CONTENTS

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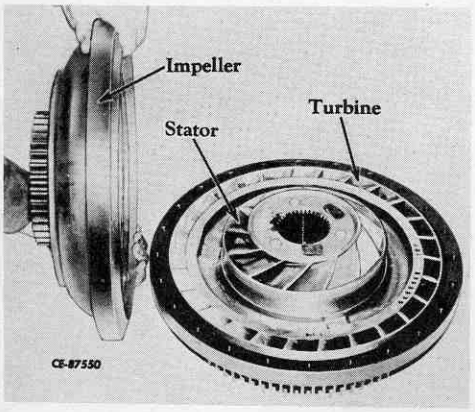
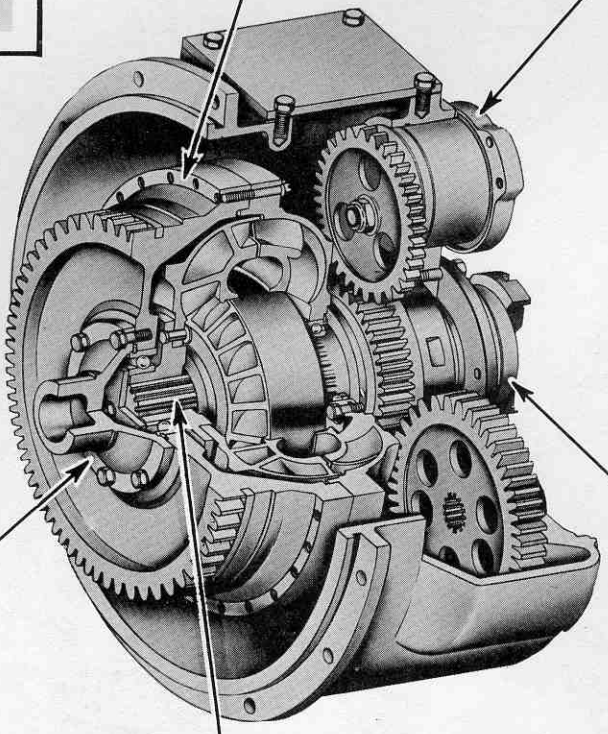
MODEL 175 SERIES LOADERS AND TD-15 SERIES B CRAWLER TRACTOR TORQUE CONVERTER SERVICE CHART

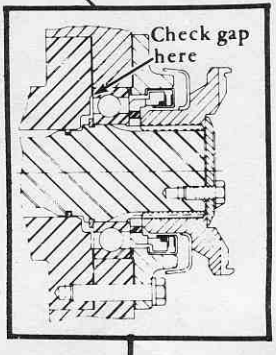


Inspect the impeller, stator and turbine for signs of rubbing. If this condition exists, it is an indication that one or more of the bearings in the converter need replacement. If the blades are excessively worn or damaged, the entire assembly must be replaced.

INPUT PUMP

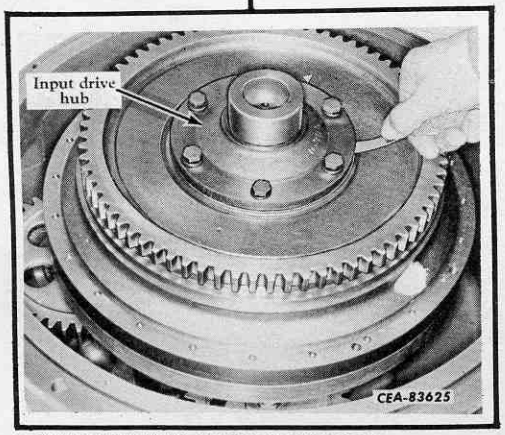
Basic Pressure:
Normal, psi 60-70
Maximum, psi 80
Pump Flow:
GPM at 2400 rpm rated engine speed
(2400 pump rpm).. 23-25





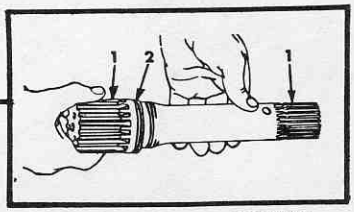
Output shaft end gap (In.) .000-.004
(Refer to manual text for instructions.)

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



OUTPUT SHAFT

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



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1. DESCRIPTION

General

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

The converter has three basic parts. The IMPELLER is bolted to the converter drive housing and the drive housing is driven by the engine flywheel. The STATOR is splined to the stationary ground sleeve hub and contains a row of stationary blades, sometimes called guide blades or reactor blades. The TURBINE is splined to the output shaft. The three parts are contained in the converter housing. The housing is filled with fluid held at a constant pressure of 50 to 80 psi during operation to suppress vacuum pockets which form at the blades under high fluid velocities. There is no direct mechanical connection between the impeller and turbine or stator.

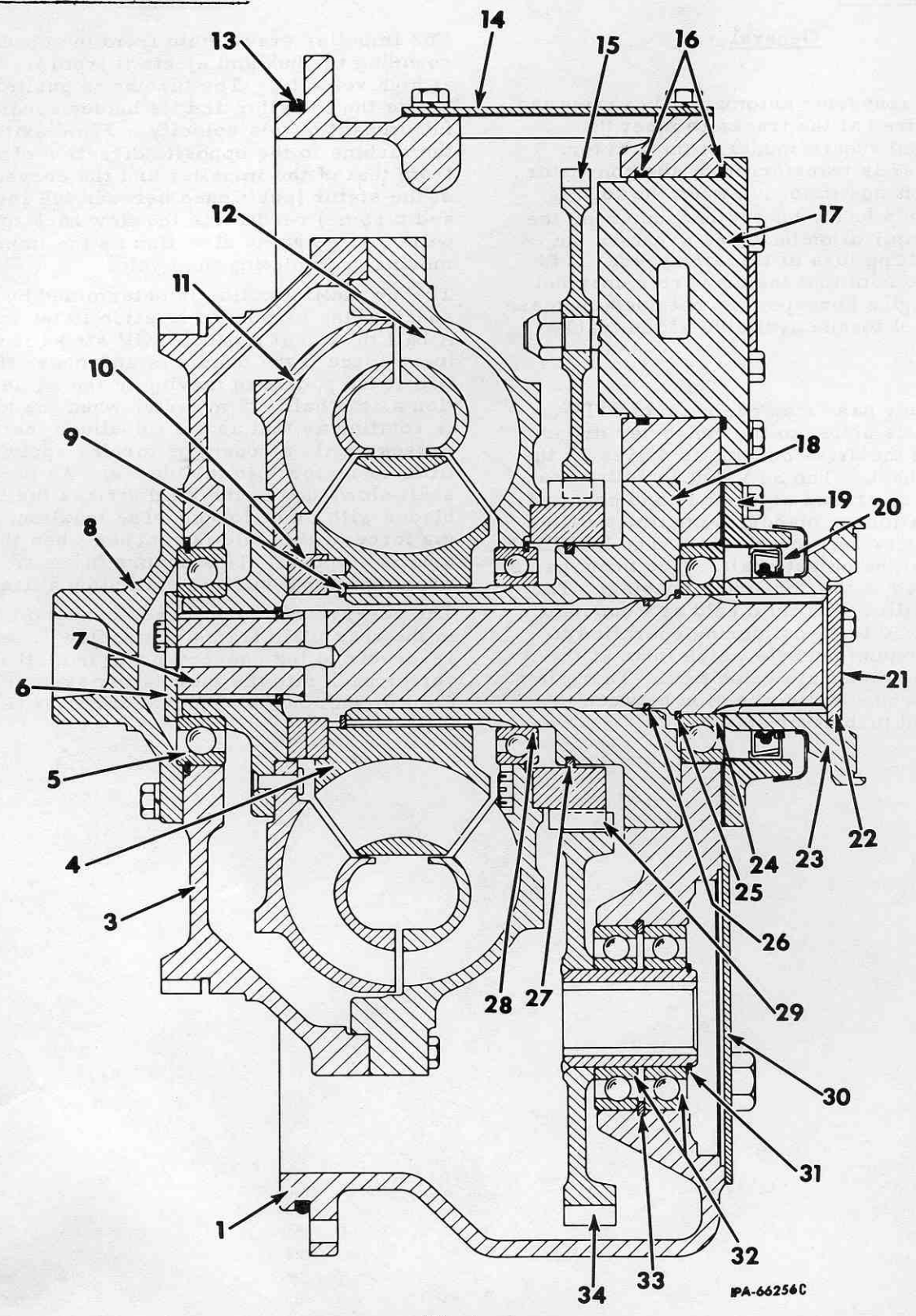
Operation

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

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

The reservoir for the torque converter fluid is in the rear main frame. The flow from the reservoir to the converter and from the converter back into the lubricating system is covered in Section 7A, "TRANSMISSION (POWER SHIFT)."

1. DESCRIPTION - Continued



Illust. 1
Cross Section of Hydraulic Torque Converter (MODEL 175 Loader Shown, TD-15 SERIES B Similar.

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Legend for Illust. 1

1. Converter housing.
3. Drive housing.
4. Stator.
5. Turbine hub bearing.
6. Retainer washer.
7. Output shaft
8. Input hub.
9. Snap ring.
10. Thrust washer.
11. Turbine.
12. Impeller.
13. "O" ring.
14. Pump inspection cover
15. Pump drive gear.
16. Pump "O" rings.
17. Input pump.
18. Ground sleeve hub.
19. Bearing retainer.
20. Oil seal.
21. Locking plate.
22. Retainer washer.
23. Output flange.
24. Output shaft bearing.
25. Snap ring.
26. Seal ring (piston hook type).
27. Seal ring (piston hook type).
28. Impeller hub bearing.
29. Accessory drive gear.
30. Power take-off cover (TD-15 SERIES B only).
31. Snap ring (Model 175 loader only)
32. Gear bearings (Model 175 loader only).
33. Snap ring (Model 175 loader only).
34. Accessory driven gear (Model 175 loader only).

2. SPECIFICATIONS

Make and size:
MODEL 175 loader . . . . . Rockford (12 inches)
TD-15 SERIES B . . . . . Rockford (13 inches)
Type . . . . . Single stage with fixed stator
Fluid temperature:
Normal . . . . . 180° -200° F.
Maximum . . . . . 250°F.
Basic pressure (supplied by internal pump):
Normal . . . . . 60-70 psi
Maximum . . . . . 80 psi
Input pump flow:
GPM at 2400 rpm rated engine speed (2400 pump rpm) 23-25

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

Converter input pump drive gear nut 45-55
Pressure filter hold-down bolt . . . . . 55 maximum

3. CHECKING MECHANICAL PROBLEMS

PROBABLE CAUSE	REMEDY
Loss of Fluid From Torque Converter	
1. Leaking connections	Operate the engine at part throttle and inspect all lines and connections for leaks. Tighten or replace parts as necessary.
2. Leaking converter	Check all the bolts and nuts and gasket joints while the system is under pressure. Replace parts as necessary.

(Continued on next page)

3. CHECKING MECHANICAL PROBLEMS - Continued

PROBABLE CAUSE	REMEDY
Torque Converter Overheating	
1. Operating too long in low efficiency ranges	Review operating instructions in the operator's manual.
2. Low oil level	Check the level in the rear main frame.
3. Low basic pressure	Check for broken lines or loose connections on the pressure side of the system. Check for excessive fluid leaking. (Refer to "Loss of Fluid from Torque Converter" problem above.)
4. Thermo by-pass valve inoperative (if equipped)	Discard the valve assembly. Refer to instructions in the "INSPECTION AND REPAIR" paragraph in section 7A, "TRANSMISSION (POWER SHIFT.")
5. Converter by-pass valve sticking	Remove valve and clean. Inspect bore and spring.
Loss of Power	
1. Low oil level	Check the level in the rear main frame.
2. Low basic pressure	Refer to Cause 2 under "Torque Converter Overheating" problem.
3. Converter input pump inoperative	Test the input pump as described in Par. 8, "INSTALLATION." Inspect pump for damaged parts and replace as necessary.
4. Converter by-pass valve sticking	Remove valve and clean. Inspect bore and spring.
5. Engine not up to rated performance	Refer to "CHECKING MECHANICAL PROBLEMS" in the engine service manual.
Grinding or Scraping Noise Inside Converter Housing	
1. Bearing failure allowing the turbine or inpeller blades to strike the fixed stator	Replace bearings, turbine or impeller as necessary.

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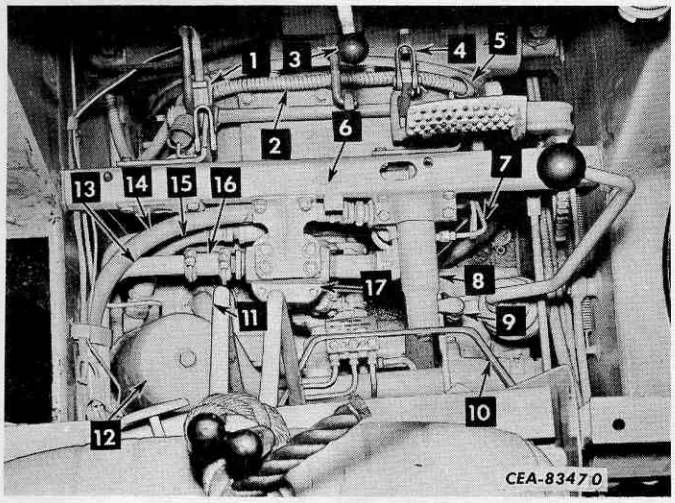
4. REMOVAL

CAUTION: Be sure that the blade or bucket has been lowered to the ground.

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

1. MODEL 175 LOADER ONLY: Remove the plug in the bottom of the hydraulic tank and allow the bucket hydraulic system to drain completely.



Illust. 2
Platform Support Disconnect Points.
(Units Using Suction Filter with Flexible Coupling.)

1. Decelerator pedal adjustable clevis.
2. Cranking motor cable.
3. Adjustable clevis.
4. Control rod clevis.
5. Spring clip.
6. Platform support.
7. Drain tube.
8. Decelerator cylinder.
9. Decelerator cylinder inlet hose.
10. Seat support bar bracket.
11. Equipment pump inlet tube.
12. Pressure filter.
13. Suction filter inlet tube.
14. Regulator drain hose.
15. Pressure filter inlet hose.
16. Flexible coupling.
17. Suction filter.

2. Disconnect the decelerator pedal adjustable clevis (1, Illust. 2 or 2A) at the pedal by removing the cotter and end pin. Remove the LH, front platform with decelerator pedal. Remove the RH, front platform. Remove the rear platform (snap on type).

3. Bend back the two spring clips (5) securing the cranking motor cable (2) to the converter housing and move the cable out of the way. (Illust. 2 or 2A).

4. Remove the platform support (Illust. 2 or 2A).

(a) Disconnect the governor control rear rod clevis (4) at the cross shaft by removing the pin and cotter.

(b) Disconnect the drain tube (7) and the inlet hose (9) at the decelerator cylinder (8).

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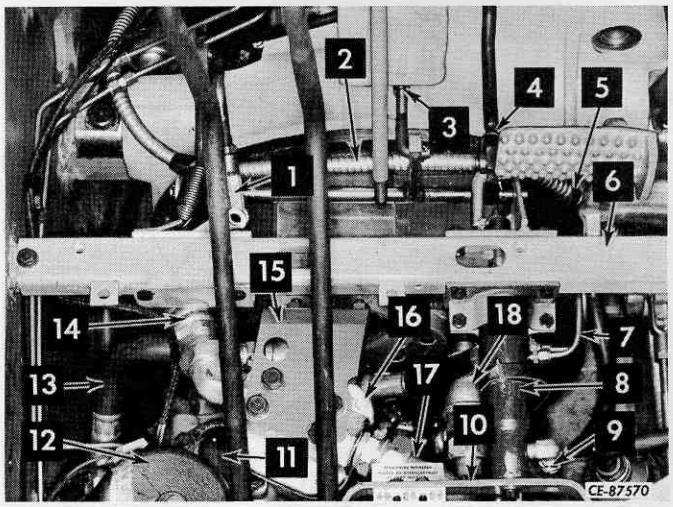


Illust. 2A
Platform Support Disconnect Points. (Units Using Suction Filter without Flexible Coupling.)

1. Decelerator pedal adjustable clevis.
2. Cranking motor cable.
3. Adjustable clevis.
4. Control rod clevis.
5. Spring clip.
6. Platform support.
7. Drain tube.
8. Decelerator cylinder.
9. Decelerator cylinder inlet hose.
10. Seat support bar bracket.
11. Equipment pump inlet tube.
12. Pressure filter.
13. Pressure filter inlet hose.
14. Suction filter inlet hose.
15. Suction filter bracket.
16. Suction filter.
17. Suction filter outlet tube.
18. Pump inlet reducing tee.

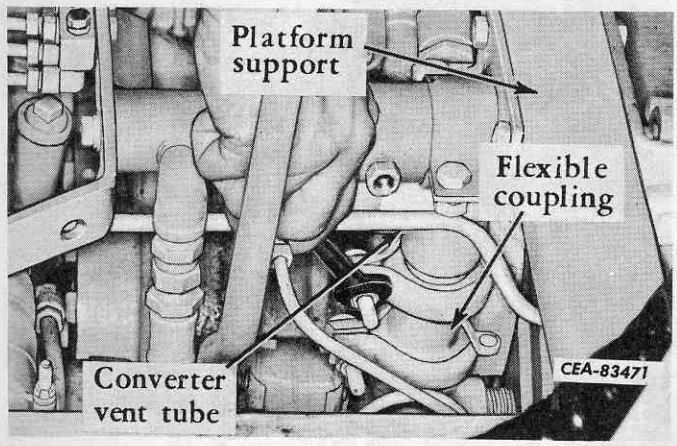
4. REMOVAL - Continued

(c) Disconnect the drain tube (7) at the converter and remove the tube.

(d) Remove the bolt, lockwasher and flat washer securing the decelerator cylinder to the seat support bar bracket (10).

(e) SUCTION FILTER WITH FLEXIBLE COUPLING: Remove the clamp on the suction filter side of the flexible coupling (16). Loosen the clamp on the filter inlet tube side of the coupling and pull the coupling sleeve onto the inlet tube (13).

(f) SUCTION FILTER WITH FLEXIBLE COUPLING: Loosen the upper clamp on the flexible coupling below the platform support and lower the clamp onto the coupling (Illust. 3).



Illust. 3
Loosening Flexible Coupling Clamp (If Equipped).

(g) Remove the cotter and end pin securing the adjustable clevis (3) to the bellcrank.

(h) SUCTION FILTER WITH FLEXIBLE COUPLING: Disconnect the regulator drain hose (14) at the converter elbow.

SUCTION FILTER WITHOUT FLEXIBLE COUPLING: Disconnect the regulator drain hose at the pump inlet reducing tee (18). Remove the stamp securing the converter inlet hose to the decelerator cylinder (8).

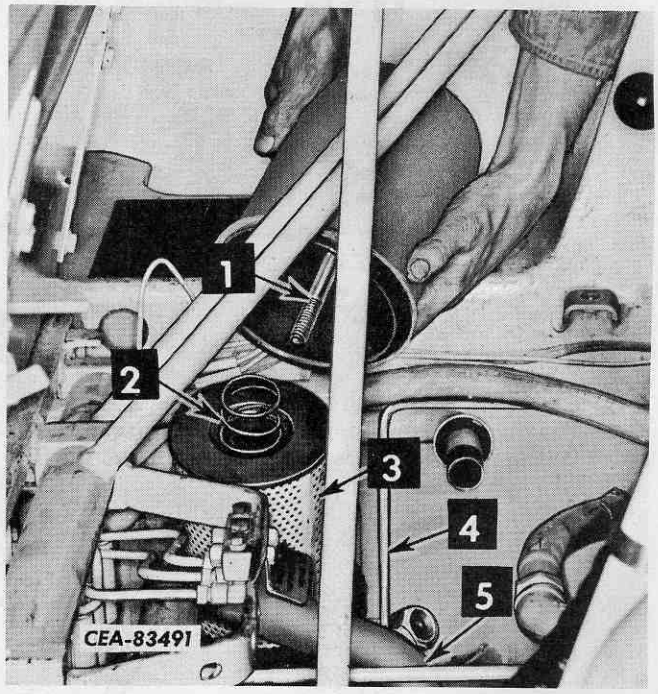
(i) Remove the cap screw, lock washer and flat washer securing the platform support (6) on each side to the front frame. Remove the support with decelerator cylinder and control linkage attached. The suction filter will also come with the support on units equipped with flexible coupling.

5. SUCTION FILTER WITHOUT FLEXIBLE COUPLING: Disconnect the inlet hose (14) at the suction filter and the outlet tube (17) at the torque converter. Remove the hardware securing the filter bracket (15) to the bracket on the converter and remove the suction filter (16) with bracket and outlet tube (Illust. 2A).

6. Disconnect the regulating valve-to-torque converter hose at the converter elbow (4, Illust. 5).

7. Disconnect the pressure filter inlet hose (2, Illust. 5) at the filter base. Disconnect the converter vent tube (5, Illust. 5) at the top of the converter housing.

8. Untread the pressure filter hold-down bolt securing the filter case to the base and remove the case with bolt. Lift the spring and element from the base (Illust. 4).



Illust. 4
Removing the Pressure Filter Case.

1. Hold-down bolt.
2. Filter spring.
3. Filter element.
4. Clutch pressure gauge tube.
5. Equipment pump inlet tube.

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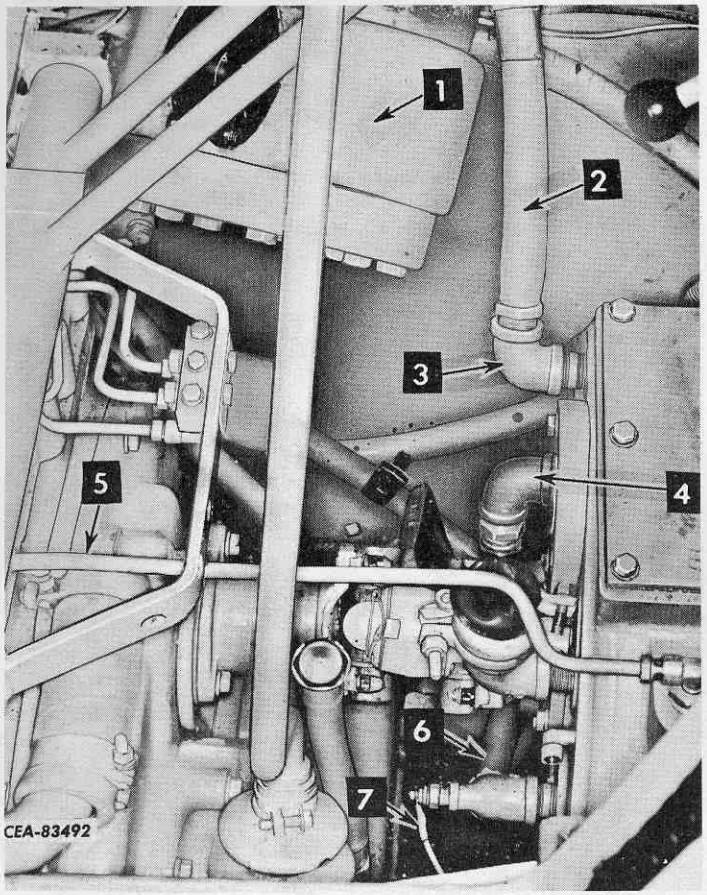


Illust. 5
Removing the Equipment Hydraulic Pump.

1. Equipment hydraulic pump.
2. Pressure filter inlet hose.
3. Elbow.
4. Elbow.
5. Converter vent tube.
6. Torque converter-to-safety filter hose.
7. Converter oil temperature sending unit cable.

9. MODEL 175 LOADER ONLY: Remove the cap screws, lock washers and clamp halves securing the equipment pump inlet tube (5, Illust. 4) to the top of the pump. Loosen the clamp nut securing the other end of the tube to the hose connector below the seat support bar bracket. Remove the tube to provide clearance for pump removal.

10. Disconnect the clutch pressure gauge tube (4, Illust. 4) at the filter base and at the other end from the front tube connection above the engine rear mounting. Remove the bolt and clamp securing the tube and electrical cables to the side of the front frame and remove the tube.

11. Remove the bolt and clamp securing the hydraulic hoses to the inner face of the front frame on the LH side of the unit just below the seat support bar. This will enable the filter base to be maneuvered more freely to facilitate equipment pump and/or converter removal. Remove the four bolts and lock washers securing the filter base to the front frame and allow the base to lay in the frame.

12. Remove the rear cover from the underside of the front frame. On the Model 175 Loader, remove the cap screws, lock washers and clamp halves securing the equipment pump outlet hose to the bottom of the pump.

13. MODEL 175 LOADER ONLY: Insert an eyebolt into one of the inlet tube mounting holes in the top of the equipment pump and attach a hoist. Remove the two pump mounting bolts and free the pump from the converter housing. Lower the pump until it rests in the front frame and transfer the hoist sling to one of the pump mounting holes. Remove the eyebolt from the pump.

14. MODEL 175 LOADER ONLY: Raise the pump out the top of the unit between the suction filter inlet tube (if equipped) and the seat support bar (Illust. 5). As the pump is being lifted out it will be necessary to maneuver the filter base to the rear as far as possible and then down under the pump. It also may be necessary to turn the elbows (3 and 4, Illust. 5) to clear the pump. If elbows are to be turned, mark them to the converter housing to facilitate returning them to the same location in installation for connecting the hoses.

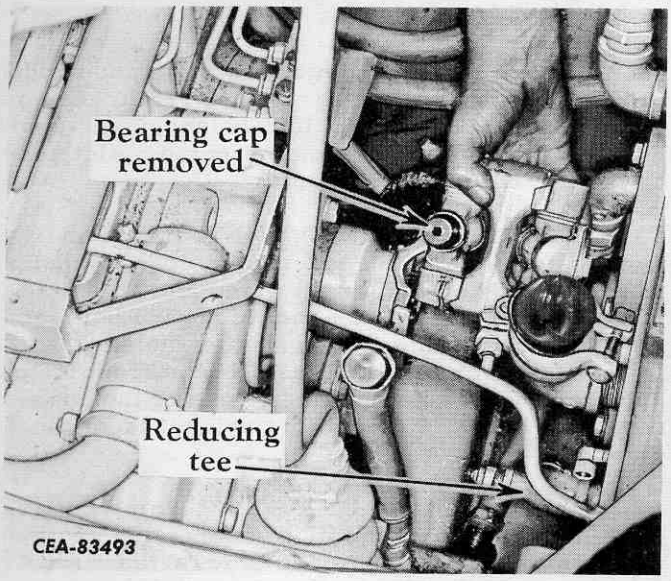
15. Disconnect the converter oil temperature sending unit cable (7, Illust. 5) at the converter and free the cable from the clip on the converter housing mounting bolt.

16. Disconnect the safety filter inlet hose (6, Illust. 5) at the converter working through the rear cover opening in the underside of the front frame.

(Continued on next page)

4. REMOVAL - Continued

17. Remove the lockwire and cap screws securing the universal joint to the converter and transmission yokes. Use a screwdriver to free the bearing caps from the transmission yoke and remove the caps from the trunnion. Hold the universal joint and bottom bearing cap (to prevent cap from falling off trunnion) and pull the assembly free of the converter yoke. Lift out the universal (Illust. 6).



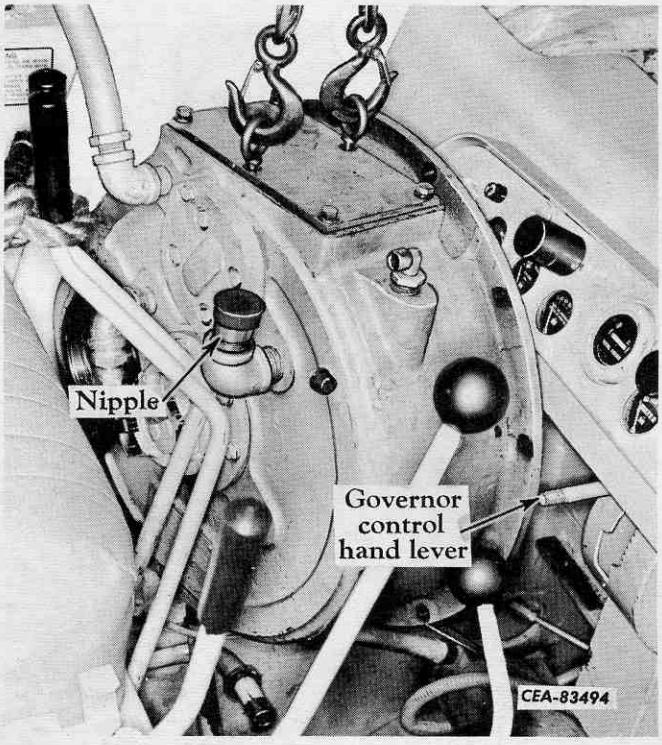
Illust. 6
Removing the Universal Joint.

18. Tie the steering levers back with a heavy rope. Raise the governor control hand lever all the way up in the ratchet and remove the ball from the end of the lever (Illust. 7).

19. Mark the reducing tee (Illust. 6) to the converter housing to assure installation in the same position and remove the tee and nipple from the housing. It will first be necessary to move the hose adapter from the tee to allow the tee to be turned out of the housing.

20. SUCTION FILTER WITH FLEXIBLE COUPLING: Loosen the clamp on the flexible coupling sleeve and remove the sleeve, gasket and retainer assembly and clamp from the nipple (Illust. 7).

21. Remove the two center cap screws and lock washers securing the pump inspection cover to the converter housing and insert eyebolts for attaching a hoist (Illust. 7).



Illust. 7
Removing the Torque Converter.

22. The pressure filter base must be allowed to lay in the front frame and as far to the rear as possible to provide clearance for moving the converter assembly back out of the flywheel housing.

23. Remove the cap screws and lock washers securing the converter housing to the flywheel housing. Pull the converter out of the flywheel housing and lift it out between the steering levers and front frame on the LH side of the unit (Illust. 7).

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

5. DISASSEMBLY

(Ref. Nos. Refer to Illust. 8)

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

(Continued on page 10)

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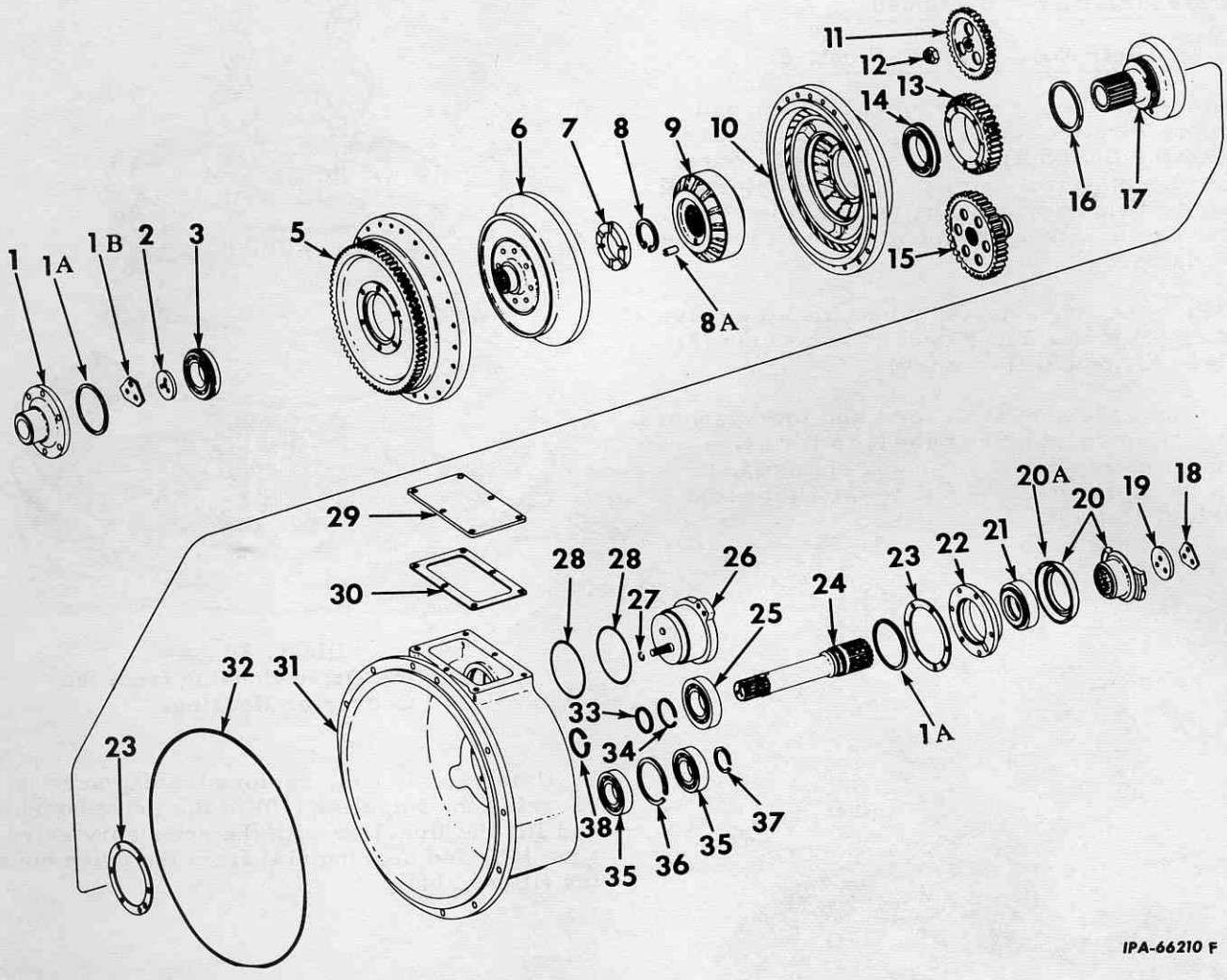


Illust. 8
Exploded View of Torque Converter (MODEL 175 Loader Shown, TD-15 SERIES B Similar).

1. Input drive hub.
1A. Shim.
1B. Locking plate.
2. Retainer washer.
3. Turbine hub bearing.
5. Drive housing.
6. Turbine.
7. Thrust washer.
8. Snap ring.
8A. Dowel.
9. Stator.
10. Impeller.
11. Input pump drive gear.
12. Gear retaining nut.
13. Accessory drive gear.
14. Impeller hub bearing.
15. Accessory driven gear (Model 175 loader only).
16. Seal ring.
17. Ground sleeve hub.
18. Locking plate.
19. Retainer washer.
20. Output flange assembly.
20A. Dust shield.
21. Oil seal.
22. Bearing retainer.
23. Gasket.
24. Output shaft.
25. Output shaft bearing.
26. Input pump.
27. Snap ring (if equipped).
28. Pump "O" rings.
29. Pump inspection cover.
30. Cover gasket.
31. Housing.
32. Housing "O" ring.
33. Seal ring.
34. Snap ring.
35. Accessory driven gear bearings (MODEL 175 Loader Only).
36. Snap ring (MODEL 175 Loader Only).
37. Snap ring (MODEL 175 Loader Only).
38. Turbine hub snap ring (if equipped).

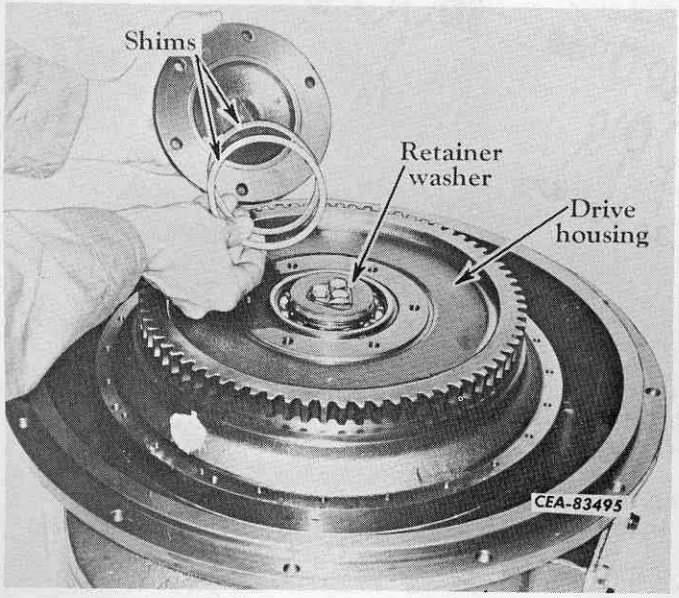
5. DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 8)

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

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

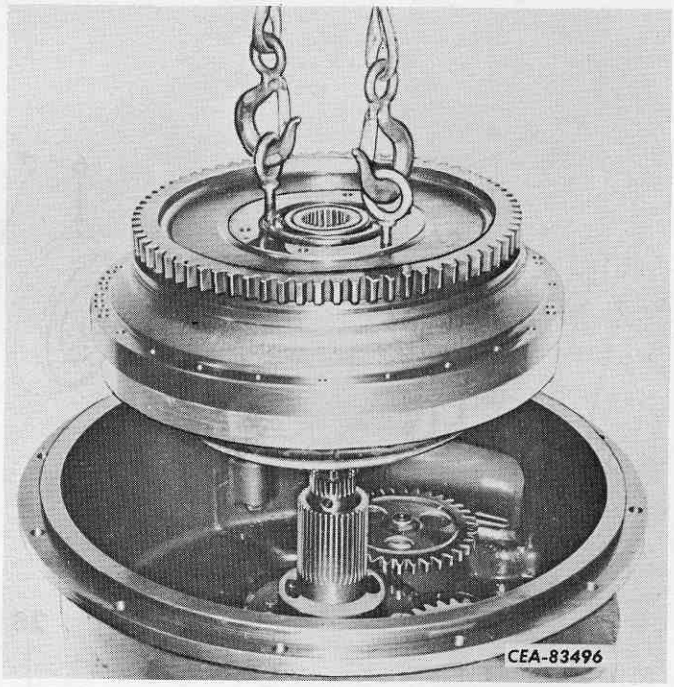
2. Remove the six cap screws and lock washers securing the input drive hub (1) to the drive housing and remove the hub and shims (1A). Keep the shims with the hub to facilitate reassembly (Illust. 9).



Illust. 9
Removing the Input Drive Hub and Shims.

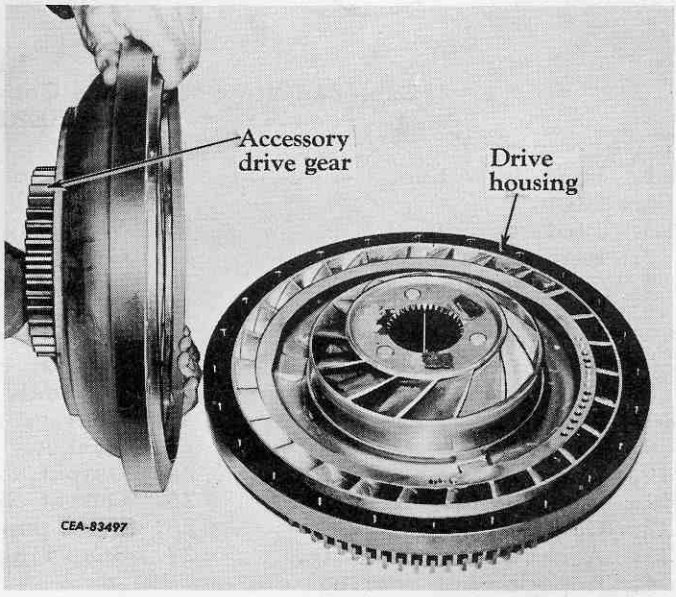
3. Bend back the tabs of the locking plate (1B). Remove the three cap screws and lift off the locking plate and retainer washer (2) (Illust. 9).

4. Insert two eyebolts into the drive housing and lift the drive housing with the impeller, stator and turbine assemblies from the converter housing (Illust. 10). Lower the assembly onto the bench. Remove the hoist and eyebolts and turn the assembly over so the drive housing is down.



Illust. 10
Lifting the Drive Housing from the Converter Housing.

5. Using an air gun, remove the cap screws securing the impeller (10) to the drive housing and lift the impeller with the accessory drive gear (13) and bearing (14) from the drive housing (Illust. 11).



Illust. 11
Removing the Impeller.

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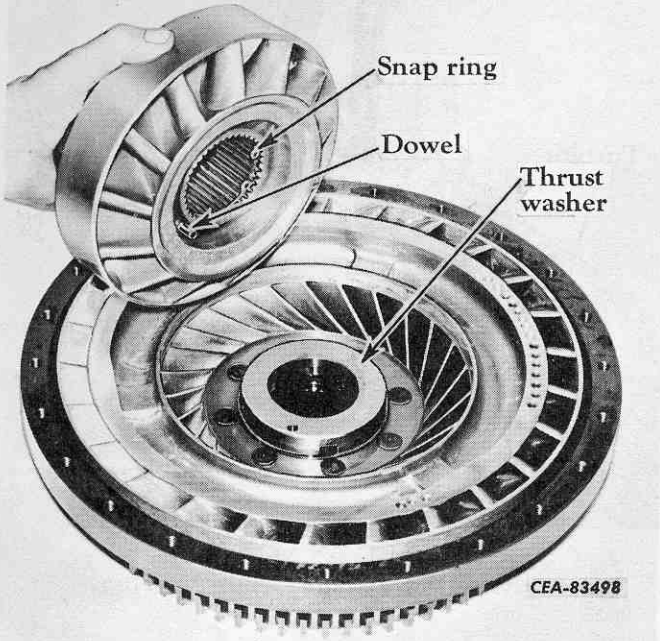
6. Lift the stator (9) from the turbine. Remove the thrust washer (7) from the turbine (Illust. 12).



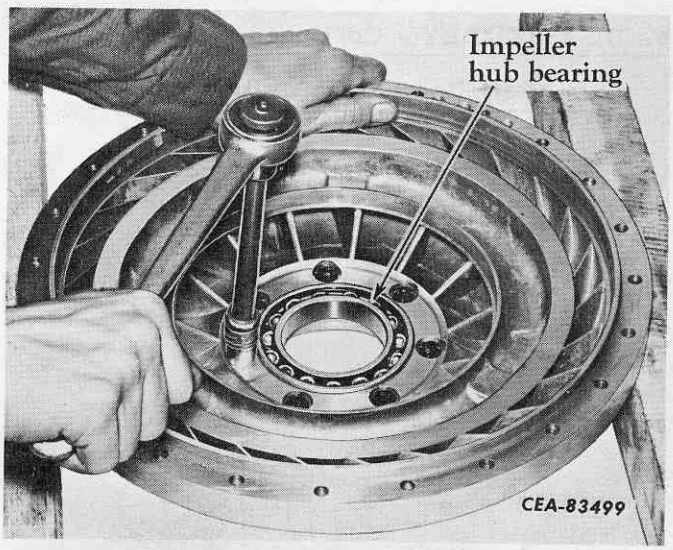
Illust. 12
Removing the Stator.

7. To replace the impeller hub bearing (14), place the impeller on blocks with the accessory drive gear (Illust. 11) down. Remove the seven cap screws securing the accessory drive gear to the impeller (Illust. 13). Then, using a suitable driver, tap the bearing out of the impeller hub.

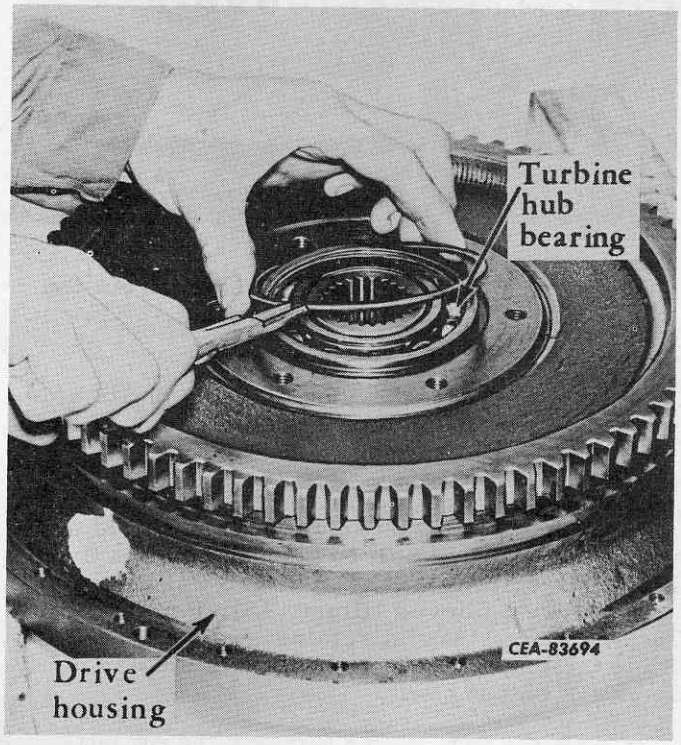
NOTE: The impeller hub bearing cannot be driven out the blade side of the impeller because of the bearing outer race retaining ring.

8. If the drive housing, turbine or turbine hub bearing (3) need replacement proceed as follows. Place the drive housing on blocks so they will not interfere with turbine removal and remove the turbine hub bearing outer race retaining ring (Illust. 14). If the retaining ring will not clear the counterbore in the drive housing, turn the assembly over and tap on the turbine to move the bearing out sufficiently for snap ring removal.

(Continued on next page)



Illust. 13
Removing the Accessory Drive Gear Mounting Screws.

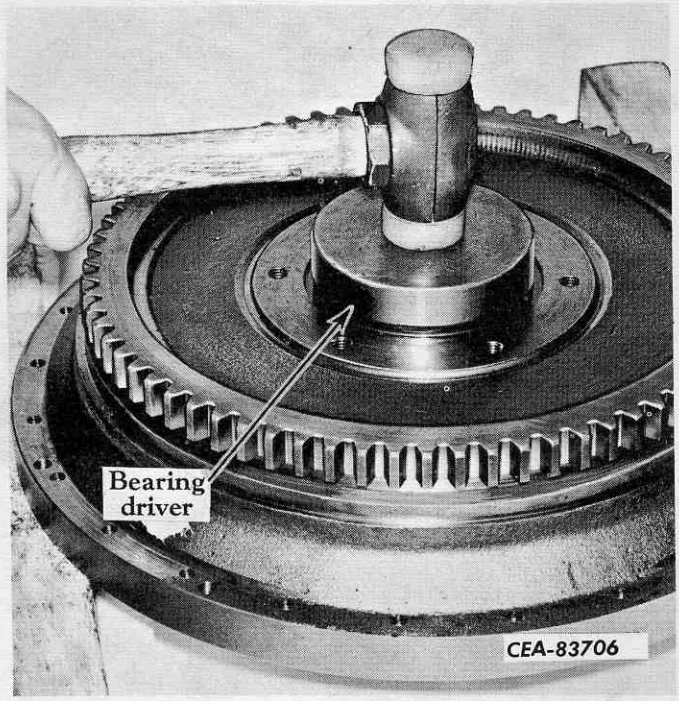


Illust. 14
Removing Bearing Outer Race Retaining Ring.

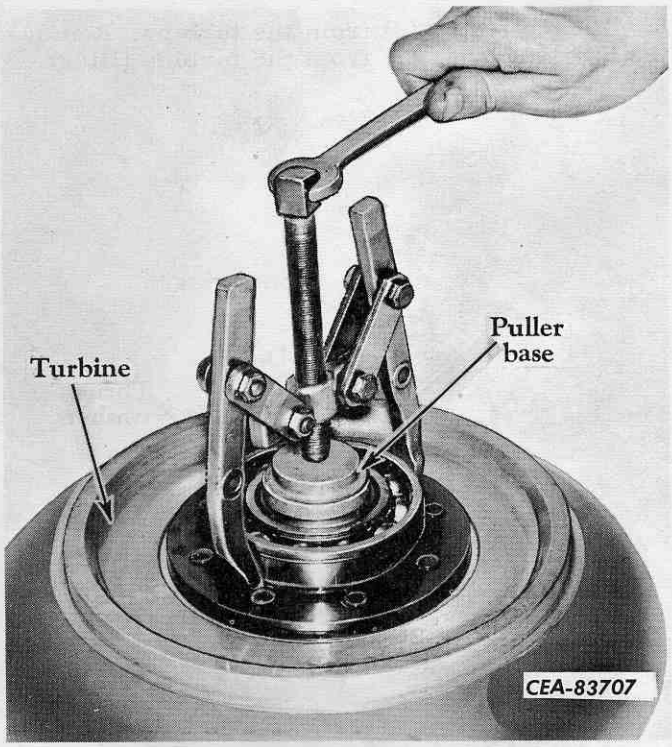
5. DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 8)

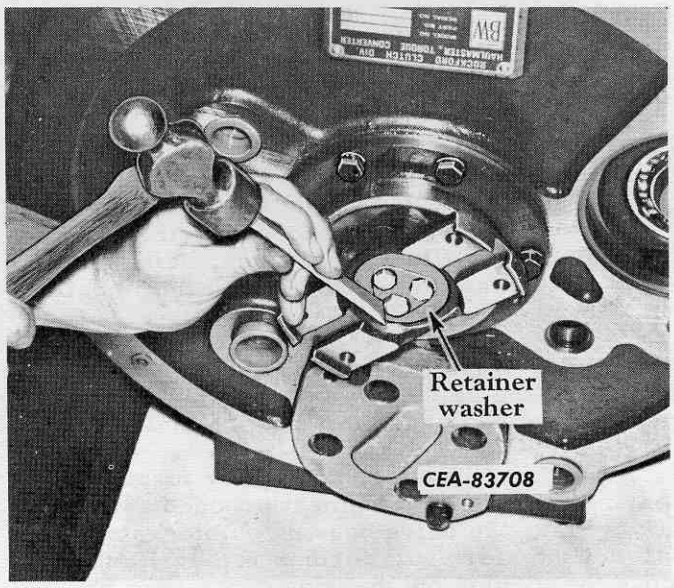
Using a suitable driver that will cover both races of the bearing, drive the bearing with turbine from the drive housing (Illust. 15). Use a bearing cup puller to remove the bearing from the turbine hub (Illust. 16).



Illust. 15
Removing the Turbine and Bearing from the Drive Housing.



Illust. 16
Removing the Turbine Hub Bearing.



Illust. 17
Bending Back Locking Plate Tabs.

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

10. Bend back the locking plate tabs (Illust. 17). Wedge a drift between the dust shield and retainer mounting bolt to keep the output flange (20) from turning as the retainer washer cap screws are removed (Illust. 18). Remove the locking plate (18) and retainer washer (19). Slide the output flange and dust shield assembly from the output shaft.

11. UNITS WITH METAL FACE TYPE OIL SEAL: Remove the cap screws and lock washers securing the bearing retainer (22) to the ground sleeve hub (17) and remove the retainer with the oil seal stator. Discard the retainer gasket (23). Slide the seal rotor from the shaft (Illust. 19). If oil seal replacement is necessary, the seal stator can be tapped out the rear of the retainer.

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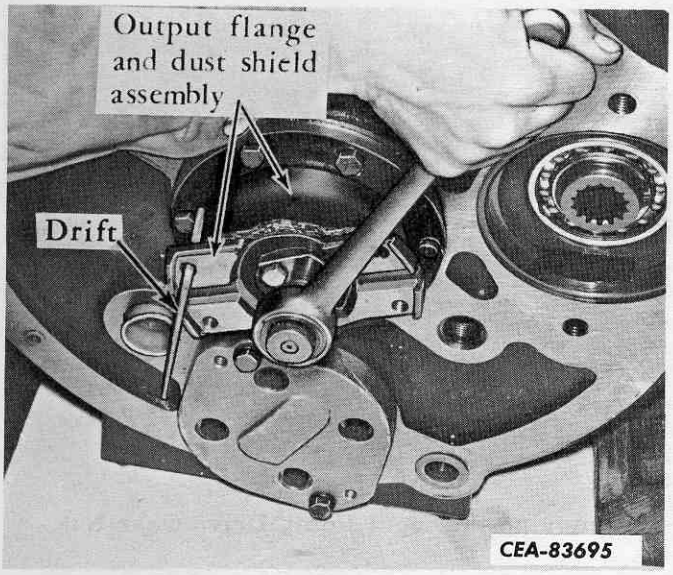
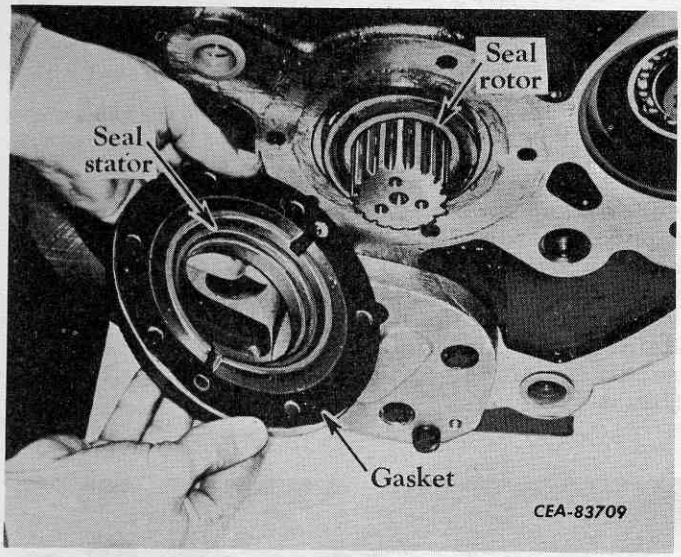


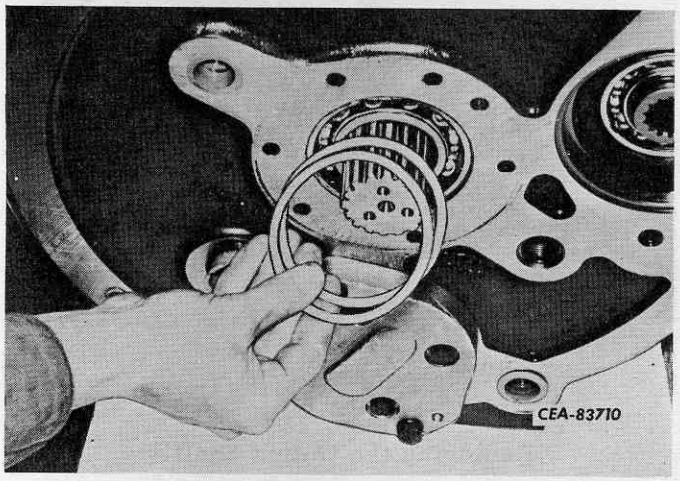
Illust. 18
Removing Retainer Washer Mounting Screw.



Illust. 19
Removing the Output Shaft Bearing Retainer on Units with Metal Face Type Oil Seal.

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

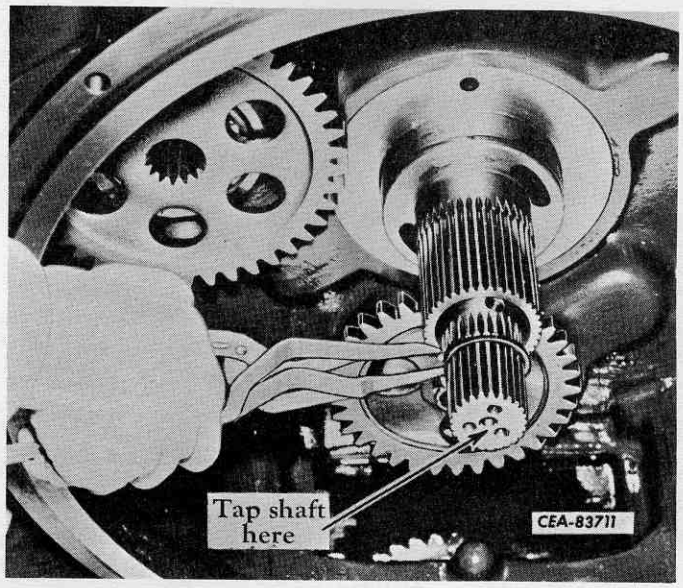
12. Remove the bearing retainer shims (1A) from the bore in the converter housing (Illust. 20). Keep these shims with the bearing retainer to facilitate proper installation. These shims are the same type as those used with the input drive hub (1) and can easily become intermixed.



Illust. 20
Removing the Bearing Retainer Shims.

13. Remove the turbine hub snap ring (38) (if equipped) from the output shaft (24). Using a soft hammer tap on the end of the shaft until the bearing (25) is free of the housing bore (Illust. 21). Remove the output shaft with bearing, snap ring (34) and seal ring (33) out the rear of the converter housing (Illust. 22).

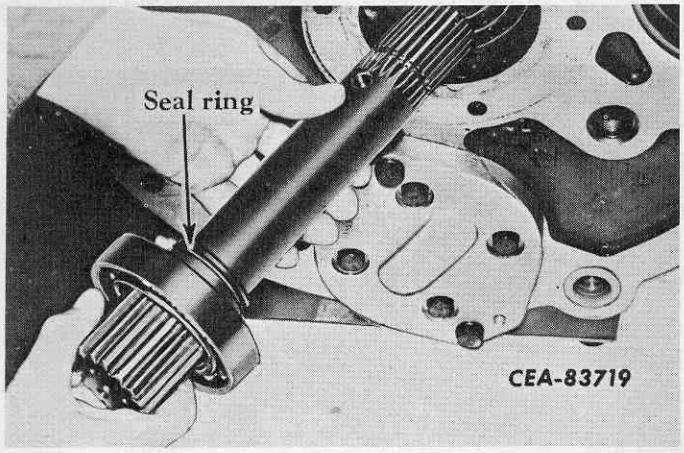
(Continued on next page)



Illust. 21
Removing the Turbine Hub Snap Ring.

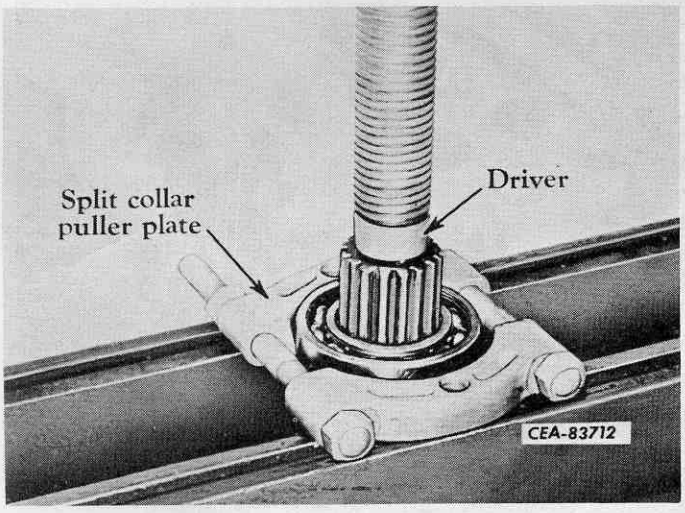
5. DISASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 8)

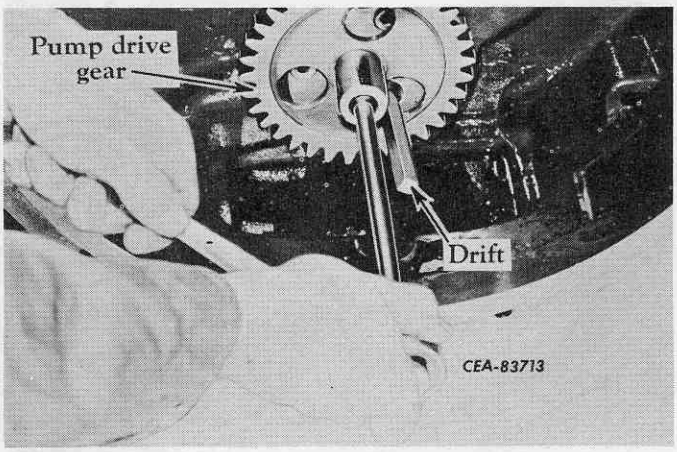


Illust. 22
Removing the Output Shaft.

14. Remove the seal ring (Illust. 22) from the output shaft. If bearing or shaft replacement is necessary, proceed as follows. Remove the snap ring (34) from the shaft. Support the shaft in a press under the bearing and press the shaft from the bearing. Use a support that will contact both bearing races such as a split collar puller plate. Use a driver to protect the shaft (Illust. 23).



Illust. 23
Removing the Output Shaft Bearing.

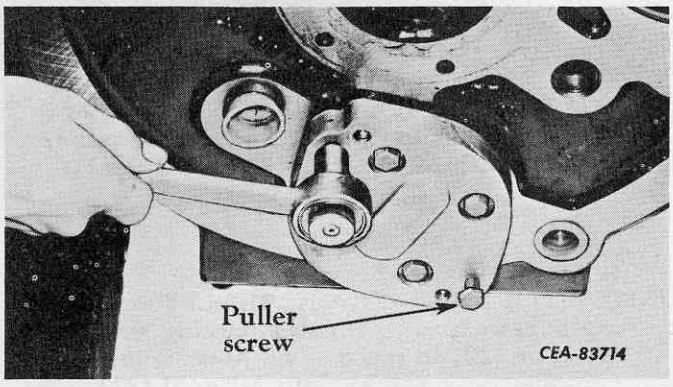


Illust. 24
Removing the Input Pump Drive Gear Nut.

15. Position a drift in the pump idler gear opening to keep the drive gear (11) from turning and remove the gear nut (12). (Illust. 24.) Slide the gear from the pump shaft.

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

16. Remove the two input pump mounting cap screws and lock washers. Use two cap screws (approximately 1-3/4 inches long) in the puller holes provided to pull the pump from the converter housing. Tighten the puller screws. When one becomes hard to turn, do the other. Remove the pump in a cocked position could result in damage to the aluminum pump flange (Illust. 25).



Illust. 25
Removing the Input Pump.

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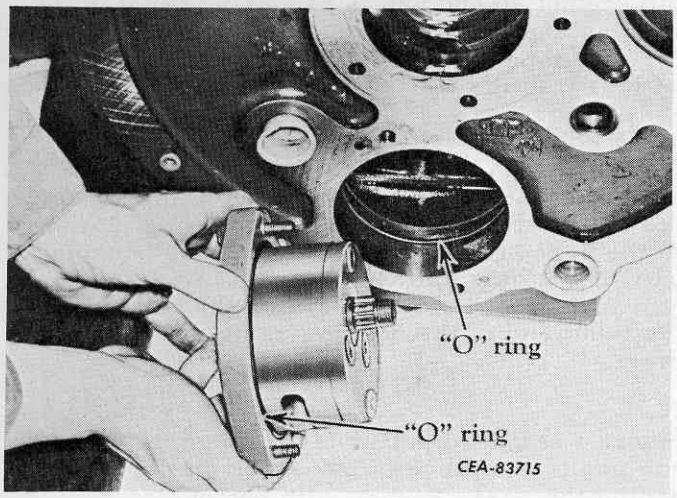
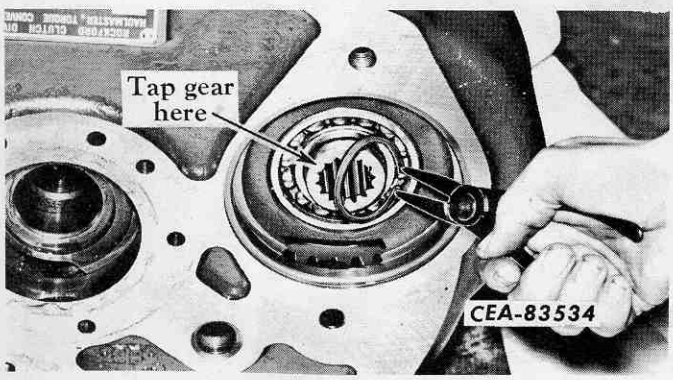


Illust. 26
Input Pump Removed.

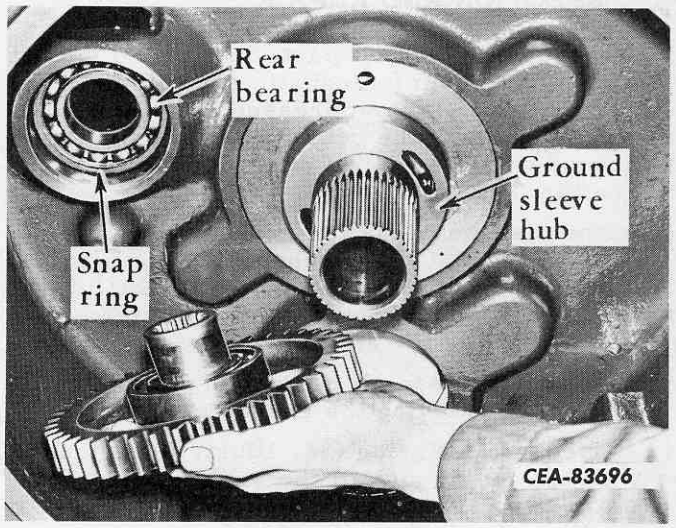
17. Remove the "O" ring (28) from the groove in the converter housing and the other "O" ring (28) from the pump body (Illust. 26).

18. MODEL 175 LOADER ONLY: Remove the snap ring (37) from the equipment pump accessory gear hub and tap the gear with front bearing from the housing (Illust. 27 and 28). If front bearing replacement is necessary, it can be removed with a bearing cup puller (Illust. 29). The rear bearing (35) can be driven or pressed out the rear of the housing. A snap ring (36) prevents the bearing from being removed out the front of the housing (Illust. 28).

19. Remove the seal ring (16) from the ground sleeve hub (Illust. 28). If the hub needs to be replaced, place converter housing in a press with the splined end of the ground sleeve hub facing down. Block up on inside of housing as close to the outside diameter of the ground sleeve hub as possible without contacting the

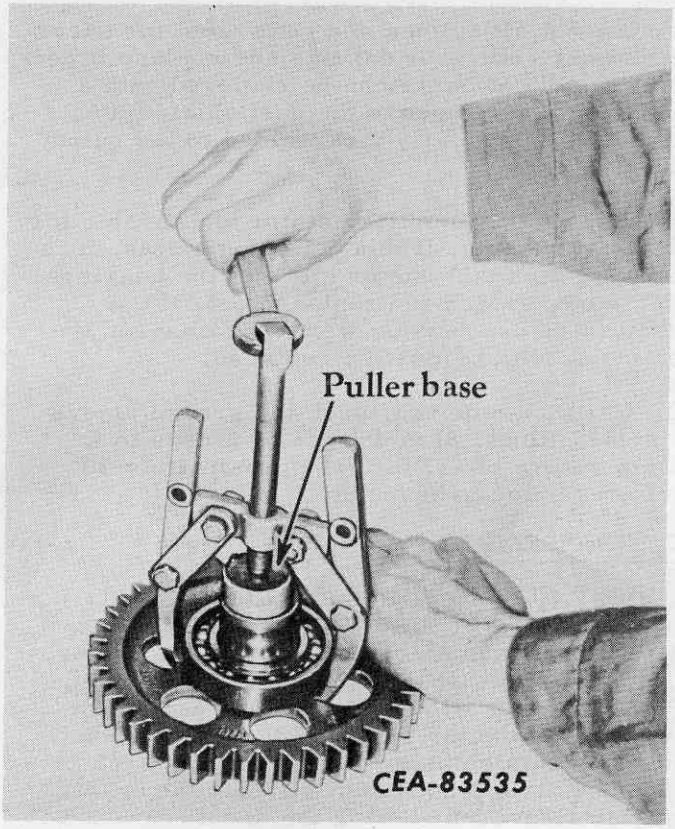


Illust. 27
Removing the Equipment Pump Accessory Gear Snap Ring.



Illust. 28
Removing the Equipment Pump Accessory Gear.

sleeve hub. Insert a steel plug, approximately 3-1/4 inches in diameter, on the rear of the sleeve hub and press out. Remove the gasket (23).



Illust. 29
Removing the Equipment Pump Accessory Gear Front Bearing.

6. INSPECTION AND REPAIR

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

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

3. Inspect and clean all hoses and piping removed when removing the converter.

4. Inspect the "O" ring (32, Illust. 8) on the converter housing and all the sealing rings for wear or damage and replace parts as necessary. Inspect the piston hook type seal ring grooves and sealing surfaces for wear and grooving.

5. Inspect the oil seal (21, Illust. 8) for hardening and fatigue. If equipped with metal face type oil seal, inspect the sealing surfaces between the rotor and stator for wear. A new oil seal must be handled and installed as described in Par. 7, "REASSEMBLY."

6. Inspect all splines and gear teeth for excessive wear, burrs or damage and replace if necessary. Slight burrs can be removed with a fine oil stone. Be sure the dust shield (20A, Illust. 8) is properly tack welded to the output flange.

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

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

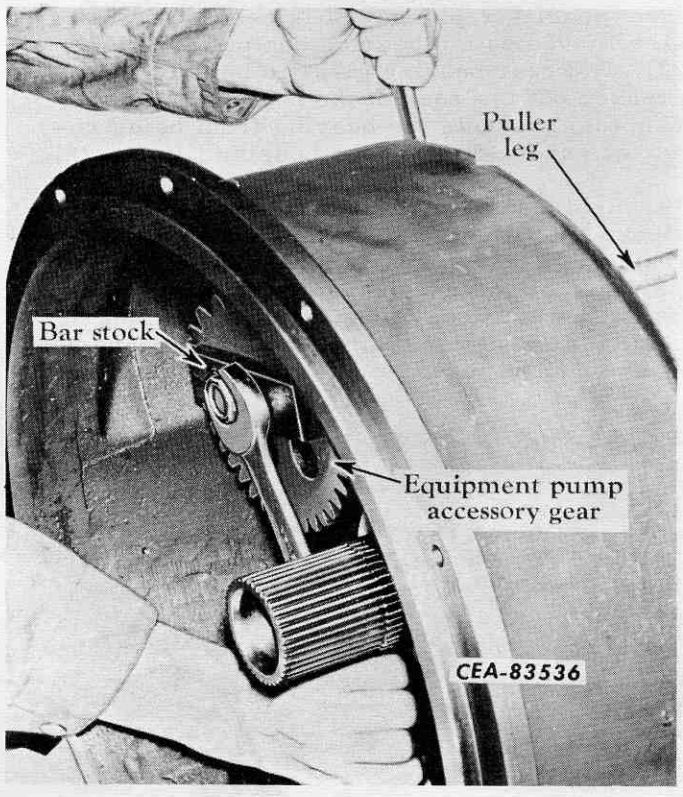
7. REASSEMBLY

(Ref. Nos. Refer to Illust. 8)

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

2. MODEL 175 LOADER ONLY: Be sure the snap ring (36) is properly seated in the housing bore (Illust. 28). Tap the rear bearing (35) into the bore from the output end of the housing until it bottoms on the snap ring. Start the gear (15) with front bearing (35) into the bore from the input end of the housing using a soft hammer.

Insert a standard puller leg through the gear and position a piece of bar stock on the leg behind the gear. Secure with nut. Place a 1-3/4 inch socket on the leg and against the rear bearing. Install a nut and draw the gear into the rear bearing until the snap ring groove in the gear hub appears. Install the snap ring (37) (Illust. 30).



Illust. 30
Installing the Equipment Pump Accessory Gear.

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3. Install the "O" ring (28) into the bore of the housing (31) and coat the bore and "O" ring lightly with heavy grease. Install the "O" ring (28) on the input pump body against the pump cover. (Illust. 26.)

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

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

5. Install the gear (11) on the pump shaft with the gear hub toward the pump. On pumps equipped with snap ring (27), the gear counterbore must fit over the snap ring to be properly positioned. Secure the gear to the shaft with the stop nut (12). Use a drift to keep gear from turning (Illust. 24). Torque the nut to the amount shown in Par. 2, "SPECIFICATIONS."

NOTE: If pump is equipped with snap ring (27) and it was removed, install a new snap ring using assembly tool 1 020 449R91. Place the tool sleeve over the pump shaft. Install the new snap ring on the sleeve and, using the tool driver, slowly tap the snap ring into the groove on the pump shaft. (Illust. 31.)

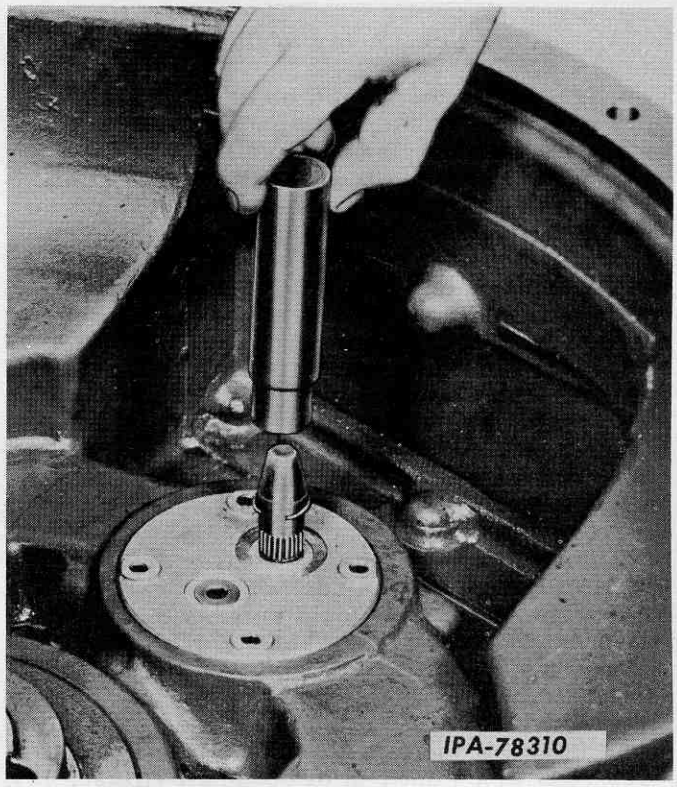
6. Place the snap ring (34) on the output shaft. Press the shaft into the bearing (25) with the output end of the shaft entering the bearing and seating the bearing against the snap ring (34). The bearing must be hold in the press so both races are supported.

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

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

9. Install the snap ring (38) (if equipped) in the groove on the output shaft (Illust. 21).

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



Illust. 31
Installing Input Pump Gear Snap Ring Using Assembly Tool (1 020 449R91)

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

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

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

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

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

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

(Continued on next page)

7. REASSEMBLY - Continued

(Ref. Nos. Refer to Illust. 8)

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

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

D. The oil seal should remain square to the bore within 0.010 per inch.

E. Install the seal stator using a driver that will fully support the back of the seal cup (absolute minimum would be where only 50 percent of the cup contacts the driver). Place the retainer in a press and press the seal stator (sealing surface down) into the retainer until it bottoms. Install the seal rotor on the end of the output shaft so the lip is to the rear or output end of the shaft (Illust. 19).

11. An output shaft end gap of 0.000 to 0.004 inch must be maintained in the converter assembly. Proceed as follows for checking and obtaining the proper end gap (Illust. 32).

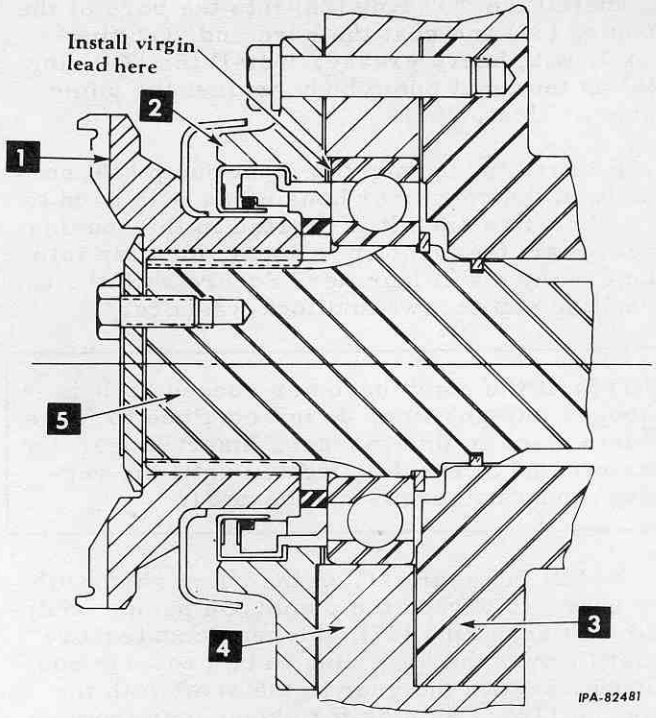
(a) Be sure the output shaft bearing is bottomed on the ground sleeve hub. Install virgin lead (approximately 1/16 inch thick) on the bearing cup.

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

(c) Remove the bearing retainer and compressed lead. With a micrometer, carefully measure the thickness of the compressed lead. This measurement, less 0.004 inch is the amount of shims (1A, Illust. 8) to be installed between the output shaft bearing cup and the retainer.

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

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



Illust. 32
Cross Section of Output End of Torque Converter. (Metal Face Type Oil Seal Shown, Lip Type Oil Seal Similar.)

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

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

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

15. Block the impeller (10) so the blades are down and, using a driver that will cover both races of the bearing (14), tap the bearing into the impeller hub until the retaining ring of the bearing bottoms (Illust. 33).

16. Secure the accessory drive gear (14) to the impeller with the seven cap screws (Illust. 13).

17. Place the turbine (6) in a press so the blades are down. Remove the retaining ring

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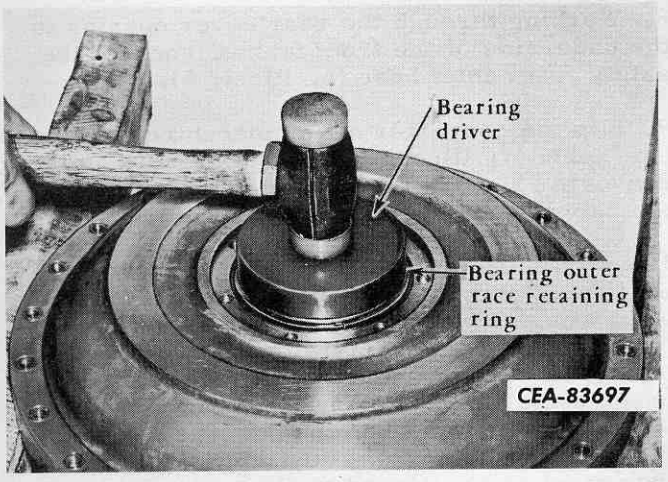


Illust. 33
Installing the Impeller Hub Bearing.

from the turbine hub bearing (3). Pressing on the inner race of the bearing, install the bearing (retaining ring groove up) on the turbine hub until it bottoms.

Place the turbine on the bench with the blades down and position the drive housing (5) over the bearing with the gear teeth up. Using a soft hammer, tap the drive housing onto the bearing until the groove in the bearing appears and install the retaining ring (Illust. 14).

18. Position the drive housing on the bench so the turbine is up. Be sure the snap ring (8) and dowel (8A) are in position in the stator (9). Place the thrust washer on the stator dowel (8A) and place the assembly into the turbine so the thrust washer is down (Illust. 12).

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

20. Turn the complete assembly over so that the accessory drive gear (13) is down. Secure a hoist to the input drive hub mounting holes on the drive housing (5) and lower this assembly into the converter housing (31). (Illust. 10.)

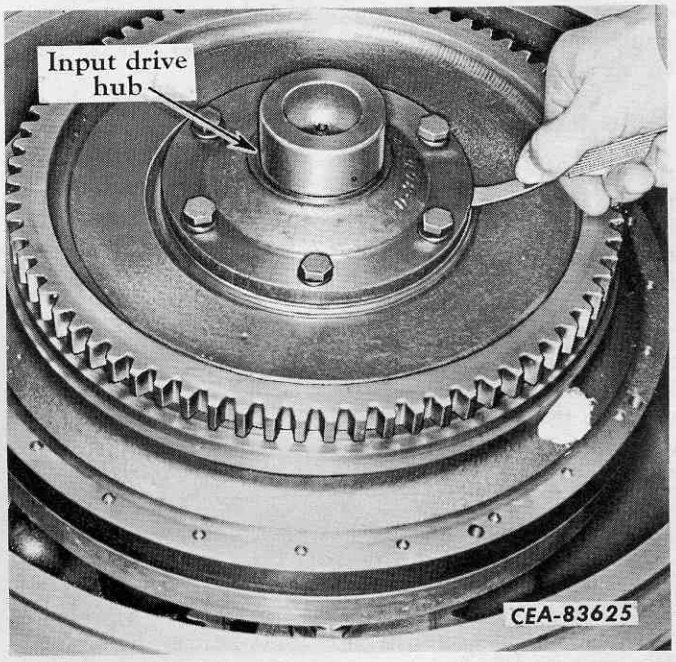
As the assembly is lowered into the converter housing the stator splines will engage with the ground sleeve hub splines; then the turbine hub will engage the output shaft splines and finally the accessory drive gear must mesh with the input pump drive gear and the equipment pump gear. If at each point,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

21. Install the retainer washer (2) and locking plate (1B) on the output shaft and secure with the three cap screws. Bend up the tabs of the locking plate (Illust. 9).

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

Check the clearance between the hub (1) and housing (5). (Illust. 34.) There must be a clearance of 0.005-0.015 inch. If necessary, add shims (1A) until a clearance of 0.005-0.015 inch is obtained without having the input hub mounting bolts tightened. When the correct gap is obtained, tighten bolts to standard torque.

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



Illust. 34
Checking Input Drive Hub Gap.

8. INSTALLATION

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

1. Remove the covering from the flywheel housing.

2. Lower the converter into position. Move the converter toward the flywheel housing by hand until some mounting cap screws can be started. Secure the converter housing to the flywheel housing with the cap screws and washers. Be sure to install the three spring clips. One to the top mounting bolt to the left of the inspection cover and one to each of the two top mounting bolts to the right of the inspection cover.

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

3. Remove the hoist and eyebolts from the inspection cover and install the cover securing cap screws and lock washers (Illust. 7).

4. SUCTION FILTER WITH FLEXIBLE COUPLING: Position the flexible coupling sleeve, gasket and retainer assembly and clamp on the suction filter lower nipple (Illust. 7) but do not tighten the clamp at this time.

5. Install the reducing tee (Illust. 6) and nipple into the converter housing until it is tight with the marks made in removal are aligned. Install the hose adapter to the tee.

6. Install the ball on the governor control hand lever.

7. Position the universal joint assembly and secure to the torque converter output flange and transmission drive yoke. Tape the bearing caps to the trunnion to keep them from falling until the mounting bolts are installed.

◆ CAUTION: If installing a new universal joint, remove the soft iron straps attached to the bearing caps. This will eliminate the possibility of the straps breaking loose and causing personal injury when the engine is running.

8. Working through the rear cover opening in the underside of the front frame, connect the safety filter inlet hose (6, Illust. 5).

9. Slip the converter oil temperature sending unit cable (7, Illust. 5) through the clip on the converter housing mounting bolt and connect the cable to the sending unit.

10. MODEL 175 LOADER ONLY: Lower the equipment pump into position, repositioning the hoist sling as was done in removal and secure to the converter housing with the two mounting bolts. Be sure to maneuver the pressure filter base as the pump is being lowered so the base is above the pump when the pump is secured. If the elbows (3 and 4, Illust. 5) were turned, they must be positioned so the marks made in removal are aligned.

11. MODEL 175 LOADER ONLY: Be sure the "O" ring in the end of the hose is in place and in good condition and secure the hose to the bottom of the equipment pump with the cap screws, lock washers and clamp halves.

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

13. Secure the pressure filter base to the front frame with the four cap screws and lock washers. The forward, bottom mounting cap screw secures a hydraulic hose with a clamp.

14. Secure the hydraulic hoses to the inner face of the front frame on the LH side of the unit just below the seat support bar with the clamp and bolt.

15. Connect the clutch pressure gauge tube (4, Illust. 4) at the filter base and at the other end to the front tube connection above the engine rear mounting. Secure the tube and electrical cables to the side of the front frame with the clamp and bolt.

16. MODEL 175 LOADER ONLY: Insert the equipment pump inlet tube (5, Illust. 4) in the connecting hose below the seat support bar bracket. Be sure the "O" ring in the pump end of the tube is in place and in good condition and secure the tube to the pump with the cap screws, lock washers and clamp halves. Tighten the clamp on the connecting hose end of the tube.

17. Position the element and spring on the pressure filter base. Be sure the "O" ring on the hold-down bolt and in the filter case are in place and in good condition and secure the filter case to the base (Illust. 4).

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18. Connect the converter vent tube (5) to the converter housing. Connect the regulating valve-to-converter hose at the elbow (4). Connect the pressure filter inlet hose (2) at the filter base (Illust. 5).

19. SUCTION FILTER WITHOUT FLEXIBLE COUPLING: Position the suction filter (16) with outlet tube and mounting bracket (15) and secure the bracket to the mounting bracket on the torque converter. Connect the outlet tube (17) to the torque converter and the inlet hose (14) to the suction filter (Illust. 2A).

20. Install the platform support (Illust. 2 or 2A):

(a) Position the support (6) (with decelerator cylinder and control linkage attached) on the mounting pads of the front frame and secure with the cap screws, lock washers and flat washers. The suction filter used with flexible coupling should also be attached to the support.

(b) SUCTION FILTER WITH FLEXIBLE COUPLING: Connect the regulator drain hose (14) to the converter.

SUCTION FILTER WITHOUT FLEXIBLE COUPLING: Connect the regulator drain hose to the pump inlet reducing tee (18). Secure the converter inlet hose to the decelerator cylinder (8) with the strap.

(c) Secure the adjustable clevis (3) to the bellcrank with the end pin and cotter.

(d) SUCTION FILTER WITH FLEXIBLE COUPLING: Secure the flexible coupling (Illust. 3) to the suction filter upper and lower nipples (refer to section 1, "GENERAL" for the proper method of installing a flexible coupling).

(e) SUCTION FILTER WITH FLEXIBLE COUPLING: Secure the flexible coupling (16) between the suction filter and filter inlet tube following procedure in step (d).

(f) Secure the decelerator cylinder to the seat support bar bracket (10) with the bolt, lock washer and flat washer.

(g) Connect the decelerator drain tube (7) to the converter and decelerator cylinder (8). Connect the cylinder inlet hose (9) at the cylinder (8).

(h) Connect the governor control rear rod clevis (4) at the cross shaft with the end pin and cotter.

21. Secure the cranking motor cable (2) to the two clips (5) on the converter housing (Illust. 2 or 2A).

22. Install and secure the LH and RH front platforms. Connect the adjustable clevis (1, Illust. 2 or 2A) to the decelerator pedal with the end pin and cotter.

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

24. MODEL 175 LOADER ONLY: Be sure the drain plug is installed and fill and vent the bucket hydraulic system as described in the pertinent instruction manual.

25. Start the engine and check for leaks. Check the input pump suction line for air leaks.

26. Perform the engine idle adjustments as described in section 4, "ENGINE."

27. Install the quick disconnect platform.

Testing the Converter Input Pump

28. Stop the engine.

29. Connect a flow meter between the pump and pressure filter.

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

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

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

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SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES

CONTENTS

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1. DESCRIPTION

General (Refer to Illust. 3)

The transmission is housed in a case which is mounted at the rear to the rear main frame with locking cap screws. Earlier units have the transmissions mounted on the rear main frame studs and secured with nuts. At the front, the transmission input shaft is coupled by a universal joint to the clutch shaft. The transmission case and cover are sealed against dirt and lubricant leakage by the use of sealing rings, gaskets and an oil seal which is located at the front of the transmission input shaft.

The lubrication of the transmission is provided by a pump which is mounted to the front of the transmission cover. The pump is driven off the reverse idler gear and operates whenever the engine is running and the clutch is engaged. The rear main frame is the source of supply for the lubricating oil that enters the transmission. Oil is drawn from the main frame, through a filter mounted on the left hand side of the front frame (mounted on the transmission cover on earlier tractors) and to the pump by the suction developed by the pump. Oil from the pump empties into the transmission case through oil lines and a cross fitting or tee at the top, rear section of the case. The oil falls from the gears and shafts to the bottom of the case where it flows back into the rear main frame through openings in the rear of the transmission case. Also connected at the cross fitting or tee is an oil tube or tubes used to direct oil for cooling the pivot brakes.

The transmission is a selective spur gear type and provides five speeds forward and four speeds reverse. Two levers control the shifter mechanism; one lever selects the forward and reverse position and the other selects the speed range. The levers are mounted on the gear shifter housing which is attached to the transmission cover. A lock out lever keyed to the gear selector lever prevents shifting the transmission to fifth speed when the forward and reverse lever is in the reverse position. The transmission gears are held in positive engagement by a gear shifter lock located on top of the transmission case.

The transmission assembly consists of four shafts on which the gears are mounted; the input shaft, fifth speed idler shaft, spline shaft and the bevel pinion shaft. The reverse idler gear is supported by bearings.

Input Shaft

The input shaft revolves on a ball bearing at the front and a straight roller bearing at the rear. The shaft is splined at both ends. The spline at the front end is for mounting the universal joint coupling from the clutch and the spline at the rear is for driving the power take-off shaft (when used). The forward and reverse driving gear is keyed to the shaft and the fifth speed driving gear is splined and rides freely on the shaft. Whenever the engine is running with the clutch engaged, the input shaft rotates; whether the transmission is in gear or in neutral.

Reverse Idler

The reverse idler gear is supported and rotates on a straight roller bearing at the rear and a ball bearing at the front. The function of the gear is to take the forward action from the input shaft and give a reverse action to the spline shaft when the forward and reverse driven gear (on the spline shaft) is brought into mesh. The reverse idler gear is in constant mesh with the forward and reverse driving gear on the input shaft, thus rotates whenever the engine is running and the clutch is engaged.

Fifth Speed Idler Shaft

This shaft is supported at the rear in the transmission case and is secured at the front to the transmission cover with two cap screws and washers. The shaft has only one gear, the fifth speed idler gear, which rotates freely on two caged roller bearings. The gear is held in position by the use of two thrust washers which are pinned to the shaft. The gear is in constant mesh with the first and fifth speed driven (on the bevel pinion shaft), but gives a driving action only when the fifth speed driving gear (on the input shaft) is brought into mesh with it.

Spline Shaft

The spline shaft revolves on a ball bearing at the front and a straight roller bearing at the rear. The spline shaft drives the bevel pinion shaft according to which sliding gear is engaged. The forward and reverse driven gear splined at the front of the shaft, drives the spline shaft (whether the transmission is in gear or neutral) whenever the engine is running with the clutch engaged and the shift lever in either forward or reverse position. When the forward and reverse driven gear is placed in neutral position, the tractor will not move in any gear range except fifth speed forward.

(Continued on next page)

1. DESCRIPTION - Continued

Bevel Pinion Shaft

The shaft is supported at the rear by a straight roller bearing and at the front by a double-row taper roller bearing. The shaft consists of the first and fifth, second and third and the fourth speed gears which are keyed to the shaft. The pinion gear is splined to the rear of the shaft and held in place with a nut.

The front bearing is housed in a bearing cage located in the transmission cover and receives the end thrust of the pinion shaft. A shim pack is provided between the transmission cover and the pinion shaft front bearing eye for setting the cone center of the pinion and bevel gear.

2. SPECIFICATIONS

Width of slot in sliding gears, inch	.380 - .390
Width of shifters fork fingers, inch	.365 - .375

Springs

	Free length inches	Test length inches	Test load pounds	Number of coils
Gear shifter poppet springs and lock plate guide spring	2	1-11/32	67	12-1/2

Transmission Oil Pump

Make and model	Wooster, P2-4EZ5-4-R-01
Pump body gear bore diameter, inches	1.539 - 1.540
Pump gear tip diameter, inches	1.5375 - 1.5380
Pump gear shaft diameter, inch	.7485 - .7485 - .7490
Bearing bore diameter, inch	.7500 - .7505
Pump gear thickness, inch	.4295 - .4300
Bearing thickness, inch	.5315 - .5320

Special Nut and Bolt Torque Data (Foot-Pounds)
(Torques Given Are For Bolts and Nuts Lubricated with SAE-30 Engine Oil.)

Bevel pinion shaft front nut	500 - 550
Bevel pinion shaft rear nut	500 - 550
Bevel pinion shaft front bearing retainer	300 - 350
Transmission pump front cover-to-rear cover cap screws (3/8" x 2-1/4")	28 - 32

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3. CHECKING MECHANICAL PROBLEMS

Probable Cause	Remedy
Gears Hard to Shift	
1. Oil in transmission too heavy	Drain and fill rear main frame with recommended lubricant. (Refer to operator's manual.)
2. Gear shifter fork damaged or out of alignment	Inspect and replace if necessary.
3. Worn or damaged shifting controls	Repair, or install new parts.
4. Burred gears	Repair, or install new parts.
5. Clutch-to-transmission gear shifter lock out of adjustment	Refer to "CLUTCH ADJUSTMENT" in Section 5.
Gears Clash	
1. Engine clutch drags	Refer to "ENGINE CLUTCH," Section 5.
2. Damaged transmission parts	Inspect and replace parts as necessary.
Gears Not In Full Mesh When In Operation	
1. Shifter forks worn or damaged	Repair, or install new parts.
2. Worn or broken bearings	Install new bearings.
Noise In Transmission	
1. Bearings worn or broken	Install new bearings.
2. Foreign material in oil	Drain, flush and refill with clean oil.
3. Gears badly worn	Install new gears.
4. Bevel gear and pinion not in proper mesh	Adjust to proper clearance.
Transmission Overheats	
1. Improper or insufficient lubrication	Use recommended lubricant; inspect oil pump for damage.
2. Low transmission oil level	Be sure drain plugs are tight. Check for leakage at the transmission cover, pump and lines.
Gears Do Not Shift	
1. Engine clutch drags	Refer to "ENGINE CLUTCH", Section 5.
2. Gearshift linkage damaged	Repair or replace parts as necessary.
3. Gear shifter springs or poppets damaged	Replace parts as necessary.
4. Gears stuck on spline shaft	Remove shaft and remove burrs or scored metal.
5. Clutch-to-transmission gear shifter lock out of adjustment	Refer to "CLUTCH ADJUSTMENT" in Section 5.

4. REMOVAL

1. Drain the oil from the rear main frame.

2. Remove the engine clutch as described in Section 5.

3. Remove the clutch hydraulic pump and motor assembly, pressure regulator and thermal valve as an assembly. (Refer to the removal instructions under "HYDRAULIC PUMP AND MOTOR ASSEMBLY" in Section 5, "ENGINE CLUTCH.")

4. Tie back the steering levers. Remove the drive yoke from the splines of the transmission input shaft.

5. Loosen the cap screw securing the forward and reverse lever to the pivot lever (12, Illust. 22). Remove the lever (2) and key (3) from the pivot lever.

6. Disconnect the operating rod (10, Illust. 2) from the camshaft (9) and remove the rod.

7. FILTER MOUNTED ON TRANSMISSION COVER: Disconnect the pivot brake cooling oil tubes from the cross (2B, Illust. 1) at the rear of the transmission case. Disconnect the filter inlet hose (17, Illust. 1) from the connector (18) and remove the hose from the bushing in the bottom of the filter.

FILTER MOUNTED ON FRONT FRAME: Disconnect the pivot brake cooling oil tubes or tube from the cross (4) or tee (4A) at the rear of the transmission case. Disconnect the filter-to-pump hose (12) at the filter elbow (13). Disengage the hose from the clip at the clutch housing and position the hose so it can be removed with the transmission (Illust. 1A).

8. Attach a hoist to the transmission and remove the cap screws securing the transmission case to the rear main frame. Transmissions on earlier units are mounted on the rear main frame studs with nuts. Remove the transmission assembly from the tractor.

9. Remove the pipe plug (10, Illust. 3) from the transmission cover to drain the remaining lubricant from the transmission.

5. DISASSEMBLY

Transmission Case and Cover

1. FILTER MOUNTED ON TRANSMISSION COVER: Disconnect and remove the filter-to-pump manifold tube (2), pump manifold-to-tee tube (3), and the transmission cover-to-transmission case tube (4). Refer to Illust. 3.

FILTER MOUNTED ON FRONT FRAME: Disconnect and remove the transmission cover-to-case hose (6) and the pump-to-transmission cover hose (9) (Illust. 1A).

2. Using the 3/4 inch drive in the end of the bevel pinion shaft to keep the shaft from turning, remove the rear nut securing the bevel pinion. With the aid of a puller, remove the bevel pinion from the shaft spline. Remove the "O" rings from the transmission case. (Illust. 4.)

3. Place the assembly on end so the gear shifting levers are up. Loosen the lower clamp on the forward and reverse gear shift pivot lever and push up the rubber boot from the gear shifter housing. Drive out the shaft securing the pivot lever to the gear shifter housing and remove the forward and reverse pivot lever assembly (refer to Illust. 5).

4. Remove the cap screws and washers securing the gear selector tower to the gear shifter housing and remove the gear shift hand lever assembly. Remove the gear selector gate and gaskets. (Refer to Illust. 5.)

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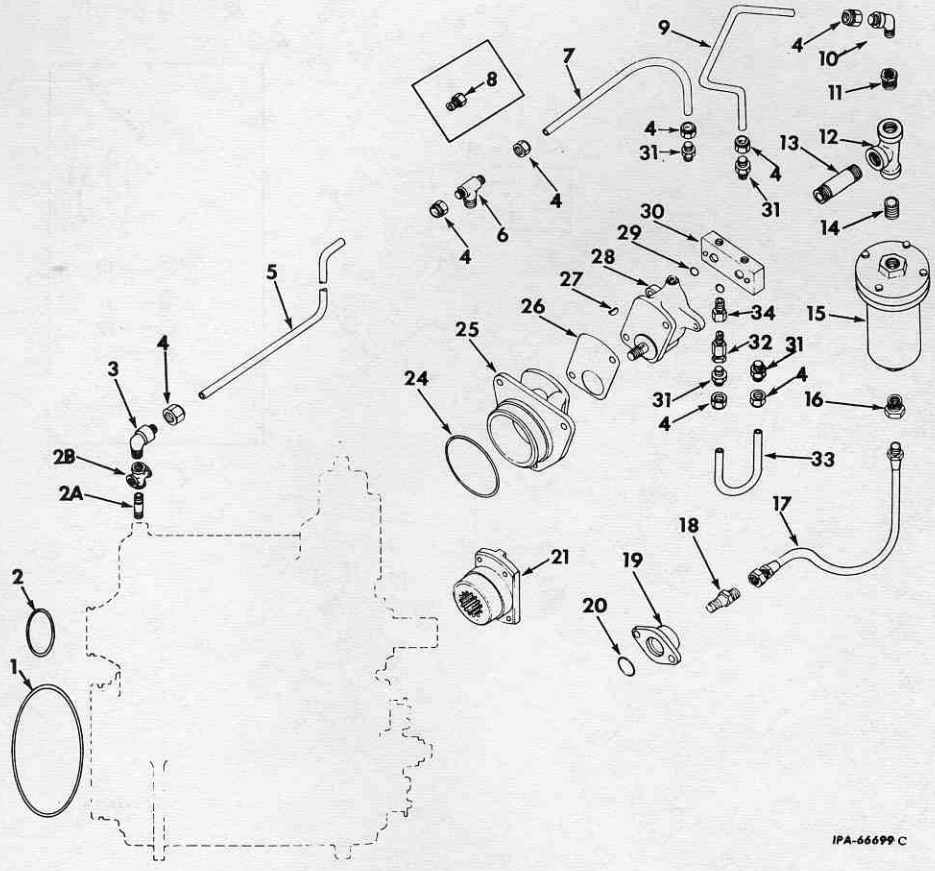
5. Remove the cap screw and plain washer securing the shaft lock pin (12, Illust. 3) at the side of the shifter housing and pull the lock pin with "O" ring from the housing.

6. Remove the cap screws, washers and nuts securing the gear shifter housing to the transmission cover. Pry the housing free of the cover dowels and lift the housing with gasket and gear shifter shaft from the cover (Illust. 6). To remove the gear shifter shaft from the housing, remove the spirol pin at the front end of the housing.

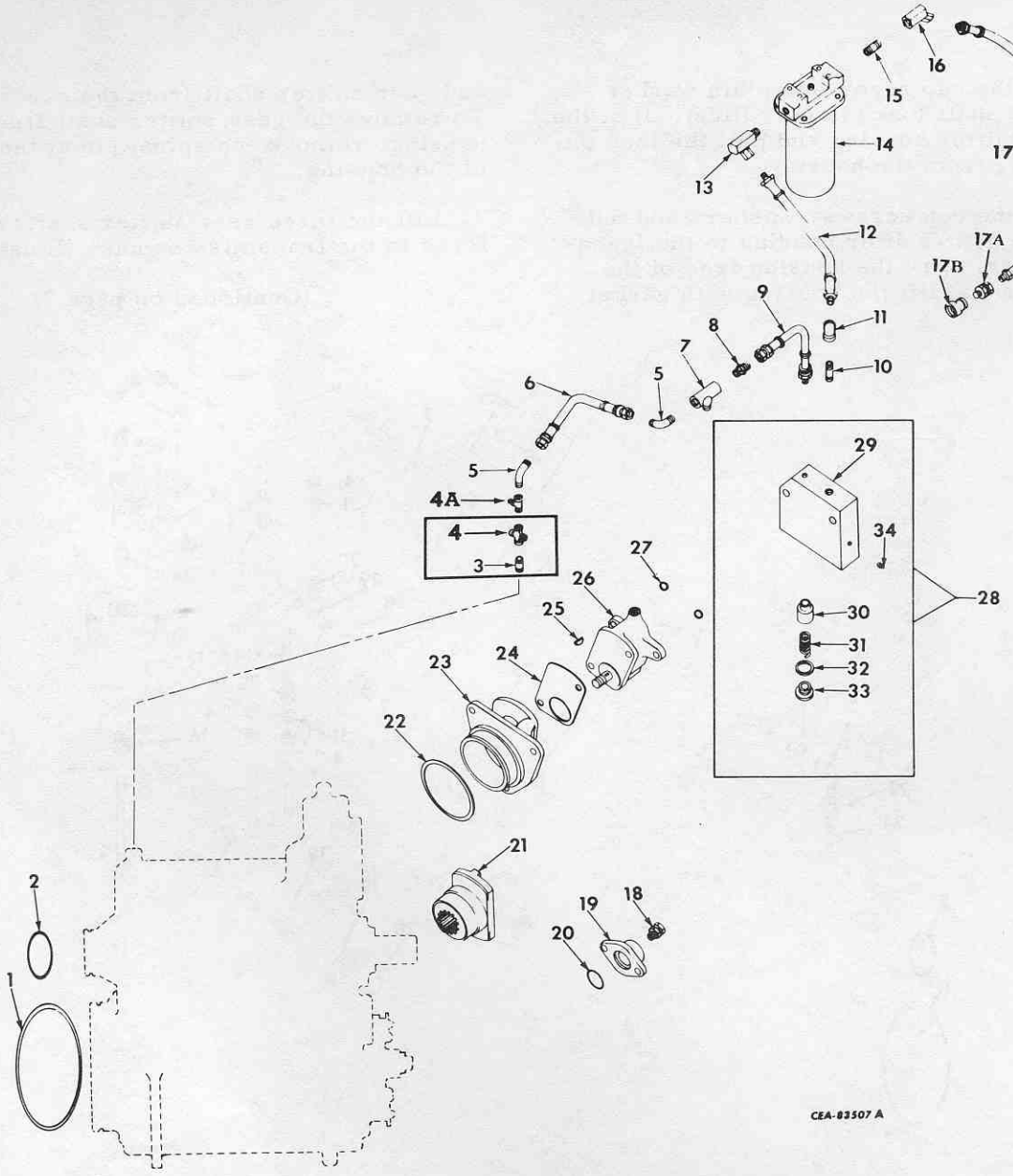
7. Lift the three gear shifter shafts from the forks in the transmission case (Illust. 6).

(Continued on page 7)



Illust. 1
Transmission Pump and Related Parts.
(Filter Mounted on Transmission Cover.)

1. Transmission case lower "O" ring.
2. Transmission case upper "O" ring.
2A. Nipple.
2B. Cross.
3. Elbow.
4. Nut.
5. Transmission cover-to-case tube.
6. Tee (in cover).
7. Manifold-to-tee-tube.
8. Connector (if equipped).
9. Filter-to-manifold tube.
10. Elbow.
11. Reducing bushing.
12. Reducing tee.
13. Pipe nipple.
14. Pipe nipple.
15. Filter assembly.
16. Reducing bushing.
17. Sump-to-filter hose.
18. Connector.
19. Sump flange.
20. "O" ring.
21. Drive yoke.
24. "O" ring.
25. Pump adapter.
26. Pump gasket.
28. Transmission pump.
29. "O" ring.
30. Pump manifold.
31. Connector.
32. Valve assembly.
33. Manifold-to-valve tube.
34. Connector.



Illust. 1A
Transmission Pump and Related Parts.
(Filter Mounted on Left Hand Side of Front Frame.)

1. Transmission case lower "O" ring.
2. Transmission case upper "O" ring.
3. Nipple.
4. Cross.
4A. Tee
5. Elbow.
6. Transmission cover-to-case hose.
7. Tee (in cover).
8. Connector.
9. Pump-to-transmission case cover hose.
10. Nipple.
11. Elbow
12. Filter-to-pump hose.
13. Elbow (filter outlet).
14. Filter assembly.
15. Nipple.
16. Elbow (filter inlet).
17. Rear frame sump-to-filter hose.
17A. Adapter.
17B. Coupling.
18. Adapter (on sump flange).
19. Rear Frame sump flange.
20. Flange "O" ring.
21. Drive yoke.
22. Adapter "O" ring.
23. Pump adapter.
24. Pump gasket.
25. Coupling key.
26. Transmission pump.
27. Check valve housing "O" rings.
28. Pump check valve assembly.
29. Check valve housing.
30. Check valve poppet.
31. Check valve spring.
32. "O" ring.
33. Check valve plug.
34. Pipe plug.

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5. DISASSEMBLY - Continued

Transmission Case and Cover - Continued

8. FILTER MOUNTED ON TRANSMISSION COVER: Remove the cap screws and washers securing the pump adapter to the transmission cover and remove the adapter with pump, manifold and hydraulic oil tube from the cover. Remove the pump drive shaft from the idler gear. Remove the "O" ring from the adapter flange. Remove the filter cover and element from the filter base. Remove the filter base and connections from the cover. (Illust. 7).

FILTER MOUNTED ON FRONT FRAME: Remove the cap screws and washers securing the pump adapter to the transmission cover and remove the adapter (23) with pump (26) and pump check valve assembly (28) from the cover. (Illust. 1A.) Remove the pump drive shaft from the idler gear. Remove the "O" ring from the adapter flange (Illust. 7).

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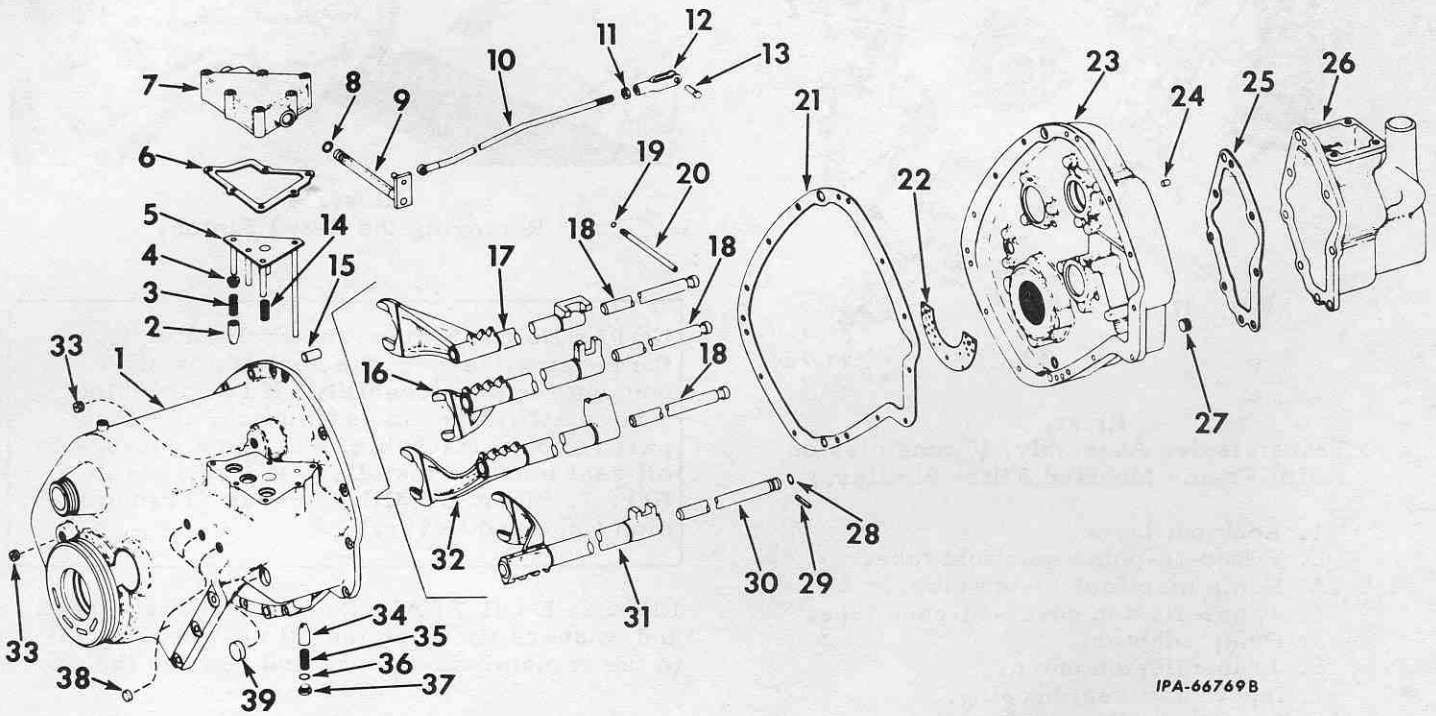
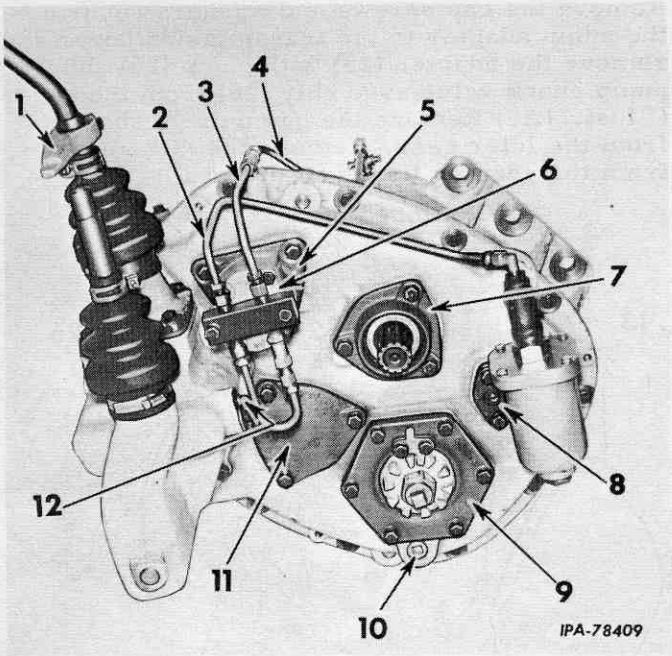


Illust. 2
Exploded View of Transmission Case and Cover.

1. Transmission case.
2. Gear shifter poppet.
3. Poppet spring.
4. Spring retainer plug.
5. Gear shifter lock plate.
6. Housing gasket.
7. Gear shift cam lock housing.
8. Camshaft "O" ring.
9. Gear shifter lock camshaft.
10. Operating rod.
11. Jam nut.
12. Clevis.
13. End pin.
14. Guide spring.
15. Dowel.
16. 3rd and 4th gear shifter fork.
17. 5th gear shifter fork.
18. Gear shifter shaft.
19. Lock pin "O" ring.
20. Shaft lock pin.
21. Cover gasket.
22. Oil return screen.
23. Transmission cover.
24. Dowel.
25. Housing gasket.
26. Gear shifter housing.
27. Plug.
28. Shaft "O" ring.
29. Spiral pin.
30. Gear shifter shaft.
31. Forward and reverse gear shifter fork.
32. 1st and 2nd gear shifter fork.
33. Pipe plug.
34. Forward and reverse gear shifter poppet.
35. Poppet spring.
36. Plug gasket.
37. Gear shifter poppet plug.
38. Shifter shaft cup plugs.
39. Reverse idler gear plug.

5. DISASSEMBLY - Continued

Transmission Case and Cover - Continued

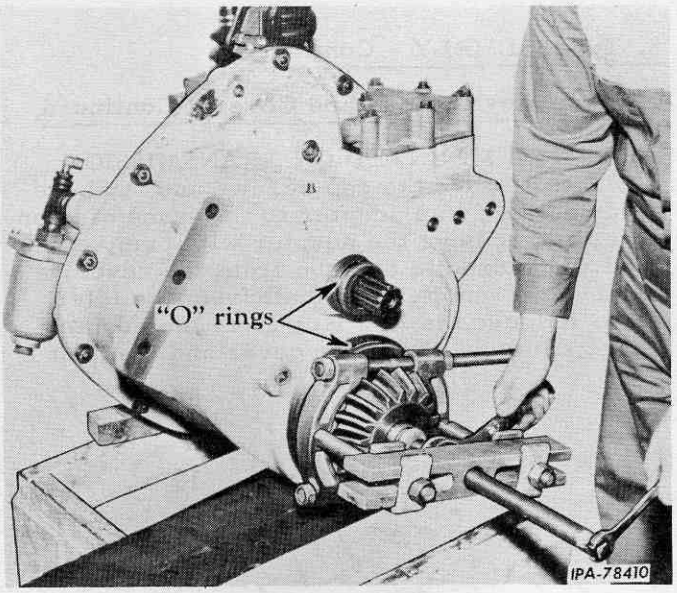


Illust. 3
Transmission Assembly. (Transmission with Frame Mounted Filter Similar.)

1. Lock out lever.
2. Filter-to-pump manifold tube.
3. Pump manifold-to-tee tube.
4. Transmission cover-to-case tube.
5. Pump adapter.
6. Transmission pump.
7. Input shaft seal housing.
8. 5th speed idler shaft.
9. Pinion shaft bearing cage.
10. Drain plug.
11. Spline shaft bearing cap.
12. Shaft lock pin.

9. Remove the bearing cap with "O" ring from the spline shaft (Illust. 7).

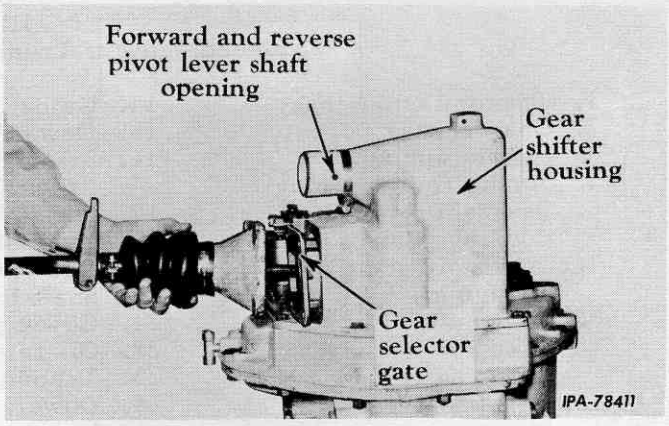
10. METAL FACE TYPE OIL SEAL: Remove the cap screws and washers securing the oil seal housing to the transmission cover and lift the housing with the stator of the oil seal and "O" ring (9, Illust. 18) from the input shaft. Lift the rotor of the oil seal from the input shaft. (Refer to Illust. 8.)



Illust. 4
Removing the Bevel Pinion.

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

LIP TYPE OIL SEAL: Remove the cap screws and washers securing the oil seal housing (8) to the transmission cover and remove the



Illust. 5
Removing the Gear Shift Hand Lever Assembly.

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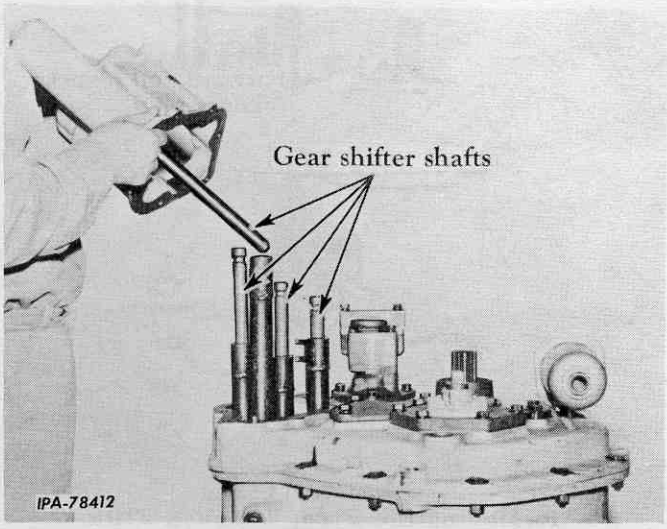
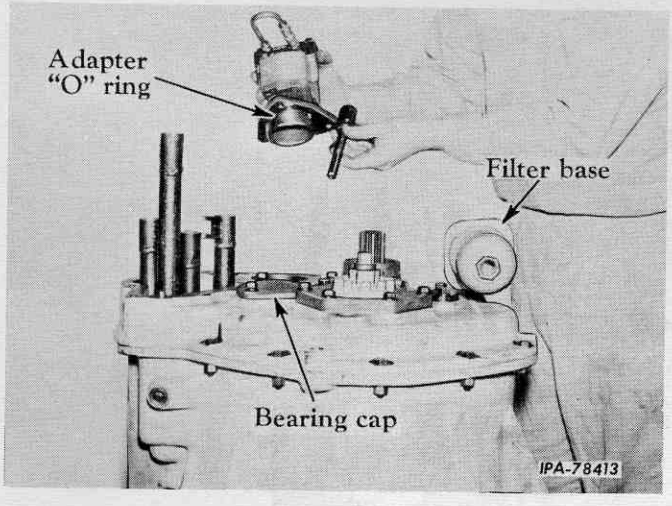


Illust. 6
Removing the Gear Shifter Housing.

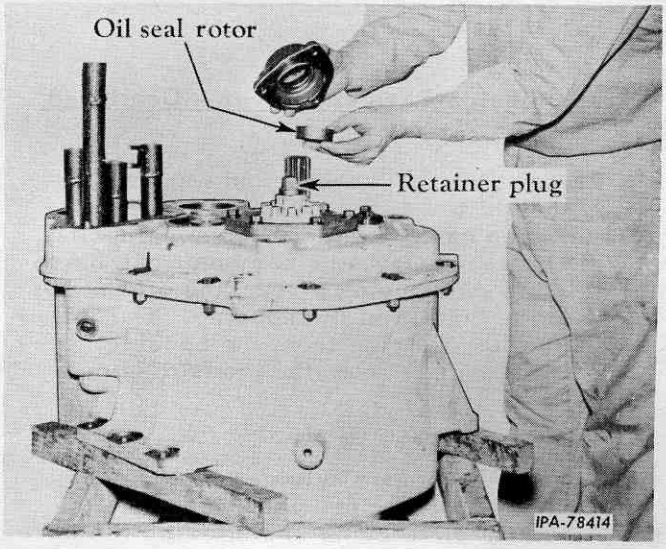


Illust. 7
Removing the Transmission Pump
and Drive Shaft.

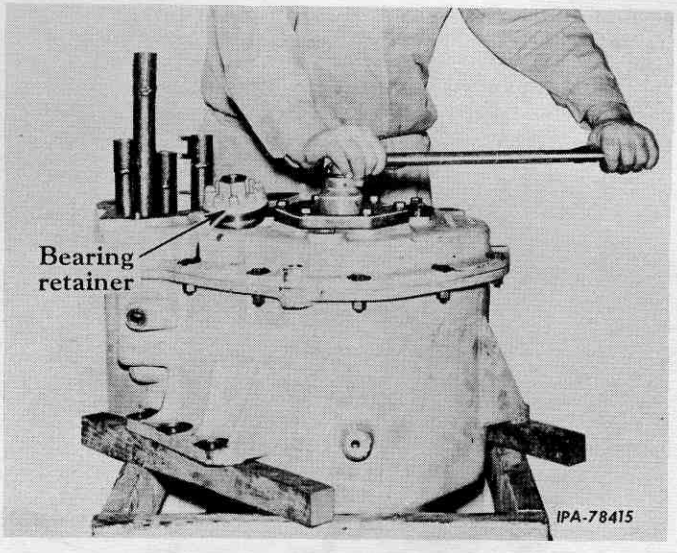
housing with "O" ring (9) and oil seal (10 or 10A). The wear sleeve (10B) used with the conversion oil seal must be cut from the shaft when replacement is necessary (Illust. 18).

11. Remove the retainer plug from the bevel pinion shaft front bearing retainer (Illust. 8).

12. Remove the lock (16, Illust. 20) from the bearing cage. Remove the bearing retainer from the bearing cage at the front of the bevel



Illust. 8
Removing the Input Shaft Oil Seal Housing
and Oil Seal. (Shafts with Metal Face
Type Oil Seal.)



Illust. 9
Removing the Bevel Pinion Shaft
Front Nut.

pinion shaft. Place two shafts in gear or use the 3/4 inch drive in the end of the bevel pinion shaft to keep the shaft from turning as the nut at the front of the shaft is removed (Illust. 19). Reinstall the bearing retainer.

(Continued on next page)

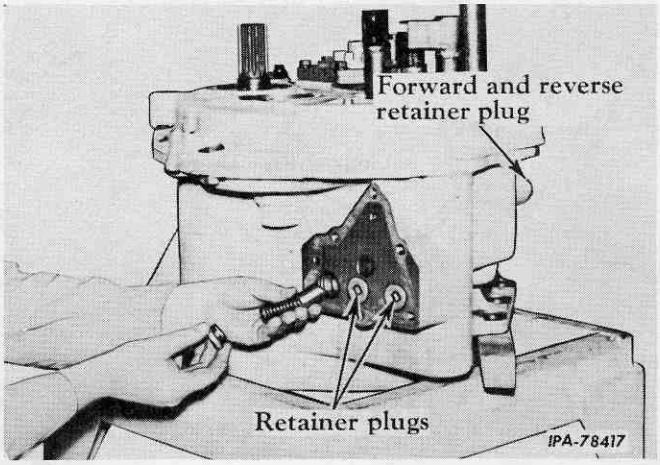
5. DISASSEMBLY - Continued

Transmission Case and Cover - Continued

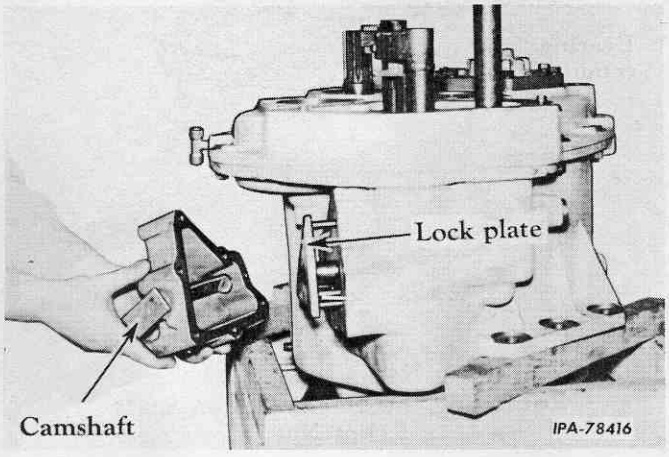
13. Remove the cap screws and washers securing the shifter cam lock housing to the transmission case. Remove the housing and gasket. If necessary, the camshaft can be removed from the housing by backing off the set screw in the bottom of the housing. Pull the camshaft with "O" ring from the housing. Remove the lock plate from the transmission case (Illust. 10).

14. Unscrew the three retainer plugs and lift out the poppet springs and poppets. Remove the lock plate guide spring from the bore in the transmission case (Illust. 11).

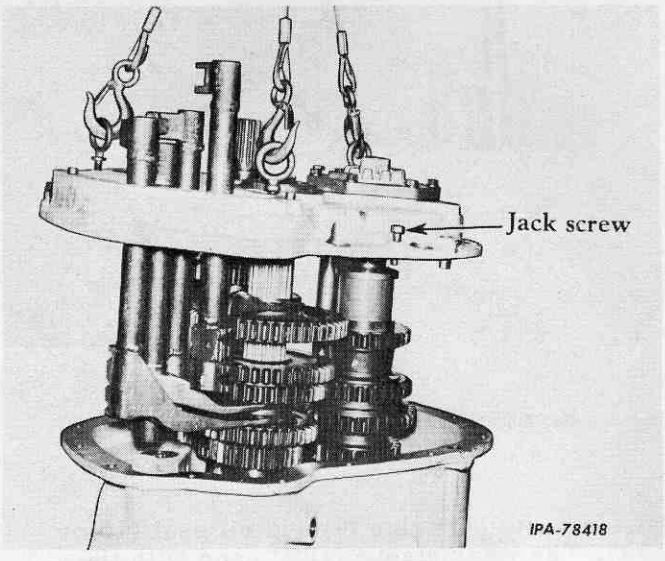
15. Unscrew the forward and reverse retainer plug from the transmission case and remove with gasket. Remove the poppet spring and poppet from the transmission case bore (Illust. 11).



Illust. 11
Removing the First Through Fifth Shifter Poppet Assemblies.



Illust. 10
Removing the Gear Shifter Cam Lock Housing.



Illust. 12
Removing the Transmission Cover with Shafts.

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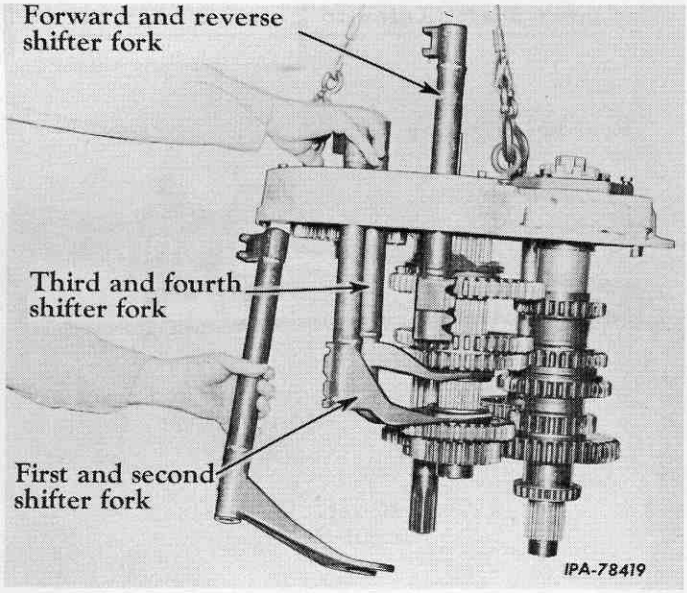
16. Remove the cap screws, nuts and washers securing the transmission cover to the transmission case. Insert jack screws into the three tapped holes in the cover to free the cover dowels from the case. Insert eyebolt in the cover and attach a hoist as shown in Illust. 12, to lift the cover with shafts from the case. Remove the cover gasket.

17. Support the weight of the cover and shaft assembly with the hoist as shown in Illust. 13. Remove the fifth gear shifter fork from the input shaft. Remove the remaining shifter forks from the spline shaft. It may be necessary to tap on the sides of the first and second shifter fork to free the fork fingers from the gear collar.



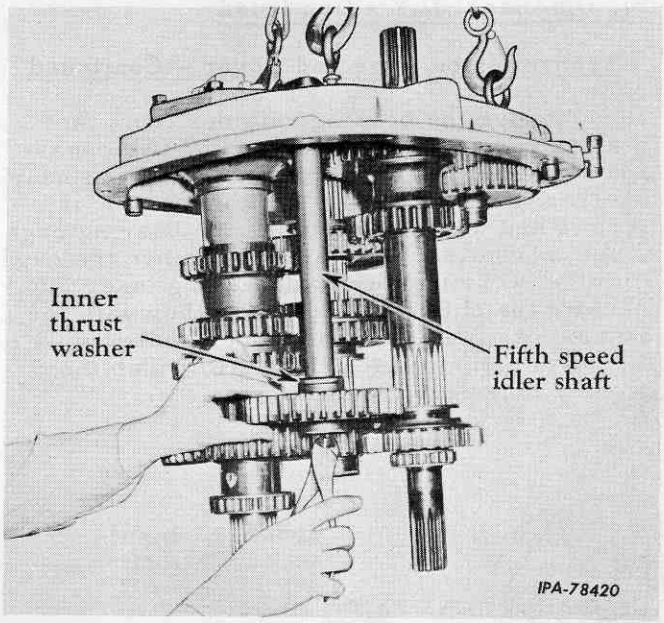
Illust. 13
Removing the Fifth Gear Shifter Fork.

18. Remove the retaining ring (19A, Illust. 18) (if equipped) from the idler shaft. Remove the thrust washer from the dowel pin under the fifth speed idler gear and pull the pin from the shaft. Remove the gear and the inner thrust washer from the shaft (Illust. 14).

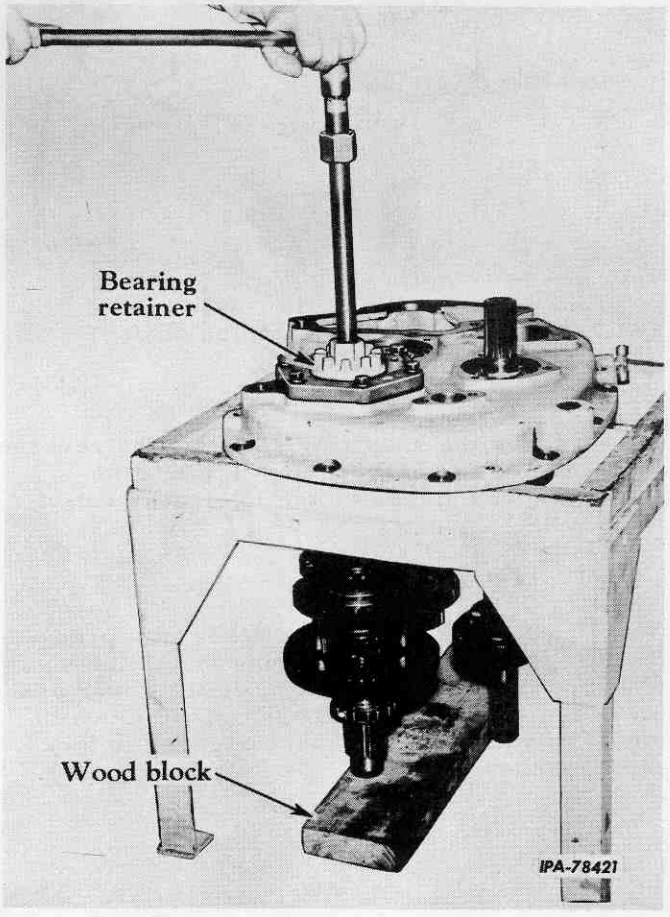
Remove the cap screws and washers securing the fifth speed idler shaft to the transmission cover and remove the shaft. Remove the "O" ring from the cover bore.

19. Place the transmission cover on a stand with the shafts down. Thread a puller screw (1-14 inch NF) into the bevel pinion shaft bearing retainer until the shaft is free of the front bearing. Place a block under the shaft to prevent the shaft from being damaged (Illust. 15).

(Continued on next page.)



Illust. 14
Removing the Fifth Speed Idler Gear Dowel Pin.

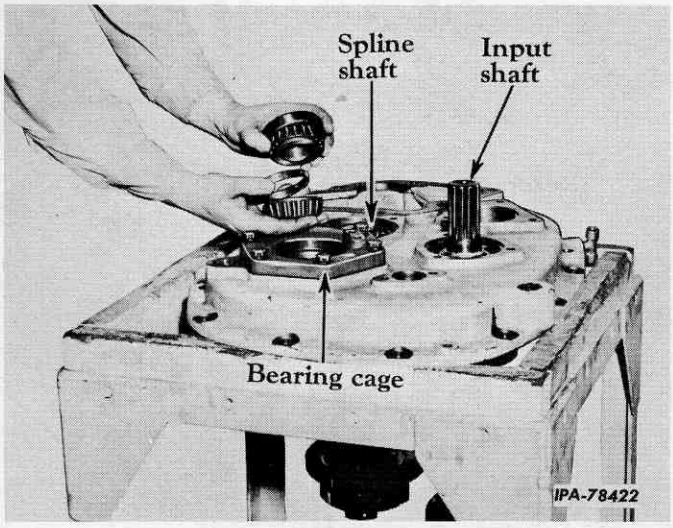


Illust. 15
Removing the Bevel Pinion Shaft.

5. DISASSEMBLY - Continued

Transmission Case and Cover - Continued

20. Remove the bearing retainer from the bearing cage. Lift the outer cup, two cones and spacer of the bevel pinion shaft front bearing from the bearing cage. Remove the cap screws and washers securing the bearing cage to the transmission cover and remove the cage with the "O" ring and front bearing inner cup. Remove the shims and keep together with the bearing cage to facilitate proper reassembly of the bevel pinion shaft (Illust. 16). Tap the bearing inner cup from the cage.



Illust. 16
Removing the Bevel Pinion Shaft Front Bearing.

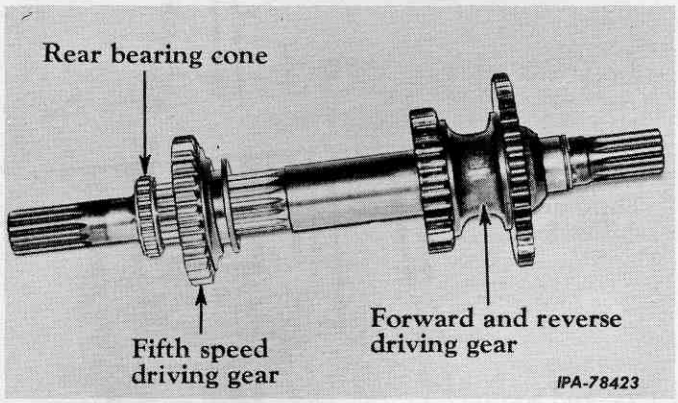
21. Remove the snap ring securing the reverse idler gear to the ball bearing in the transmission cover and drive the idler gear out of the bearing.

22. Place the transmission cover in a press. Remove the snap ring securing the spline shaft (Illust. 16) to the ball bearing in the cover and press the shaft from the bearing. Remove th input shaft (Illust. 16) from the cover in the same manner.

23. Remove the input and spline shaft bearing from the transmission cover. To reverse idler gear, front bearing can easily be removed from the transmission cover if replacement is necessary.

The four rear bearing outer races can be pulled from the transmission case if replacement of the bearings is necessary. To remove the bevel pinion shaft rear bearing outer race, it will first be necessary to remove the retaining snap ring.

Input Shaft (Refer to Illust. 17 and 18)



Illust. 17
Input Shaft.

24. With a bearing puller, remove the rear bearing cone from the shaft. Remove the fifth speed driving gear from the shaft splines.

NOTE: The forward and reverse driving gear is a tight shrink fit on the shaft. To remove the gear, use a torch on the gear hub. Care must be taken that heat is uniform all around the hub and applied fast enough to prevent transferring of heat to the gear bore or shaft. Do not heat to more than 400°F.

25. Place the shaft in a press and remove the forward and reverse driving gear. Remove the gear key from the shaft.

(Continued on page 14)

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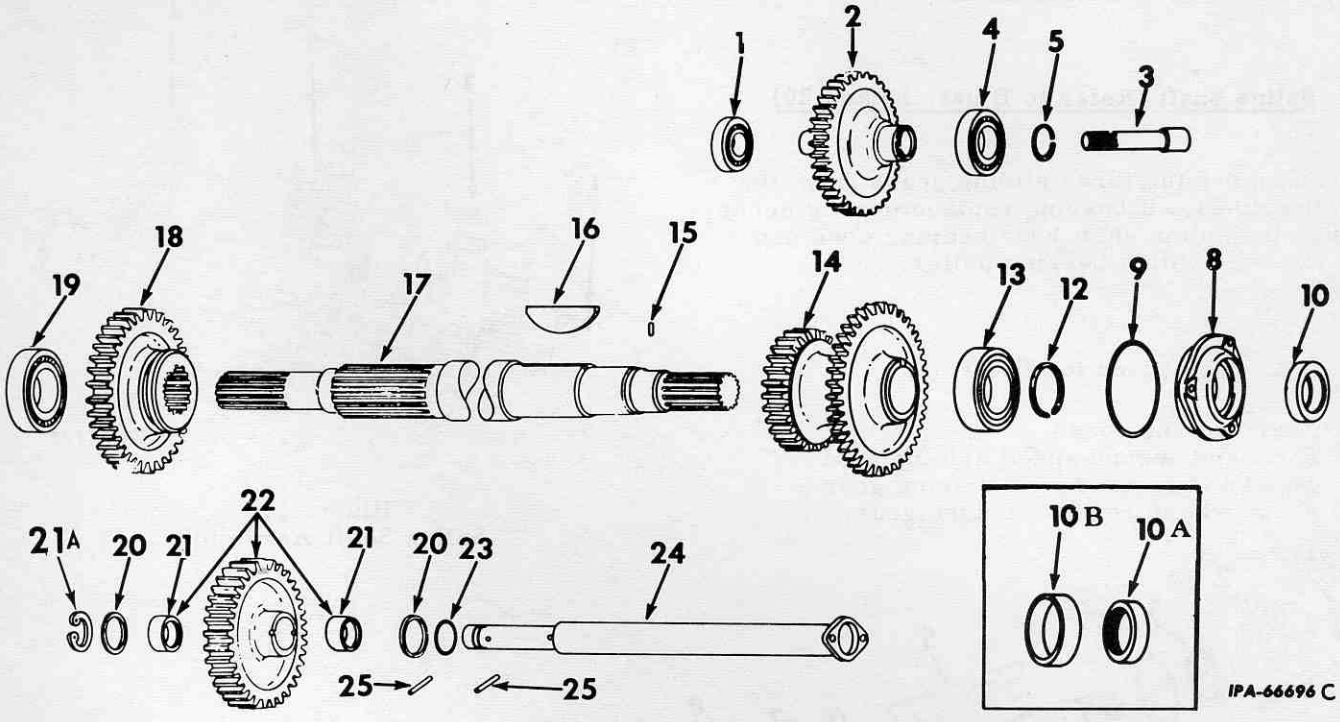


Illust. 18
Exploded View of Reverse Idler Gear Input Shaft
and Fifth Speed Idler Shaft.

1. Bearing.
2. Idler gear.
3. Transmission pump drive shaft.
4. Bearing.
5. Snap ring.
8. Seal housing.
9. "O" ring.
10. Lip type oil seal.
10A. Lip type conversion oil seal.
10B. Wear sleeve.
12. Snap ring.
13. Bearing.
14. Forward and reverse gear.
15. Dowel pin. (Used with metal face type oil seal only)
16. Key.
17. Input shaft.
18. Fifth speed drive gear.
19. Bearing.
20. Thrust washer.
21. Needle bearings.
21A. Retaining ring (if equipped).
22. Fifth speed idler gear with bearings.
23. "O" ring.
24. Fifth speed idler shaft.
25. Pin.

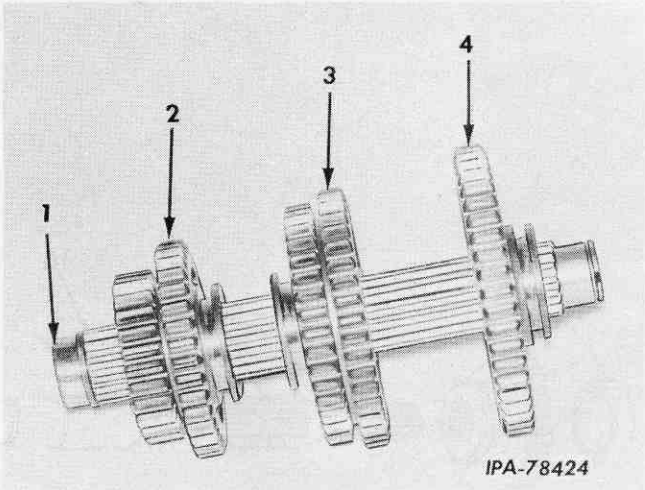
5. DISASSEMBLY - Continued

Spline Shaft (Refer to Illust. 19 and 20)

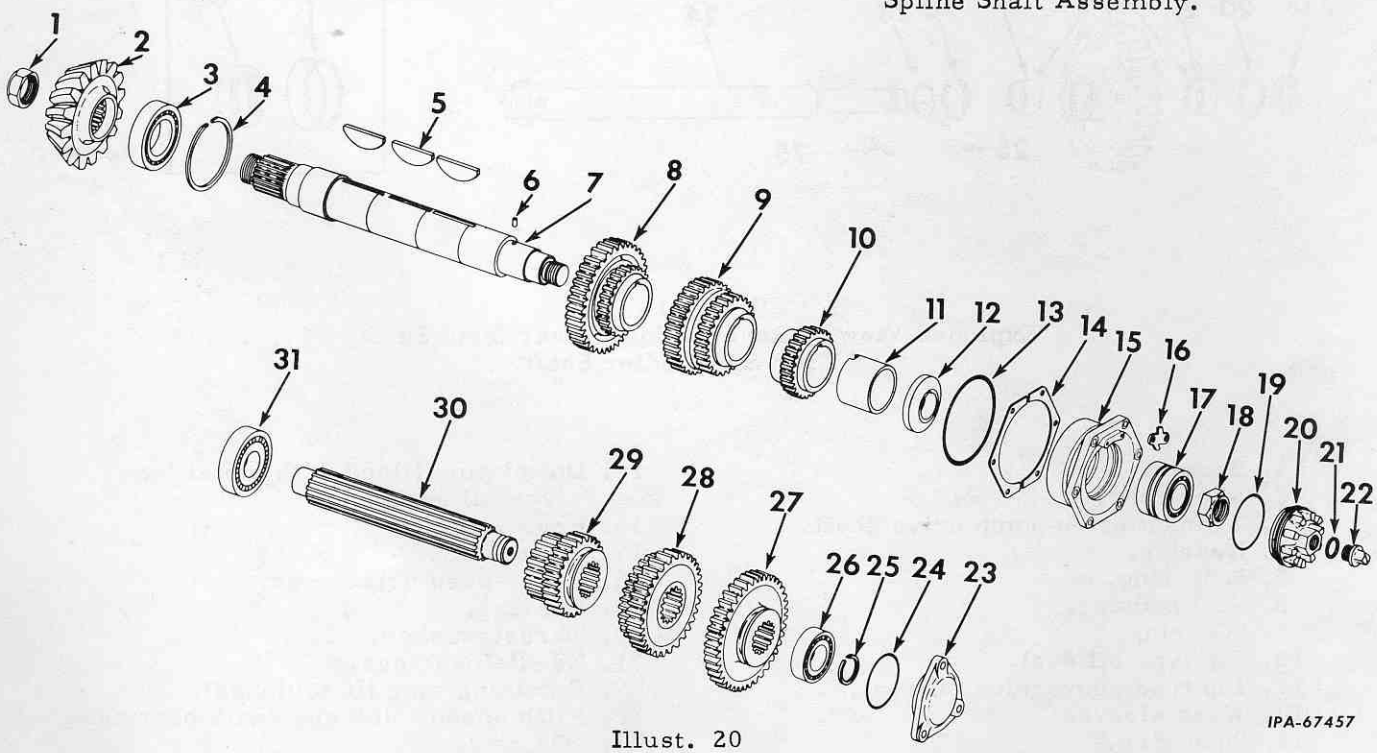
26. Remove the three sliding gears from the shaft splines. If bearing replacement is necessary, the spline shaft rear bearing cone can be removed with a bearing puller.

Legend for Illust. 19

1. Rear bearing cone.
2. First and second speed driving gear.
3. Third and fourth speed driving gear.
4. Forward and reverse driven gear.



Illust. 19
Spline Shaft Assembly.



Illust. 20
Exploded View of the Spline Shaft and Bevel Pinion Shaft.

1. Pinion nut.
2. Bevel pinion.
3. Rear bearing.
4. Snap ring.
5. Keys.
6. Dowel pin.
7. Pinion shaft.
8. First and fifth speed gear.
9. Second and third speed gear.
10. Fourth speed gear.
11. Rear spacer.
12. Front spacer.
13. "O" ring.
14. Shims.
15. Bearing cage.
16. Lock.
17. Front bearing.
18. Front nut.
19. "O" ring.
20. Bearing retainer.
21. Gasket.
22. Plug.
23. Bearing cap.
24. Cap "O" ring.
25. Snap ring.
26. Front bearing.
27. Forward and reverse speed gear.
28. Third and fourth speed gear.
29. First and second speed gear.
30. Spline shaft.
31. Rear bearing.

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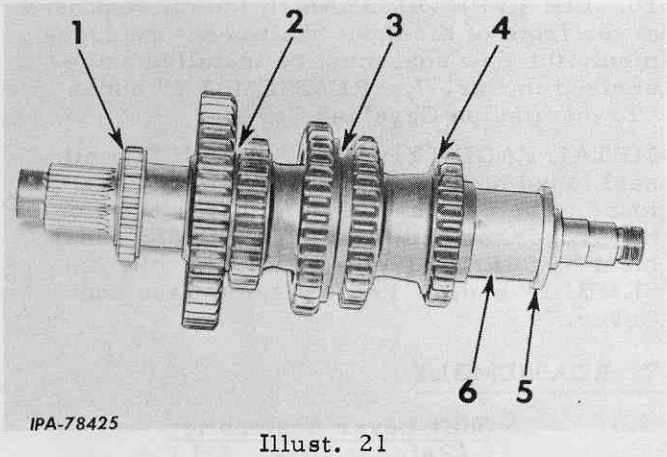
Bevel Pinion Shaft (Refer to Illust. 20 and 21)



Illust. 21
Bevel Pinion Shaft Assembly.

1. Rear bearing cone.
2. First and fifth speed gear.
3. Second and third speed gear.
4. Fourth speed gear.
5. Rear spacer.
6. Front spacer.

27. Remove the front and rear spacers from the shaft. Using a bearing puller, remove the rear bearing cone from the shaft.

NOTE: The gears on the bevel pinion shaft are tight shrink fits. To remove the gears, use a torch on the gear hubs. Care must be taken that heat is uniform all around the hubs and applied fast enough to prevent transferring of heat to the gear bores or shaft. Do not heat to more than 400°F.

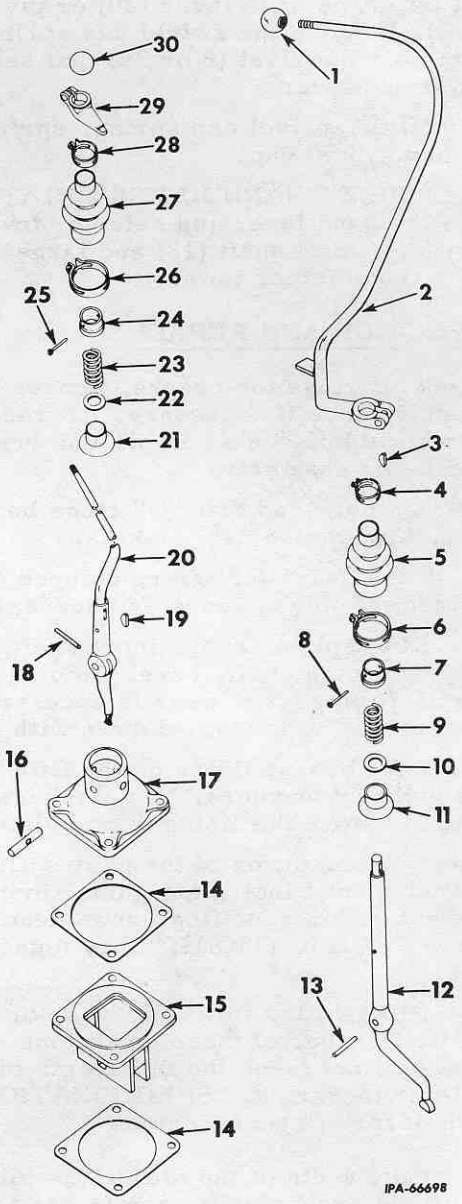
28. Place the shaft in a press supported by the fourth speed gear. Press the shaft out of the gear and remove the gear key.

29. Remove the second and third speed gear and key and then the first and fifth speed gear and key in the same manner as the fourth speed gear.

Shift Lever Assemblies (Refer to Illust. 22)

30. GEAR SHIFT HAND LEVER ONLY: Remove the hand lever ball. Loosen the cap screw securing the lock out lever to the hand lever and remove the lock out lever and key.

(Continued on next page.)



Illust. 22
Exploded View of Shift Lever Assemblies.

Legend for Illust. 22

1. Hand lever ball.
2. Forward and reverse lever.
3. Key.
4. Boot clamp.
5. Boot.
6. Boot clamp.
7. Spring stop.
8. Rivet.
9. Swivel cap spring.
10. Spring washer.
11. Swivel cap.
12. Pivot lever.
13. Lever shaft.
14. Gaskets.
15. Selector gate.
16. Shaft.
17. Selector tower.
18. Shaft.
19. Key.
20. Gear shift hand lever.
21. Swivel cap.
22. Spring washer.
23. Swivel cap spring.
24. Spring stop.
25. Rivet.
26. Boot clamp.
27. Boot.
28. Boot clamp.
29. Lock out lever.
30. Hand lever ball.

5. DISASSEMBLY - Continued

Shift Lever Assemblies (Refer to Illust. 22) - Continued

31. Loosen the boot clamps and slide the rubber foot off of the hand lever (20) or pivot lever (12). Remove the swivel cap spring stop by tapping out the rivet (8 or 25) that secure the stop to the lever.

32. Lift off the swivel cap spring, spring washer and swivel cap.

33. GEAR SHIFT HAND LEVER ONLY: To separate the hand lever and selector tower, drive out the small shaft (18) and large shaft (16) from the selector tower.

6. INSPECTION AND REPAIR

1. Inspect bearings for cracks, scores and wear and, replace if necessary. All reusable bearings should be soaked in oil and wrapped until ready for assembly.

2. It is recommended that "O" rings be replaced with new. Always use new gaskets.

3. Inspect the gears for wear, chipped or broken teeth. Replace gears as necessary.

4. Inspect the splines of the input shaft, spline shaft, bevel pinion shaft, bevel pinion and gears. Replace shaft on gear if wear is excessive. Slight burrs can be smoothed down with a stone.

5. Inspect the bronze lining on the fifth speed idler gear thrust washers. New washers must be installed before the lining is completely gone.

6. Inspect the condition of the gear shifter poppet springs and lock plate guide spring. If they are not within specification as described in Par. 2, "SPECIFICATIONS," they must be replaced.

7. Inspect the shifter forks for wear or misalignment. If either of these conditions exist, the gears will not mesh the full length of the teeth. Refer to Par. 2, "SPECIFICATIONS," for width of fork fingers when new.

8. Inspect the width of the slot in the sliding gears. If it is excessively worn (refer to Par. 2, "SPECIFICATIONS," for dimension of new parts) replace the gear.

9. The individual bearing parts of the double-row, tapered-roller bearing used at the front of the pinion shaft are a select fit with each other and are not serviceable separately. A preload is provided by a spacer between the two bearing cups. If any part of the bearing is excessively worn or damaged, it must be replaced with a complete new bearing. Refer to "Procedure for Servicing and Adjusting Tapered Roller Bearings" under "INSPECTION AND REPAIR" in Section 7A.

10. LIP TYPE OIL SEAL: If the oil seal used at the front of the input shaft needs replacement, the new seal must be installed as described in Par. 7, "REASSEMBLY" under "Transmission Case and Cover."

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

7. REASSEMBLY

Shift Lever Assemblies (Refer to Illust. 22)

1. GEAR SHIFT HAND LEVER ONLY: Position the hand lever in the selector tower and secure to the tower with the large shaft (16). Insert the small shaft (18) through the tower and large shaft.

2. Place the swivel cap, spring washers and spring on the hand lever (20) or pivot lever (12). Position the swivel cap spring stop on the lever aligning the small hole in the stop with the small hole in the lever and secure the stop to the lever with the rivet (8 or 25).

3. FORWARD AND REVERSE LEVER ONLY: Position the rubber boot with upper and lower clamps on the pivot lever (12) but do not tighten the clamps.

GEAR SHIFT HAND LEVER ONLY: Position the rubber boot with upper and lower clamps on the hand lever until the bottom of the rubber boot is over the neck of the selector tower (17) and shafts (16 and 18) in the tower. Tighten the boot clamps. Install the key (19) in the hand lever. Position the lock out lever on the key and secure to the hand lever with the cap screw and washer. Install the ball (30).

Bevel Pinion Shaft (Refer to Illust. 20 and 21)

NOTE: Before installing the gears on the pinion shaft they must be heated to a temperature of not more than 400°F.

4. Position the shaft in a press with the splined end up and install the rear bearing cone until it bottoms on the shaft shoulder.

5. Reverse the shaft in the press and install a gear key in the lower keyway in the shaft. Install the heated first and fifth speed gear (small gear up) on the shaft until it bottoms on the shaft shoulder. Install the second and third

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speed gear and gear key in the same manner until it bottoms in the gear hub.

6. Install the remaining gear key in the shaft. Install the heated fourth speed gear (long taper of gear hub down) on the shaft until it bottoms on the gear hub.

7. Install the rear spares being sure to align the slot in the spacer with the fourth speed gear key. Remove the shaft from the press and install the front spacer engaging the spacer with the dowel pin in the shaft.

Spline Shaft (Refer to Illust. 19 and 20)

8. Place the shaft in a press so the end with the snap ring groove is down. Press on the rear bearing cone so that the lip of the cone is down. Remove the shaft from the press.

9. Install the first and second speed gear, then the third and fourth speed gear and the forward and reverse driven gear on the shaft.

NOTE: The first and second speed gear and the forward and reverse driven gear must be installed with the shifter fork slot away from the rear bearing cone. The slot of the third and fourth speed gears must face the bearing cone.

Input Shaft (Refer to Illust. 17 and 18)

NOTE: Before installing the forward and reverse driving gear on the shaft it must be heated to not more than 400°F.

10. Install the gear key and place the shaft in a press so the end with the seal locating dowel pin is up. Install the heated gear on the shaft (small gear down) until it bottoms on the shaft shoulder.

11. Reverse the shaft in the press and install the fifth speed gear on the shaft splines so the shifter fork slot is towards the forward and reverse driving gear.

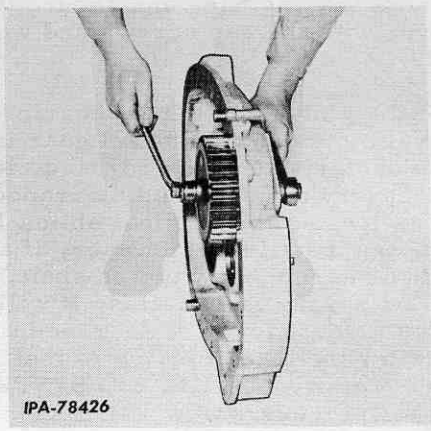
12. Press the rear bearing cone on the shaft until it bottoms on the shaft shoulder. Remove the shaft from the press.

Transmission Case and Cover

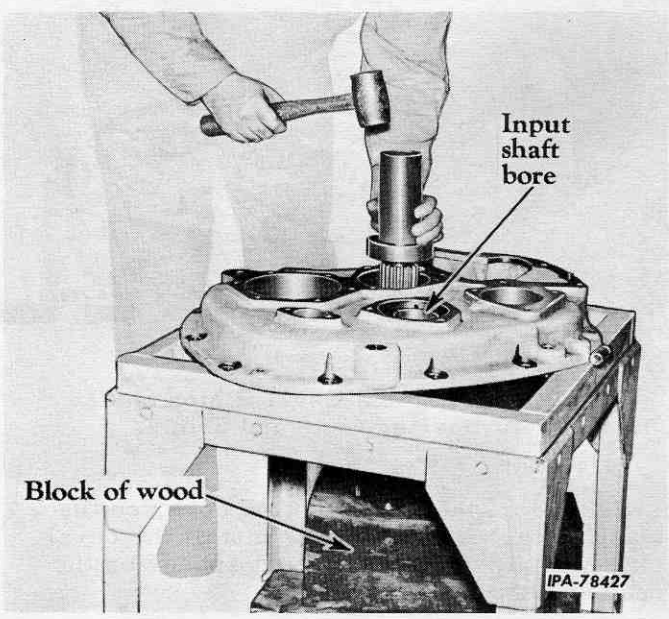
13. If the reverse idler gear rear bearing needed replacement, install a new bearing cone on the gear hub. Support the gear in a press and install the bearing cone until the lip of the cone bottoms on the gear hub. Remove the gear from the press.

If the reverse idler gear front ball bearing needed replacement, install a new bearing in the transmission cover until it bottoms.

14. Place the reverse idler gear in position in the transmission cover. Stack plain washers on a cap screw and insert the cap screw through the ball bearing and reverse idler gear. Install a nut on the cap screw and tighten the cap screw until the snap ring groove in the gear hub clears the ball bearing. (Illust. 23.) Remove the cap screw, nut and washers. Install the snap ring in the gear hub.



Illust. 23
Installing the Reverse Idler Gear.



Illust. 24
Installing the Spline Shaft Front Bearing.

15. Position the spline shaft and transmission cover in a stand. The shaft must be blocked so it is in its relative position in the cover

(Continued on next page.)

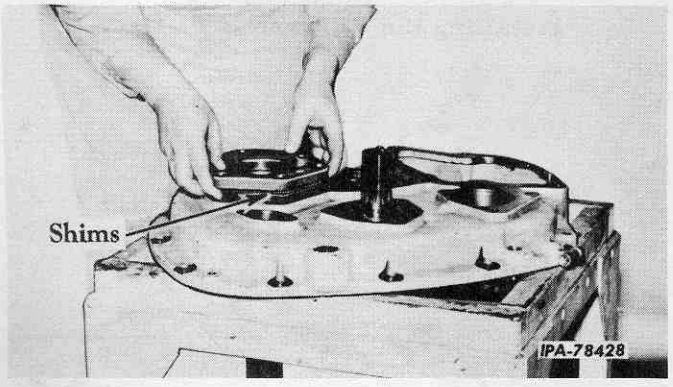
7. REASSEMBLY - Continued

Transmission Case and Cover - Continued

(Illust. 24). Tap the spline shaft front bearing into the cover (Illust. 24) until it bottoms and secure the shaft to the bearing with the snap ring. Assemble the input shaft, input front bearing and snap rin in the same manner (Illust. 24).

16. Install the "O" ring (13, Illust. 20) in the groove on the bearing cage. Place the original shims on the bearing cage and secure the cage to the cover with the cap screws and washers (Illust. 25).

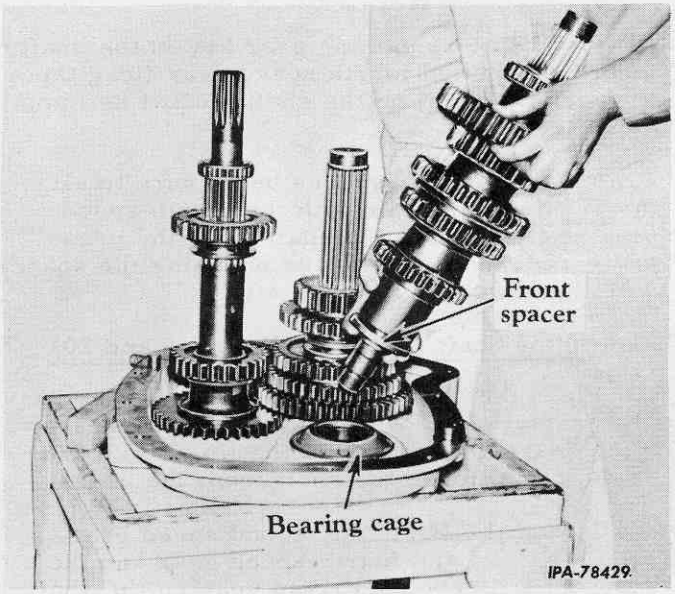
NOTE: If the pinion shaft front bearing, pinion shaft, bevel pinion and the bevel gear in the steering planetary are to be re-used, it will not be necessary to check end clearance and backlash as long as the original shims (14, Illust. 20) are installed. However, if a new or reworked bearing, new pinion shaft, bevel pinion or bevel gear is installed, it will be necessary to adjust for end clearance and backlash after the transmission is installed in the tractor (refer to "STEERING SYSTEM," Section 8 for procedure.)



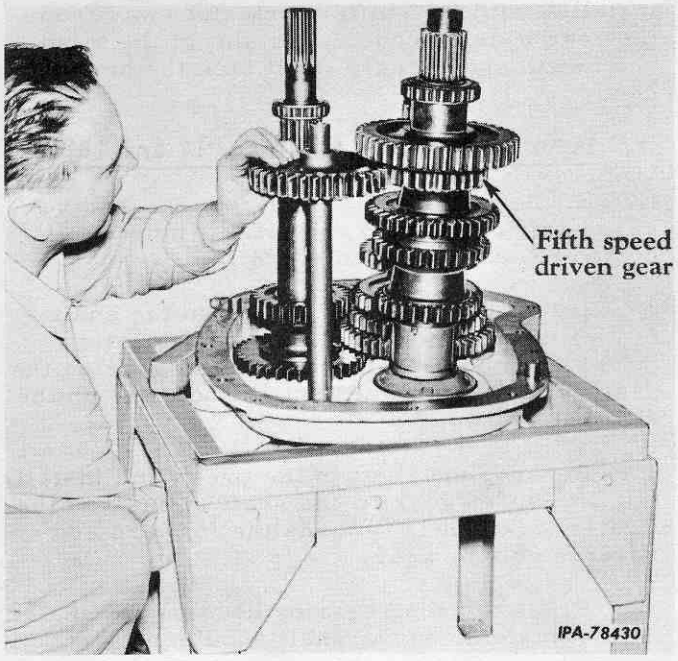
Illust. 25
Installing the Bevel Pinion Shaft Bearing Cage and Shims.

17. Reverse the transmission cover on the stand so the shafts are up. Install the bevel pinion shaft, resting the front spacer on the bearing cage (Illust. 26).

18. If the needle bearings needed replacement, press new bearings into the fifth speed idler gear until they are flush with the inner edge of the chamfer of the gear bore. Place an "O" ring on the fifth speed idler shaft until it is up against the shaft flange and insert the shaft part way through the front side of the transmission cover.



Illust. 26
Installing the Bevel Pinion Shaft.



Illust. 27
Installing the Fifth Speed Idler Gear.

Insert the dowel pin in the lower pin hole in the shaft next to the shaft shoulder and place the thrust washer (bronze lining up) on the shaft engaging the slot in the thrust washer with the dowel pin. Place the fifth speed idler gear in position next to the fifth speed driven gear (on

the bevel pinion shaft) and insert the idler shaft through the idler gear until the hole for the thrust washer dowel pin appears. Insert the dowel pin into the shaft and install the thrust washer (bronze, lining down) engaging the slot in the washer with the dowel pin. Secure the shaft to the transmission cover with the cap screws and washers (Illust. 27). Later type fifth speed idler shafts have a groove that locates behind the outer thrust washer (20) to accommodate the retaining ring (19A). Install this retaining ring in the shaft only if the transmission case being used is equipped with a counterbore at this contact point to accept the retaining ring (Illust. 18).

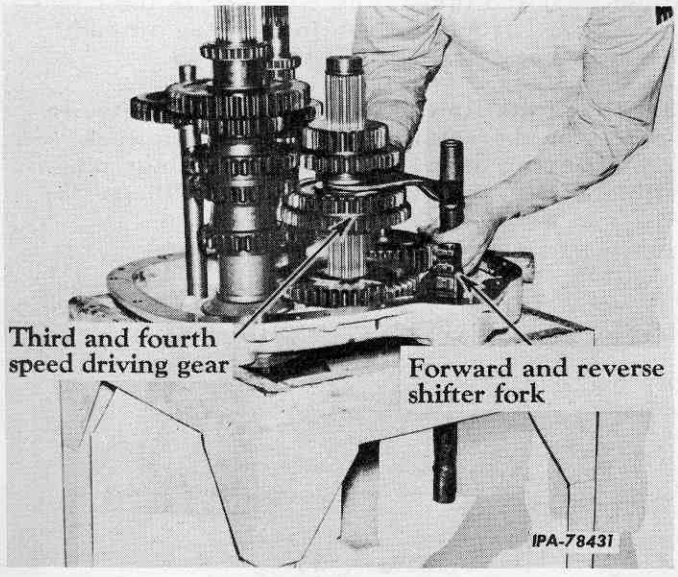
19. Insert the forward and reverse shifter fork through the transmission cover and engage the fork fingers on the collar of the forward and reverse driven gear (Illust. 28 and 30).

NOTE: Place a block of wood under the transmission stand to keep the following shifter forks in position until the transmission case is installed (Illust. 29).

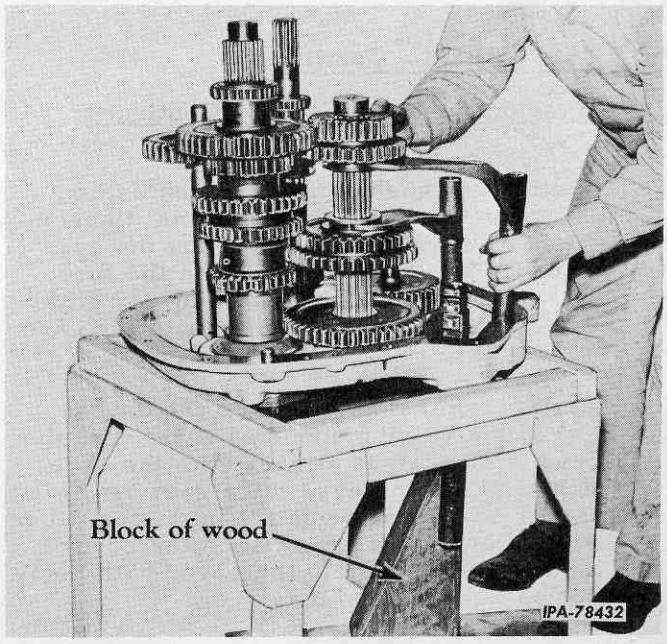
20. Insert the third and fourth gear shifter fork through the cover and engage the fork fingers on the collar of the third and fourth speed driving gear (Illust. 28 and 30).

21. Install the first and second gear shifter fork (Illust. 29 and 30). Install the fifth gear shifter fork (Illust. 30).

22. If the idler gear, input shaft, bevel pinion shaft or spline shaft rear bearing needed replacement, install a new bearing cup into the transmission case until it bottoms. The input shaft bearing cup must be installed with the lip of the cup against the case. The bevel pinion shaft bearing cup must be secured in the case with the retaining snap ring.

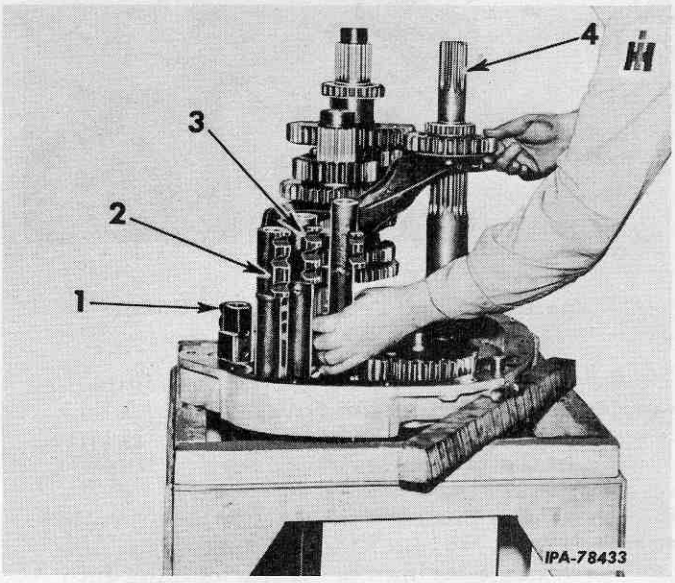


Illust. 28
Installing the Third and Fourth
Gear Shifter Fork.



Illust. 29
Installing the First and Second
Gear Shifter Fork.

(Continued on next page)



Illust. 30
Installing the Fifth Gear Shifter Fork.

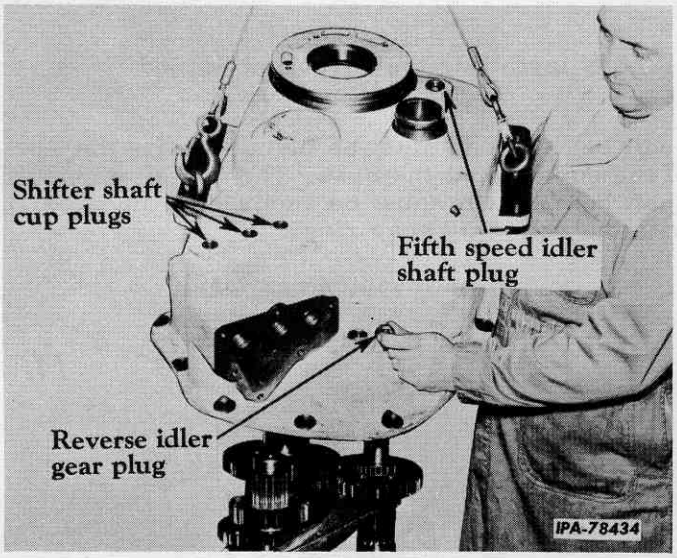
1. Forward and reverse shifter fork.
2. First and second shifter fork.
3. Third and fourth shifter fork.
4. Input shaft.
5. Wood block.

7. REASSEMBLY - Continued

Transmission Case and Cover - Continued

23. Install a new gasket on the transmission cover. Attach a hoist to the mounting flanges of the transmission case and position the case over the cover (Illust. 31). Remove the three cup plugs, the reverse idler gear plug and fifth speed idler shaft plug from the rear of the case (Illust. 31).

Lower the transmission case onto the cover, looking through the plug openings to be sure the fifth speed idler shaft is aligned with the bore in the case and the reverse idler gear rear bearing cone is seating properly in its cup. Use a rubber mallet to seat the case on the cover dowels. Secure the case to the cover with the cap screws, washers and nuts.



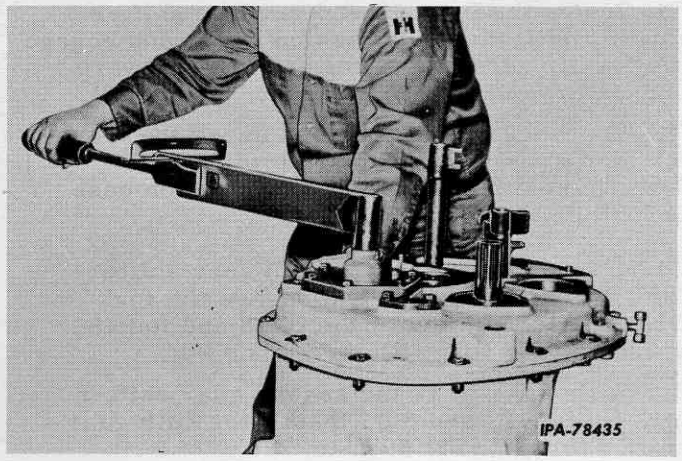
Illust. 31
Installing the Transmission Case.

24. Reverse the assembly on the transmission stand so the transmission cover is up. Block the bevel pinion shaft to raise it in its relative position in the transmission cover.

25. Install the pinion shaft double taper roller bearing (Illust. 16) into the bearing cage. Install the inner bearing cup of the bearing into the cage with the large diameter of the taper up. Be sure the cup bottoms squarely on the cage. Tap the inner cone of the bearing on the pinion shaft (with the large diameter of the taper up) until it bottoms on the front spacers (12, Illust. 20).

Install the outer cone of the bearing on the pinion shaft (small diameter of the taper up) until it bottoms on the inner cone. Place the bearing spacer in the cage on the inner cup and install the outer cup of the bearing until it bottoms on its cone.

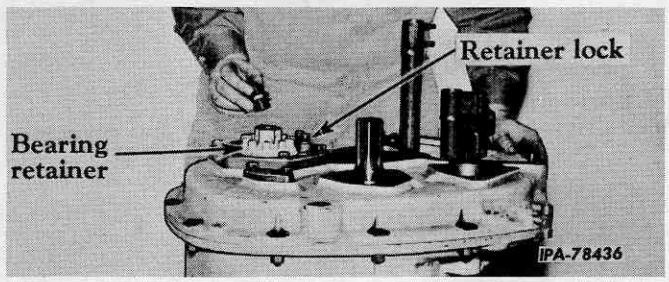
26. Install the nut on the front of the bevel pinion shaft. Place two shafts in gear or use the 3/4 inch drive in the rear of the pinion shaft to keep the shaft from turning and torque the nut to the amount shown in Par. 2, "SPECIFICATIONS." (Illust. 32.)



Illust. 32
Applying Torque to the Pinion Shaft Front Nut.

27. Install the "O" ring on the bearing retainer (Illust. 33) and thread the retainer in the bearing cage. Torque the retainer to the amount shown in Par. 2, "SPECIFICATIONS."

28. Place the lip of the retainer lock between the lugs on the retainer and secure the lock to the bearing cage. Install the retainer plug with gasket in the bearing retainer (Illust. 33).



Illust. 33
Installing the Bearing Retainer Plug and Gasket.

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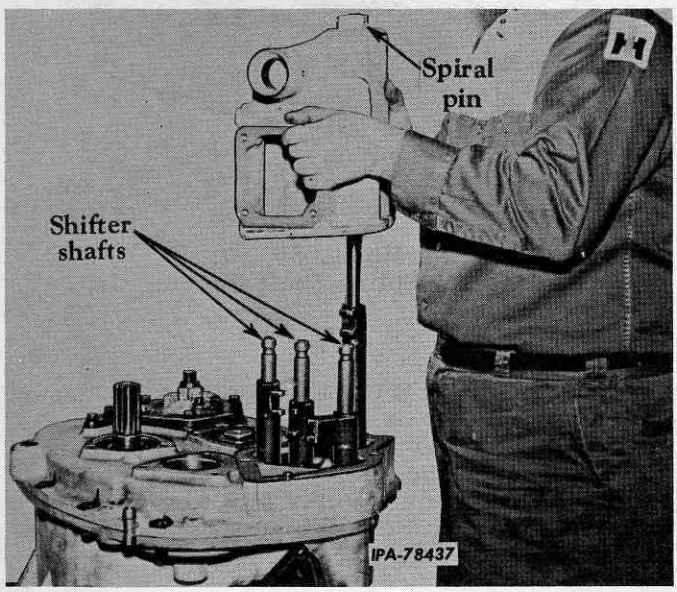
29. Insert the three gear shifter shafts into the forks so the grooved end is up. The forks can be moved slightly until the openings in the bottom of the transmission case, where the cup plugs were removed (Illust. 31), can be seen from the top. Be sure the shifter shafts enter the case bores at these openings. (Illust. 34).



Illust. 34
Installing the Gear Shifter Housing.

30. Place an "O" ring on the remaining shifter shaft (largest of the four shafts) and insert it into the gear shifter housing until the groove in the shaft is aligned with the pin opening in the housing. Secure the shaft with the spiral pin (Illust. 34). Install a new housing gasket on the transmission cover and position the gear shifter housing with shifter housing with shifter shaft on the cover dowels. Seat the housing on the cover dowels with a rubber mallet and secure with the cap screws, washers and nuts (Illust. 34).

31. Place an "O" ring on the shift shaft lock pin and position the lock pin in the side of the shifter housing. Using a drift at the cup plug openings in the bottom of the case, raise the shifter shafts until the lock pin engages the groove in the top end of the shafts. (Illust. 35.) After the lock pin is engaged with the three shifter shafts, secure the lock pin to the side of the shifter housing with the plain washer and cap screw.

32. METAL FACE TYPE OIL SEAL: If this seal was inspected and found serviceable, the following method of handling this seal must be used:

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

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

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

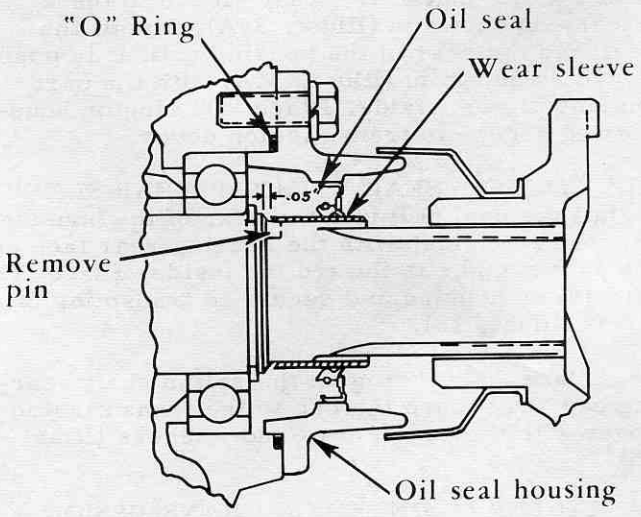
2. Coat the seal rotor face with Molykote to permit a few minutes running until oil can reach the seal faces. Some of this is likely to rub off during the final cleaning.

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

C. Place an "O" ring in the seal rotor groove and place the rotor over the pin (15) in the end of the input shaft. Install the seal housing (8) with the seal stator and "O" ring (9) on the shaft and secure the housing to the transmission cover (Illust. 18).

LIP TYPE CONVERSION OIL SEAL (Refer to Illust. 34A): If this seal is being installed for the first time, be sure to remove the dowel pin (15, Illust. 18) from the shaft. Before installing wear sleeve, check that the shaft surface is clean and free of rust. Heat the wear

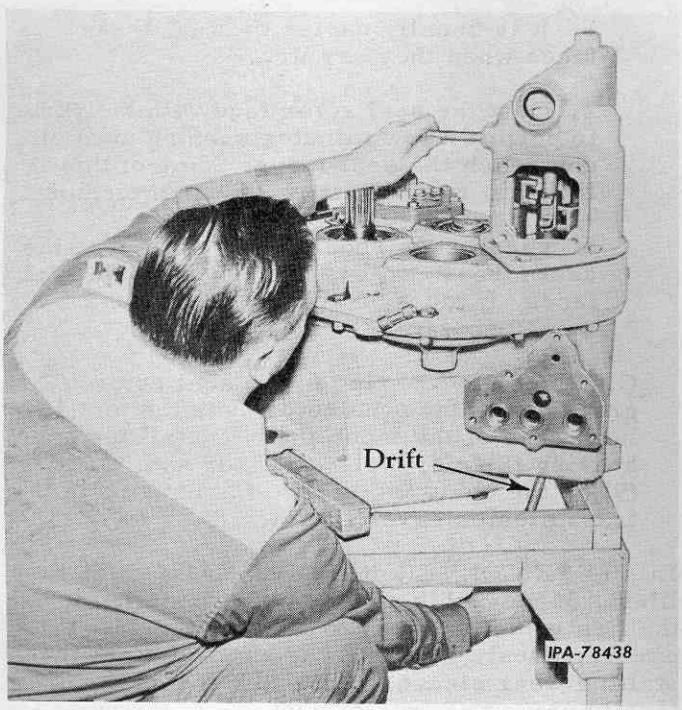
(Continued on next page)



Illust. 34A
Input Shaft with Lip Type Conversion Seal.

7. REASSEMBLY - Continued

Transmission Case and Cover - Continued



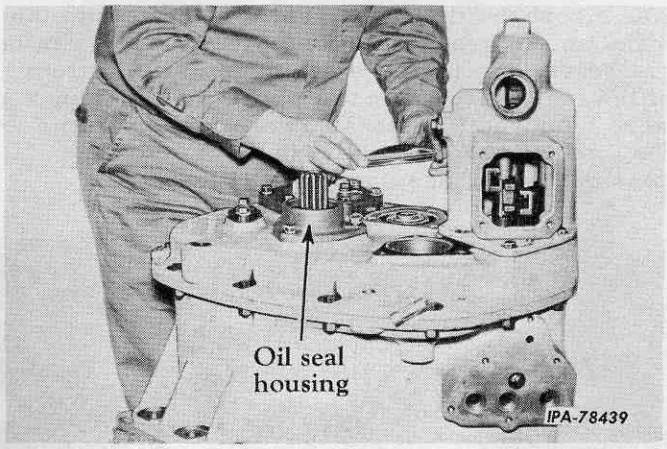
Illust. 35
Installing the Shifter Shaft Lock Pin.

sleeve from 250°F. to 300°F. by submerging it in hot oil. Install the wear sleeve to the dimension shown in (Illust. 34A). Install the seal into the rear of the housing until it is positioned as shown in (Illust. 34A) with the part number to the outside. Place "O" ring on housing and secure to transmission cover.

LIP TYPE OIL SEAL WITHOUT WEAR SLEEVE: Install the seal (10) into the rear of the housing (8) until it is flush with the housing rear face and the part number is toward the inside. Place "O" ring (9) on housing and secure to transmission cover (Illust. 18).

33. Place an "O" ring on the spline shaft bearing cap and secure the cap to the transmission cover with the cap screws and washers (Illust. 36).

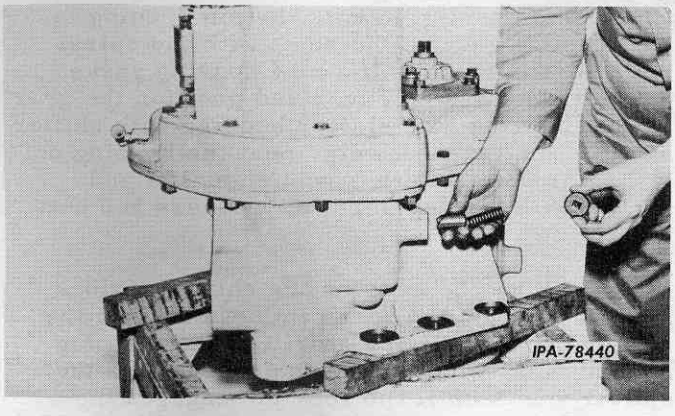
34. FILTER MOUNTED ON TRANSMISSION COVER: Insert the pump drive shaft into the reverse idler gear. Place an "O" ring on the pump adapter and secure the adapter with pump, manifold (30, Illust. 1) and tube (33, Illust. 1) to the transmission cover with the cap screws and washers (Illust. 7).



Illust. 36
Installing the Spline Shaft Bearing Cap.

FILTER MOUNTED ON FRONT FRAME: Insert the pump drive shaft into the reverse idler gear. Place an "O" ring on the pump adapter (23) and secure the adapter with pump (26) and pump check valve assembly (28) to the transmission cover with the cap screws and washers (Illust. 1A).

35. Install the forward and reverse shifter poppet assembly. Insert the poppet and poppet spring in the bore of the transmission case. Place a new gasket on the retainer plug and install the plug (Illust. 37).



Illust. 37
Installing the Forward and Reverse Shifter Poppet Assembly.

Install the three remaining shifter poppet assemblies (Illust. 11). Place the three poppets and springs in the bore of the case and install the retainer plugs.

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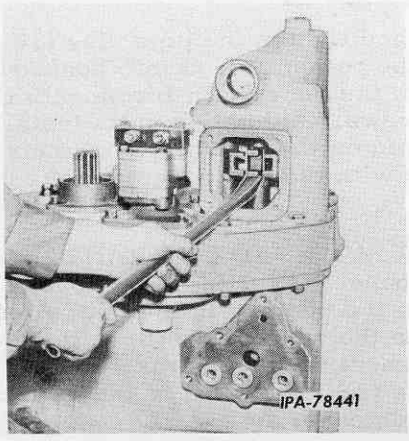
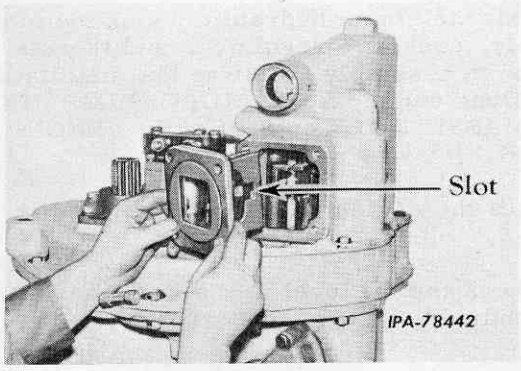


Illust. 38
Placing the Shifter Forks in Neutral Positions.

36. Using a pry bar as shown in Illust. 38, place the transmission in neutral by aligning the slots in the three shifter forks. Place the guide spring (14, Illust. 2) in position on the lock plate and install the lock plate in the transmission case (Illust. 10). Place a new gasket on the transmission case and secure the gear shifter cam lock housing with camshaft to the case (Illust. 10).

NOTE: If the camshaft was removed from the cam lock housing, place a new "O" ring on the camshaft and insert the camshaft through the housing. Secure the camshaft on the housing by tightening the set screw in the bottom of the housing.

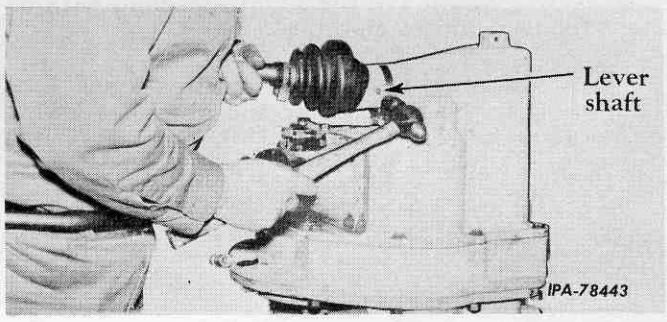
37. Place a new lower gasket (14, Illust. 22) on the selector gate and install the selector gate in the shifter housing. The slot in the selector gate is off center and the gate must be installed so the slot will be aligned with the slots in the shifter forks. (Illust. 39.)



Illust. 39
Installing the Gear Selector Gate.

38. Place the upper gasket (14, Illust. 22) on the selector gate and install the gear shift hand lever assembly being sure the lever engages with one of the slots on the shifter forks. Secure the selector tower to the shifter housing with the cap screws and washers (Illust. 5).

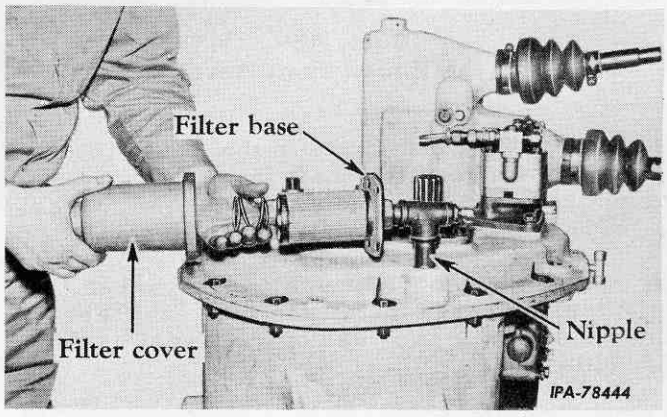
39. Insert the forward and reverse lever assembly in the shifter housing until you feel the pivot lever (12, Illust. 22) engage the slot of the shifter shaft in the bottom of the housing. Secure the lever to the housing with the lever shaft (Illust. 40). Pull the rubber boot over the neck of the shifter housing until it covers the lever shaft and secure with the two clamps.



Illust. 40
Installing the Forward and Reverse Lever Assembly.

40. FILTER MOUNTED ON TRANSMISSION COVER: Install the filter tee and nipple to the transmission cover. Assemble the filter and secure the filter cover to the filter base (Illust. 41).

(Continued on next page)



Illust. 41
Installing the Transmission Pump Filter.

7. REASSEMBLY - Continued

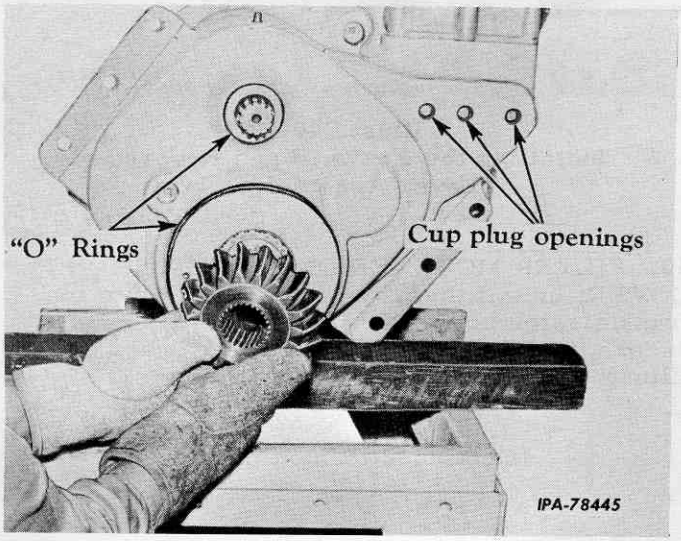
Transmission Case and Cover - Continued

41. FILTER MOUNTED ON TRANSMISSION COVER: Connect the transmission cover-to-transmission case tube (4), pump manifold-to-tee tube (3) and the filter-to-pump manifold tube (2). (Illust. 3.)

FILTER MOUNTED ON FRONT FRAME: Connect the transmission cover-to-case hose (6) and the pump-to-transmission cover hose (9) (Illust. 1A).

42. With the aid of a hoist place the transmission assembly on the stand so the shifting levers are up. Block the case to keep the assembly from rolling and leave the hoist attached with a slight tension on the chain.

43. Heat the bevel pinion to not more than 300°F and tap the pinion onto the pinion shaft splines (Illust. 42).



Illust. 42
Installing the Pinion Shaft Bevel Gear.

44. Insert a 3/4 inch drive in the end of the pinion shaft to keep the shaft from turning and torque the rear nut to the amount shown in Par. 2, "SPECIFICATIONS."

45. Install the two "O" rings on the rear of the transmission case. Install the three shifter shaft cup plugs in the rear of the transmission case (Illust. 42).

8. INSTALLATION

1. Install and tighten the pipe plug (10, Illust. 3). Hoist the transmission into position and secure it to the rear main frame with the locking cap screws. On earlier units install the transmission on the rear main frame studs and secure with the nuts. Remove the hoist.

2. FILTER MOUNTED ON TRANSMISSION COVER: Connect the filter inlet hose (17, Illust. 1) to the bushing in the bottom of the filter and to the connector (18) at the rear main frame. Connect the pivot brake cooling oil tubes to the cross (2B, Illust. 1) at the rear of the transmission case.

FILTER MOUNTED ON FRONT FRAME: Connect the filter-to-pump hose (12) at the filter elbow (13) and secure the hose with the clip to the clutch housing. Connect the pivot brake cooling oil tube or tubes to the cross (4) or tee (4A) at the rear of the transmission case (Illust. 1A).

3. Connect the operating rod (10, Illust. 2) to the camshaft (9).

4. Install the key (3, Illust. 22) in the pivot lever (12). Install the forward and reverse lever (2, Illust. 22) on the pivot lever and secure with the cap screw.

5. Install the drive yoke on the splines of the transmission input shaft.

6. Be sure the rear main frame drain plugs are installed and tight. Fill the rear main frame with the type and quantity of oil as described in the operator's manual.

7. Install the clutch hydraulic pump and motor assembly, pressure regulator, and thermal valve as an assembly (refer to the installation instructions under "HYDRAULIC PUMP AND MOTOR ASSEMBLY" in Section 5, "ENGINE CLUTCH.")

8. Install the engine clutch as described in Section 5.

9. Recheck the oil level in the rear main frame and add oil as necessary.

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TRANSMISSION OIL PUMP

9. REMOVAL

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

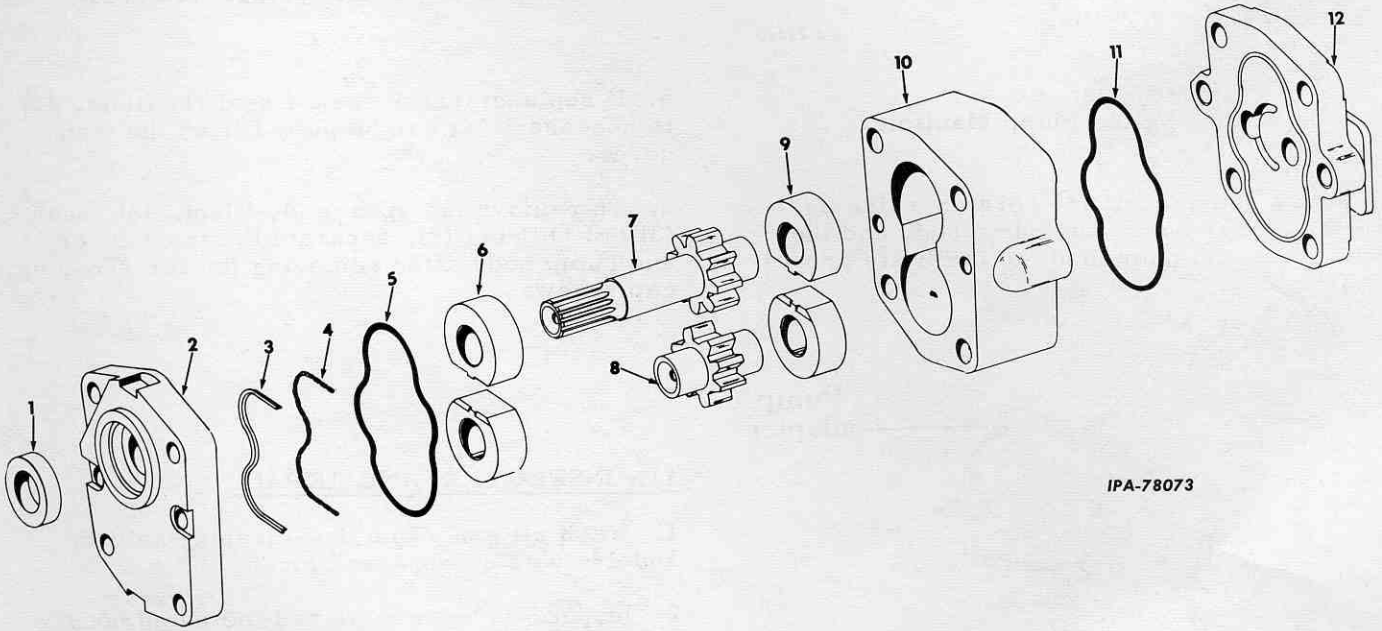
1. Remove the center platform.

2. FILTER MOUNTED ON TRANSMISSION COVER: Disconnect and remove the pump manifold-to-tee tube (3) and the filter-to-pump manifold tube (2). (Refer to Illust. 3.) Remove the cap screws and washers securing the pump adapter to the transmission cover and remove the adapter with pump, manifold and hydraulic oil tube.

FILTER MOUNTED ON FRONT FRAME: Disconnect the filter-to-pump hose (12) at the filter elbow (13). Disengage the hose from the clip at the clutch housing and position the hose to be removed with the pump. Disconnect the pump-to-transmission case cover hose (9) at the connector (8). Remove the cap screws and washers securing the pump adapter to the transmission cover and remove the adapter (23) with pump (26) and pump check valve assembly (28) (Illust. 1A).

3. Remove the pump drive shaft from the reverse idler gear and cover the pump adapter opening in the transmission cover to prevent dirt and dust from entering.

10. DISASSEMBLY



Illust. 43
Exploded View of Transmission Oil Pump.

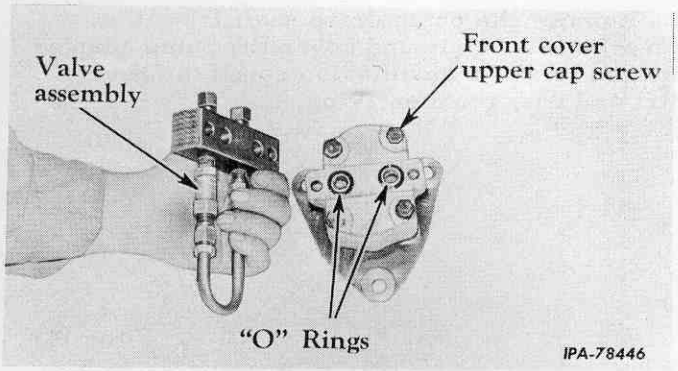
1. Oil Seal.
2. Front cover.
3. Gasket seal.
4. Spacer.
5. "O" ring.
6. Inner bearings.
7. Drive gear assembly.
8. Driven gear.
9. Outer bearings.
10. Body.
11. "O" ring.
12. Rear cover.

TRANSMISSION OIL PUMP

10. DISASSEMBLY - Continued

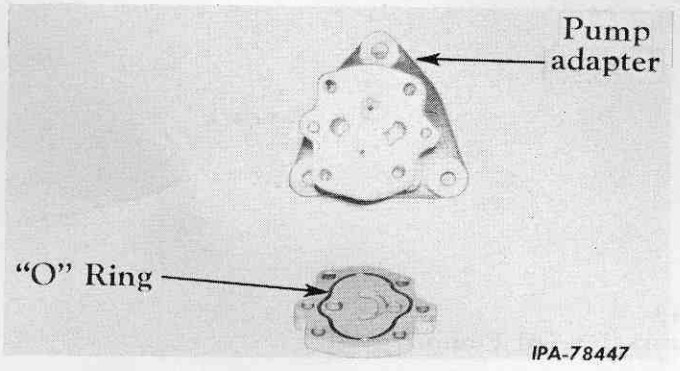
1. FILTER MOUNTED ON TRANSMISSION COVER: Remove the two cap screws and washers securing the manifold to the pump and remove the manifold with tube and valve assembly. Remove the "O" rings from the pump (Illust. 44).

FILTER MOUNTED ON FRONT FRAME: Remove the two cap screws and washers securing the valve assembly (28) to the pump and remove the valve assembly with hoses (9) and (12). Remove the two "O" rings (27) from the check valve housing (29) (Illust. 1A).



Illust. 44
Removing the Pump Manifold.

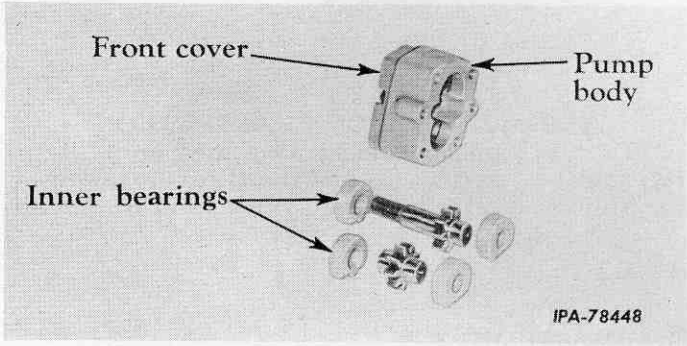
2. With a sharp scriber, scratch a line between the rear cover and pump body and the front cover and pump body to facilitate proper reassembly.



Illust. 45
Pump Rear Cover Removed.

3. Remove the four cap screws and five washers securing the pump rear cover to the front cover and pump adapter. Remove the rear cover and discard the cover "O" ring. Tap the adapter free of the pump front cover. (Illust. 45).

4. Using a soft hammer, tap on the end of the drive gear assembly to remove the two gears and bearings from the pump body. Remove the two inner bearings from the pump body (Illust. 46).



Illust. 46
Pump Gears and Bearings Removed.

5. If replacement of the oil seal (1, Illust. 43) is necessary, it can be pulled from the front cover.

6. To remove the spacer (4, Illust. 43), seal (3) or "O" ring (5), separate the front cover and pump body after removing the two securing cap screws.

11. INSPECTION AND REPAIR

1. Wash all parts in a dry-cleaning solvent and dry with compressed air.

2. Inspect the gear teeth and the pump body bore for chipping or cracks and replace parts as necessary.

3. Inspect the splines of the pump drive shaft and on the end of the pump drive gear assembly for excessive wear or damage. Slight burrs can be smoothed down with a stone.

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TRANSMISSION OIL PUMP

4. Inspect the pump gear tip diameter, gear thickness and the pump body bore diameter for excessive wear. If excessively worn, replace. (Refer to Par. 2, "SPECIFICATIONS" for dimensions of new parts.)

5. Inspect the bearing thickness, bearing bore and the shaft diameters of the pump gears for grooving or excessive wear. (Refer to Par. 2, "SPECIFICATIONS" for dimension of new parts.)

6. Discard gaskets and "O" rings. Inspect the oil seal in the pump front cover for excessive wear or damage. If seal replacement is necessary, apply a light coat of Permatex No. 3 to the seal bore in the front cover and press the new seal into the cover (seal lip down) until it bottoms in the bore.

7. FILTER MOUNTED ON TRANSMISSION COVER: The check valve assembly (Illust. 44) has an opening pressure of 40 psi. If defective, the complete valve assembly must be replaced.

FILTER MOUNTED ON FRONT FRAME: The check valve assembly (28) should be disassembled, inspected and cleaned. This valve has an opening pressure of 35-45 psi. Remove the plug (33) with "O" ring from the housing (29) and lift out the spring (31) and poppet (30). Check the poppet seat in the housing (29) for nicks or burrs. If the poppet seat or housing needs replacement, a complete valve assembly must be installed. Check the poppet for nicks and burrs and replace if necessary. Check the valve spring for strength and damage. If the spring does not fall within the specifications shown in the following table it must be replaced. Reassemble the valve assembly into the housing using a new "O" ring (32). Refer to Illust. 1A.

Check Valve Spring		
Free Length Inches	Test Length Inches	Test Load Pounds
1-27/32	3/4	6

12. REASSEMBLY

1. If the oil seal (1, Illust. 43) needed replacement be sure the new seal has been installed in the front cover as described in Par. 11, "INSPECTION AND REPAIR."

2. Install the seal (3, Illust. 43), spacer (4) and "O" ring (5) in the grooves of the front cover (2). Place the front cover on the pump body (10), aligning the scribe marks made in disassembly, and secure with the gwo cap screws.

3. Place the inner bearings in position in the bore of the pump body. Install the drive gear assembly being careful not to damage the oil seal in the front cover as it passes through. Install the driven gear and outer bearings in the pump body (Illust. 46).

4. Place the pump adapter and new pump gasket (26, Illust. 1) on the bench. Position the pump front cover on the adapter so it pilots in the adapter bore. Use a soft hammer to seat the front cover in the adapter. Place a new "O" ring in the pump rear cover and install the cover on the pump body aligning the scribe marks made in disassembly (Illust. 45).

5. Install the two cap screws and washers to secure the rear cover to the pump adapter. Install the two cap screws to secure the rear cover to the front cover. Place the two plain washers under the front cover upper cap screw (Illust. 44) so the thicker washer is against the rear cover. Torque the cap screws to the amount shown in Par. 2, "SPECIFICATIONS."

6. FILTER MOUNTED ON TRANSMISSION COVER: Install new "O" rings in the pump rear cover. Install and secure the pump manifold with oil tube and valve assembly to the pump (Illust. 44).

FILTER MOUNTED ON FRONT FRAME: Place the two "O" rings (27) in the back of the check valve housing (29). Position the valve assembly (28) with hoses (9 and 12) on the pump and secure with the two cap screws and washers (Illust. 1A).

TRANSMISSION OIL PUMP

13. INSTALLATION

1. Remove the covering from the transmission cover and insert the pump drive shaft into the reverse idler gear.

2. Install a new "O" ring (24, Illust. 1) on the pump adapter and secure the adapter to the transmission cover.

3. FILTER MOUNTED ON TRANSMISSION COVER: Connect the filter-to-pump manifold tube (2, Illust. 3) and the pump manifold-to-tee tube (3).

FILTER MOUNTED ON FRONT FRAME: Connect the pump-to-transmission case cover hose (9) at the connector (8). Connect the filter-to-pump hose (12) at the filter elbow (13) and secure the hose with the clip to the clutch housing (Illust. 1A).

4. Install the center platform.

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SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES