks in the reservoir and all oil lines.
4. If the horn does not sound when the converter oil temperature reaches 265° F - 285° F, immediately reduce the engine load and allow the engine to idle until the oil cools to at least 120° F. Then determine why the warning switch did not function properly.

H. 30, 60 and 90 Day Warranty Checks

It is generally accepted in the industrial and construction equipment fields that actual field working conditions cannot be duplicated at the factory or in the distributor's shop. Therefore, factory tests may not always find trouble that could be brought about by conditions in the field later on.

Being well aware of the above, we recommend that 30, 60 and 90 day warranty checks be made to try and find if any of the problems listed under the TROUBLE SHOOTING section below, exist. It is our firm belief that if defective material or poor workmanship was erroneously introduced into the manufacture of the "PAYLOADER", it would cause trouble within 90 days after the unit was put into operation.

The warranty checks should include all the steps listed under Pre-Delivery Service as well as those listed below:

1. Determine if the customer is using the correct weight of oil in the converter and reservoir housing system.
2. Determine if the customer is changing the oil filter and oil as recommended.
3. Determine if the customer has kept the clutch properly adjusted.
4. Determine whether or not the customer has been abusing the machine or operating in high gear when under severe loading conditions and overheating the oil in the system.

The customer should be reminded that he is solely responsible for the proper maintenance and operation of his unit throughout its life.

IV. TROUBLE SHOOTING

The information in this section is presented as a guide to the operator and maintenance crew in locating trouble in the torque converter and reservoir assembly.

A. Oil Leaking from the Engine Flywheel Housing

1. Cause: Rear engine oil seal leaking.
   Remedy: Install new seal.
2. Cause: Pump seal leaking.
   Remedy: Replace seal.
3. Cause: Broken or frayed collector block "O" ring.
   Remedy: Replace "O" ring.
4. Cause: Dynaseal - washers leaking at pump.
   Remedy: Install new washers.

NOTE: To make the above corrections, it will be necessary to remove the reservoir housing assembly from the engine.

B. Oil Leaking from the Clutch Housing

1. Cause: Output shaft seal leaking.
   Remedy: Replace the seal.

NOTE: To make the above corrections, it will be necessary to remove the P.T.O. housing, clutch flywheel and output shaft from the reservoir housing assembly.

C. Lack of Torque Multiplication

1. Cause: Failure of Sprag clutch.
   Remedy: Replace Sprag unit outer and inner race. Clean out entire system.
2. Cause: Clutch slipping.
   Remedy: Replace or readjust clutch disc.

D. Overheating

1. Cause: Due to lack of oil circulation due to:
   pump drive failure
   worn out pump
   open relief valve
   clogged inlet screen
   clogged filter
   clogged orifice
   clogged cooler
   low oil level
   Remedy: Pressure checks at high and low pressure side will help to determine source of trouble.

E. Noisy - No Torque Output or Erratic Output

1. Cause: Broken straps at engine flywheel.
   Remedy: Replace using double strap per section on reassembly of converter element to flywheel.

V. SERVICE & OVERHAUL

A. Overhaul Suggestions

We recommend that the disassembly and assembly of the torque converter and reservoir assembly be handled by our distributors in their own repair shops.

No special tools are required to remove the assembly from the "PAY-LOADER". Disassembly, inspection, reassembly and reinstallation can also be done with common shop tools and equipment. In most cases, it will be necessary to remove the engine unit from the "PAY-LOADER" in order to work on the con-

verter assembly. In the HA and HAH, it will then be necessary to remove the transmission from the assembly if work is to be done on the clutch or clutch flywheel or converter output shaft. Fig. No. 6 shows the clutch end of the converter assembly which is mounted on an HA "PAYLOADER" engine. The engine has been removed from the tractor in this picture and the converter assembly can now be removed for disassembly, inspection and reassembly.

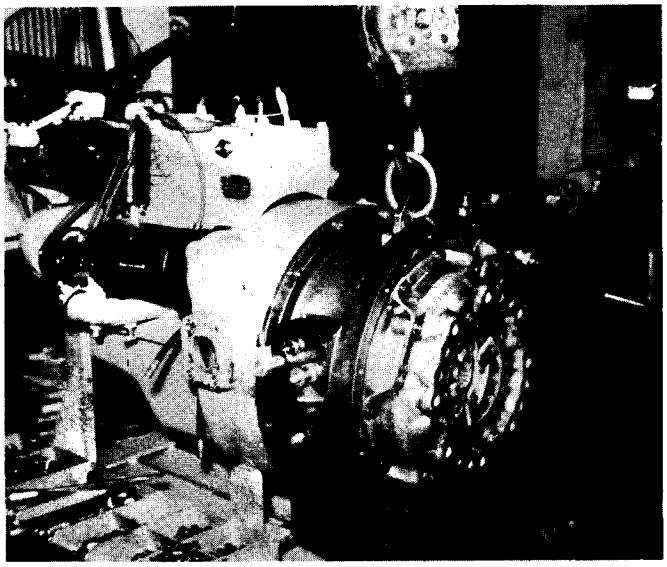


Fig. No. 6
Clutch Installation

B. Disassembly Procedure for the Reservoir Housing Assembly

As the assembly is removed from the flywheel housing the converter element itself will remain bolted to the flywheel. The assembly removed will then contain all of the items shown in Fig. No. 7 except item No. 1, the converter element itself. All items in Fig. No. 7 are serviceable as individual parts with the exception of the pump, Item No. 2. If it has been determined that the pump is the source of trouble, it should be replaced as a complete unit.

TORQUE CONVERTER & RESERVOIR ASSEMBLY GROUP
MODEL HA PAYLOADER ONLY

	Item No.	Part No.	Part Name	Qty.
	1	122362	Torque Converter Assembly - See Note	1
	2	119157	Pump Assembly	1
	3	122690	Oil Seal (included in item 2)	1
	4	119163	Capscrew (Drilled Head) 5/16" N.C. x 2-3/4" Long	2
	5	122359	Capscrew (Drilled Head) 5/16" N.C. x 2-5/8" Long	2
	6	122360	Dynaseal Washers	4
	7		Lockwire - #16 Half Hard Steel Wire	1
	8	122467	"O" Ring	1
	9	119088	Collector Block	1
	10	119153	Seal Ring	1
	11	119176	Retaining Ring	1
	12	118866	Ball Bearing	1
	13	119821	Reservoir	1
	14	119899	Gasket - Cover (Upper)	1
*	15	127625	Cover - Assembly (includes sleeve)	1
	16	108117	Capscrew - 3/8" N.C. x 1-1/4" Long - Cover	6
			Lockwasher - 3/8" Std. - Cover	6
	17	119094	Flange - Cover	1
	18	108013	Capscrew - 1/4" N.C. x 3/4" Long	2
			Lockwasher - 1/4" Std.	2
	19	119096	Plate - Orifice	1
*	20	119095	Gasket - Flange	1
*	21	116152	Plunger (Ball)	1
*	22	119138	Spring	1
	23	114851	Washer	2
	24	116716	Plug	2
	25	119904	Gasket - Cover (Lower)	1
	26	119903	Cover - Lower	1
	27	108116	Capscrew - 3/8" N.C. x 1" Long	6
			Lockwasher - 3/8" Std.	6
	28	119154	Oil Seal	1
	29	119087	Output Shaft	1
	30	119930	Place Bolt	6
	31	123100	Flywheel	1
	32	122481	Dowel	1
	33	123231	Pilot Bearing	1
	34	119139	Inlet Tube Assembly	1
	35	119159	Gasket - Inlet Tube	1
	36	108018	Capscrew - 1/4" N.C. x 1-3/4" Long	2
			Lockwasher - 1/4" Std.	2
	37	128530	Elbow - Reservoir	1
	38	125931	Tube	1
	39	128531	Connector	1
	40	128513	Tee	1
	41		Plug - Tee - 3/8" Sq. Hd. Pipe	1
	42	103488	Elbow (Into Cover)	1
	43	115364	Pipe - Oil Filler	1
	44	110787	Breather & Filler Cap	1

Always give the "Payloader" Serial Number with the Part Number and Name of Items needed when ordering Repair Parts.

* On order for items 15, 21 & 22, supply the following: 138532 Cover, 134152 Plunger and 138531 Spring. These new items also obsolete items 17, 18, 19 and 20.

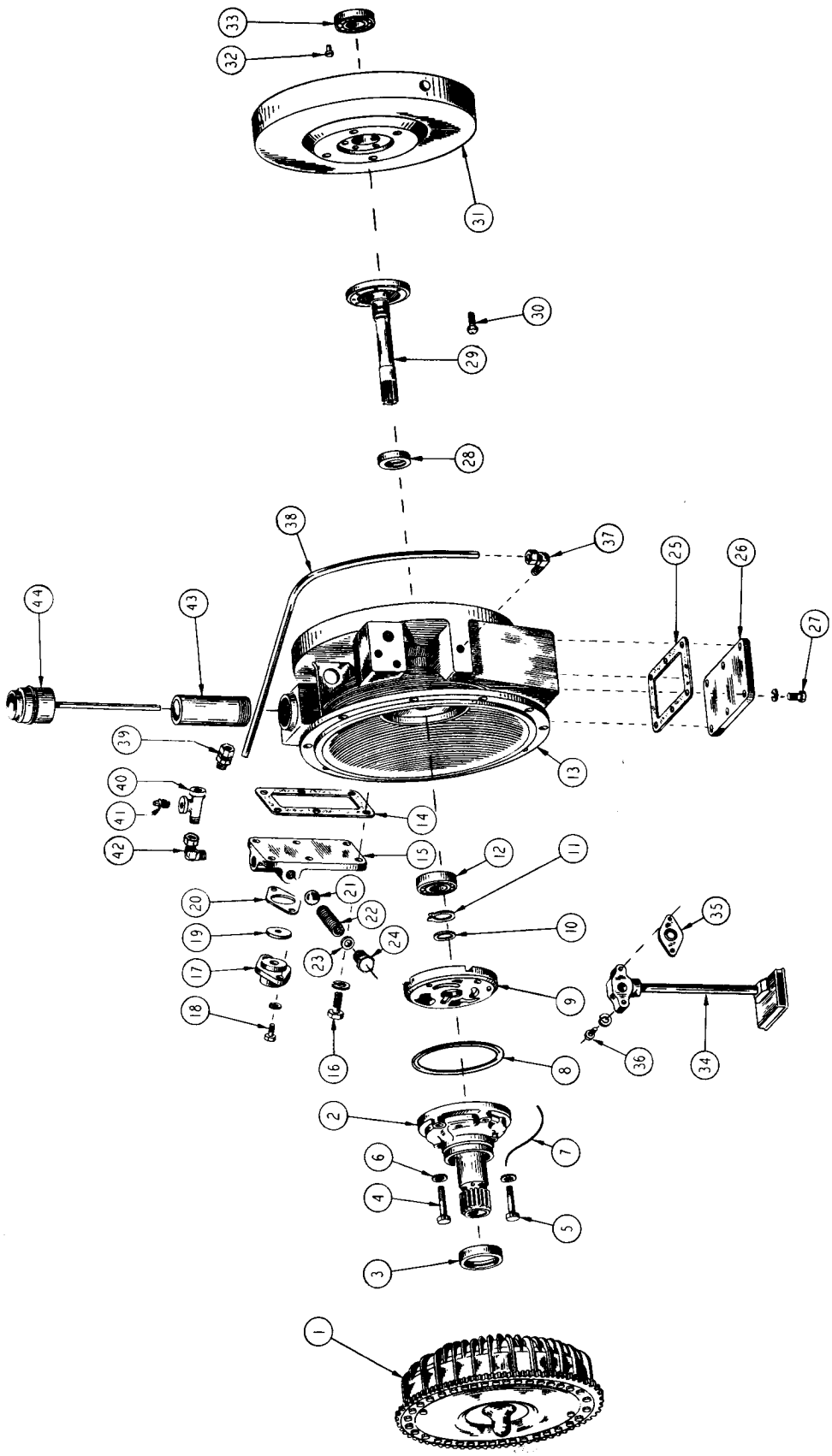


Fig. 7
TORQUE CONVERTER and RESERVOIR GROUP

Disassembly should proceed as follows:

Place the housing (13) on a bench with clutch side up. Use 3 wooden blocks 4" thick to support the housing and protect the shafts extending down.

Remove the clutch cover assembly and disc. Remove the 6 flywheel place bolts. The flywheel (31) is doweled to the output shaft flange. It can be loosened by rocking the wheel with alternate hammer tapping at the edges of the wheel between dowel pins. Use a soft hammer, rubber or leather, as the flywheel face is mild steel. The pilot bearing should be pressed out from the engine side of the flywheel.

Turn the housing (13) over on the output side protecting the edges of the casting from bench damage. In this position the 4 wired screws (4 & 5) can be removed from the pump body (2). NOTE: Two of these screws are longer than the others, however they all use special "Dynaseal" washers (6). The pump (2) can now be lifted out. Also, the pump "O" ring (8) and collector block (9), Fig. No. 7 can be removed. Be careful not to damage the edges of the collector block; it must be a good fit in the housing. Fig. No. 8 shows the pump assembly, "O" ring removed and the collector block in place.

The output shaft (29) can be removed after the seal ring and the snap ring have been removed. Press the output shaft through the bearing. The bearing and seal can then be pressed or tapped out.

The cover, relief valve parts and orifice plate parts shown in Fig. No. 9 can now be removed for inspection. The parts shown in Fig. No. 9 have been replaced by new and improved parts. If the cover on the unit is assembled with a sleeve, spring and plunger or is assembled with a sleeve, spring and ball, it is strongly recommended that the parts checked (X) in the chart on page 20 be ordered and installed according to "PAYLOADER" Model and Serial Number. Installation of the parts listed in the chart eleminates the 119094 Flange, 108013 Capscrews, 119096 Orifice Plate and 119095 Gasket. (Refer Fig. No. 7) There is an orifice drilled in the 135311 and 138532 covers.

IMPORTANT NOTE: If excessive converter pressures are encountered on the Model HA only, remove the 134152 plunger and the 138531 spring.

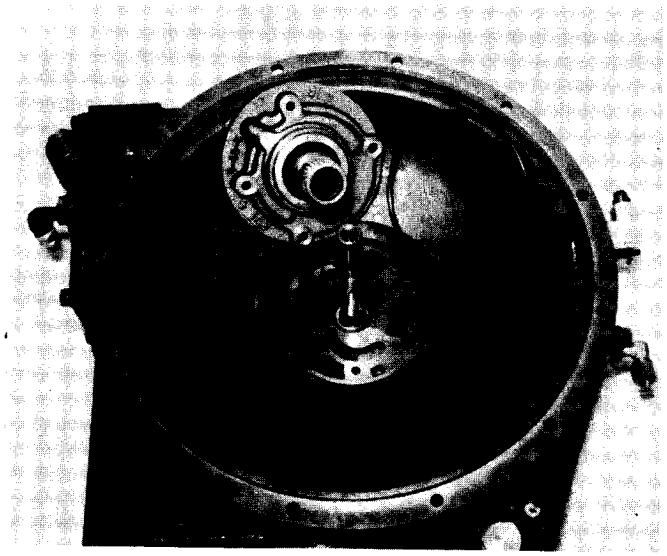


Fig. No. 8
Pump Group

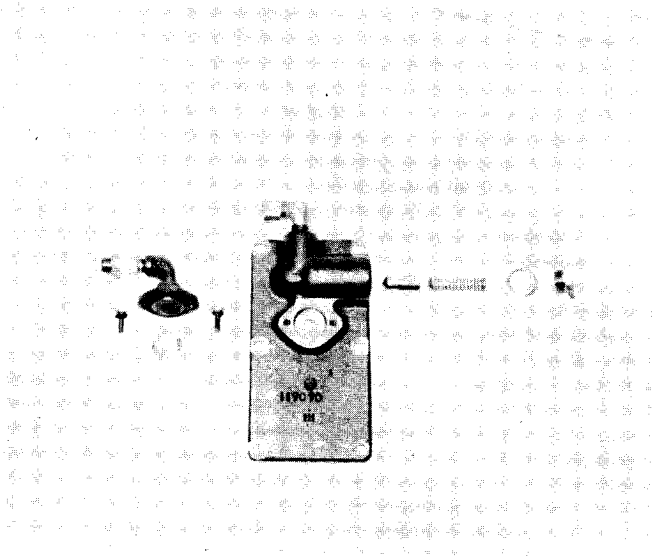


Fig. No. 9
Orifice, Cover Plate and Relief Valve

The pump inlet tube assembly can be found in the housing just above the bottom cover plate (26). It can be removed for inspection and cleaning. (See Fig. No. 10)

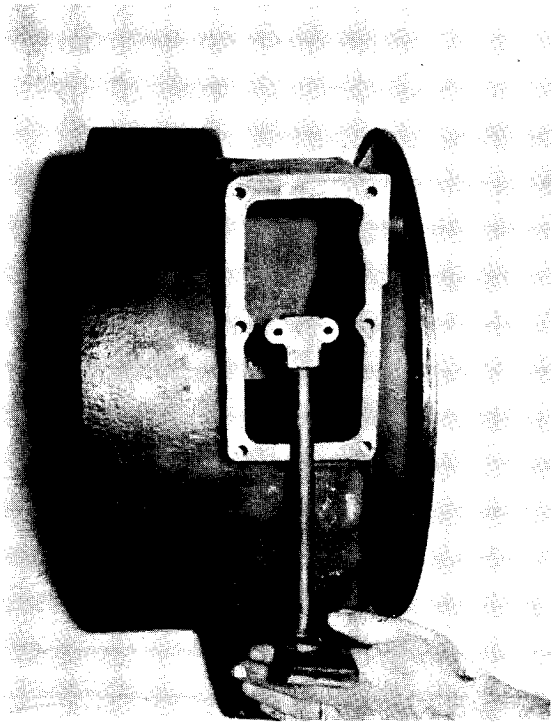


Fig. No. 10
Pump Inlet Tube Assembly

To remove the converter element from the flywheel, first remove the left hand motor mount. This uncovers a hole so that a wrench or screwdriver can be inserted to hold or turn the flywheel. Using a socket through the 1-1/2" pipe plug hole in the front side of the flywheel housing, remove the eight (8) self-locking nuts from the special capscrews holding the converter to the converter straps. Order and install the following parts if just four straps are used to connect the converter to the engine flywheel. Install new straps as shown in Figure 11.

*NOTE: On Model HF "PAYLOADER" units with engine serial numbers prior to 2876452-TC and on Model HRG "PAYLOADER" units with engine serial numbers prior to 2875683-TC, order 8-108091 capscrews instead of 8-130824 capscrews. Also order 16-130823 locknuts instead of 8. On Model HRD "PAYLOADER" units with engine serial numbers prior to A-2255722, order 8-108095 capscrews instead of 8-130824 capscrews. Also order 16-130823 locknuts instead of 8.

One (1) 129988 spacer and two (2) 132850 straps replace one (1) 119089 strap. The spacer is placed against the engine flywheel between the straps and the flywheel.

The 130823 locknuts replace the locknuts formerly used to fasten the straps to the converter. The new capscrews replace the capscrews formerly used to fasten the straps to the engine flywheel.

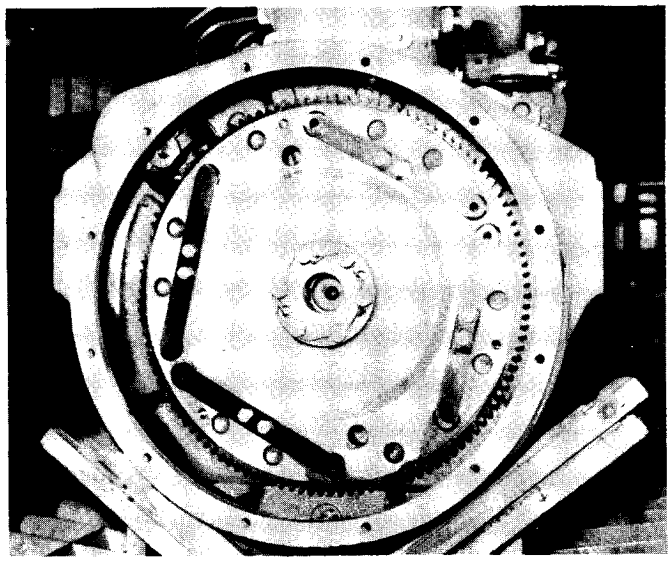


Fig. 11
New Style Strap Installation

QTY.	PART NO.	DESCRIPTION	HA	HAH	HF*	HR*	HU	HH
8	132850	Straps	X	X	X	X	X	X
4	129988	Spacers	X	X	X	X	X	X
8	130823	Locknuts	X	X	X	X	X	X
8	108092	Capscrews	X					
8	108093	Capscrews		X				
8	130824	Capscrews			X	X	X	X
4	128571	Lockwire			X	X	X	X

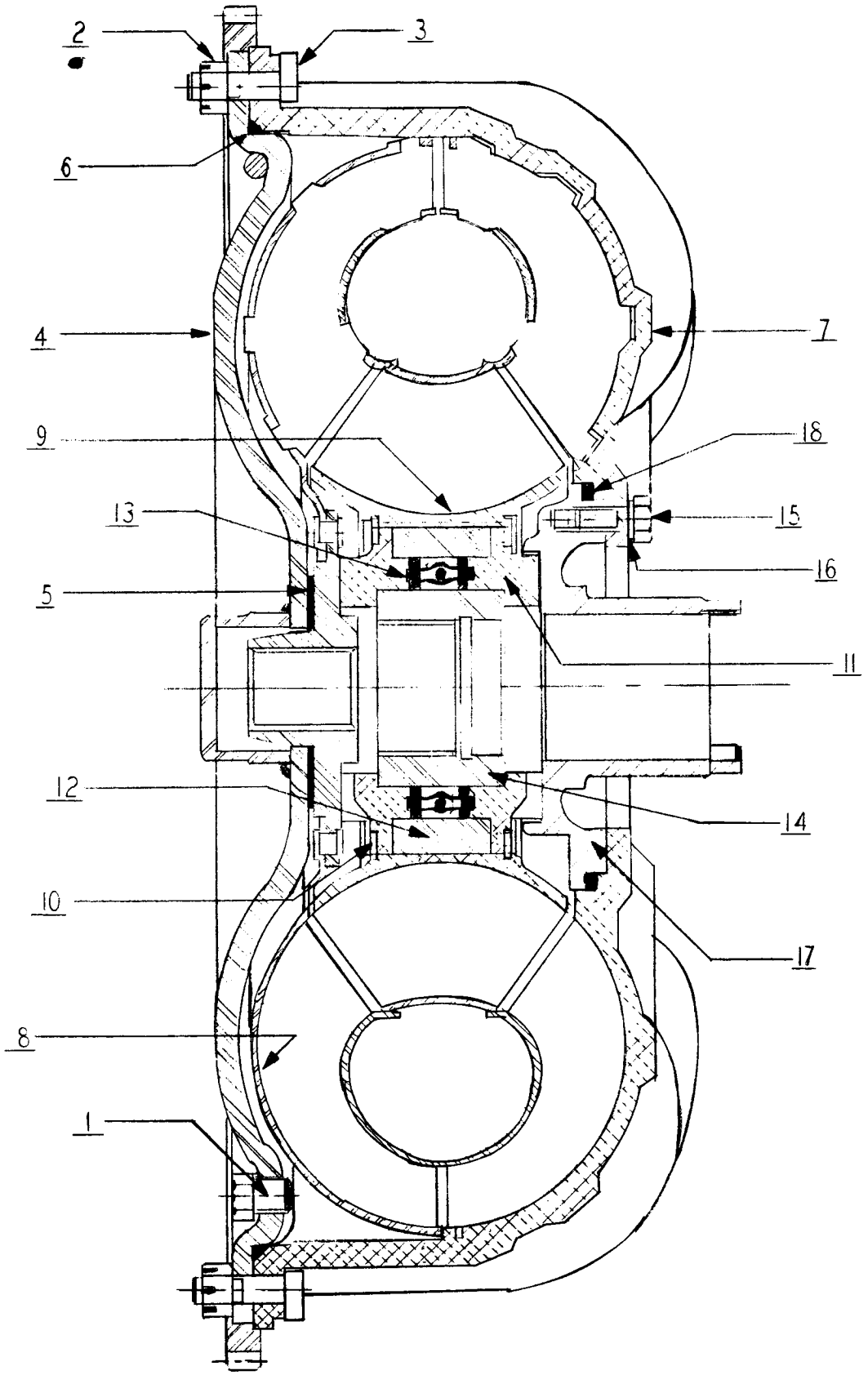


Fig. No. 12
Cross Sectional View of Torque Converter

C. Disassembly of the Torque Converter

It is very seldom that the converter has to be repaired. Broken straps may cause external damage and dirty oil can damage the converter internally. The parts shown in Fig. No. 12 are all serviceable as individual parts. In all cases, we recommend that our distributors repair the converter in their own shops.

1. Remove the two drain plugs (1) from the front cover assembly (4) and drain the oil.

2. Punch-mark the blank holes in the cover assembly (4) and remove the ten nuts (2) and bolts (3) from the converter assembly. NOTE: The letter "O" stenciled on the outside surface of the impeller (7) must line up with the letter "O" stamped on the outside or front side of the front cover assembly (4).

3. Using a leather or rubber hammer, tap the front cover assembly (4) away from the impeller (7). Remove the "O" ring (6), washer (5) from the front cover assembly. Remove the turbine (8) and stator (9) with its component parts from the impeller (7). NOTE: The word "FRONT" appears on one side of the stator (9). This side should face toward the front cover assembly (4) at the time of reassembly.

4. Remove both snap rings (10) from the stator (9). Separate the thrust washers (11) from the stator (9). The outer ring (12) Sprag assembly (13) and inner race (14) may now be pressed from the stator (9).

   NOTE: The word "FRONT" appears on one side of the Sprag assembly (13) and should face toward the front cover assembly (4) at the time of reassembly.

5. To replace the impeller hub (17) or seal ring (18), remove the capscrews (15) and nuts (16).

6. Refer to Section D "Tips on Inspection and Repair".

D. Tips on Inspection and Repair

1. Cleaning -- Clean all parts with gasoline or commercial cleaning solvents.

2. Plan to replace all seals and gaskets when reassembling. This includes the small cast iron piston ring type seal on the output shaft and the four (4) Dynaseal washers used with the pump body bolts in the reservoir housing assembly.

3. The pump should not be serviced in the field. Replace with new unit and send the used pump to the factory for rebuilding. (See Fig. No. 9).

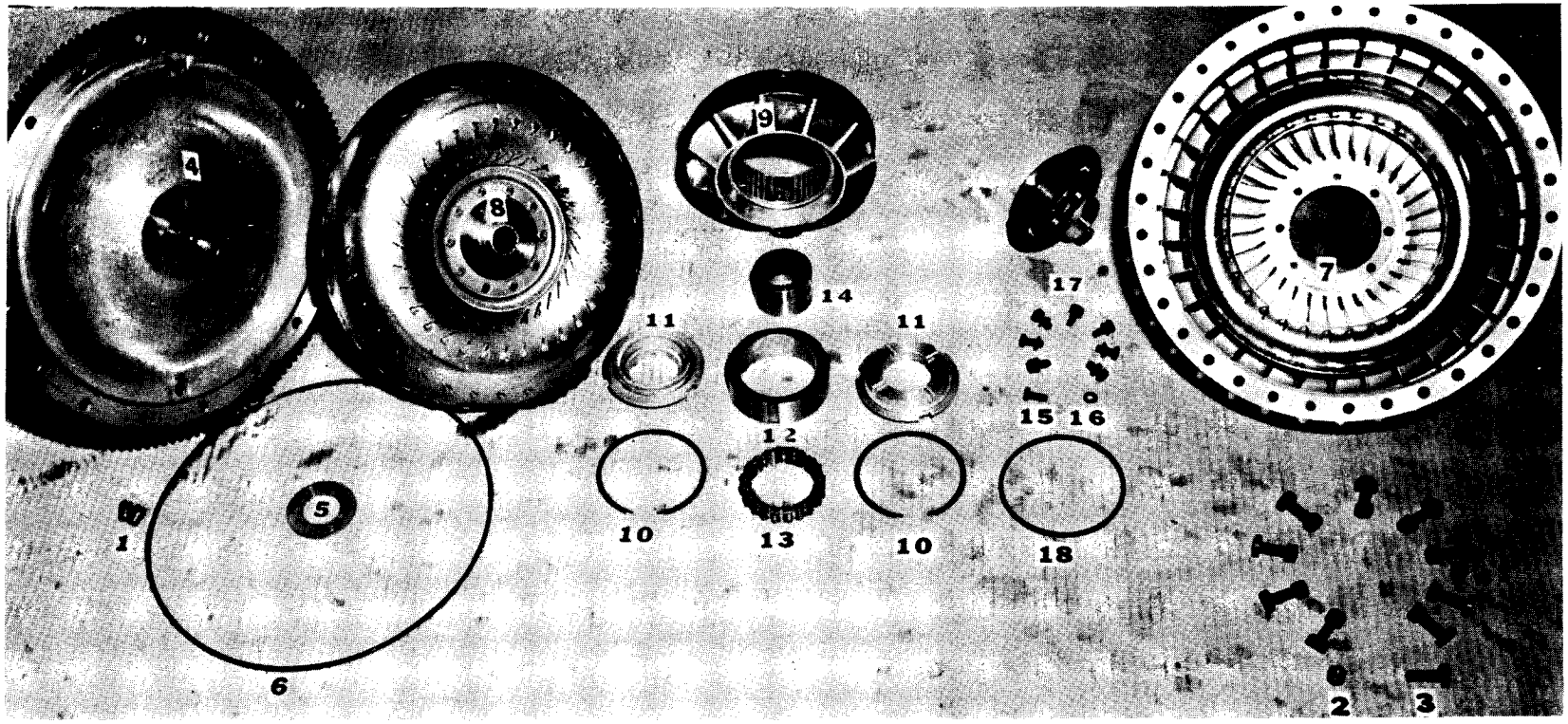
4. If a plunger instead of a ball is used in the cover plate, order and install those parts listed under Item No. 5 in Section B -- "Disassembly Procedure for the Reservoir Housing Assembly".

5. Check all machined surfaces for cracks, scratches and pits.

6. Be sure the intake pipe assembly and strainer are clean.

7. Inspect oil passages in the housing.

8. Check hydraulic lines for chafing.



ITEM	PART NO.	DESCRIPTION	QTY.
1	134672	1/4" Plug (included in item 4)	2
2	119447	Nut	10
3	119448	Bolt	10
4	119774	Front Cover Assembly	1
5	119353	Washer	1
6	119449	"O" Ring- Front Cover Assembly	1
7	119740	Impeller	1
8	119475	Turbine	1
9	119739	Stator	1
10	119352	Snap Ring	2
11	119452	Stator Thrust Washer	2
12	119366	Outer Race	1
13	141817	Sprag Assembly (22 Sprags)	1
14	119225	Inner Race	1
15	119211	Capscrew	8
16	WL-14	Lockwasher	8
17	119453	Impeller Hub	1
18	119365	Ring Seal	1

Fig. 13
Torque Converter

9. Check straps on engine flywheel. If required, install new straps referred to in Item 7 under Section B -- "Disassembly Procedure for the Reservoir Housing Assembly." (Refer to Fig. No. 11).

E. Assembly of the Torque Converter (Refer to Fig. No. 12 and 13)

1. Coat a new seal ring (18) with a slight film of #2 Permatex and insert the seal ring (18) in the recess on the inside of the impeller (7). Replace the impeller hub (17) and secure with the capscrews (15) and lockwashers (16).

2. Slowly rotate the Sprag assembly (13) until it fits into the center of the outer ring (12). With a rotary motion, insert the inner ring (14) into the center of the Sprag assembly (13). NOTE: the splined end of the inner race (14) should face toward the "FRONT" side of the Sprag assembly (13).

3. Place the outer ring (12) with its component parts in the center of the stator (9) so that the wide "I. D." flange side of the Sprag assembly (13) matches the "FRONT" side of the stator (9). NOTE: The grooves on the O. D. of the outer ring (12) match the lugs in the center of the stator (9).

4. Insert the thrust washers (11) on each side of the stator (9) so that the notches in the washers (11) match the lugs in the stator (9). The 4 grooves in the washer (11) should face away from each side of the stator (9). Lock the washers (11) in place with the snap rings (10).

5. Block up the front cover assembly (4) so that the front side does not touch the bench. The front side of the front cover assembly (4) is that side which has the protruding shaft recess, which fits into the engine flywheel. Coat a new "O" ring (6) with type "A" automatic transmission oil and place it on the back side of the front cover assembly (4).

6. Place the thrust washer (5) over the hub of the turbine (8). The side of the turbine (8) shown in Fig. 13 faces toward the front of the front cover assembly (4). Place the turbine (8) on the front cover assembly (4).

7. Insert the stator (9) in the center of the turbine (8) so that the "FRONT" side of the stator (9) faces the front cover assembly (4). Lay the impeller (7) over the turbine (8) and stator (9). Match the "O" stenciled on the impeller (7) with the "O" stamped on the front side of the front cover assembly (4). Fasten the assembly together with the ten bolts (3) and nuts (2) placed in the holes in the front cover assembly which are not punch marked as described in Step 2 under Section "C" Disassembly of the Torque Converter. If a new front cover assembly (4) is used, insert the bolts (2) and nuts (3) in the same position as

shown below in Fig. 14.

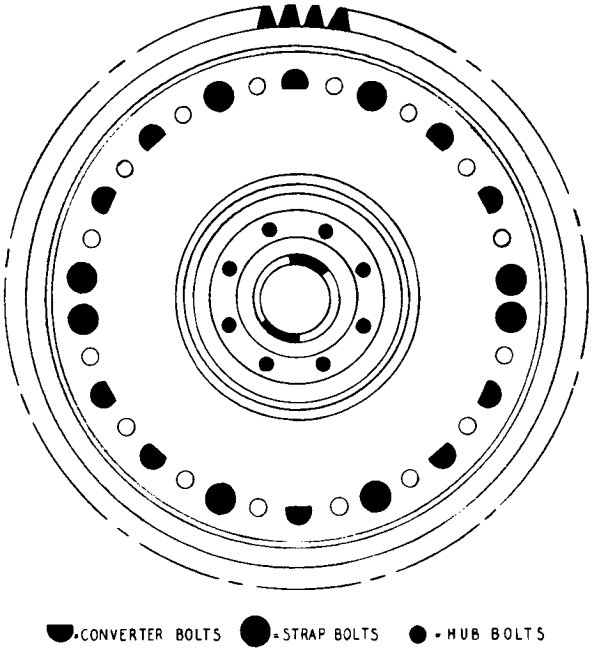
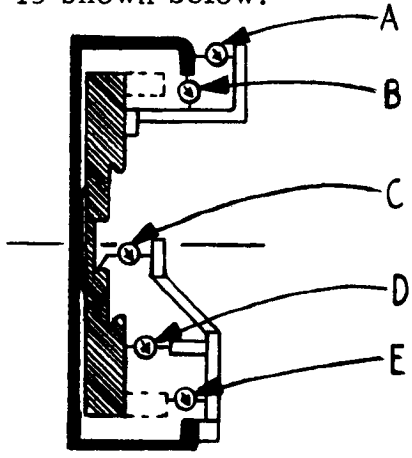


Fig. No. 14
Converter Bolt Circle

8. Whenever the torque converter or engine is disassembled and repaired, dial indicate the engine flywheel, flywheel housing, clutch flywheel and clutch housing as shown in Fig. No. 15 shown below.



MAX. T.I.R. LIMITS

Engine	A	B	C	D	E
Flywheel	.008	.008	.005	.008	.008
Clutch Flywheel	.011	.011	.005	.010	.010

Fig. No. 15
Dial Indicator Check Points

9. Install the two 1/4" plugs (1) in the front cover assembly (4).

10. Install the converter straps as described in Step 7 under Section B -- "Disassembly Procedure for the Reservoir Housing Assembly." Fasten converter to converter straps.

F. Assembly of the Reservoir Housing. (Refer to Fig. 7)

1. Lay the housing (13) on a bench with the clutch side down. Install shaft bearing (12) in the housing making sure that the race is flush with the bottom of the collector block (9) recess in the housing.

2. Insert the collector block (9) in the housing with the chamfered edge facing down and hold in place with two short capscrews. This is done to keep the bearing in place until after the output shaft (29) has been installed.

3. Turn the housing (13) over and block it up about 4" off the bench. Install oil seal (28). The lip of the seal should face toward the inside of the housing.

4. Lightly tap or press the output shaft (29) into position. Make certain that the shaft flange does not touch the 4 casting lugs in the housing. Grind off the lugs if clearance is required.

5. Turn the housing over again with the clutch side down. Remove the collector block (9) and place it in its proper position with the chamfered edge up. Be sure that the collector block does not rock or bind in the housing recess. If the fit is satisfactory, remove for next step of installation.

6. Place the snap ring (11) in the groove around the output shaft (29) next to the shaft bearing (12). Next, install a new seal ring (10) on the shaft.

7. Cover the seal ring (10) with a high grade of grease and place the collector block (9) in position with the chamfered edge up. Be sure not to damage the ring when setting the block into position. A damaged ring may cause a loss of pressure in the high pressure system, or leakage at clutch housing.

8. Place the "O" ring (8) over the chamfered edge of the collector block (9).. Slip the pump (2) over the output shaft (29) and secure it to the housing with two capscrews (4) 2-3/4" long and two capscrews (5) 2-5/8" long. Noticing the varied thickness of the capscrew bosses in the pump housing should help you determine where each capscrew should be placed. Use a new Dynaseal washer (6) with each capscrew and torque to 16-18 foot pounds. Lock the capscrews in place with #16 gauge wire (7).

9. Turn the housing over on the engine flywheel side and block it up so that the output shaft does not touch the bench. Attach a dial indicator to the input shaft flange and indicate the machined surfaces at the housing as shown in Fig. 16. The run-out of the indicated surfaces should not exceed .011 T.I.R. (Total Indicated Reading).

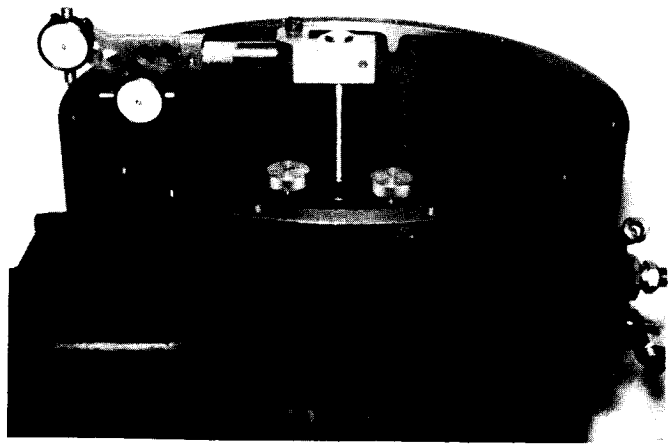


Fig. No. 16
Indicating Clutch Flywheel Housing

10. With the two (2) dowels (32) in place on the output shaft, fasten the clutch flywheel (31) to the input shaft with the 5 special capscrews (30). Torque the capscrews to 43 foot pounds. Attach a dial indicator to the housing and indicate the run-out of the flywheel surface and pilot bearing bore as shown in Fig. 17. The run-out on the flywheel should not exceed .010 T.I.R. and the run-out on the pilot bearing bore should not exceed .005 T.I.R.

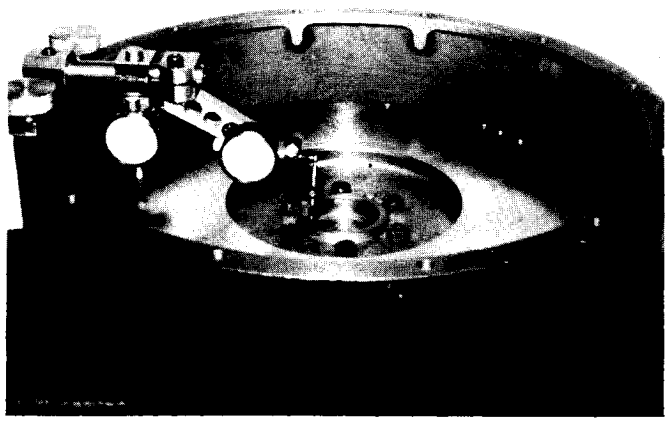


Fig. No. 17
Indicating Flywheel

11. Pack the pilot bearing (33) with a high grade of grease and install it in the flywheel with the open side of the bearing down. As shown in Fig. 18, use a pilot shaft and install the driven member and clutch cover assembly. Secure in place with 8 capscrews and torque to 36 foot pounds.

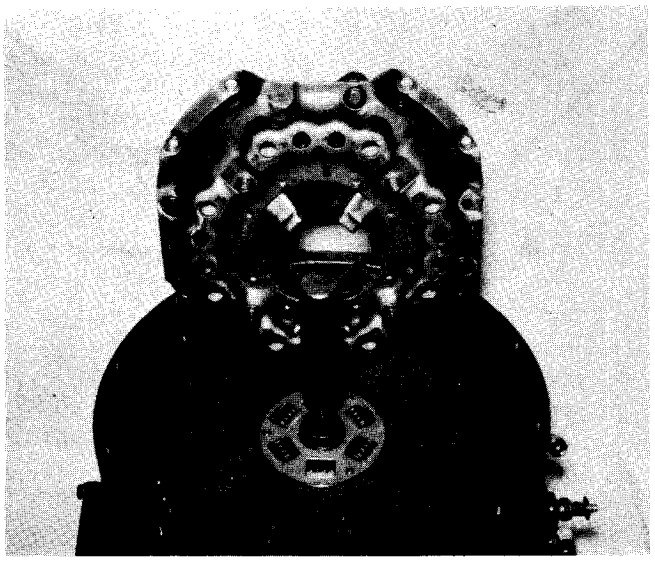


Fig. No. 18
Clutch Assembly

12. Install the bottom cover (26) and the L.H. cover plate (15) which contains the orifice and relief valve.

13. With the converter (1) securely in place, mount the reservoir housing assembly on the engine. CAUTION: Be sure that the fingers in the pump (2) and the fingers in the converter fit side by each. If the fingers oppose each other, they will cause the pump to bind and break when the capscrews holding the reservoir housing assembly to the engine are tightened.

14. Remove plug (41) from tee (40) and insert a 200 pound oil pressure gauge. Also, insert a tee in the line between the filter and orifice (17) on Models HA and HAH and, between the oil cooler and orifice on Models HF, HR, HU and HH. Place another 200 pound pressure gauge in this particular tee.

15. Make all the necessary connections required to put the "PAYLOADER" back into operation.

16. Fill the torque converter system with Type "A" transmission fluid as outlined in Item D under Section III - Service and Maintenance.

17. Put the "PAYLOADER" under full load and take a reading of the pressure gauges in the high and low pressure lines. The high pressure gauge should read between 40 and 50 P.S.I. and the low pressure gauge should read between 25 and 30 P.S.I.

18. Refer to Section IV -- "Trouble Shooting" if the pressure readings do not meet those specified above.

Model & S/N PART NO.	HA 26900 thru 2A-2977	HA 2A-2978 And Up	HA 2A-29849 And Up 3A-1131 And Up	HAH 51929 thru 4A-1341	HAH 4A-1342 And Up	HF 85061 And Up	HR 43800 And Up	HU 14A-1001 thru 14A-1363 15A-1001 thru 15A-1119	HH 18A-1001 thru 18A-1448 19A-1001 thru 19A-1133
135311 Cover				X	X	X	X	X	X
138532 Cover	X	X	X						
134152 Plunger	X	X		X	X	X	X	X	X
138531 Spring	X	X		X	X	X	X	X	X
116716 Plug	X			X			X	X	X
114851 Washer	X			X			X	X	X