

SECTION 5-F
TRIPLE TURBINE TRANSMISSION
REMOVAL AND INSTALLATION
DISASSEMBLY AND ASSEMBLY
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5-36 REMOVAL AND INSTALLATION OF TRIPLE TURBINE TRANSMISSION

a. Removal of Transmission

1. Hoist front and rear of car and rest it solidly on stands placed under frame. Frame side rail should be at least 20" above floor.
2. Disconnect track bar and shock absorbers at axle housing.
3. Disconnect parking brake cable at equalizer and brake pipe at torque tube bracket.
4. Remove exhaust pipe(s).
5. Disconnect torque tube from torque ball and move rear axle back to disengage propeller shaft from universal joint.
6. Remove converter housing cover.
7. Turn flywheel until one converter drain plug can be loosened sufficiently to provide an air vent, then turn flywheel until opposite drain plug is straight down. Remove this plug and allow oil to drain from converter.

8. Remove filler pipe from oil pan to drain oil from transmission.

9. Remove bolts to disconnect converter from flywheel.

10. Disconnect speedometer cable, disconnect shift rod from shift lever, and disconnect stator operating control rod.

11. Carefully mark transmission support and frame at each end of support so support may be reinstalled in same fore and aft position. This step is necessary to insure against any shear strain being imposed on the engine mountings when support is reinstalled.

12. Place transmission jack or hoist in position and adjust it to securely support the transmission in accordance with instructions for the equipment being used.

13. Remove two nuts and four bolts and nuts holding mount to support.

14. Raise transmission just enough to take weight off support. Remove eight support to frame member bolts. If shims are present, care-

fully note number and location so they may be reinstalled in original location.

15. Place suitable jack under rear end of engine lower crankcase so that engine will be safely supported while transmission is removed.

CAUTION: *Do not use bar with hooks placed over frame side rails because brake pipes on top of left side rail will be damaged.*

16. Lower transmission slightly and disconnect cooler pipes.

17. Lower the transmission just enough so that converter housing bolts can be reached. With engine and transmission supported by the separate jacks, disconnect the converter housing from engine crankcase.

18. Move transmission rearward to disengage hub of converter pump cover from crankshaft, lower transmission and remove it from under car.

b. Installation of Transmission

1. Turn flywheel so that one hole for converter attaching bolt is straight up and notched flange is down.

2. Raise transmission into place with same equipment as used for removal. Align converter attaching bolt holes with holes in flywheel before moving transmission forward against cylinder crankcase.

3. Adjust lifting equipment so that converter housing meets the engine crankcase squarely and engages the two dowels. Then install all converter housing bolts with lockwashers. Tighten all bolts uniformly to 45-55 ft. lbs. torque.

4. Attach oil cooler pipes.

5. Reassemble mounts and support to transmission. Reinstall shims between support and frame in their original position. *Take care to locate support fore and aft in its original position* to avoid putting any shear strain on the engine mounts. Install support to frame bolts. Refer to Par. 2-25 for mount adjustment.

6. Attach flywheel to converter using $\frac{5}{16}$ "-24 300M bolts. Bolts of lesser quality must not be used at this location. 300M bolts can be identified by six radial marks on the bolt head.

7. Remove transmission hoist and engine support or jack.

8. Check converter drain plugs for tightness, then install converter housing cover.

9. Attach oil filler pipe to oil pan.

10. Align blind spline on propeller shaft with blank spline in universal joint, move axle assembly forward to engage splines. Connect torque tube to torque ball with bolts and lockwashers.

11. Reassemble exhaust system making sure that pipes are centered in the frame member holes and that the system is free from binds.

12. Reconnect track bar and shock absorbers to axle brackets.

13. Reconnect parking brake cable at equalizer and brake pipe at torque tube bracket.

Bleed rear brakes.

14. Connect speedometer cable to driven gear sleeve and connect shift rod to shift lever on transmission. Connect stator operating control rod to lever.

15. Wipe all oil from outside of transmission then lower car to floor.

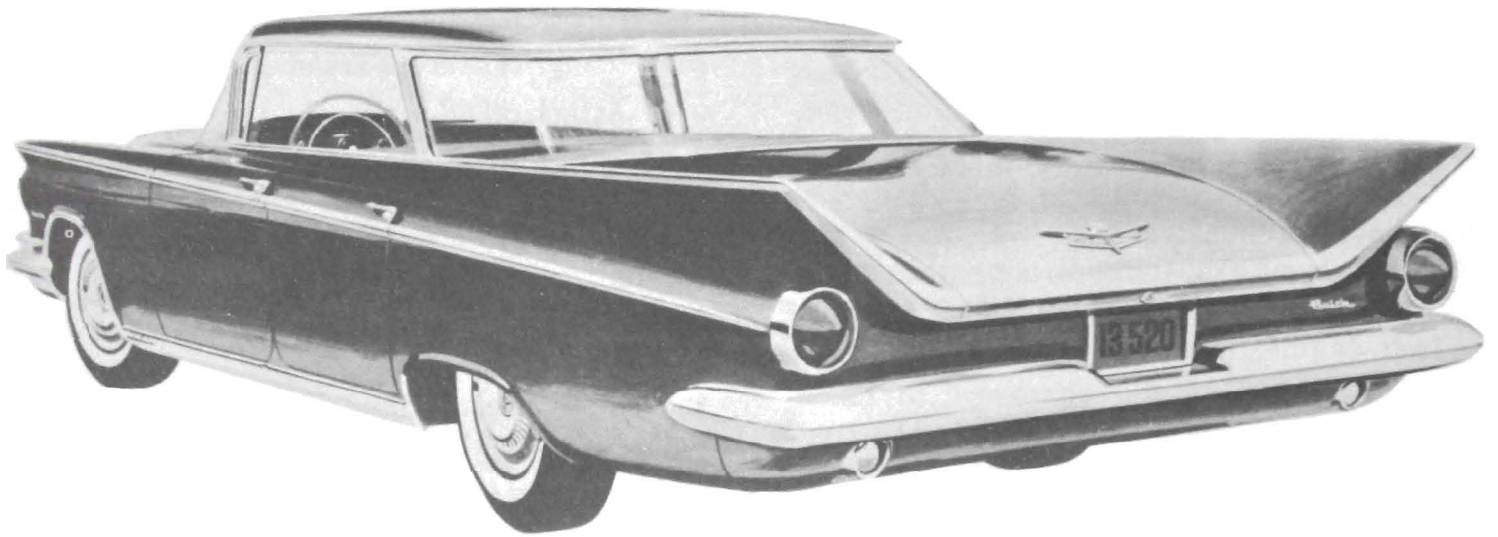
16. Tighten torque ball bolts (see par. 4-12).

17. Fill transmission to proper level as described in paragraph 1-4.

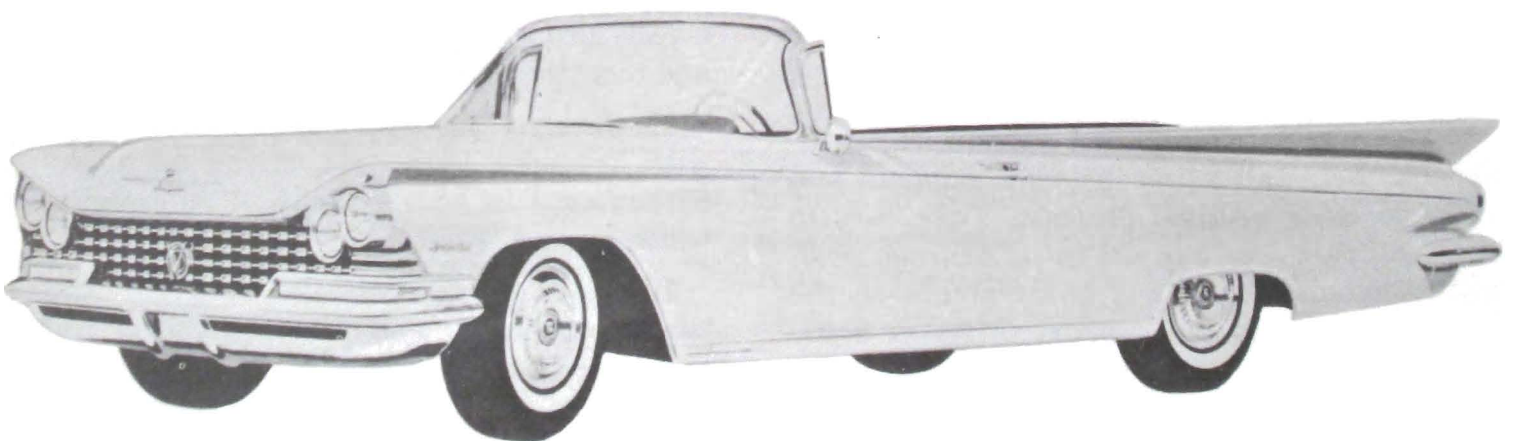
18. Check adjustment of control linkage. Check adjustment of stator operating controls and throttle linkage (par. 3-9).

19. Road test car for approximately 20 miles with frequent stops and starts as might be encountered in heavy traffic. A thorough road warm-up is desired.

20. Place car on hoist and carefully examine the transmission and all connections for oil leaks. Recheck oil level.

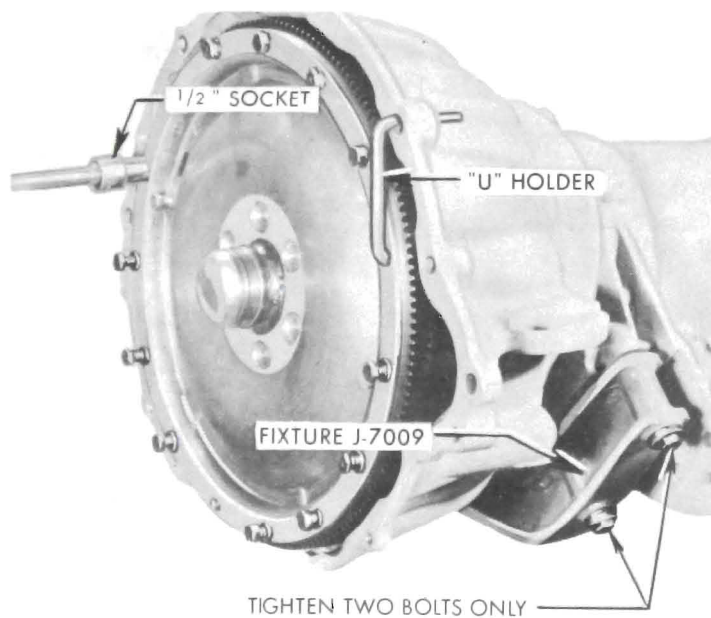


Model 4639



Model 4667

5-37 TRIPLE TURBINE CONVERTER: REMOVAL, DISASSEMBLY, INSPECTION, REASSEMBLY

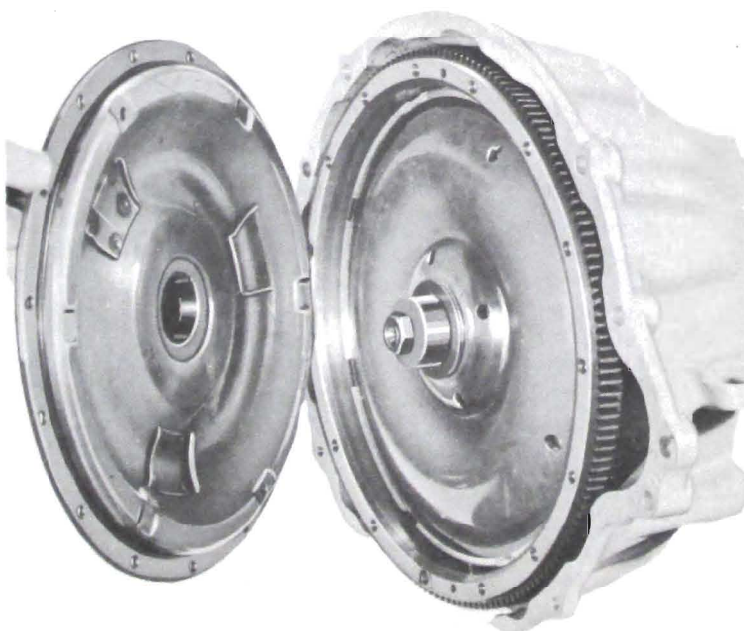


a. Converter Pump Cover Removal and Inspection

1. Assemble Triple Turbine transmission to fixture J-7009 taking care to tighten the two bolts on one side of the fixture only. Install the two bolts on the opposite side finger tight. Remove the twelve converter bolts using a "U" holder and 1/2" socket.

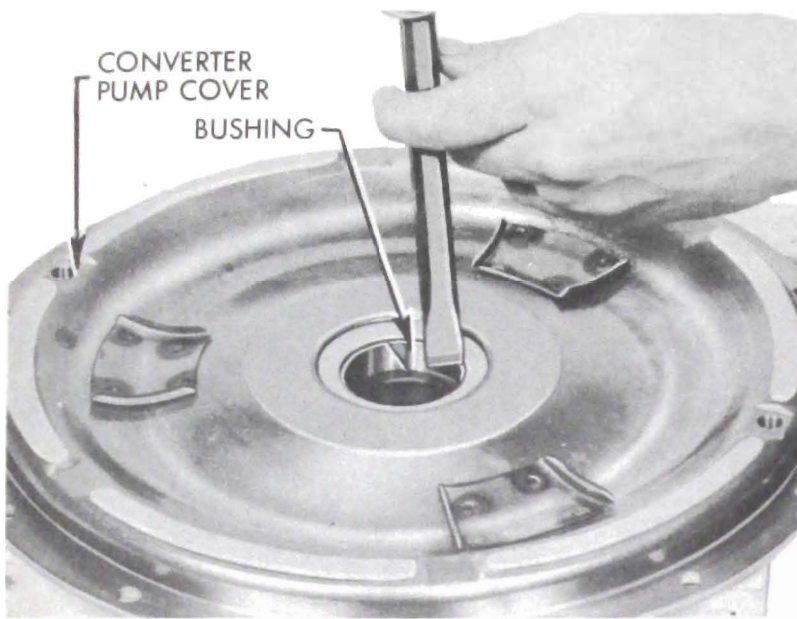
NOTE: Converter pump cover bolts are 300M steel identified by six radial marks on the bolt head.

5-229



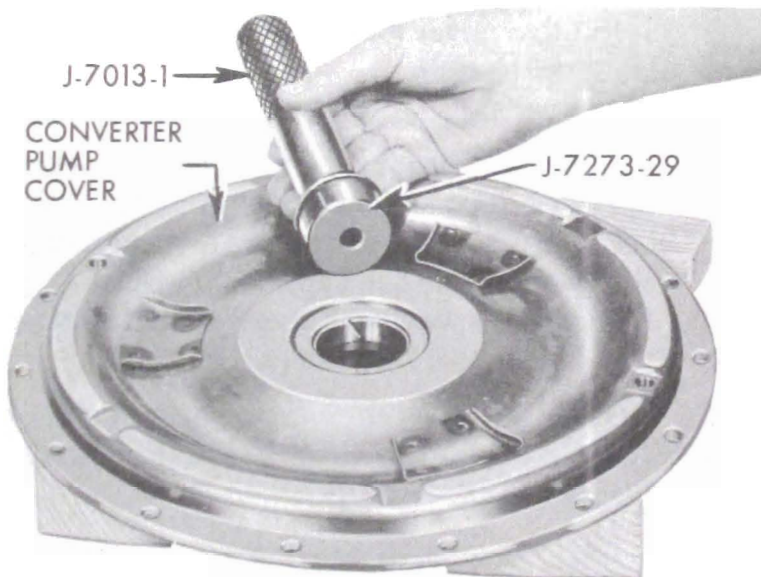
2. Pry to loosen, remove cover and "O" ring. Discard "O" ring.

5-230



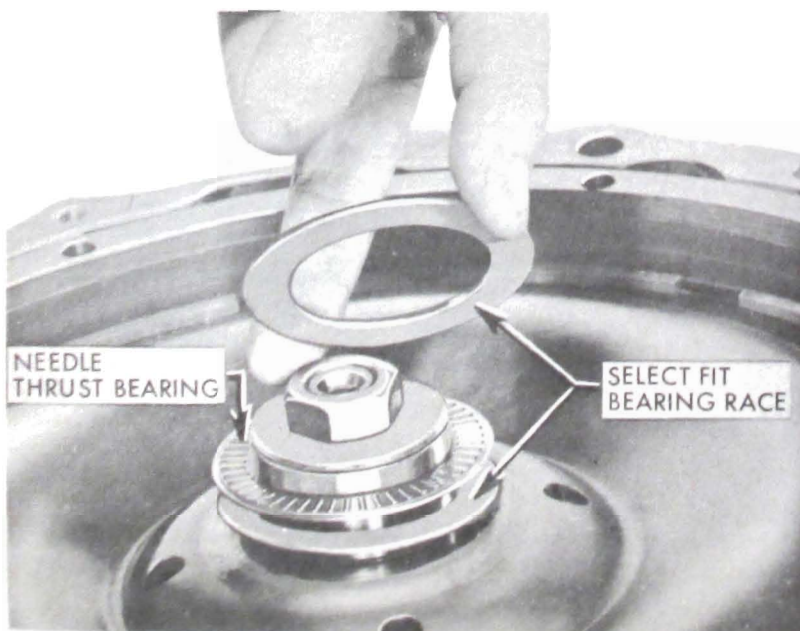
3. Examine converter pump cover bushing. If worn or scored, collapse bushing with chisel and remove.

5-231



4. Install new converter pump cover bushing using J-7013-1 Handle and J-7273-29 Installer.

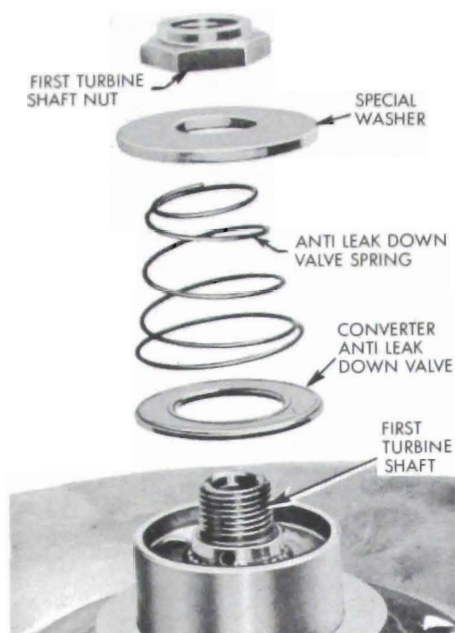
5-232



b. Turbine Removal

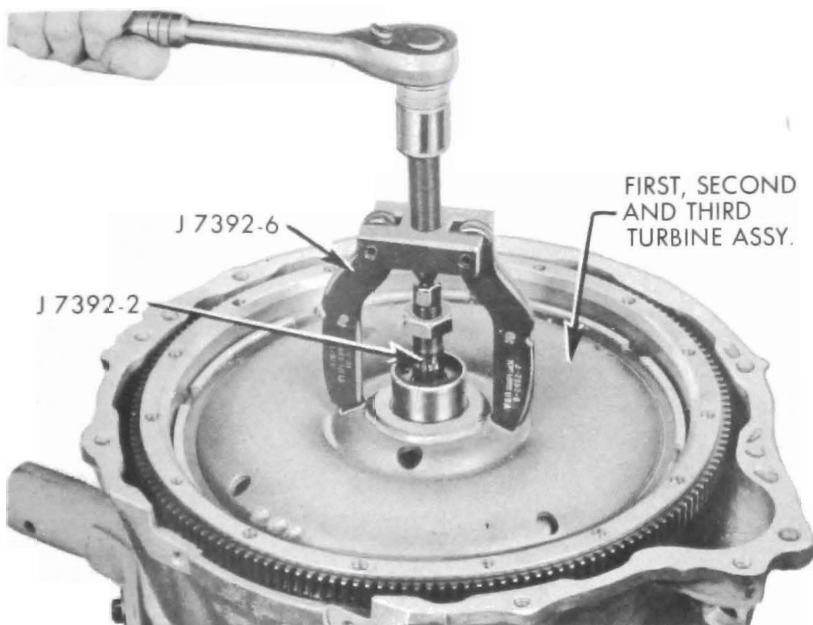
1. Remove select fit bearing races and needle thrust bearing. (Between first turbine hub and converter pump cover.) Place in converter pump cover.

5-233



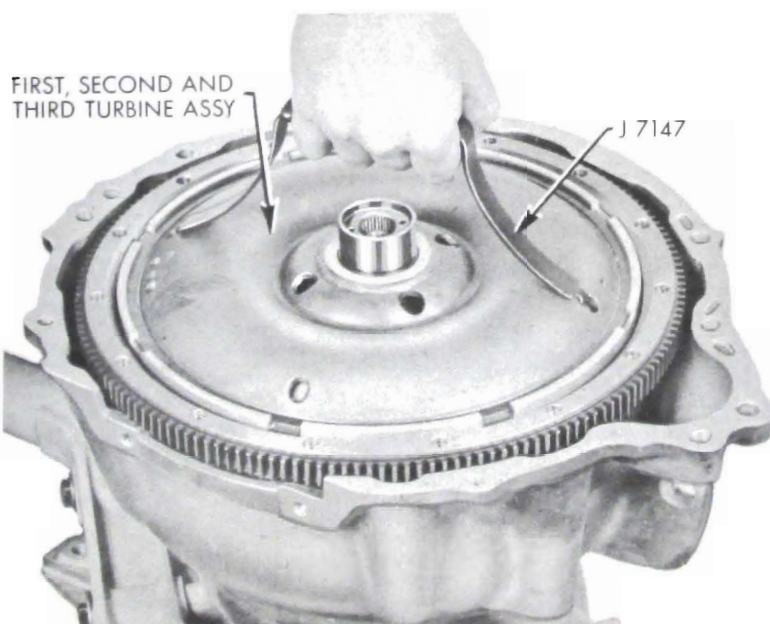
2. Remove first turbine shaft nut, special washer, converter anti-leak down valve spring, and anti-leak down valve.

5-234



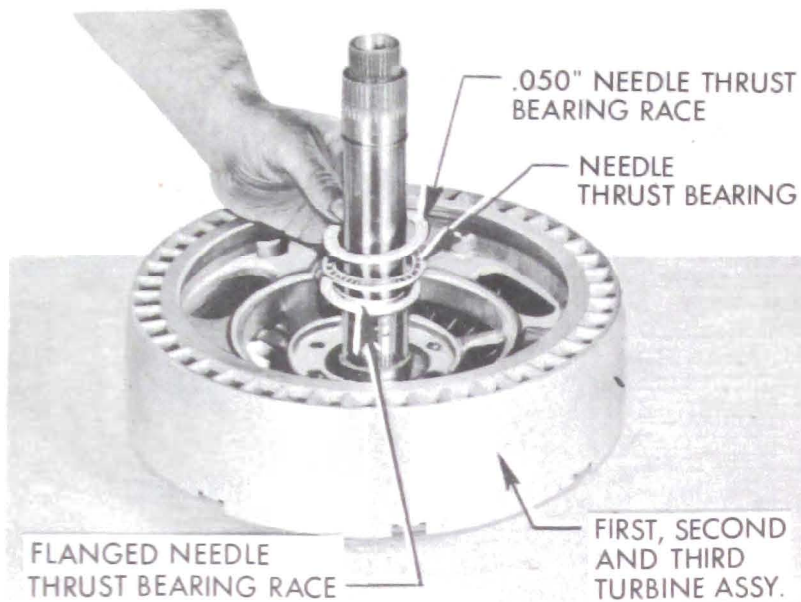
3. Assemble first turbine disc and hub puller as shown. Turn bolt clockwise to pull first turbine hub off first turbine shaft. When disc on hub is loosened, remove tool.

5-235



4. Lift first, second, and third turbine assembly from transmission using tool J-7147 or other suitable means. Set assembly on bench, shafts up.

5-236

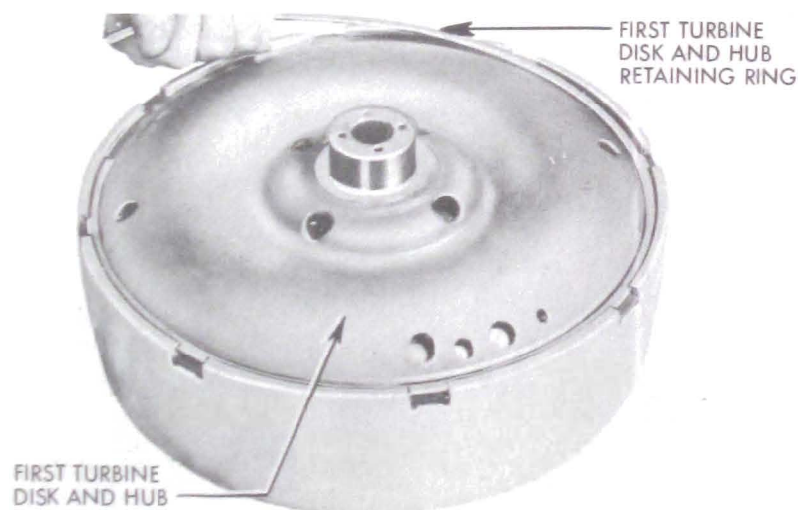


c. Turbine Disassembly and Inspection

1. Remove needle bearing, flanged needle bearing race, and .050" plain bearing race from second turbine hub.

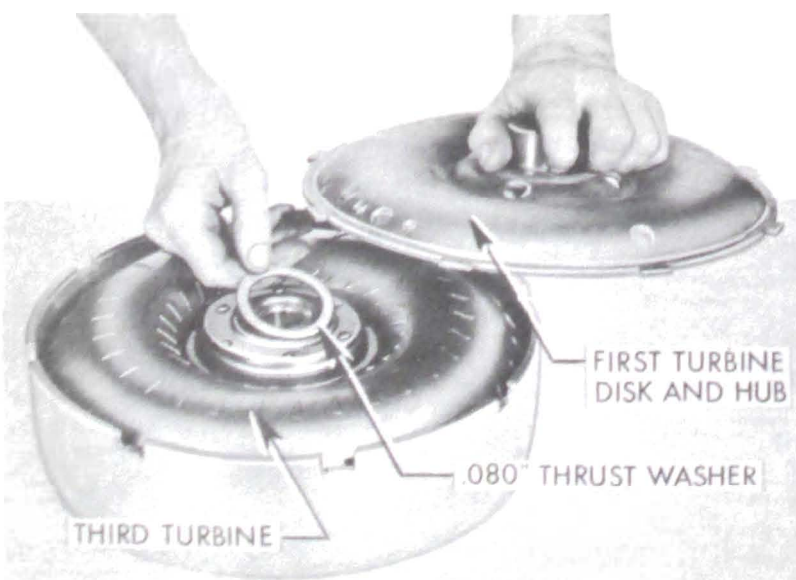
NOTE: *These races and bearing may have remained on top of stator.*

5-237



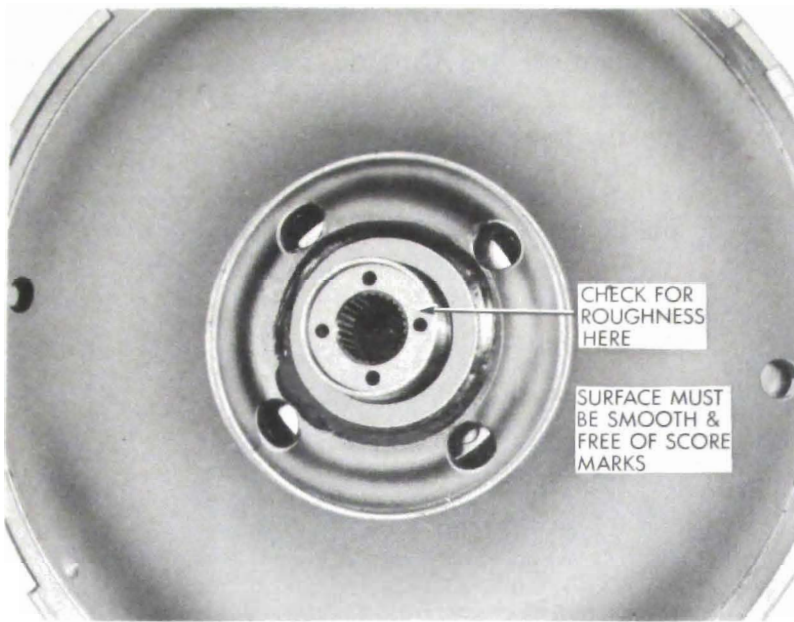
2. Set assembly shafts down through hole in bench. Remove first turbine to disc and hub retainer ring. Use a thin bladed screwdriver at inner edge of ring to raise edge of ring. Press on outer edge of ring to slide ring up slope of thin screwdriver over step of first turbine disc and hub.

5-238



3. Remove 1st turbine disc, hub and .080" lead-coated bronze thrust washer on 3rd turbine hub.

5-239



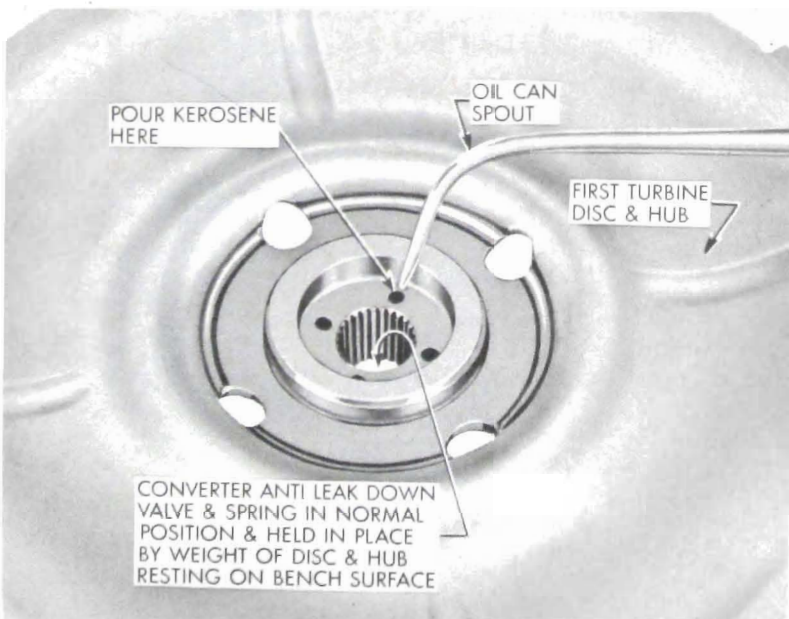
4. If the transmission is being disassembled to correct a converter leakdown complaint: Check first turbine disc and hub for roughness that might cause the converter anti-leakdown valve to leak.

5-240



5. If anti-leakdown valve seat is rough or scored, use fine lapping compound and a flat washer to smooth up the valve seat. Press down lightly on washer and use a circular motion until a good finish is obtained.

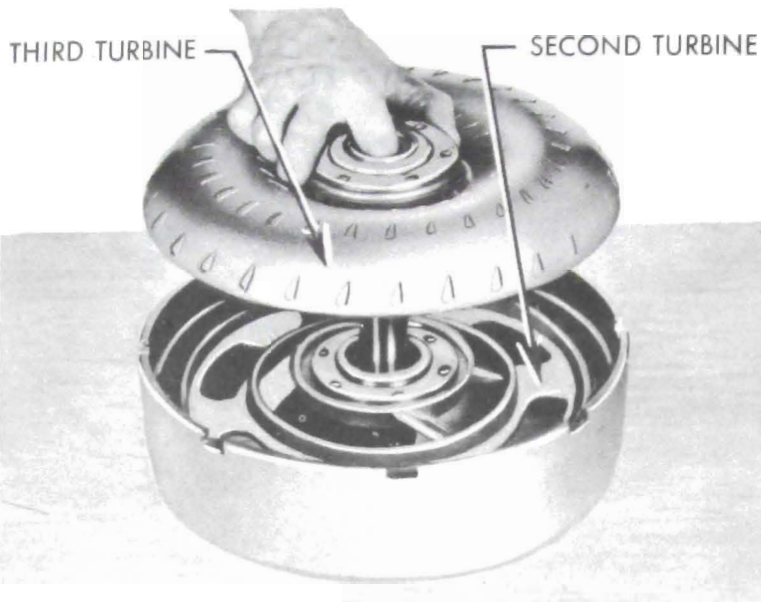
5-241



6. Assemble converter anti-leakdown valve and spring into forward face of first turbine disc and hub; set assembly on bench so weight of disc and hub holds spring and valve in position.

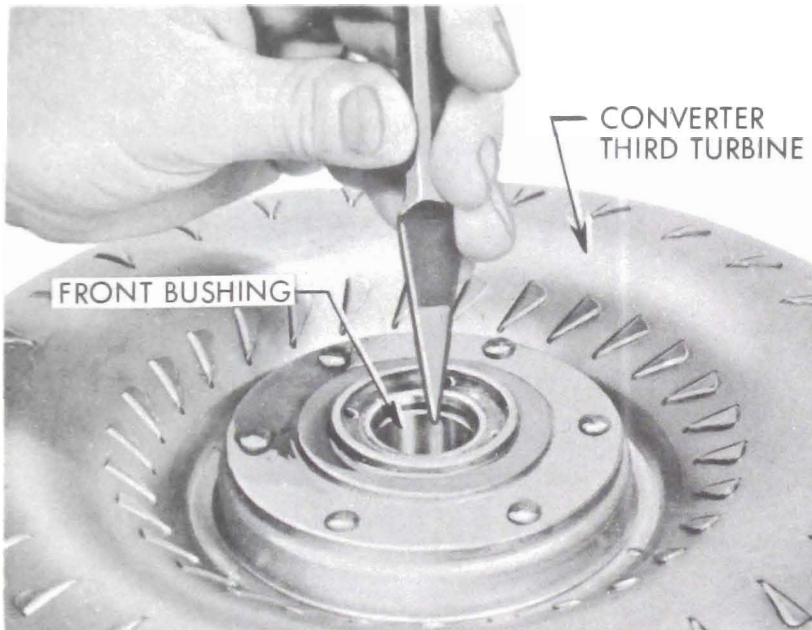
Pour kerosene in any of the four holes until the level is nearly to the top. The valve should hold the kerosene for several minutes. If the kerosene leaks down, the valve may have a nick or scratch or the valve seat may require more lapping.

5-242



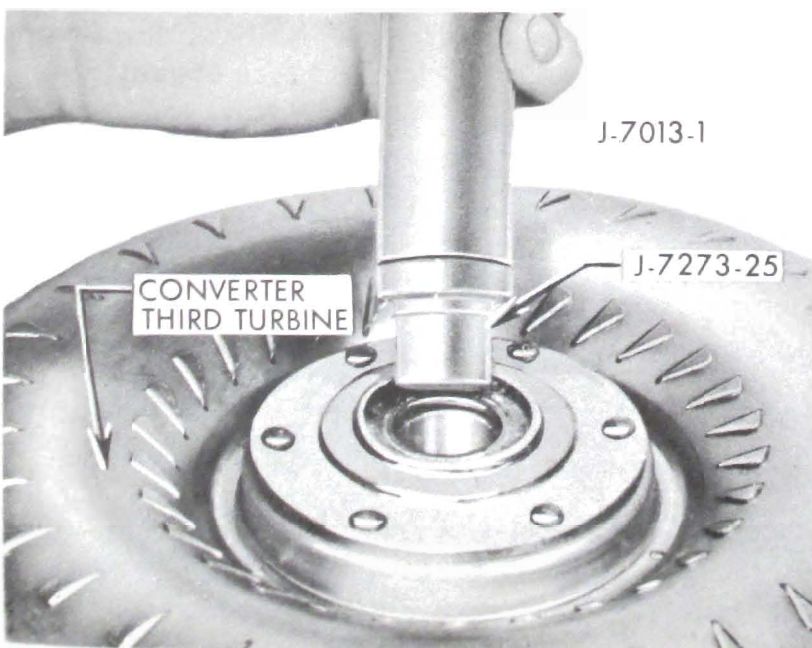
7. Remove 3rd turbine, flanged needle bearing race, needle bearing and .050" plain needle bearing race.

5-243



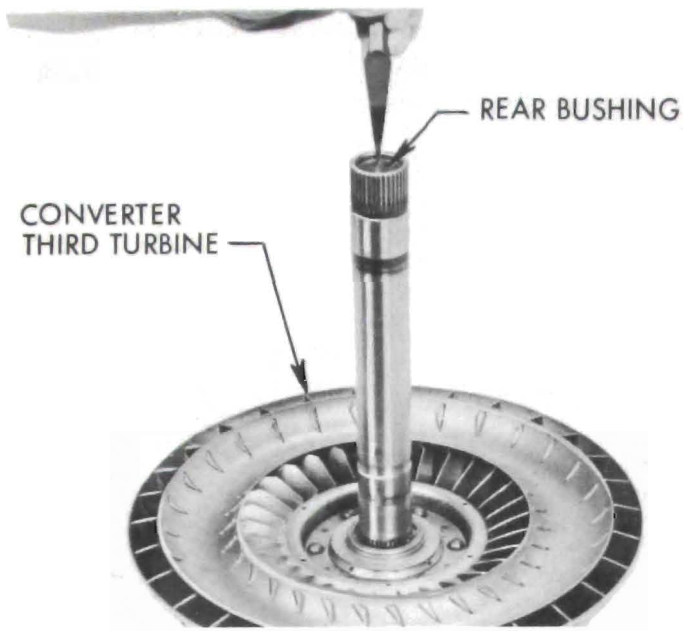
8. Examine third turbine front bushing. If worn or scored, cut out bushing with chisel.

5-244



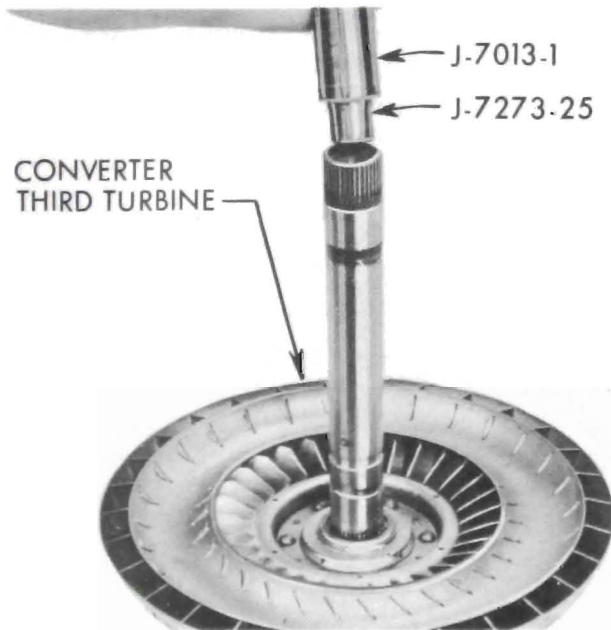
9. Install new third turbine front bushing using J-7013-1 and J-7273-25.

5-245



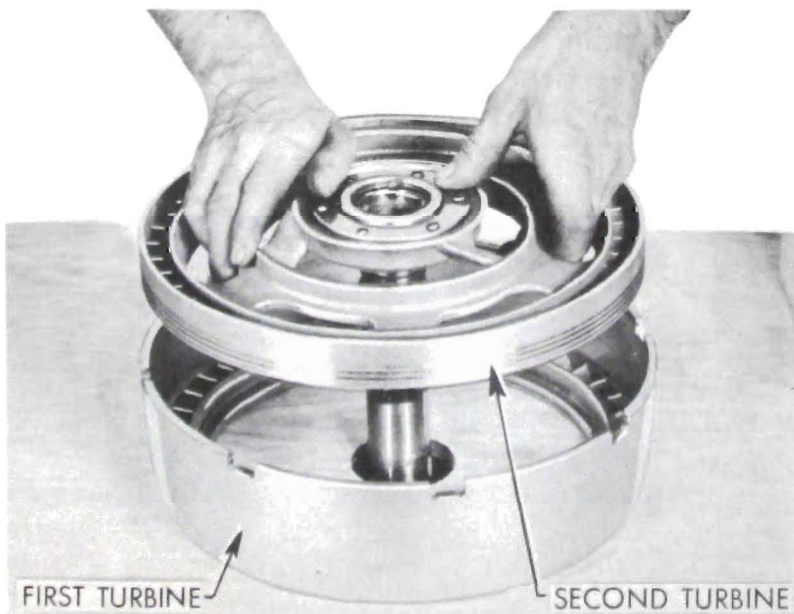
10. Examine third turbine rear bushing. If worn or scored, cut out bushing with chisel.

5-246



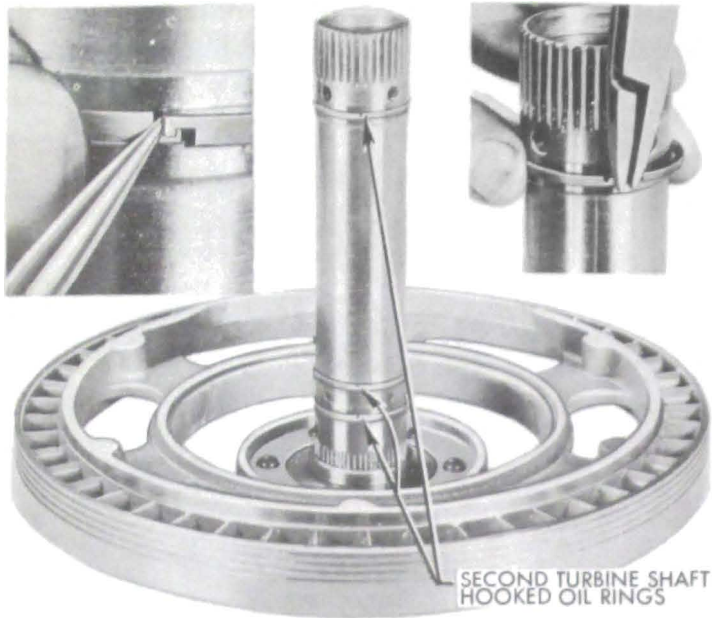
11. Install new third turbine rear bushing using J-7013-1 and J-7273-25.

5-247



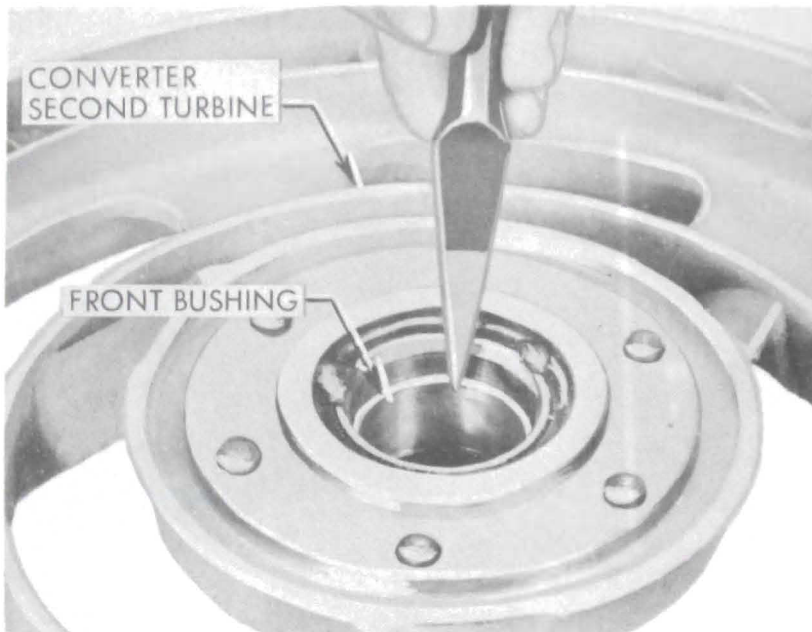
12. Remove 2nd turbine.

5-248



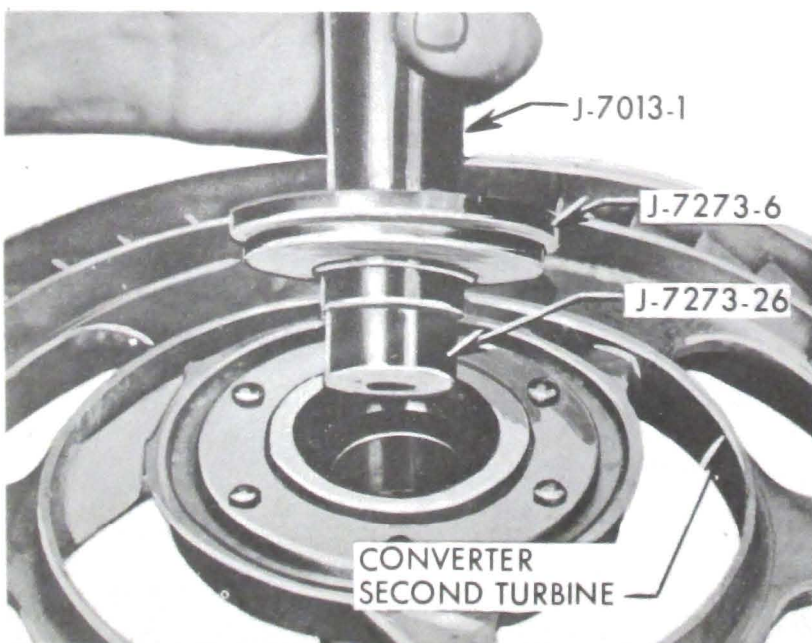
13. Inspect and if necessary to replace, unhook, expand and remove three second-turbine shaft hooked oil rings.

5-249



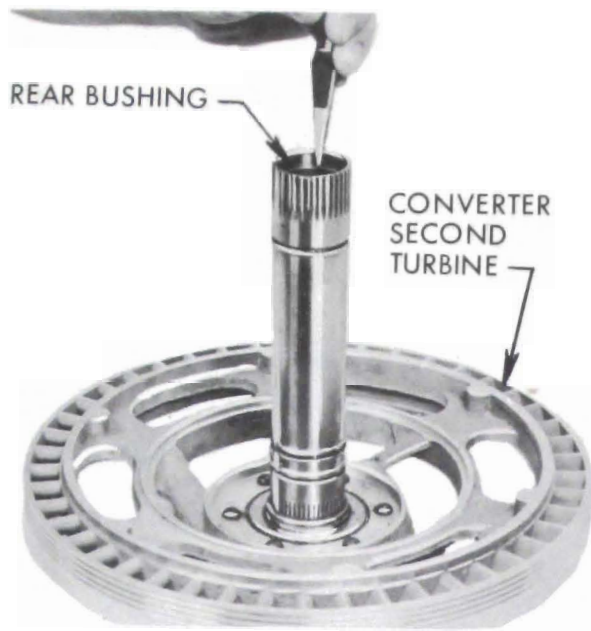
14. Examine second turbine shaft front bushing. If worn or scored, collapse bushing with chisel and remove.

5-250



15. Install new second turbine shaft front bushing using J-7013-1 Handle and J-7272-26-6 (Counter bore on 6 toward handle).

5-251



16. Examine second turbine shaft rear bushing. If worn or scored, collapse bushing with chisel and remove.

5-252



17. Install new second turbine shaft rear bushing using J-7013-1 Handle and J-7273-26 Installer.

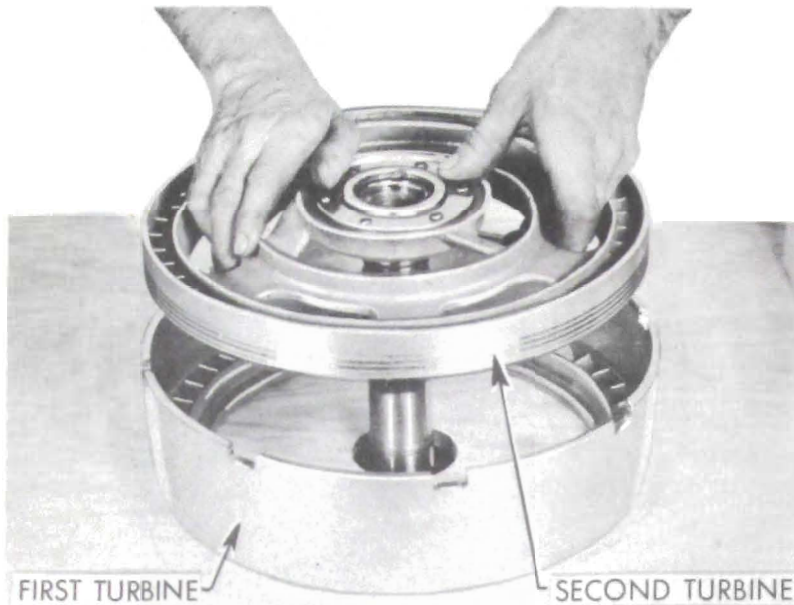
5-253



18. Expand and install new hooked oil rings on 2nd turbine shaft. Hook ends of rings by holding one end firmly in groove and working other end around to hook.

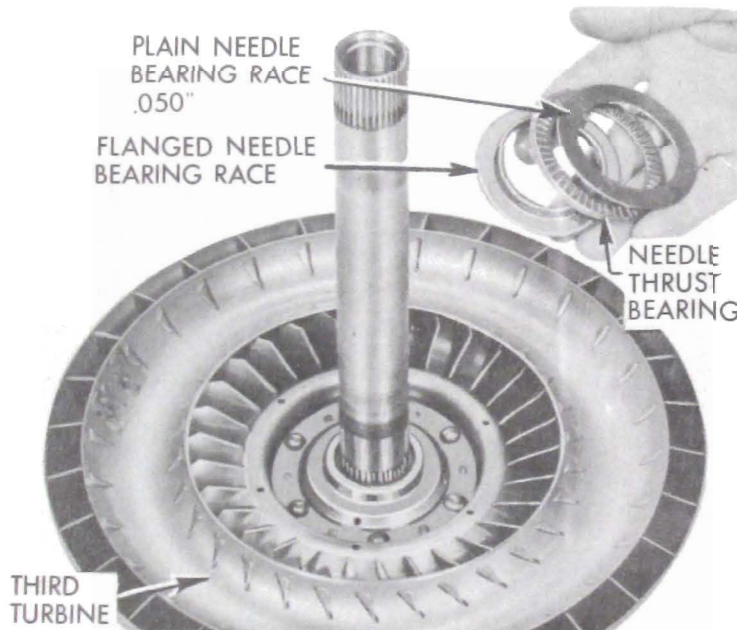
NOTE: Second turbine shaft oil rings are slightly smaller (.050") than two rings used on the output shaft. These rings must not be interchanged with those used on the output shaft.

5-254

**d. Reassembly of Turbines**

1. Lubricate second turbine shaft front and rear bushings and insert 2nd turbine with oil rings in place through hole in bench to rest on 1st turbine.

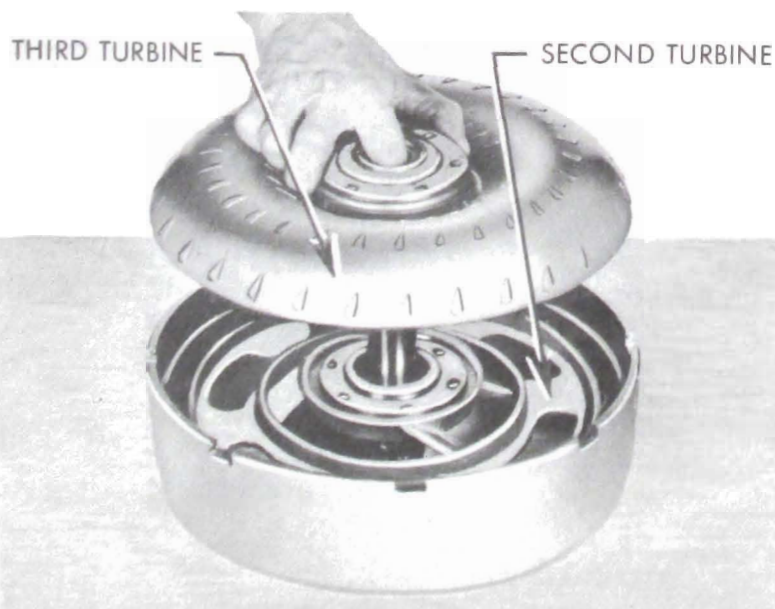
5-255



2. Inspect and if necessary to replace, install new flanged needle bearing race, flange "up", needle thrust bearing ($1\frac{3}{4}$ " x $2\frac{1}{2}$ "), and plain needle bearing race (.050") on 3rd turbine hub. Hold in place with heavy lube. Lubricate front and rear 3rd turbine shaft bushings.

NOTE: *Always measure needle bearings and races. Some are within .010" thickness and $1/16$ " diameter of each other and can easily be incorrectly assembled.*

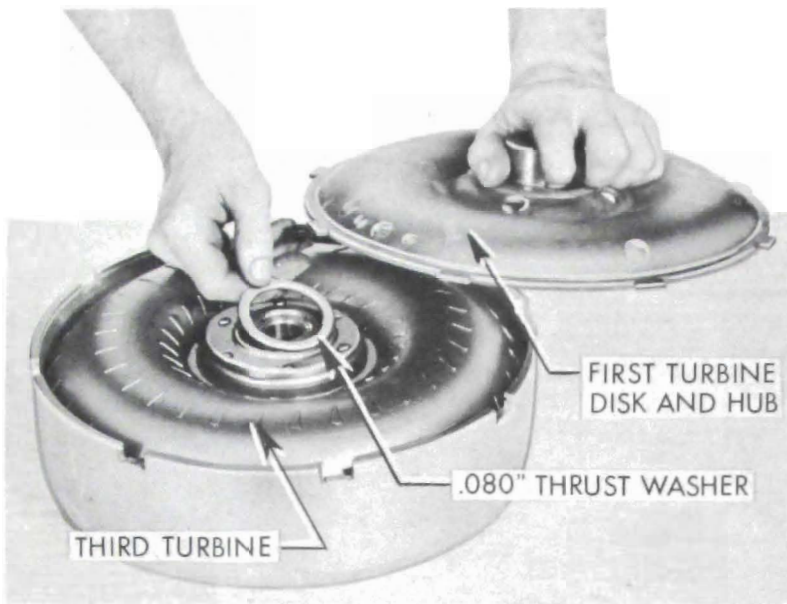
5-256



3. With needle bearing and races held in place with heavy lube, insert 3rd turbine shaft into 2nd turbine shaft. Lower into position.

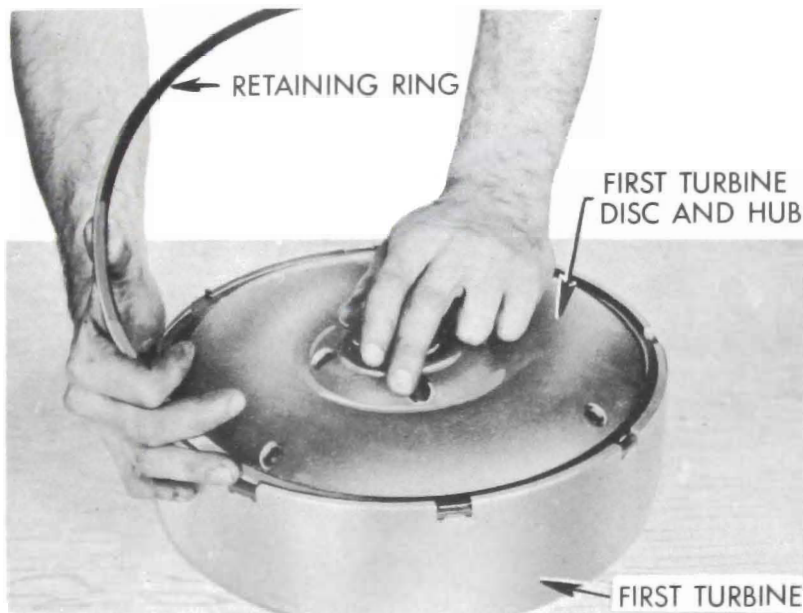
NOTE: *Heavy lube referred to in this manual can be wheel bearing grease or chassis lube. Use only enough to hold bearings and races in place.*

5-257



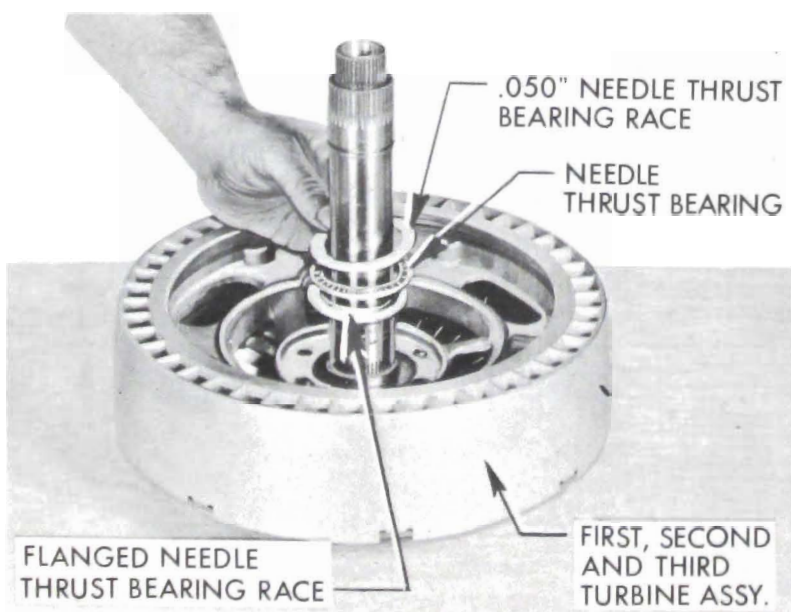
4. Inspect and, if necessary to replace, place new .080" lead-coated bronze thrust washer on hub of 3rd turbine. Lubricate washer and position 1st turbine disc and hub with tangs in slots of 1st turbine.

5-258



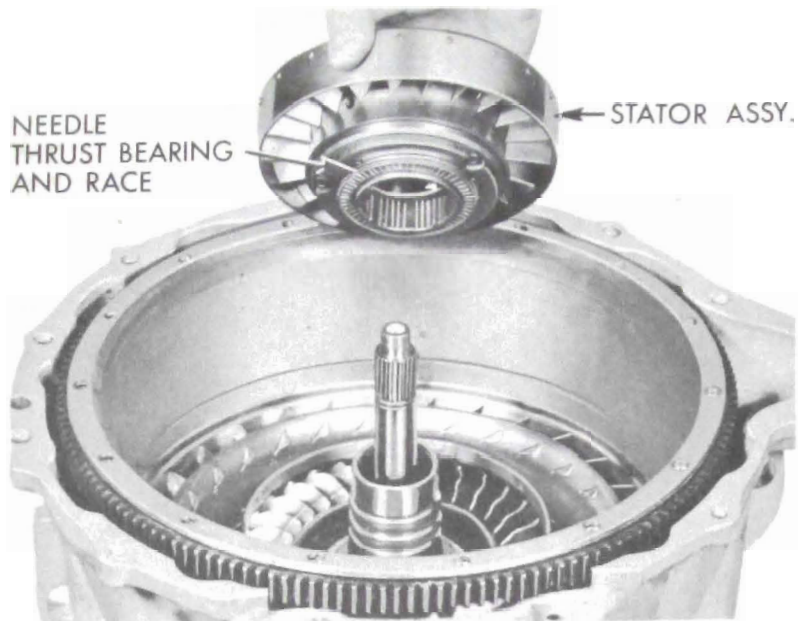
5. Install 1st turbine disc and hub retaining ring so high edge will engage the groove in the 1st turbine and the inner lower edge forces down on the 1st turbine disc and hub. Tap solidly into groove and inspect for proper installation.

5-259



6. With assembly on bench, shafts up, inspect and, if necessary to replace, install new flanged needle bearing race, flange "up" on 2nd turbine hub, next, needle thrust bearing (1 $\frac{3}{4}$ " x 2 $\frac{1}{2}$ ") and last, .050" bearing race. Set completed sub-assembly aside if further work is to be done on the transmission. Refer to paragraph 5-56 for installation of turbine assembly.

5-260

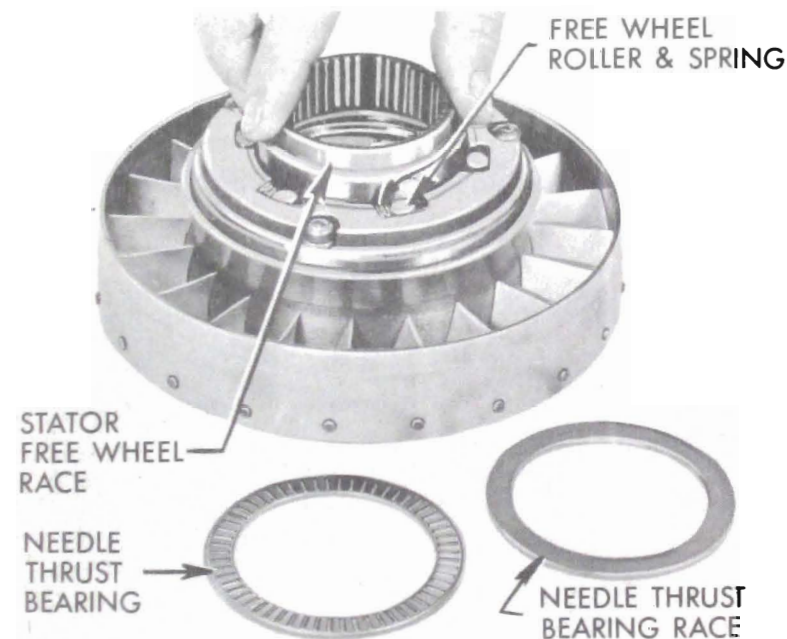


e. Removal, Disassembly and Inspection of Infinitely Variable Pitch Stator

1. Lift converter pump until stator race is clear of splines on reaction shaft (approximately 2½"). Lower converter pump and remove the stator. To avoid pinching fingers, use caution when lowering pump.

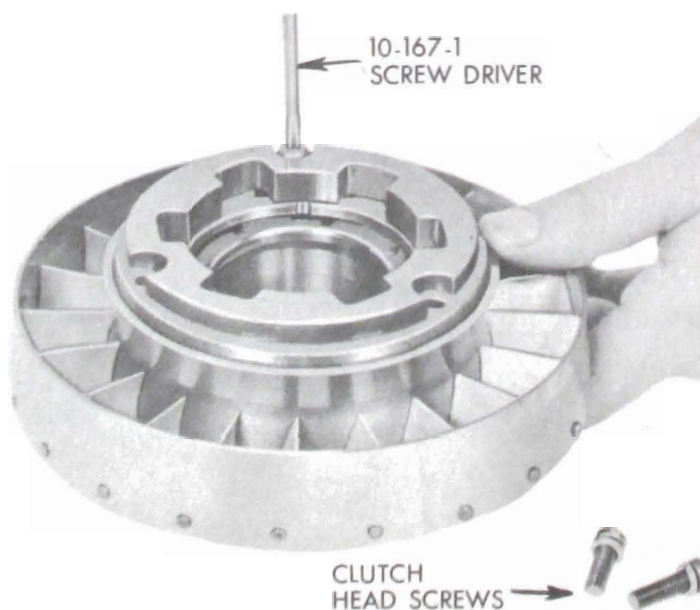
Remove needle thrust bearing and bearing race (Stator cam to converter pump hub).

5-261



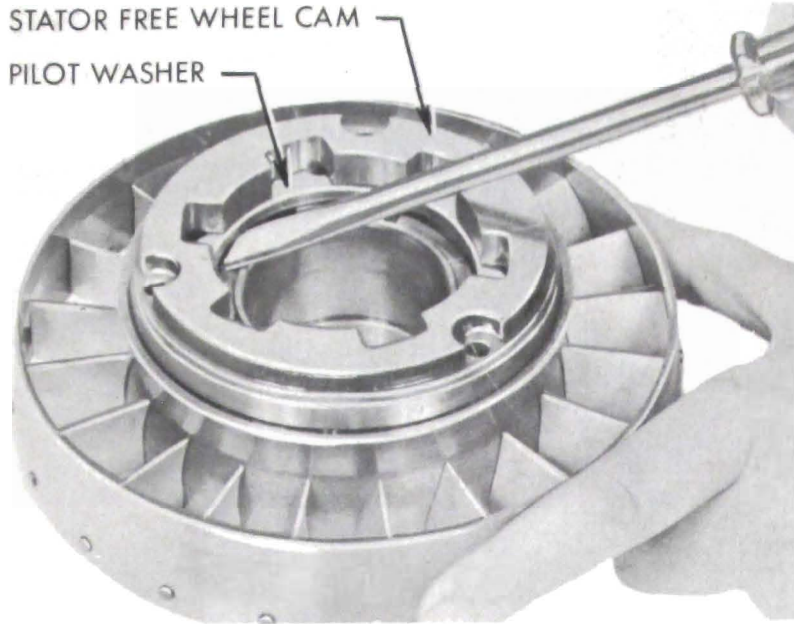
2. Pull out stator free wheel race while rotating clockwise. Examine the race. Its outer surface should be free of nicks or dents.

5-262



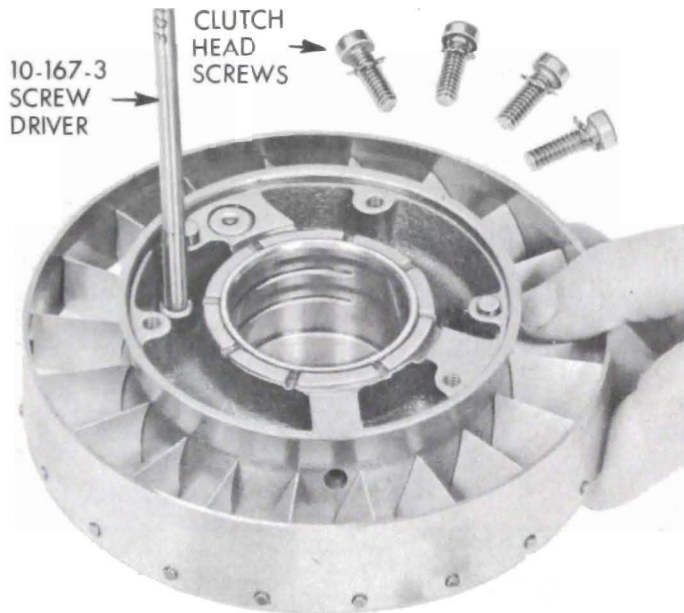
3. Remove 3 special clutch head screws from stator cam to stator carrier using Tool 10-167-1.

5-263



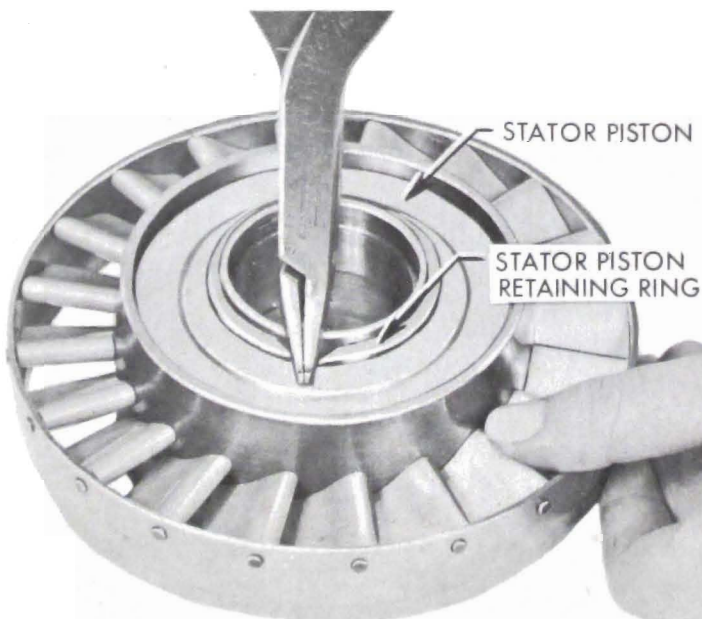
4. Pry up stator free wheel cam and bronze washer with screwdriver, using care to avoid damage to washer. Remove cam and washer.

5-264



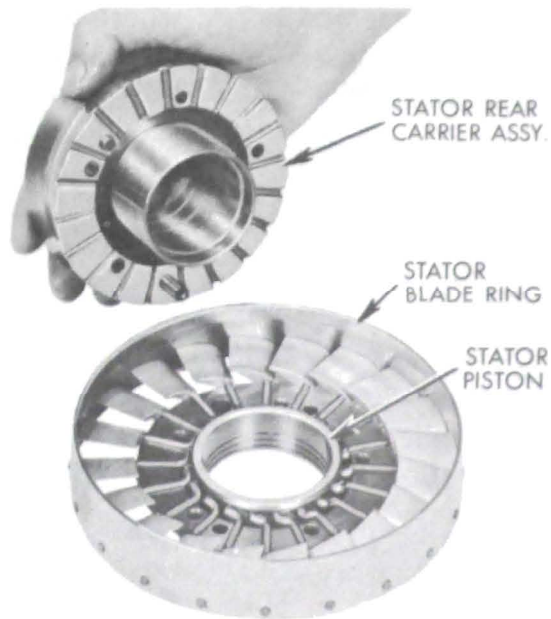
5. Remove five clutch head front to rear carrier screws using Tool 10-167-3.

5-265



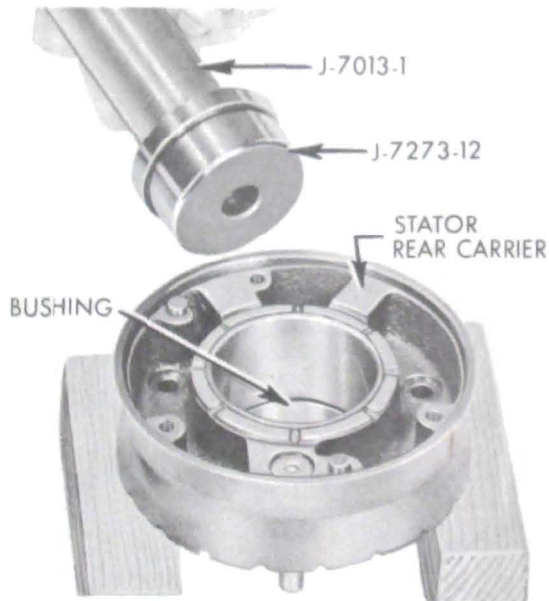
6. Invert assembly, expand and remove stator piston retaining ring from rear carrier to stator piston.

5-266



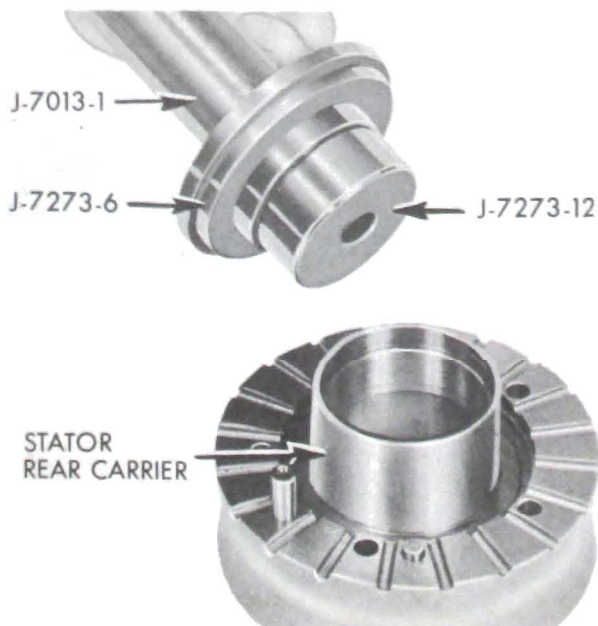
7. Invert assembly and rotate all stator blades to extreme high angle position and remove stator rear carrier assembly from front carrier. Remove blades and stator blade ring from stator front carrier and piston assembly.

5-267



8. Examine stator rear carrier bushing. If worn or scored, remove bushing using tool J-7013-1 Handle and J-7273-12 Remover.

5-268



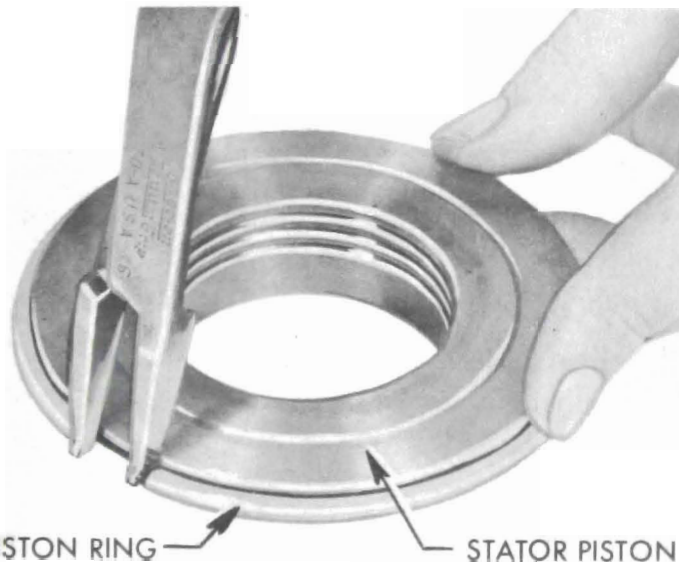
9. With assembly supported on steel sleeve, install new stator rear carrier bushing using tool J-7013-1 Handle and J-7273-6-12 Installer. (Counterbore on 6 toward handle.)

5-269



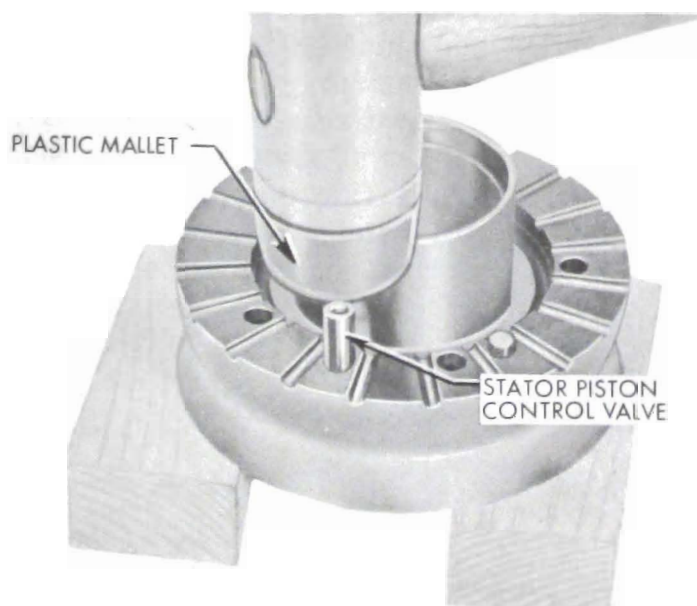
10. Remove stator piston and ring from front carrier. Examine piston ring and bore for burrs, nicks, or scratches.

5-270



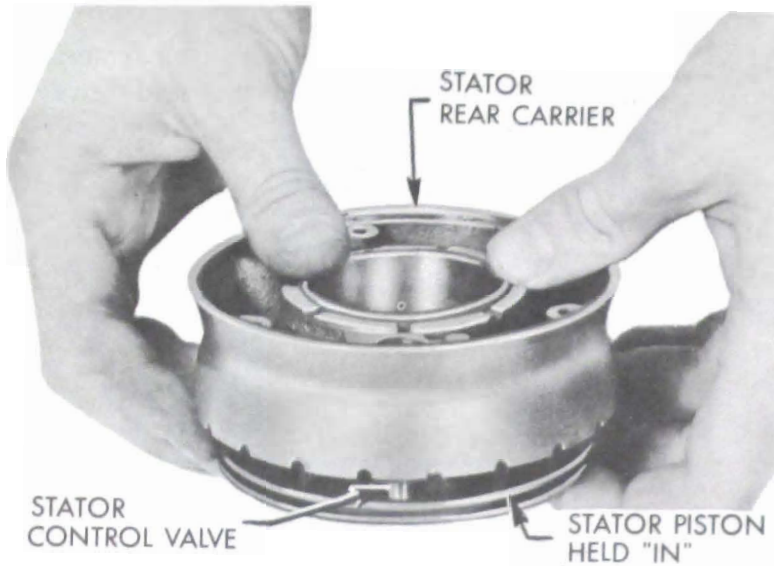
11. Expand and remove ring from stator piston with snap ring pliers.

5-271



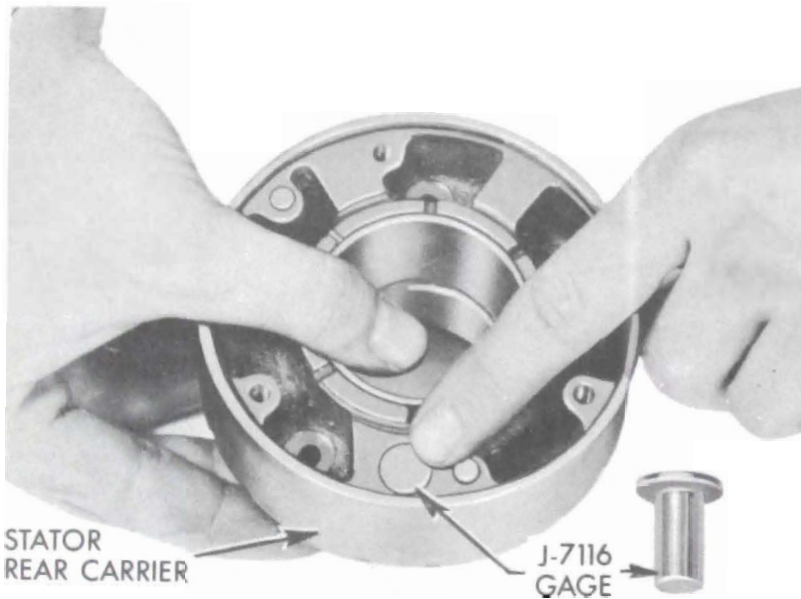
12. If the stator piston control valve is sticking, or there is reason to believe the spring is weak, remove the valve by suitably supporting stator rear carrier and remove stator piston control valve, spring and retainer from stator rear carrier by rapping sharply on valve with a plastic mallet.

5-272



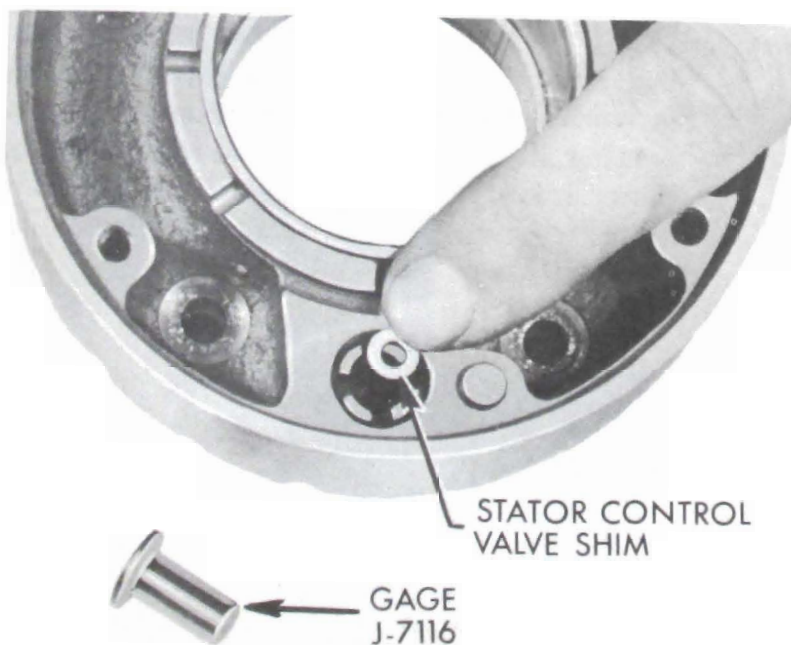
13. For gaging purposes only: assemble stator piston shoulder "up" to rear carrier and press together. Insert valve in bore of rear carrier.

5-273



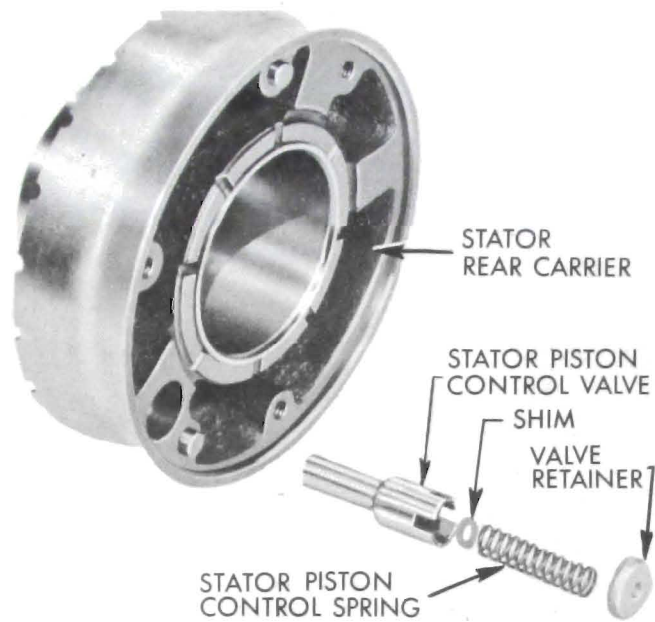
14. Insert gage J-7116 in stator control valve. With piston held against carrier and tool in place, top of tool should be flush with boss of stator rear carrier.

5-274



15. If gage is below surface of stator rear carrier, add shims to bring gage as close to flush with surface as possible. Shims are available in two sizes only, .007" and .021". Total thickness of shims used should not exceed .042". If thickness of shims required exceeds .042" stator rear carrier, stator piston or stator valve may require replacement.

5-275



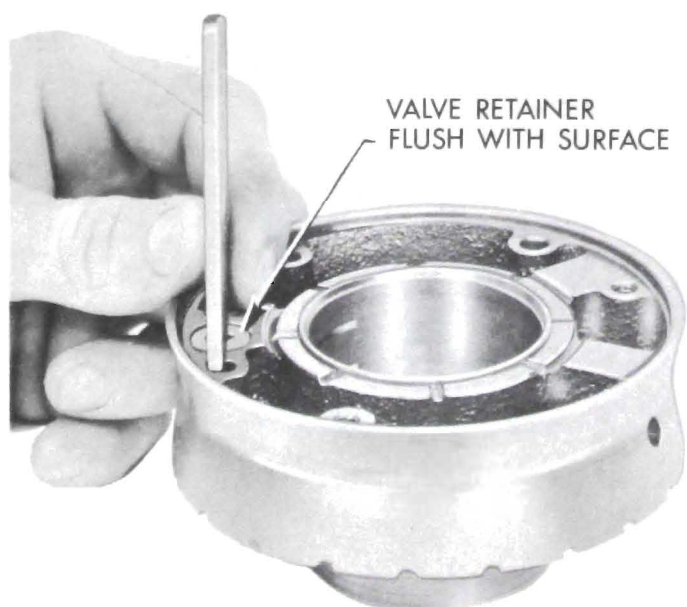
f. Reassembly of Infinitely Variable Pitch Stator

1. After stator valve has been checked and shims added if necessary, assemble valve, new service spring, and retainer to stator rear carrier.

NOTE: *Be certain shims lay flat in position inside valve bore.*

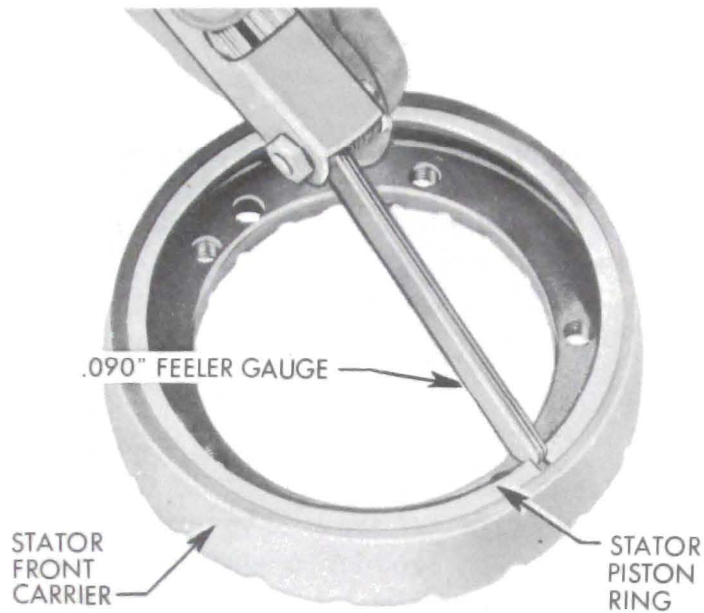
Service springs *only* must be used after shims have been selected with Gauge J-7116. Service springs are held to much closer tolerances than production springs and are calibrated especially for use with Gauge J-7116. Under no circumstances should the original thickness of shims be altered unless Gauge J-7116 is used to determine the shim thickness and the shims so selected are installed with a *service spring*.

5-276



2. Tap new valve retainer into stator carrier squarely and flush with stator carrier surface. Use flat tool to drive retainer to prevent cocking of retainer during installation.

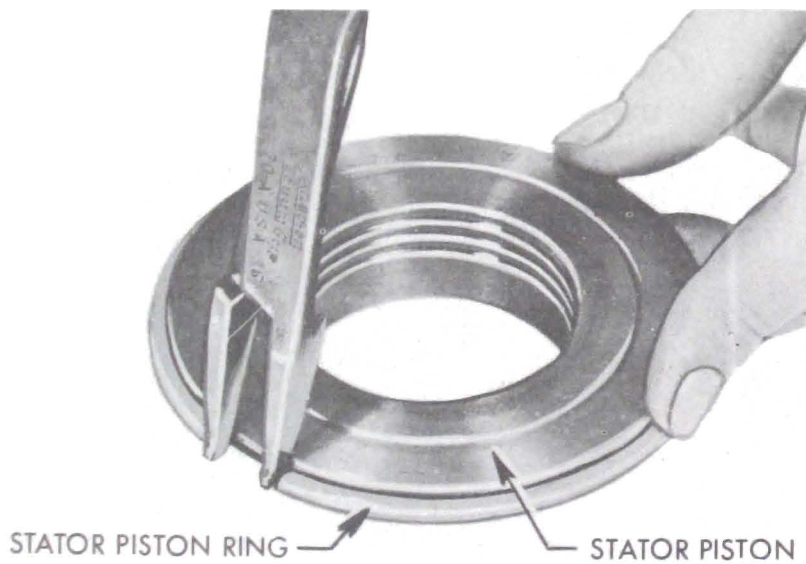
5-277



3. Insert stator piston ring in bore of stator front carrier. (Check gap with feeler gage—should be $.090'' \pm .010''$.)

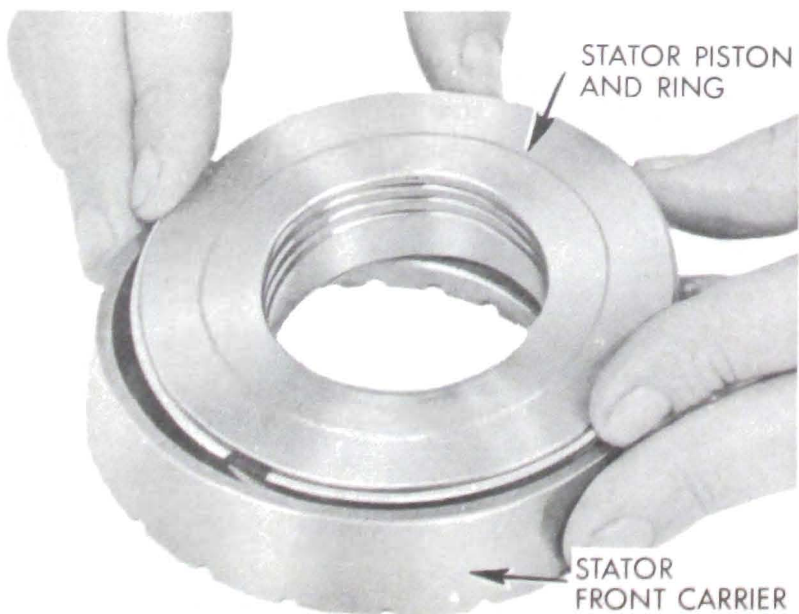
NOTE: *This gap serves as the piston "bleed" hole for the stator piston.*

5-278



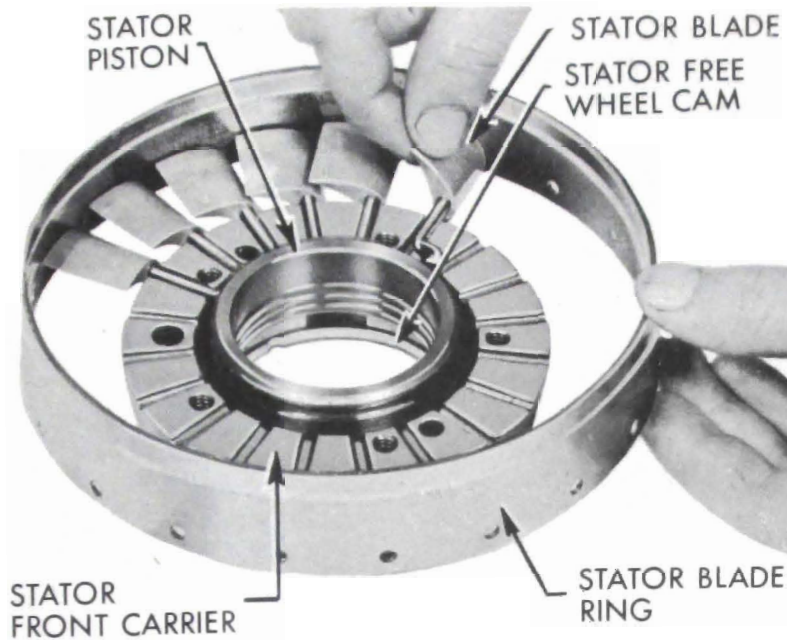
4. Expand and install stator piston ring on stator piston.

5-279



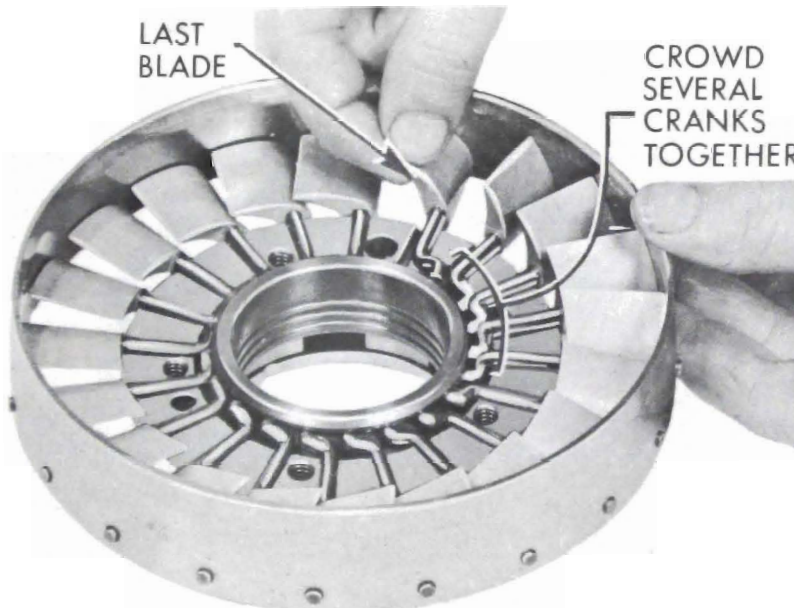
5. Install piston and ring into stator front carrier by tilting and inserting gap side of ring first and then pressing in.

5-280



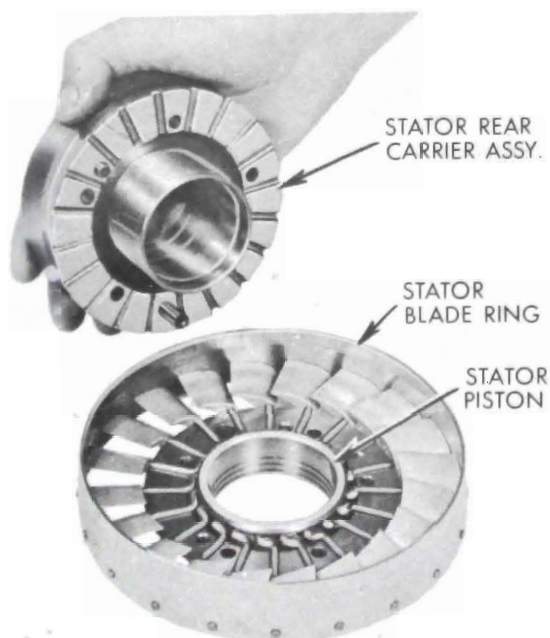
6. Examine blades and cranks. The blades must not be bent or nicked, and the cranks must be smooth and free of burrs. Set stator front carrier assembly and piston on stator free wheel cam and pilot washer assembly to hold piston "in". Support edge of stator blade ring and insert blades into carrier and piston assembly. Be sure edge of ring nearest holes is "down" as pictured.

5-281



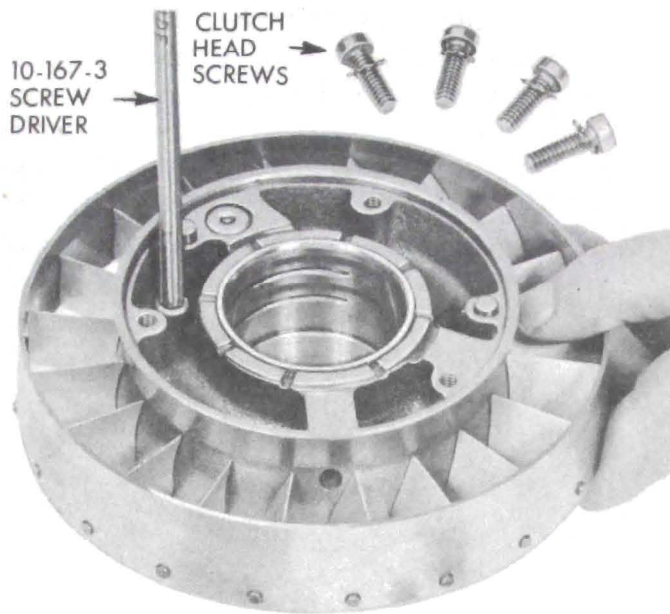
7. Install last blade by crowding several adjacent blade cranks together.

5-282



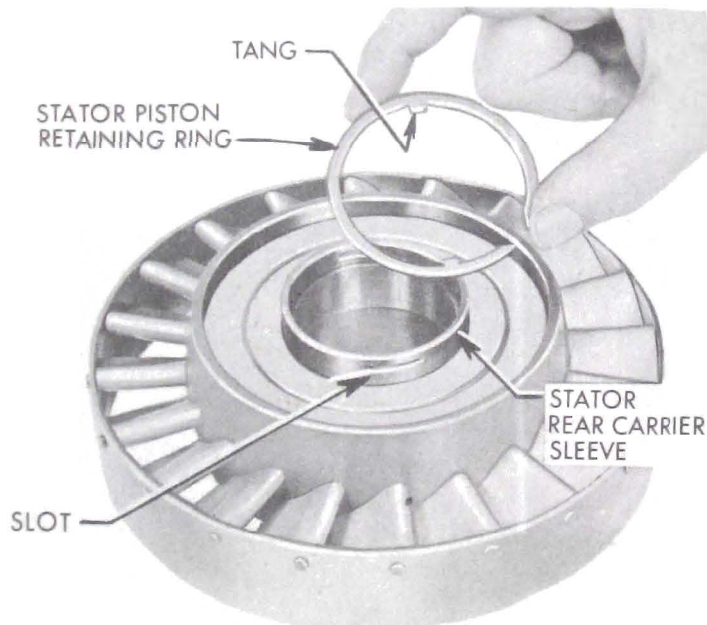
8. With stator blades at extreme high angle position, assemble rear stator carrier assembly to stator front carrier assembly. Note position of dowels and dowel holes.

5-283



9. Install five clutch head screws and lock washers using Tool 10-167-3. Torque to 10-12 ft. lbs.

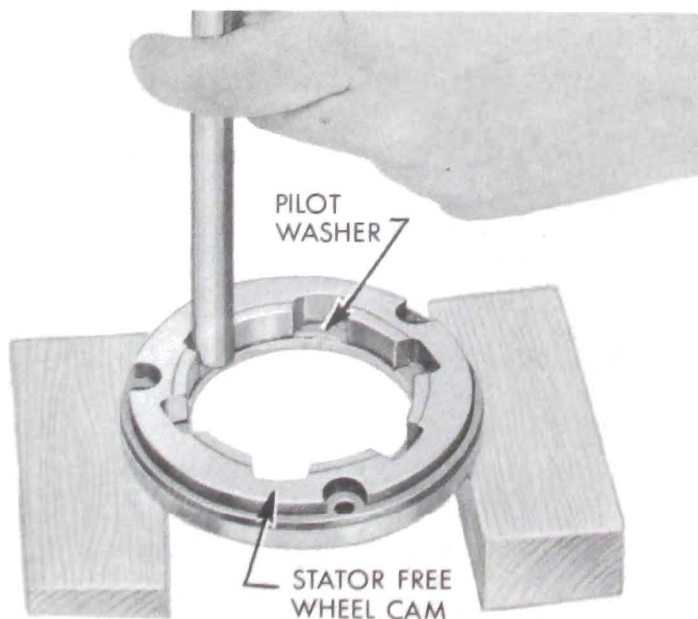
5-284



10. Install stator piston retaining ring on stator rear carrier sleeve.

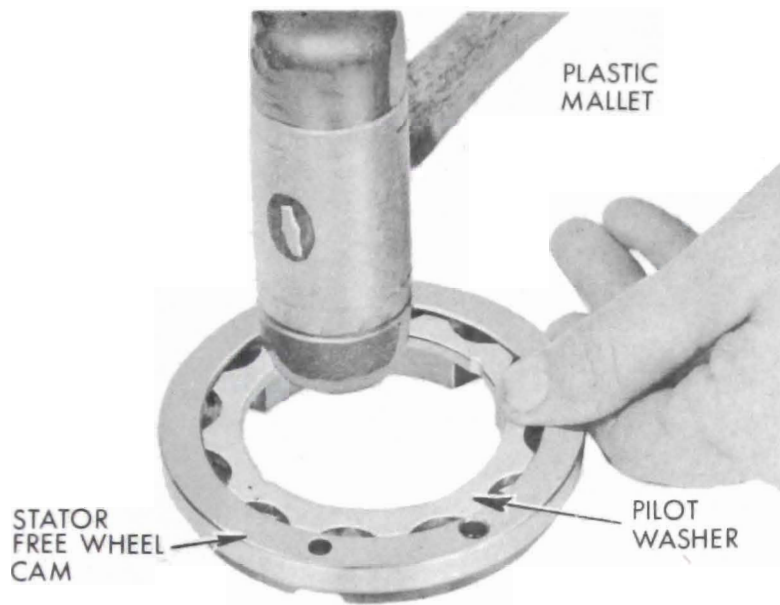
NOTE: Tangs on retaining ring must enter slots in sleeve. Move stator blades from high to low angle several times. Check for free operation.

5-285



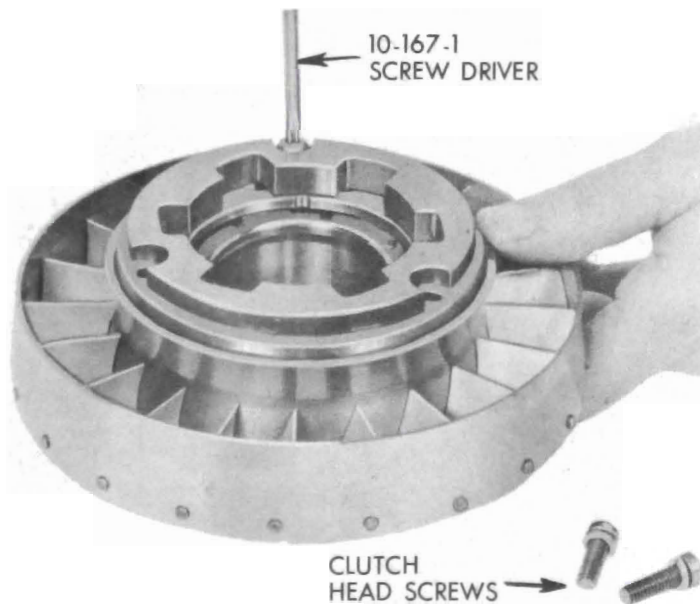
11. Inspect pilot washer and if necessary to replace, suitably support stator free wheel cam and remove pilot washer using a plastic hammer and drift.

5-286



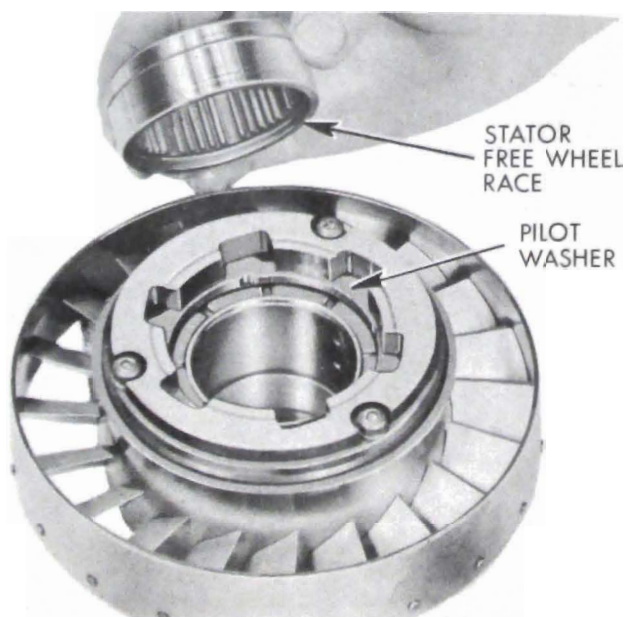
12. Install pilot washer in stator free wheel cam using a plastic hammer. Make sure pilot washer is seated in bore of cam.

5-287



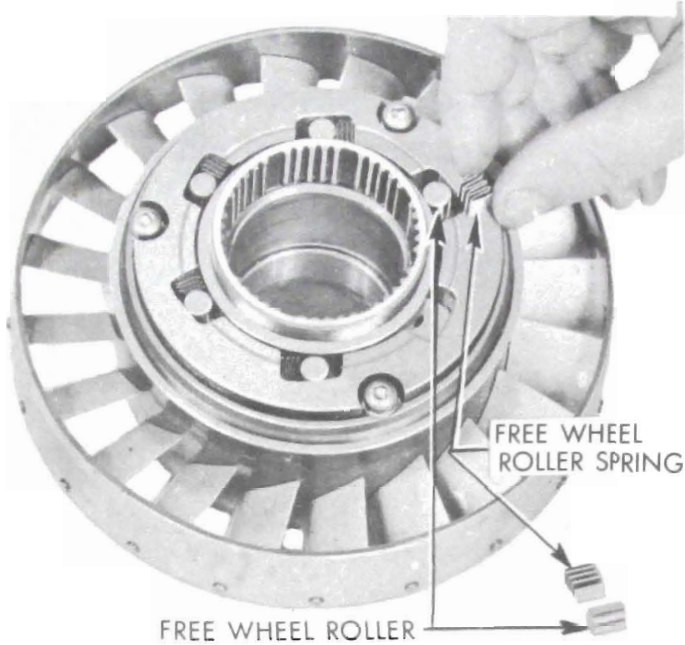
13. Assemble stator free wheel cam and pilot washer assembly to stator rear carrier with three clutch head screws and lock washers using Tool 10-167-1. Note position of dowels and dowel holes. Torque screws to 10-12 ft. lbs.

5-288



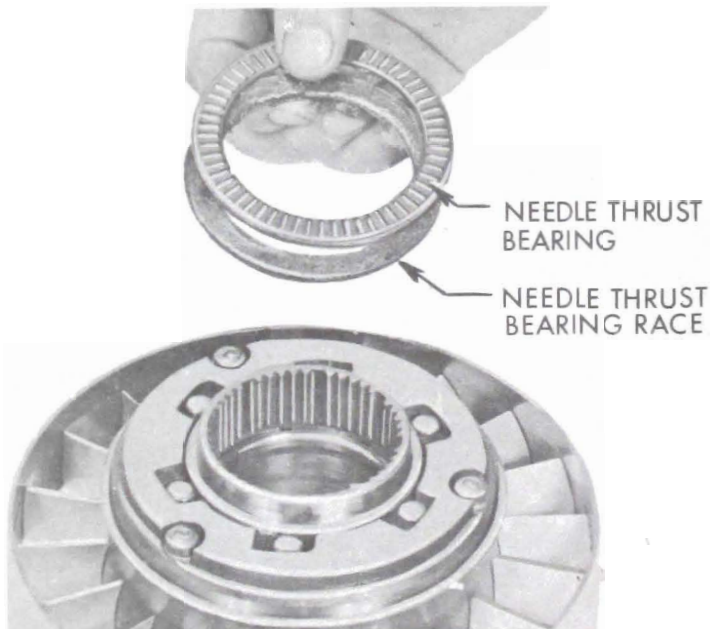
14. Lubricate and insert stator free wheel clutch inner race, small diameter end up, into pilot washer. Inner race should rotate freely in pilot washer.

5-289



15. Install free wheel clutch rollers and springs—roller toward narrow end of cam opening, and spring at wide end of opening. Inner race should rotate freely in clockwise direction and lock on counter-clockwise rotation.

5-290

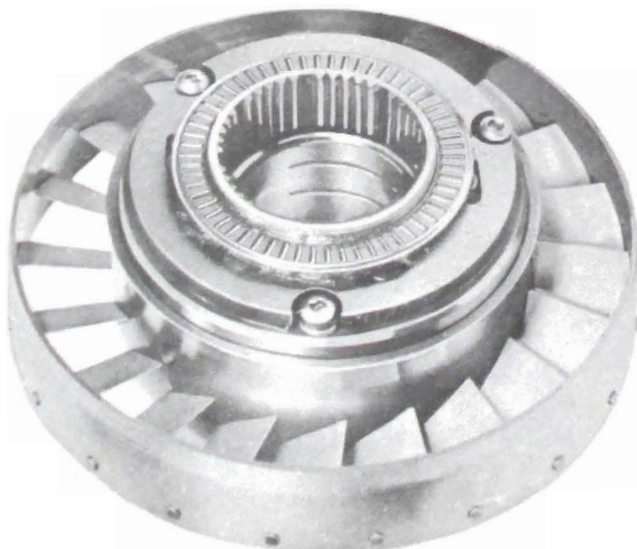


16. Apply heavy lube and install bearing race and needle thrust bearing ($2\frac{1}{4}$ " I.D. x 3" O.D.) on stator free wheel race.

NOTE: Race next to free wheel rollers and springs.

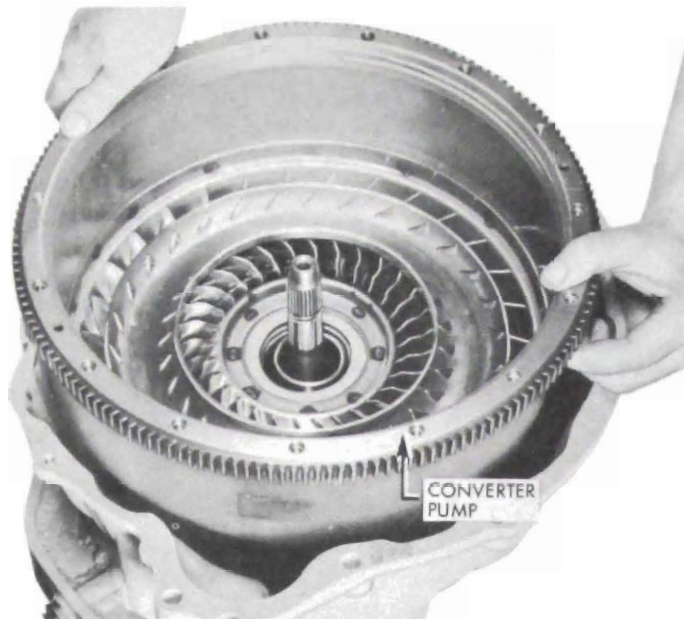
NOTE: If the needle thrust bearing or race is scored or worn, both must be replaced.

5-291



17. Set assembly aside if further work is to be done on transmission. Refer to paragraph 5-56 for installation of stator assembly.

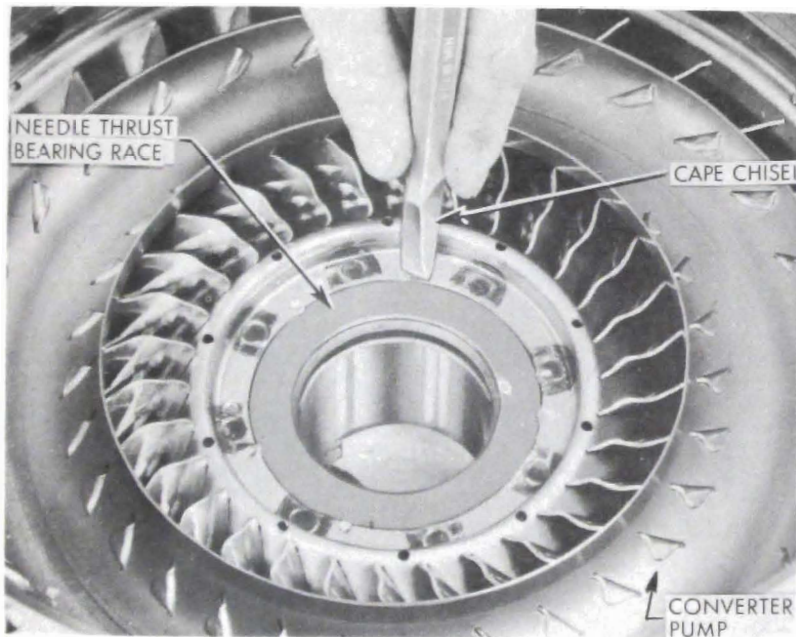
5-292



g. Removal of Converter Pump. Inspection, Removal, and Replacement of Stator Cam to Pump Hub Bearing Race

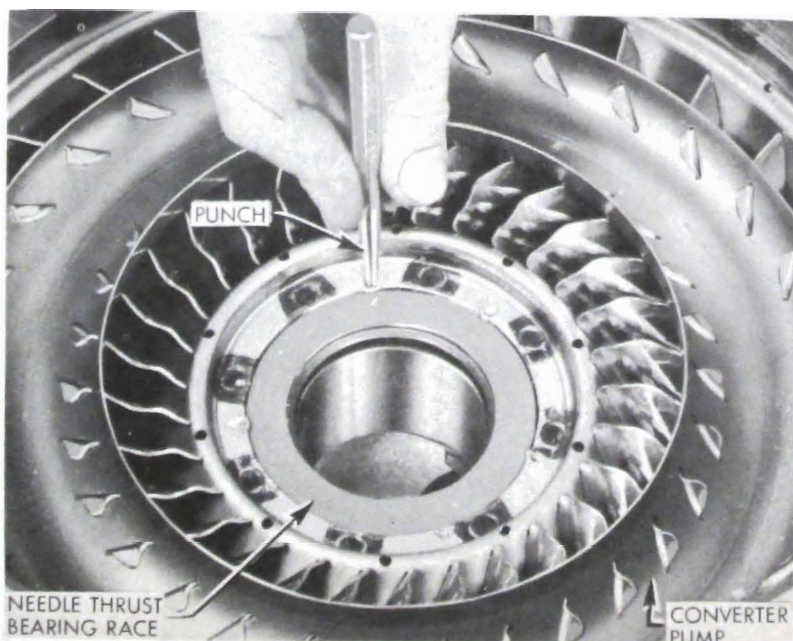
1. Remove converter pump by lifting straight up.

5-293



2. Examine needle thrust bearing race staked to converter hub. (Stator cam to converter pump hub needle thrust bearing race.) If worn or scored, carefully chip out staking with cape chisel and remove worn race.

5-294

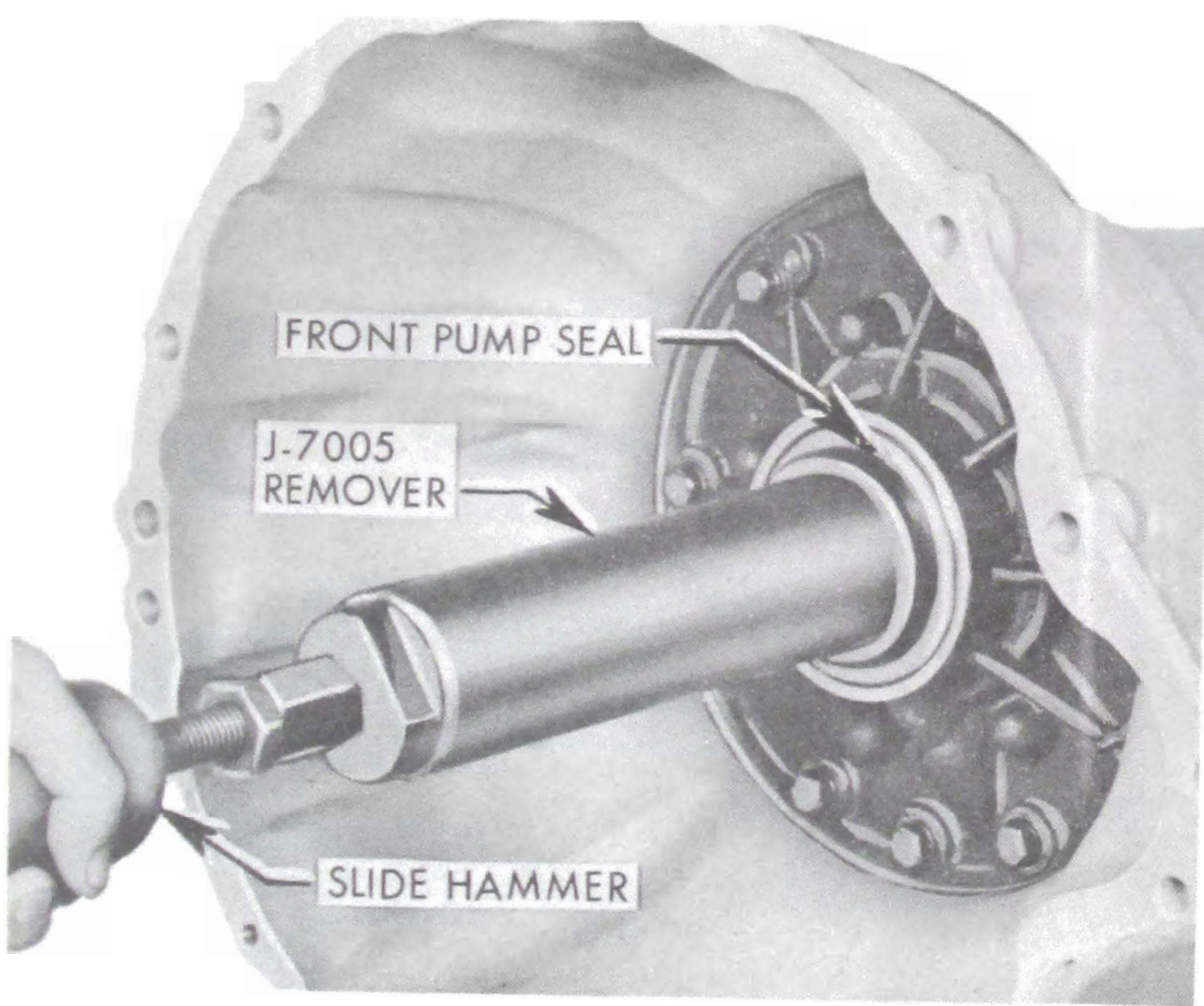


3. Be sure converter pump hub surface is clean and smooth. Install new thrust washer by lightly staking in place with punch in several places.

Refer to paragraph 5-56 for installation of converter pump.

5-295

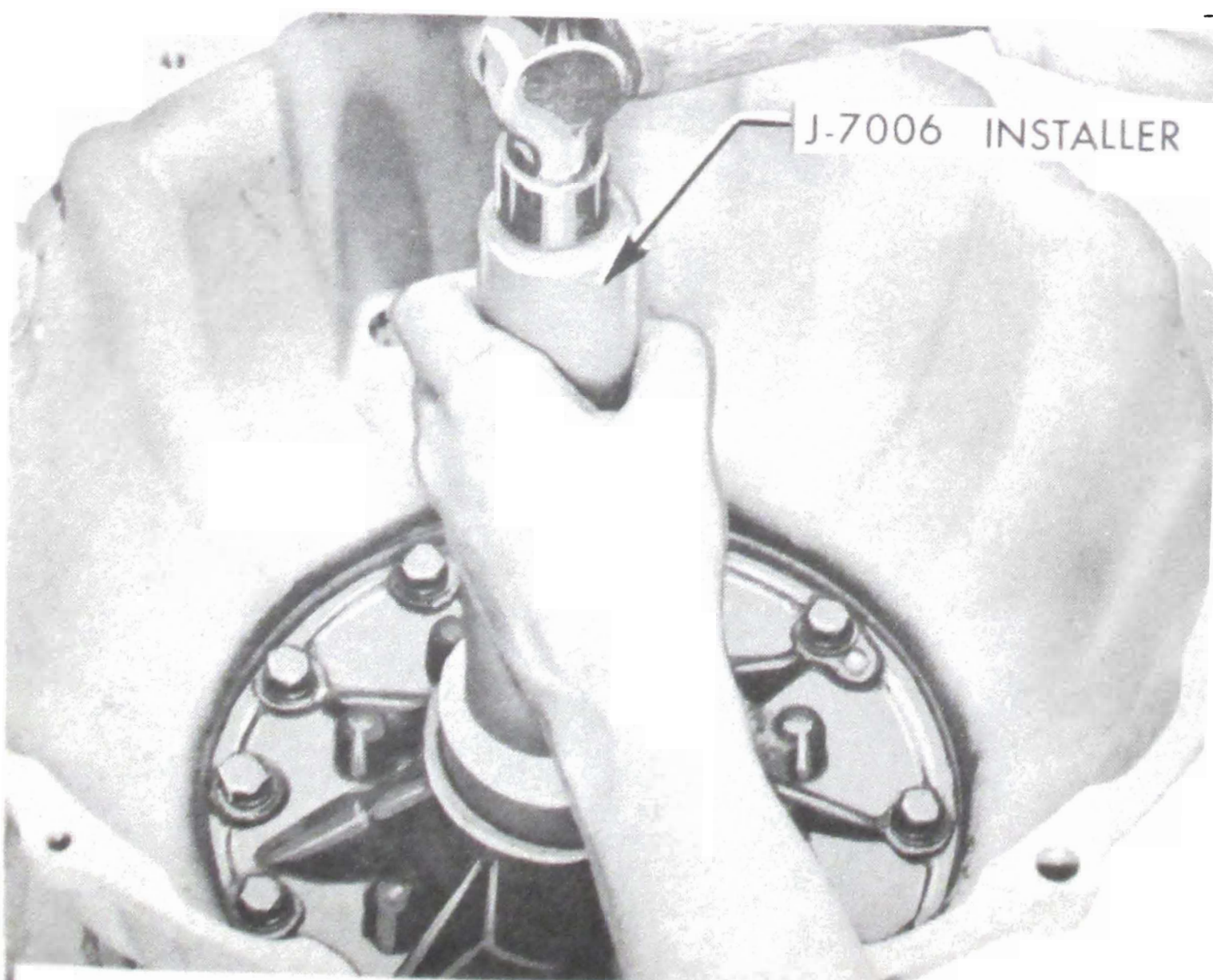
5-38 TRIPLE TURBINE PUMP SEAL REMOVAL AND REPLACEMENT



1. With transmission horizontal, thread seal remover J-7005 into seal until threads engage steel part of seal. Install slide hammer and hammer sharply to remove seal.

NOTE: *If reaction shaft, pump, and reverse piston assembly is to be removed, pump seal may be removed on bench.*

5-296

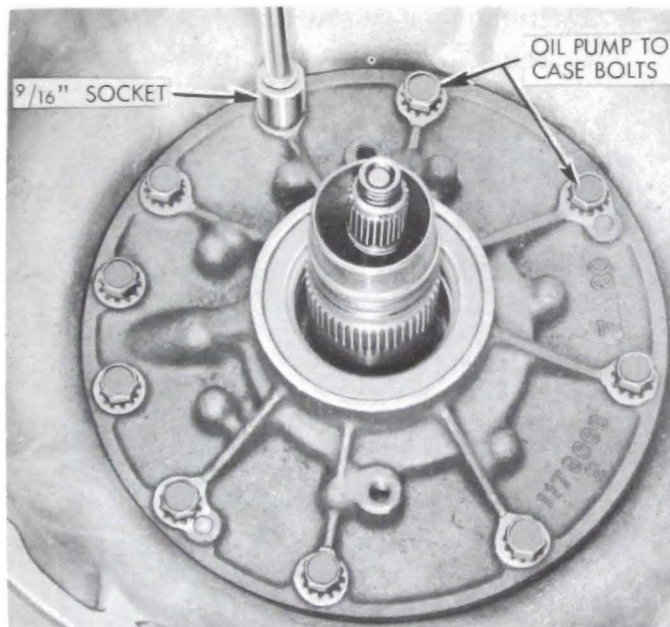


2. Install new pump seal with pump in transmission using Tool J-7006.

NOTE: *It is not necessary to remove the planet sets, first turbine shaft, and output shaft assembly to remove and reinstall the pump seal or the complete pump-reverse piston assembly.*

5-297

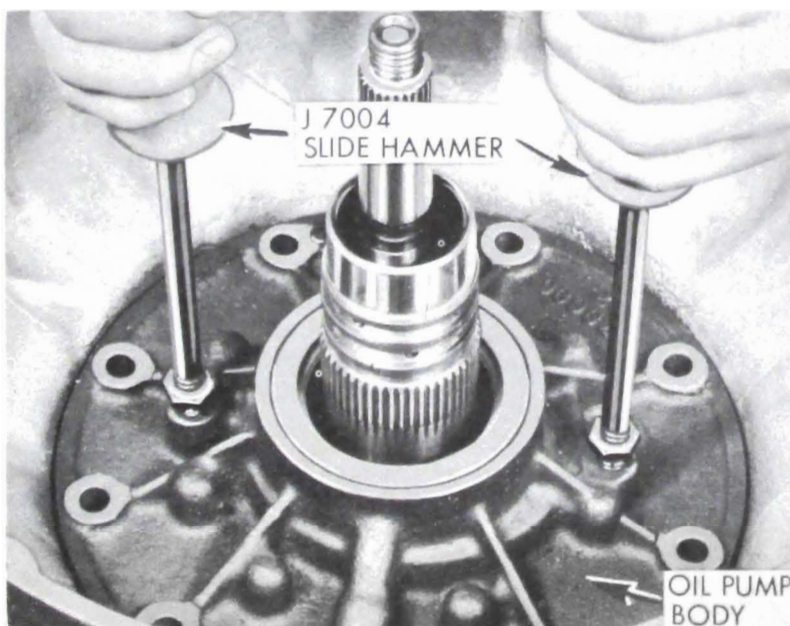
5-39 REACTION SHAFT AND FLANGE, PUMP, REVERSE PISTON ASSEMBLY: REMOVAL, DISASSEMBLY, INSPECTION AND REASSEMBLY



a. Removal of Stator Reaction Shaft and Flange, Pump and Reverse Piston Assembly

1. Remove ten pump body to case bolts ($\frac{9}{16}$ " socket).

5-298

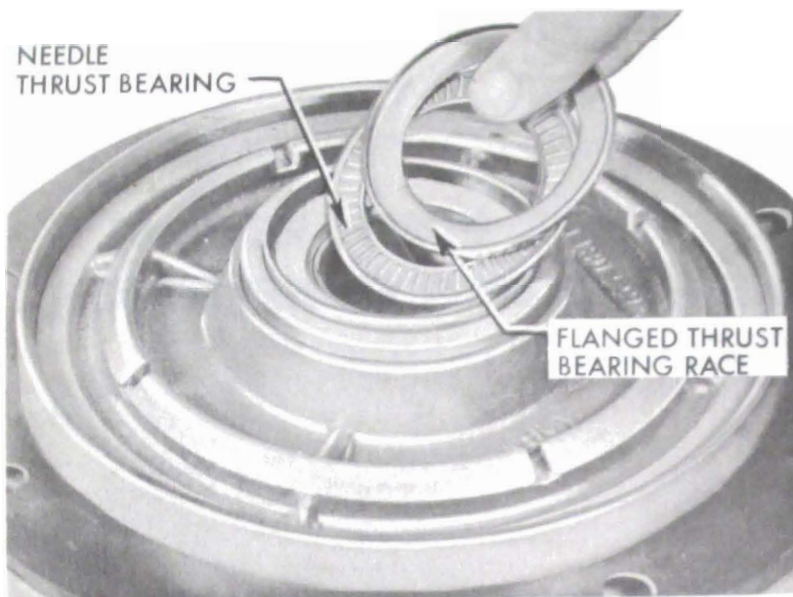


2. With transmission front end up, install two J-7004 slide hammers in tapped holes of pump body and hammer evenly to remove pump, stator reaction shaft and flange, and reverse clutch piston assembly. Set assembly on bench and remove slide hammers.

Refer to paragraph 5-48 for installation of pump-reaction shaft and flange assembly.

5-299

5-134

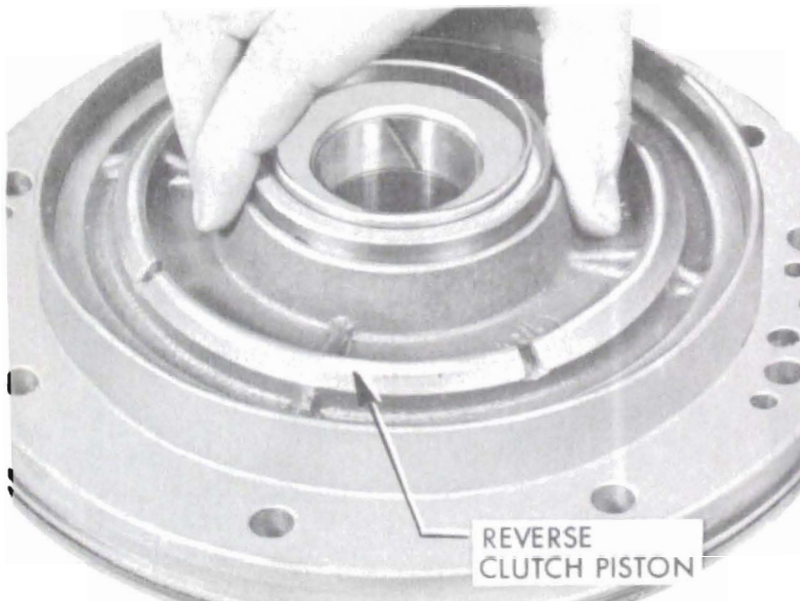


b. Disassembly, Inspection and Reassembly of Stator Reaction Shaft and Flange, Pump, and Reverse Piston Assembly

1. Remove needle thrust bearing and flanged rear thrust bearing race (between stator reaction shaft and front planet ring gear assembly). Remove reaction flange to case gasket.

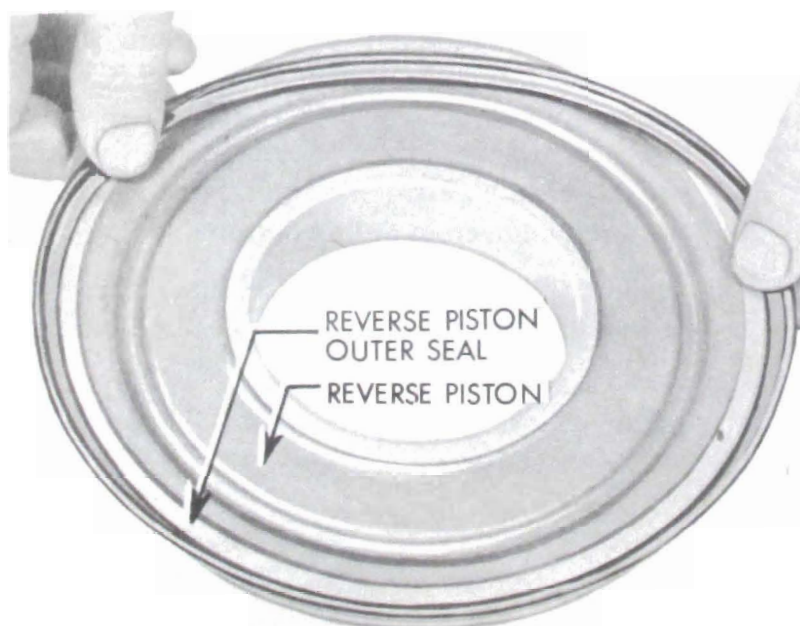
NOTE: *This bearing and rear race may have stuck to front planet set ring gear carrier during disassembly.*

5-300



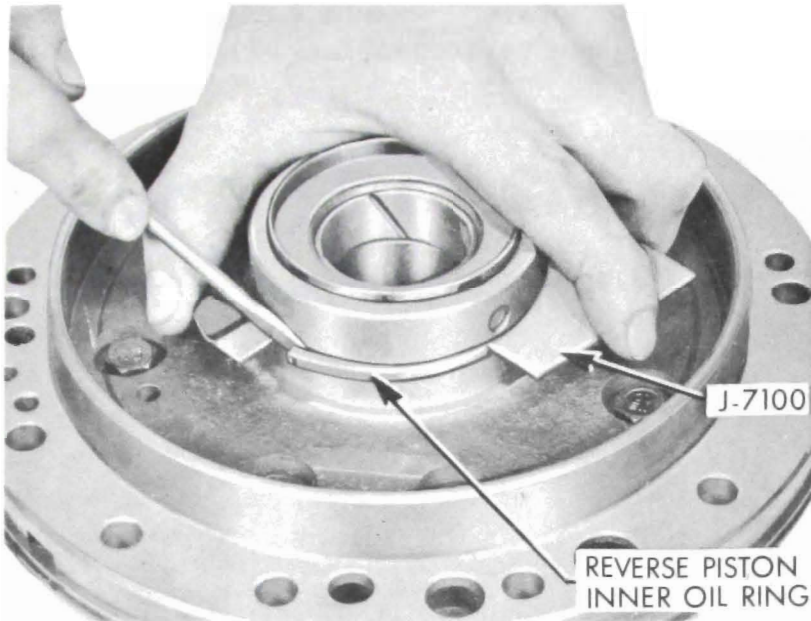
2. Remove reverse clutch piston. Use pliers to grip ribs of piston if piston sticks in bore.

5-301



3. Remove and discard reverse piston seal. Examine bore of piston for nicks, scratches, or burrs.

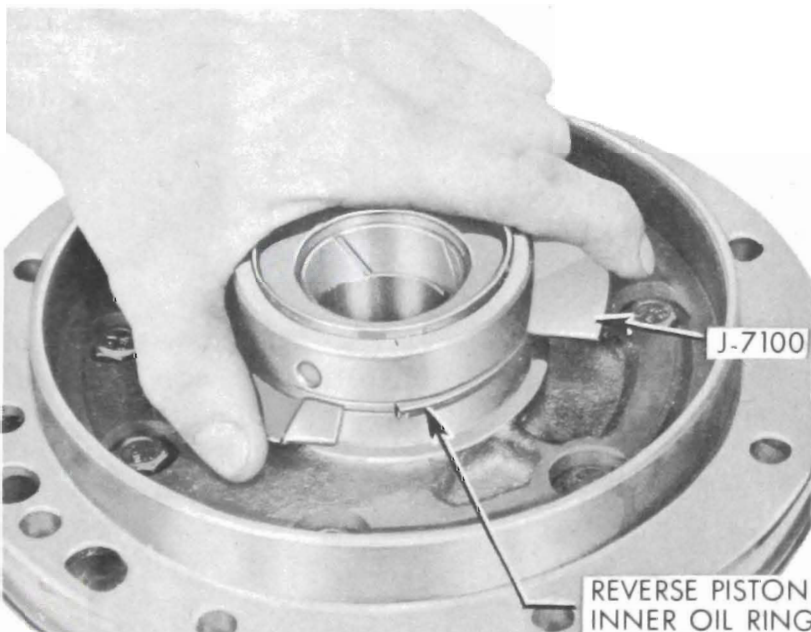
5-302



4. On jobs equipped with cast iron inner oil rings: Inspect and if necessary to replace, unhook reverse piston oil ring, using Tool J-7100. Assemble tool on ring so ring is forced solidly in groove and movable arm contacts ring approximately $\frac{1}{4}$ " from end. Press in on movable arm and pry up free end of ring with small screwdriver. Release arm. Expand and remove ring.

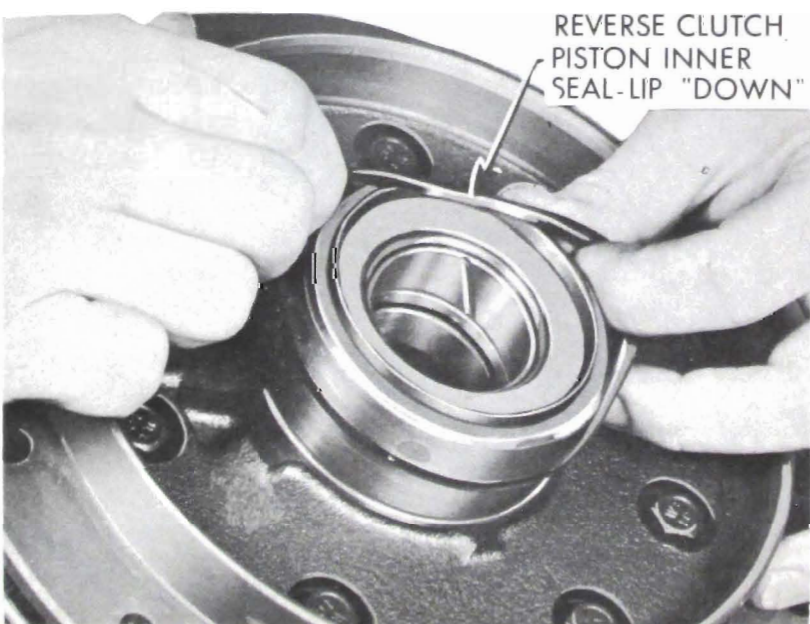
On jobs equipped with rubber inner oil seal: Pull off and discard rubber inner oil seal.

5-303



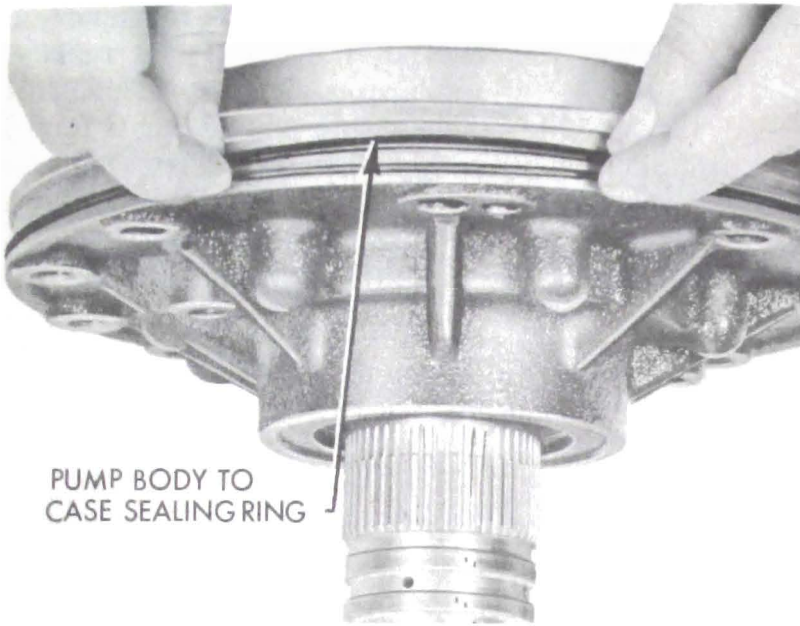
5. Expand and install new reverse piston oil sealing ring on reaction shaft. Hook ends using Tool J-7100. Assemble tool on ring so ring is forced solidly in groove and movable arm contacts ring approximately $\frac{1}{4}$ " from end. Press in on arm to hook ends.

5-304



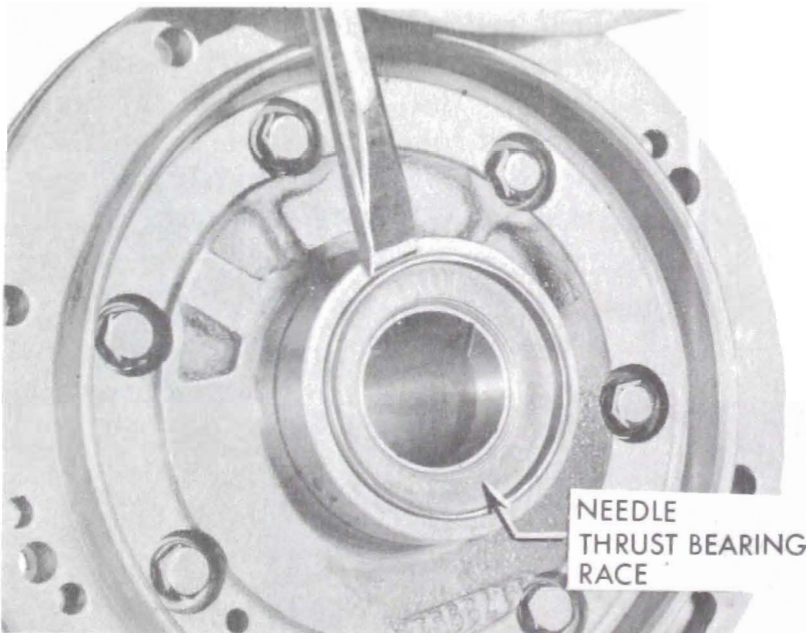
6. If job is equipped with rubber inner seal: Lubricate and carefully install new rubber seal lip "down". Use care to avoid damage to seal during installation.

5-305



7. Remove and discard pump body to case sealing ring (square section).

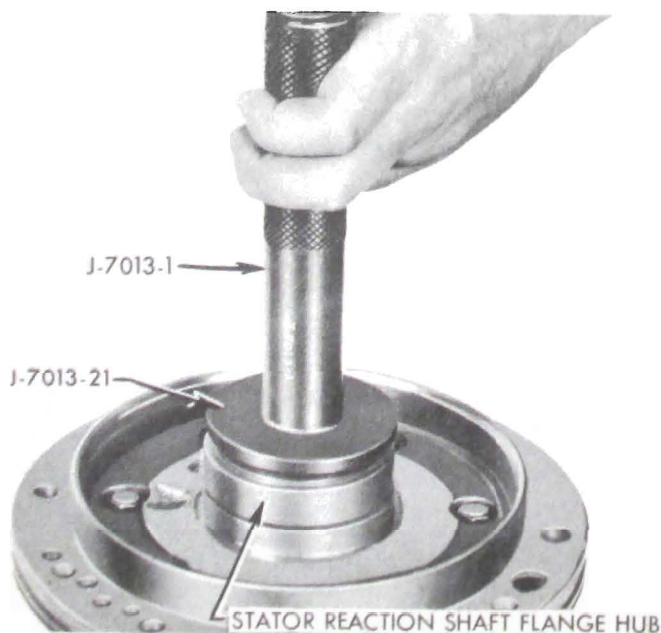
5-306



8. Inspect flanged needle thrust bearing race (between stator reaction shaft and front planet ring gear assembly). If race requires replacement, break it with a chisel and remove.

NOTE: This bearing race is specially hardened and is very brittle. It is not likely it will need replacement; however, if it is to be replaced, be careful to use eye protection as the race may shatter when struck with chisel.

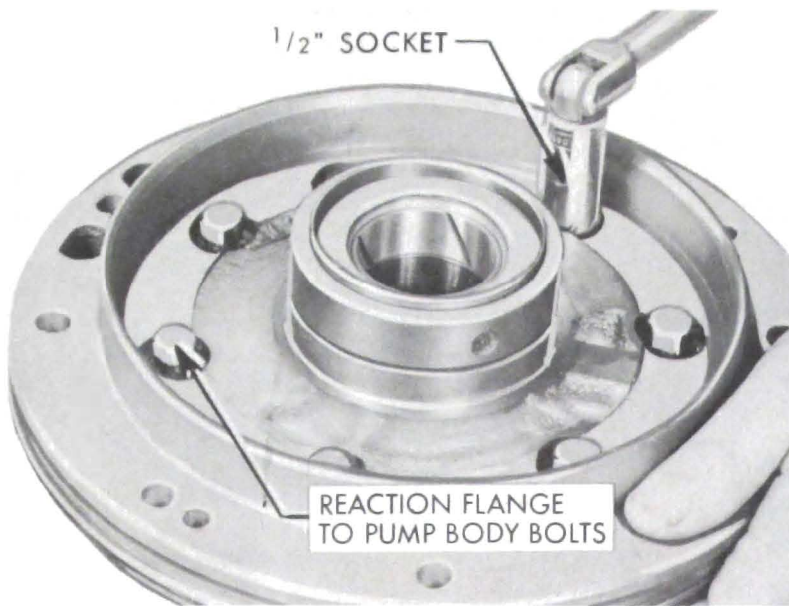
5-307



9. Inspect reaction shaft rear end; clean up all burrs and nicks.

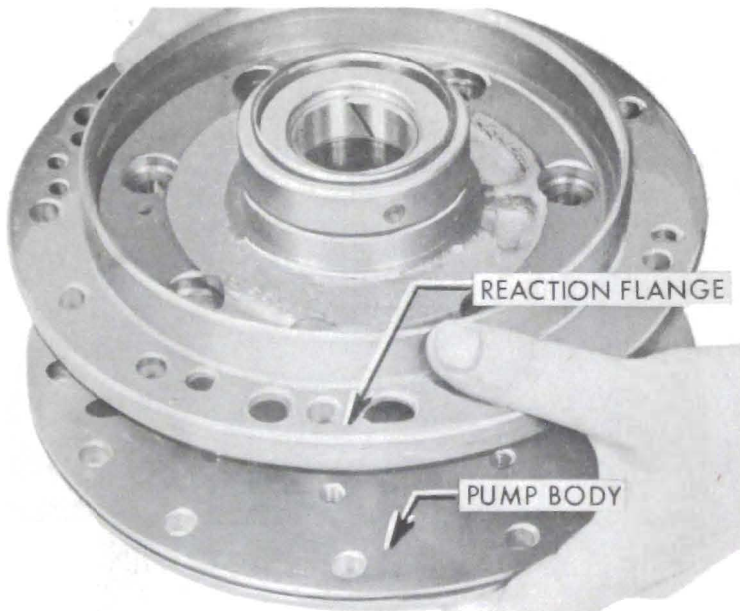
Install new flanged needle thrust bearing race squarely in reaction shaft using Tool J-7013-1 Handle, and J-7013-21 Installer.

5-308



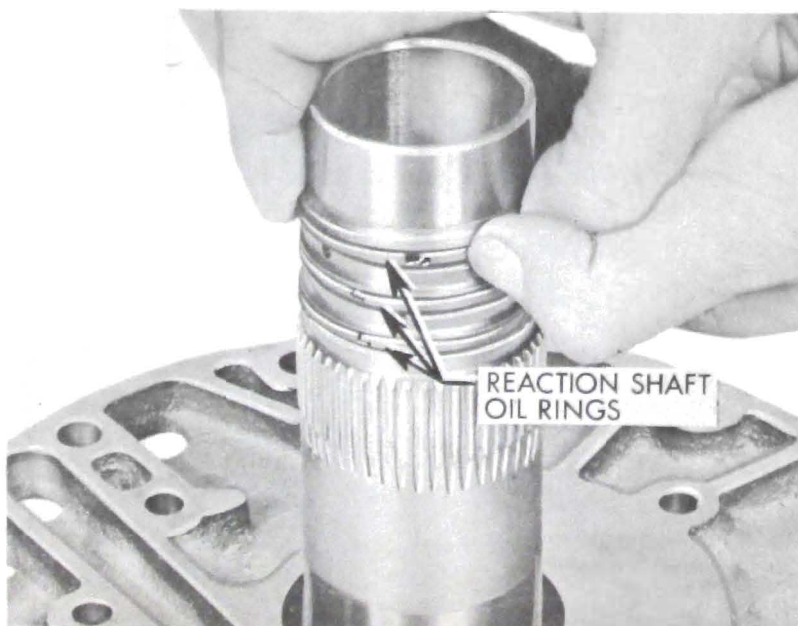
10. Remove seven reaction flange to pump body bolts (1/2" socket).

5-309



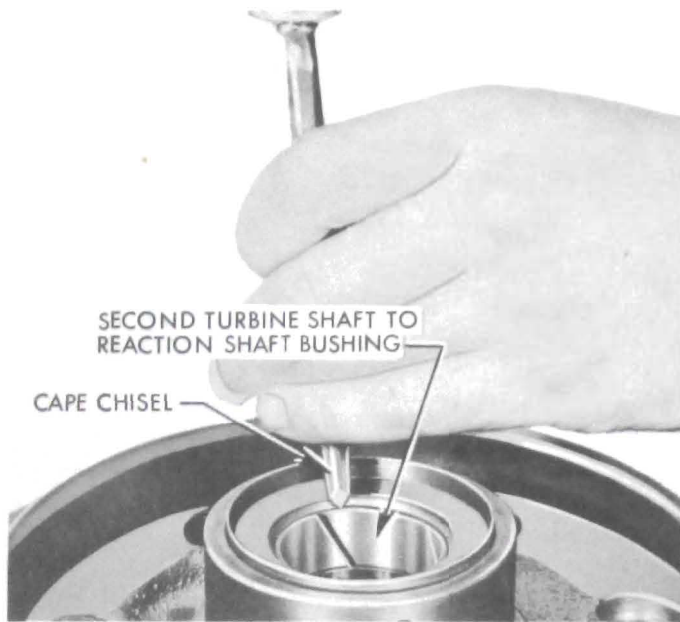
11. Separate pump body from reaction flange by tapping assembly on bench, shaft down.

5-310



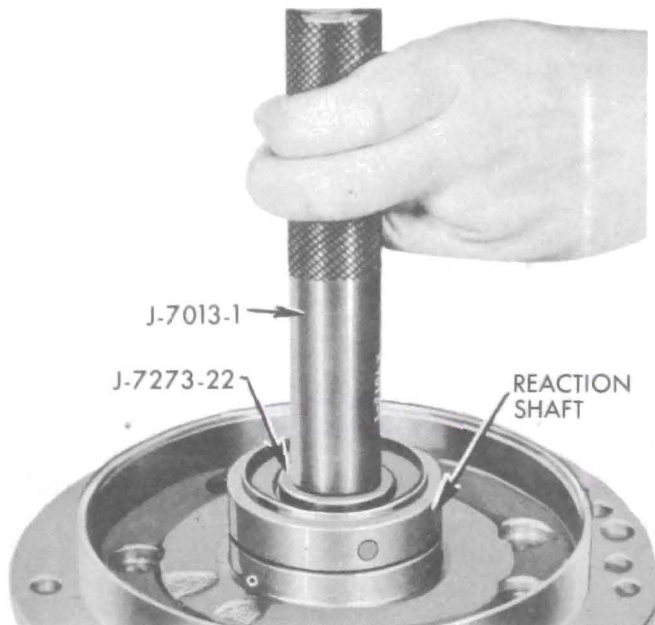
12. Inspect and if necessary to replace, unhook and expand the three reaction shaft oil rings. Remove from reaction shaft.

5-311



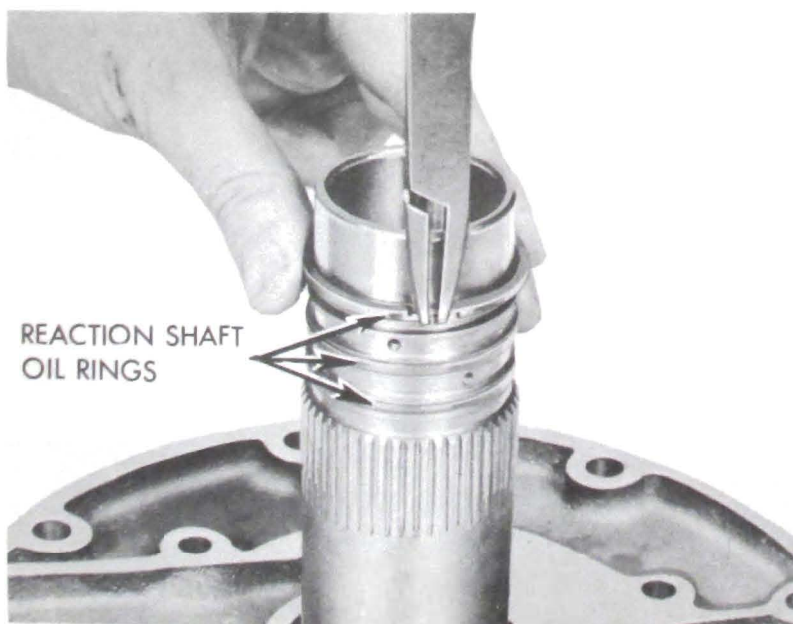
13. Examine second turbine shaft to reaction shaft bushing. If worn or scored, collapse bushing with cape chisel. Remove bushing.

5-312



14. Install new second turbine shaft to reaction shaft bushing using Tool J-7013-1 Handle and J-7273-22 Installer.

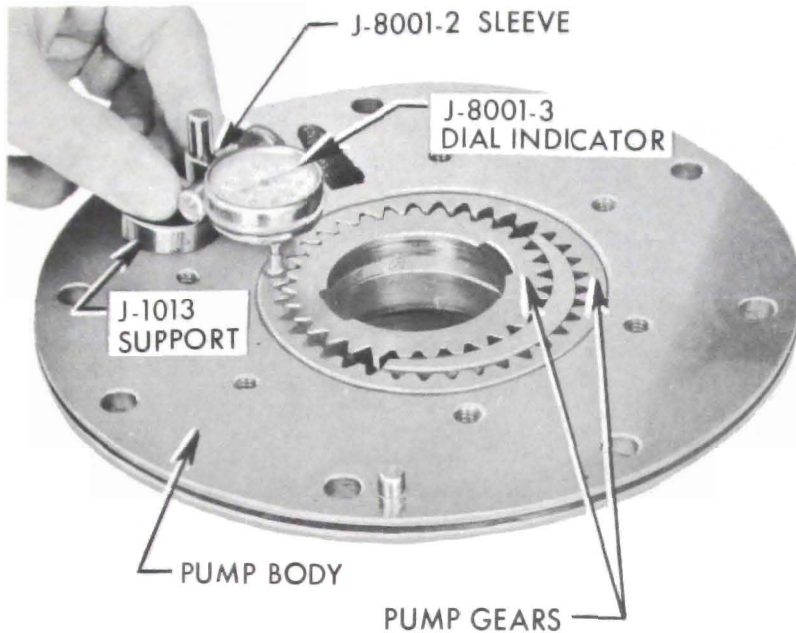
5-313



15. Using snap ring pliers, carefully expand and install three new reaction shaft oil rings in grooves.

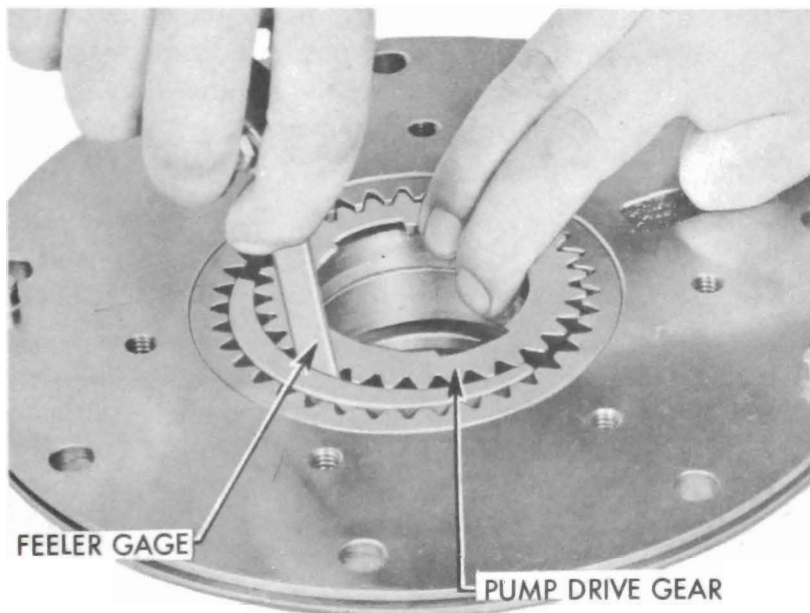
Hold one end of hooked ring firmly in groove and work other end of ring into position. Rotate hooked ring in groove to check for burrs or dirt that may be present.

5-314



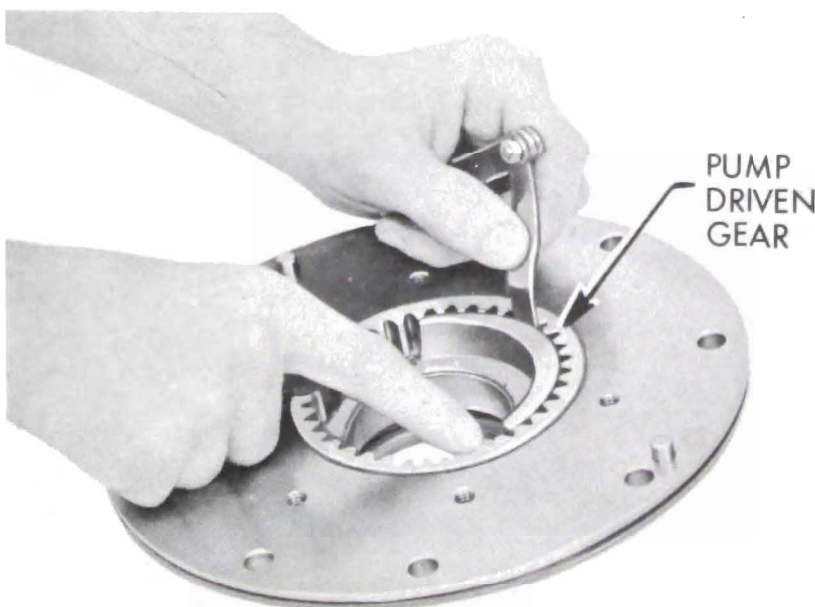
16. Check pump gear end clearance using Dial Indicator Support J-1013, J-8001-2 Sleeve, and J-8001-3 Dial Indicator. Zero indicator on pump body, then slide plunger to rest on gears, one at a time. Reading should be between .001" and .0025" below pump body. Replace pump if necessary.

5-315



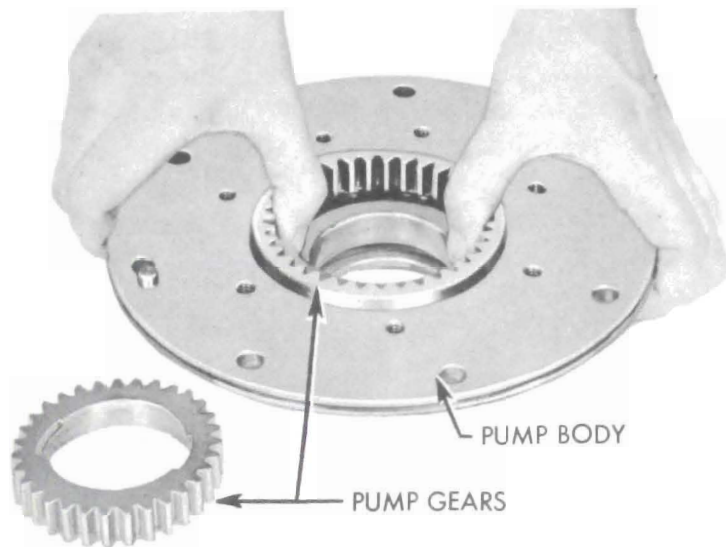
17. Hold drive gear away from crescent and check gap between gear and crescent with a .009" feeler gauge and then a .017" feeler gauge. The .009" gauge should "go" and the .017" should "not go". If the .009" does "not go" the clearance is less than .010" required. If the .017" "goes" the clearance is more than the .016" maximum allowed. Replace pump if necessary.

5-316



18. Hold pump driven gear away from crescent and check gap between gear and crescent with a .005" feeler gauge and then a .010" feeler gauge. The .004" gauge should "go" and the .010" should "not go". If the .004" does "not go", the clearance is less than .005" required. If the .010" "goes", the clearance is more than the .009" maximum allowed. Replace pump if necessary.

5-317

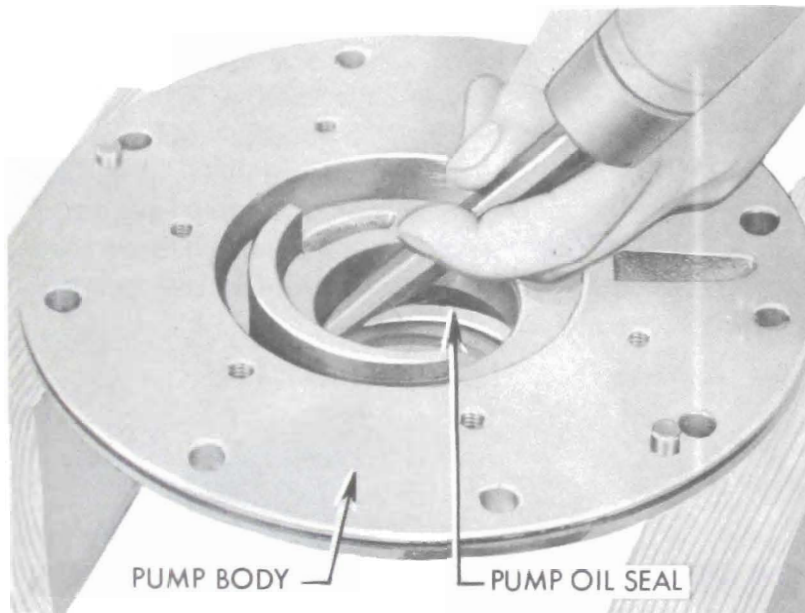


19. Remove pump gears by lifting straight up.

NOTE: *All surfaces of these gears are accurately ground and must be protected against nicks, scratches and dirt of any kind.*

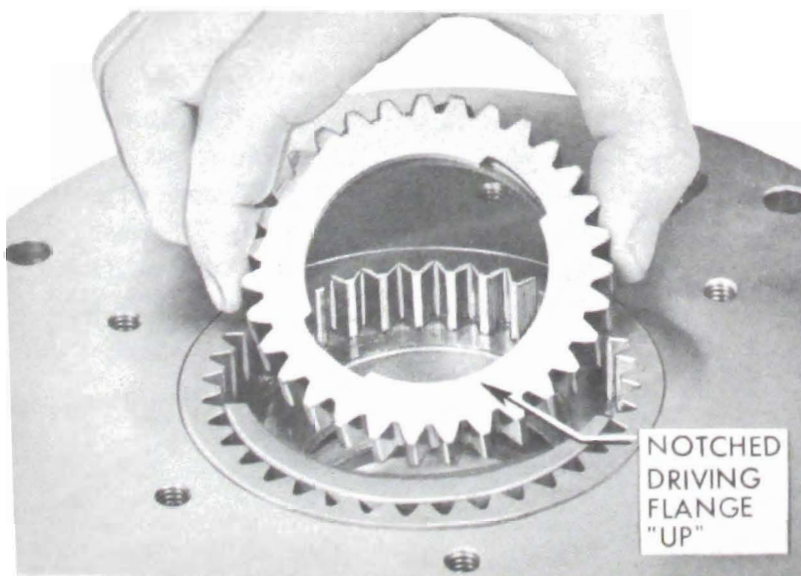
Examine pump bushing. If bushing is badly scored or worn, pump assembly must be replaced.

5-318



20. If pump seal is to be replaced at this time rather than with pump in transmission, suitably support pump body and drive out pump seal using drift and hammer.

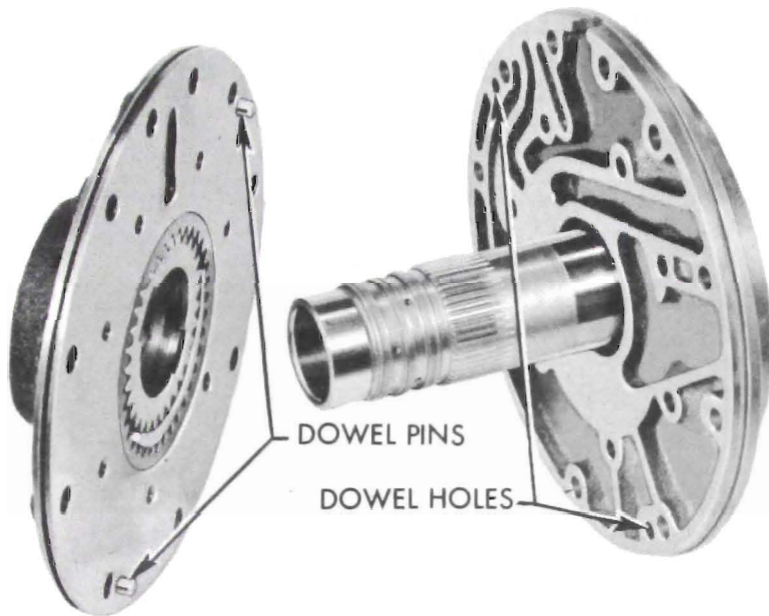
5-319



21. *Clean and lubricate pump gears and install in pump body by lowering straight down into body. Do not use force.*

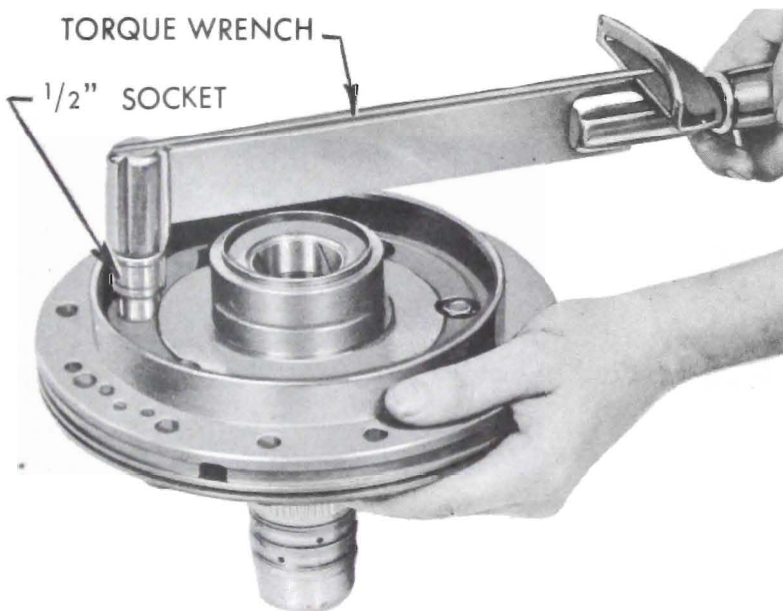
NOTE: *Pump drive gear must be installed with notched driving flange "up" and counter-bored side toward pump seal.*

5-320



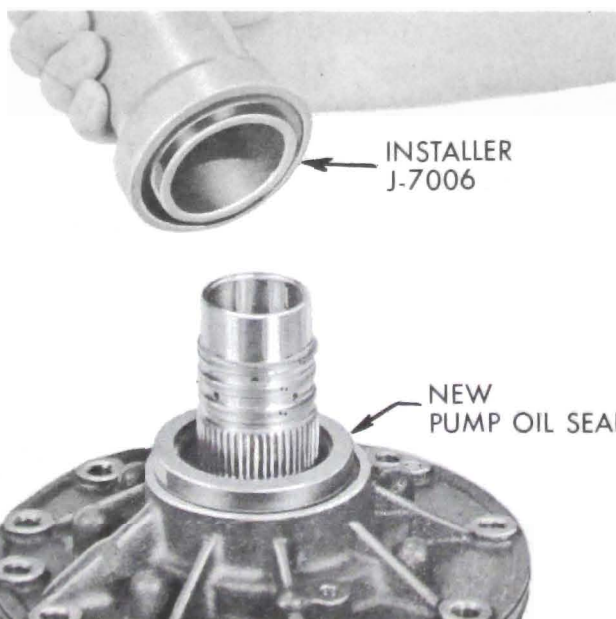
22. Lubricate and carefully assemble pump assembly to reaction shaft flange assembly. Note position of dowel pins in pump body and holes in reaction shaft flange. The surfaces of these two parts *must* be clean before assembly.

5-321



23. Install seven $\frac{5}{16}$ "-18 x $\frac{1}{8}$ " reaction shaft flange to pump body bolts ($\frac{1}{2}$ " socket). Tighten alternately and evenly to 20-25 ft. lbs. using a torque wrench.

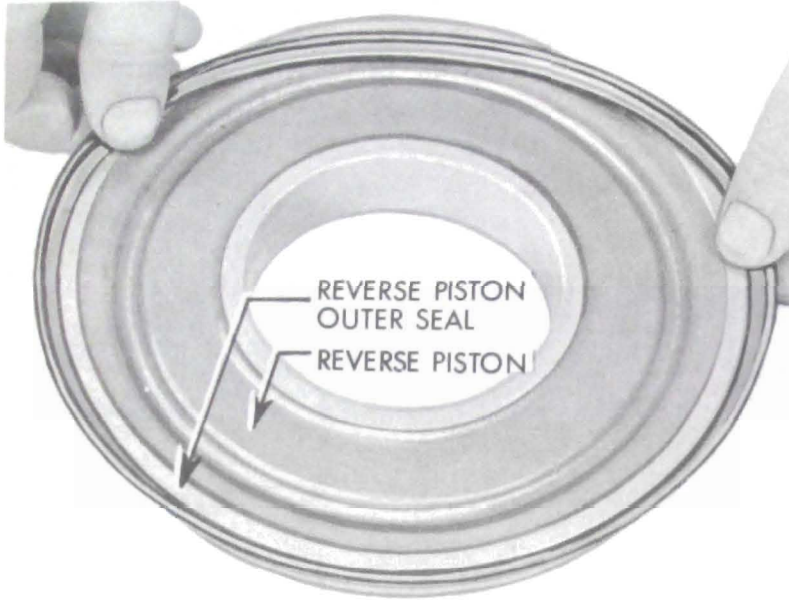
5-322



24. If seal was removed, suitably support assembly to protect needle bearing race and drive new pump seal into pump body using hammer and Seal Installer J-7006.

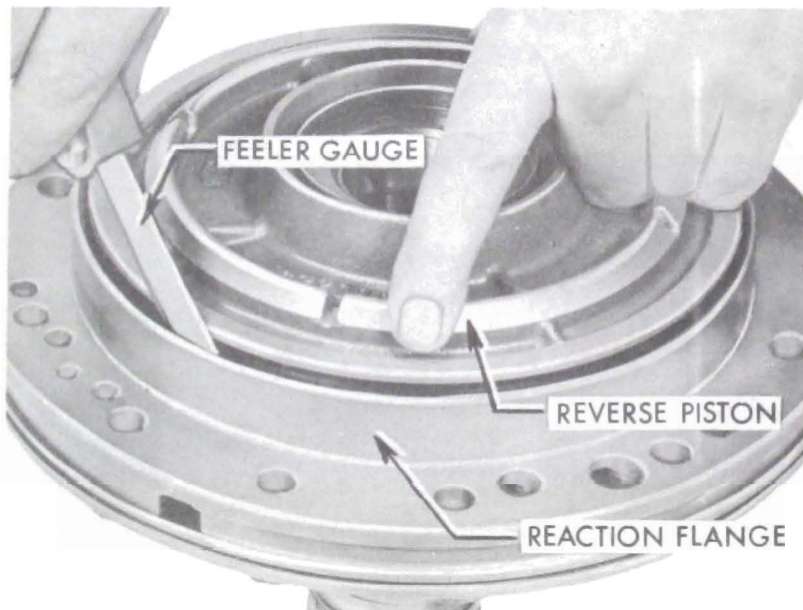
NOTE: *Reaction shaft pilots tool to insure square seating of seal.*

5-323



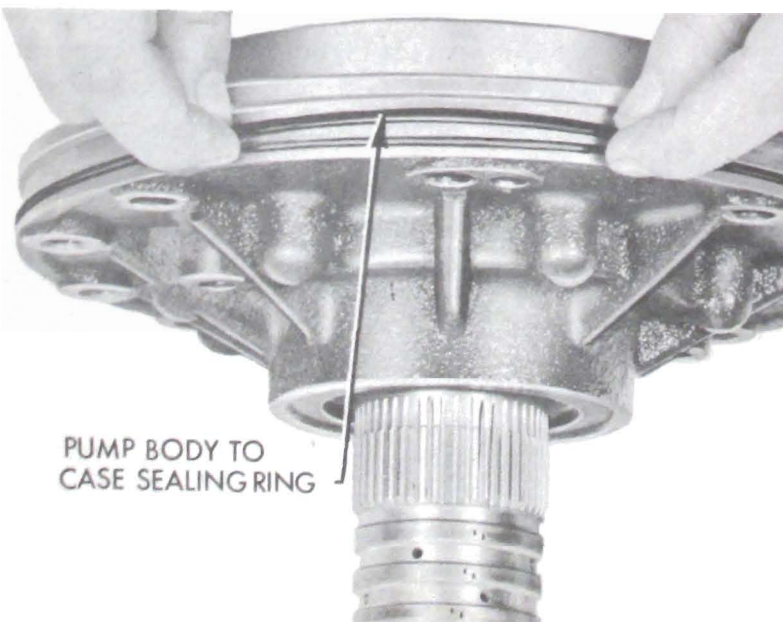
25. Install new reverse piston outer seal with lip away from ribbed side of piston.

5-324



26. Lubricate reverse piston seals and install piston assembly in bore of reaction flange by running a smooth edged feeler gauge around reverse piston to keep lip of outer seal down. Use care to prevent damage to seals.

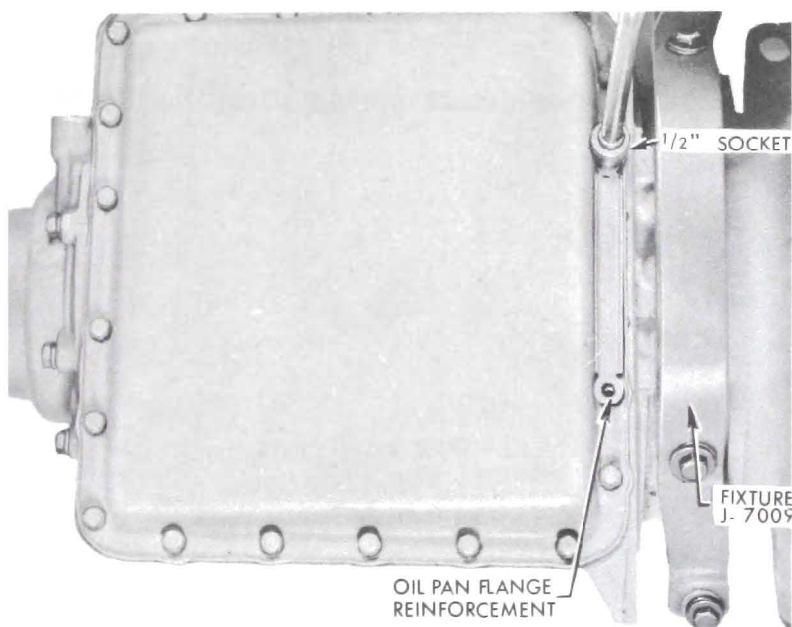
5-325



27. Install new pump body to case sealing ring squarely in groove of pump body. If further work is to be done on transmission, set assembly aside. Refer to paragraph 5-48 for installation of reaction shaft-pump assembly.

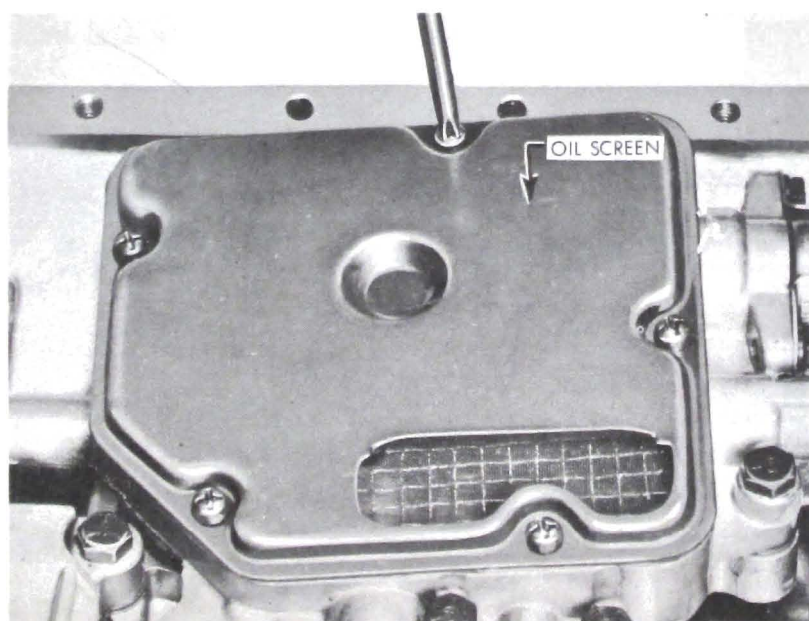
5-326

5-40 OIL PAN AND SCREEN REMOVAL



1. With transmission upside down, remove twenty oil pan bolts ($\frac{1}{2}$ " socket), oil pan flange reinforcement and oil pan. Remove and discard oil pan gasket.

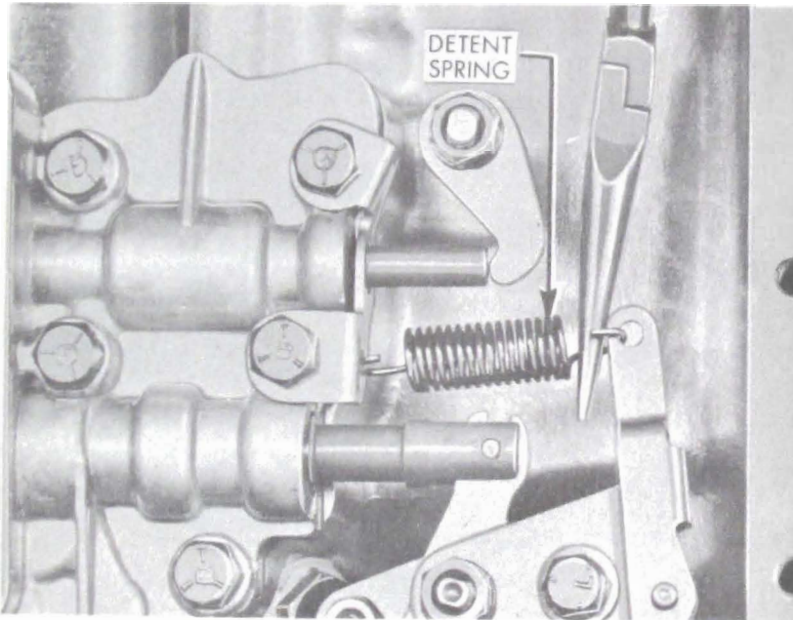
5-327



2. Remove five oil screen screws, remove screen. Refer to paragraph 5-54 for installation of oil pan and oil screen.

5-328

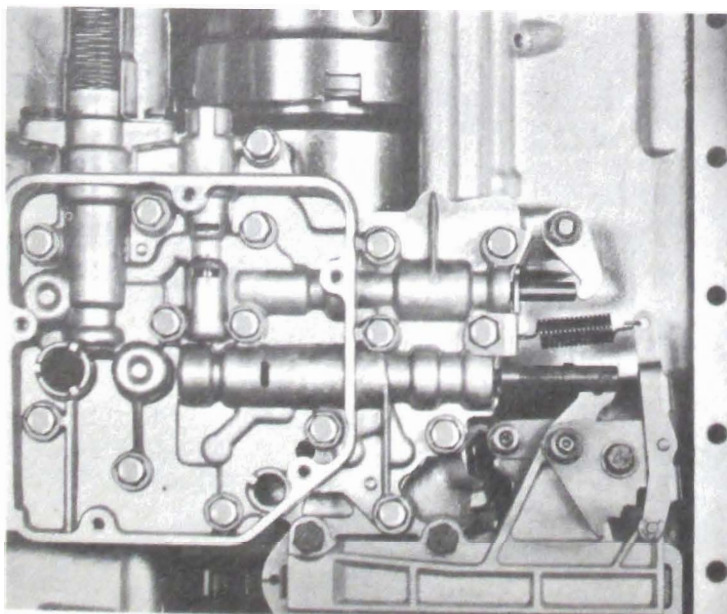
5-41 VALVE BODY: REMOVAL, DISASSEMBLY, INSPECTION AND REASSEMBLY



a. Removal of Valve Body

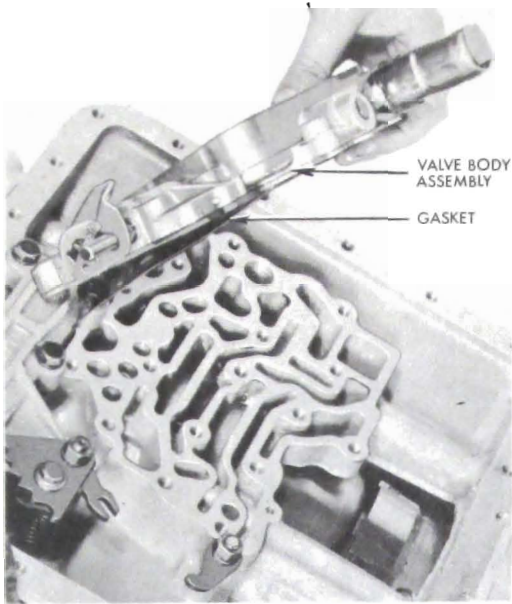
1. Remove detent spring using needle nose pliers.

5-329



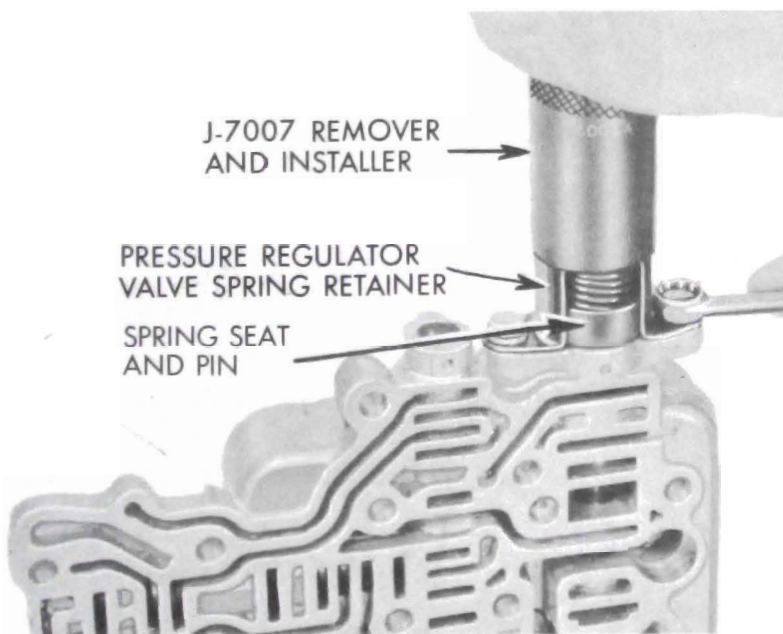
2. Remove sixteen valve body bolts and lock washers ($\frac{1}{2}$ " socket).

5-330



3. Remove valve body assembly and gasket carefully to avoid drooping valves. Examine gasket for evidence of leakage or improper installation.

5-331



b. Disassembly and Inspection of Valve Body

Use the exploded view of the valve body as a guide during disassembly.

1. Remove pressure regulator valve spring retainer and spring seat and pin using Tool J-7007 and $\frac{7}{16}$ " wrench.

5-332

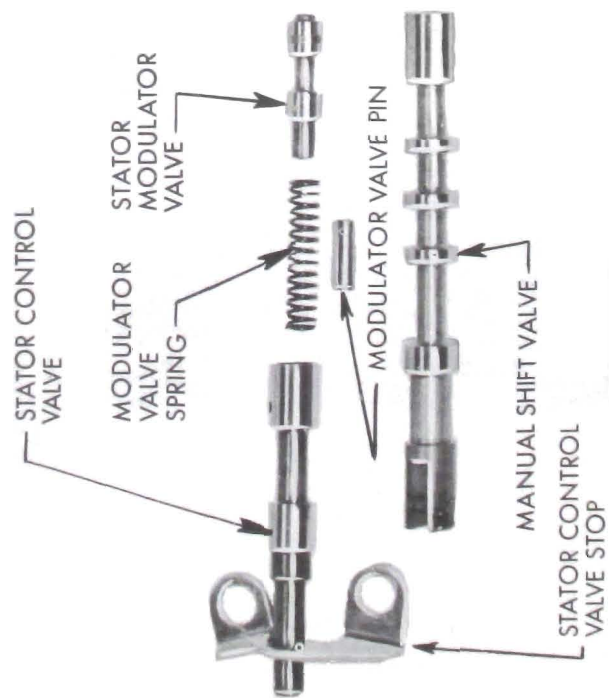
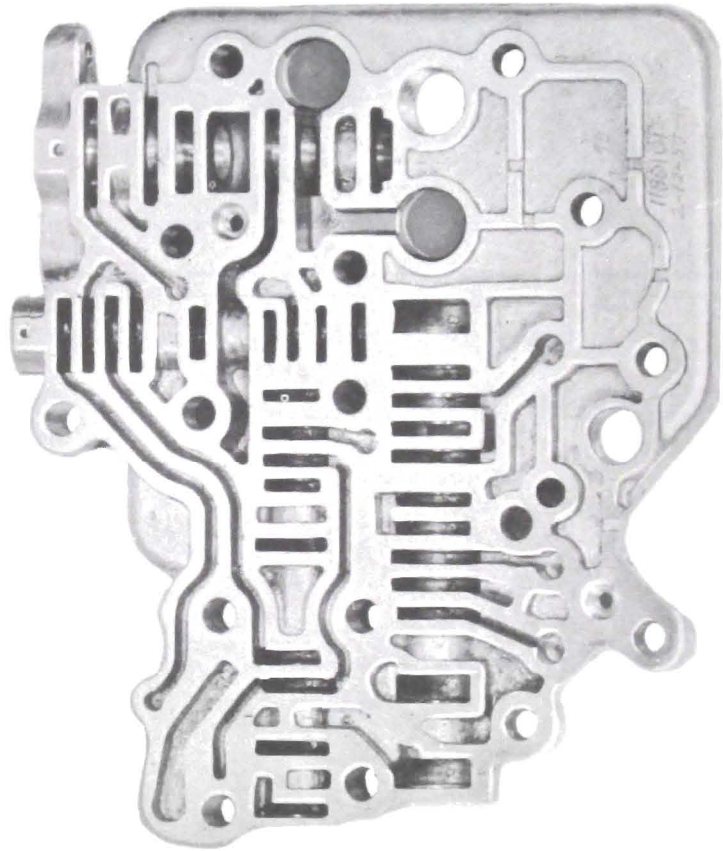
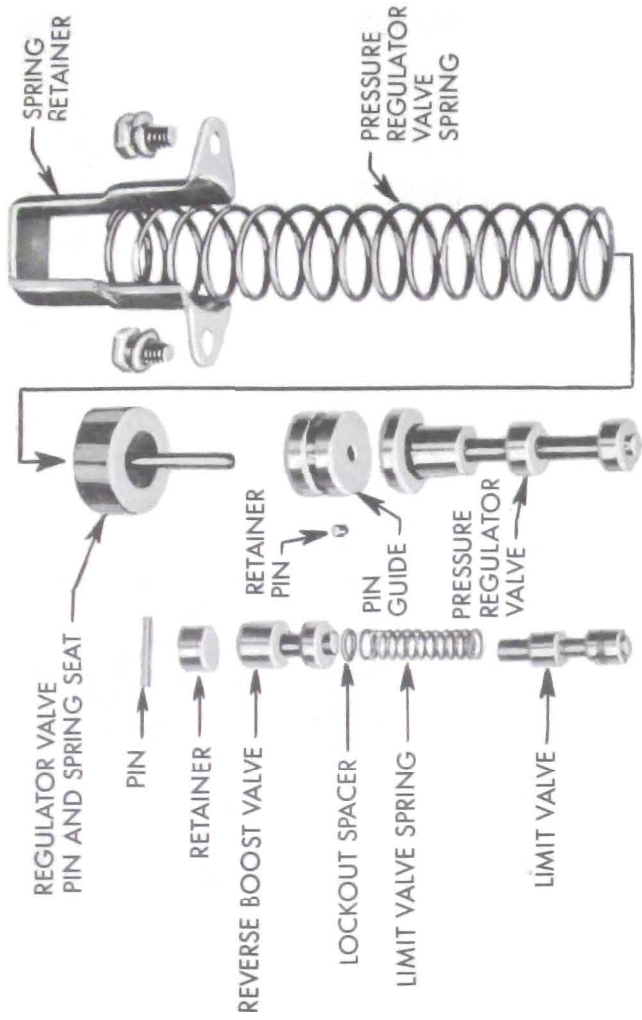


Figure 5-333—View of Valve Body Disassembled

2. Remove manual shift valve.
 3. Remove stator control valve and stop.
 4. Remove stator modulator valve, valve spring, and valve pin by rapping valve body against hand.
 5. Remove two valve body cover plate screws with cross recess head screwdriver. Remove plate and gasket.
 6. Examine gasket for evidence of leakage or improper installation.
 7. Remove pressure regulator guide retaining pin by rapping valve body against hand.
 8. Remove pressure regulator valve pin guide by rapping valve body against hand.
 9. Slide out pressure regulator valve.
 10. While holding in on retainer, remove reverse boost valve retainer pin with needle nose pliers.
 11. *NOTE: Retainer and valve may pop out when pin is removed. Be ready to catch valve and retainer to prevent damage.*
 12. Remove reverse boost valve retainer.
 13. Remove reverse boost valve, boost valve lockout spacer, limit valve spring, and limit valve by rapping valve body against hand.
 14. Thoroughly clean valve body and valves in solvent, and inspect for evidence of wear or damage due to dirt or improper assembly. Be sure small holes in limit, stator modulator, and pressure regulator valves are not plugged with foreign material.
 15. Dry valve body with clean air blast to be absolutely certain no foreign material is left in valve body cavities.
-

c. Assembly of Valve Body

Use the exploded view of the valve body as a guide during assembly (Figure 5-333).

1. Install limit valve, grooved land first. Shake valve body to allow limit valve to reach proper position.

NOTE: Limit valve and stator modulator valve are identical and interchangeable.

2. Install limit valve spring (longer than stator modulator valve spring) and reverse boost valve lockout spacer.

3. Install reverse boost valve, narrow land first.

4. Insert reverse boost valve retainer. Depress retainer against spring pressure and install retainer pin flush with surface of valve body.

5. Insert pressure regulator valve, small end first.

6. Insert pressure regulator valve pin guide so end is just flush with edge of valve body.

7. Install pressure regulator valve pin guide retainer pin into valve body and groove of pin guide.

8. Insert stator modulator valve into valve body, grooved land first. Shake valve body to allow modulator valve to reach proper position.

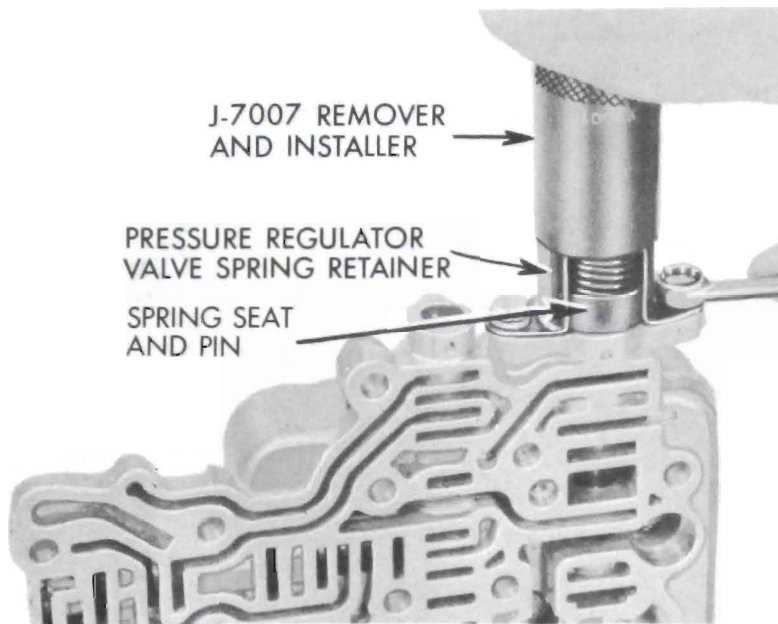
9. Install stator modulator valve spring.

10. Install stator modulator valve pin inside modulator valve spring.

11. Install stator control valve.

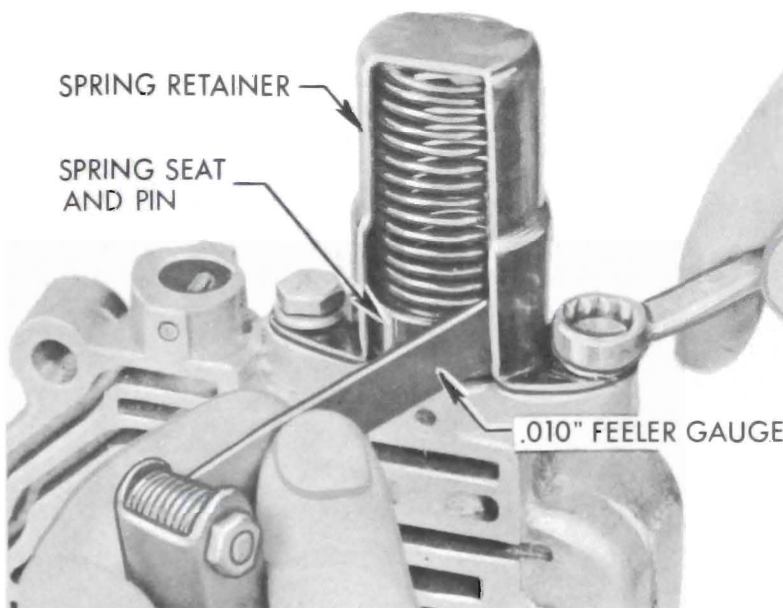
12. Install shift control valve, slotted end out.

13. Insert pressure regulator valve pin and spring seat into pin guide.



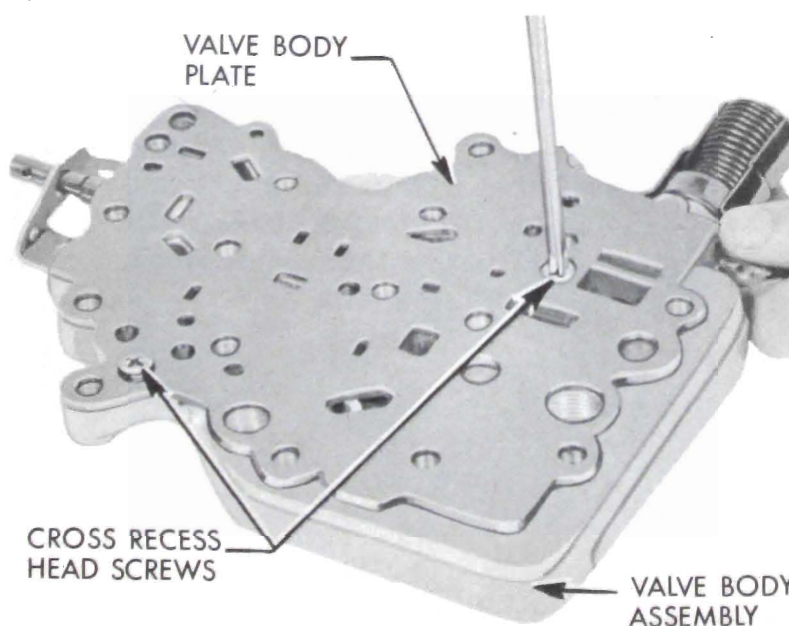
14. Install pressure regulator valve spring and spring retainer using Tool J-7007.

5-334



15. Before tightening retainer bolts, check clearance between spring seat and retainer with a .010" feeler gauge. Spring seat must rotate and move without touching retainer. Install stator control valve stop on stator control valve.

5-335



16. Be certain that surface of valve body is clear of dirt and has no burrs. Install new valve body plate to valve body gasket. Check and be certain that the pressure regulator valve pin guide retaining pin is in place. Install valve body plate with two cross recess screws. Be certain that valve body plate gasket lines up with holes in valve body.

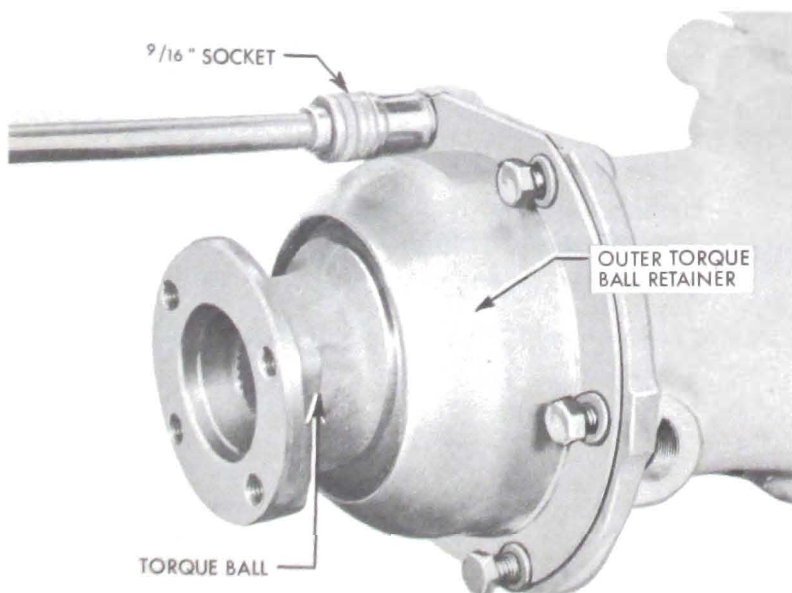
5-336



17. If further work is to be done on transmission, set sub-assembly aside. Refer to paragraph 5-52 for installation of valve body.

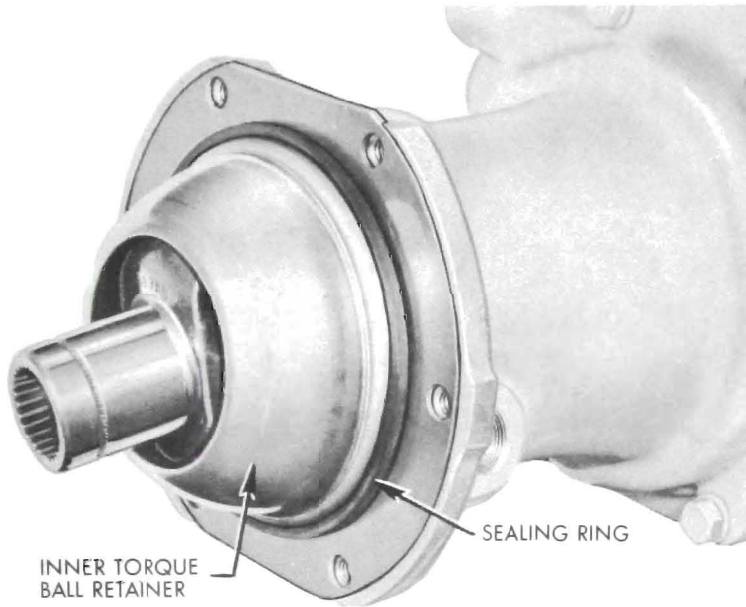
5-337

5-42 TORQUE BALL, TORQUE BALL RETAINERS AND UNIVERSAL JOINT REMOVAL AND INSPECTION



1. Remove six torque ball retainer bolts ($\frac{9}{16}$ " socket). Remove outer torque ball retainer. Remove torque ball. Examine rubber bonded to torque ball for tears or other failure that might cause leaks. Examine outer torque ball retainer for roughness or dents that could damage torque ball; discard if defective.

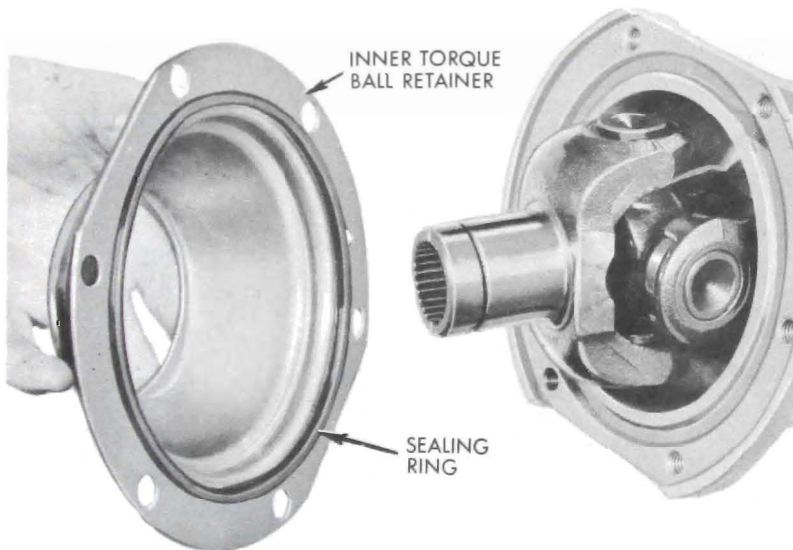
5-338



2. Remove sealing ring from outside of inner torque ball retainer.

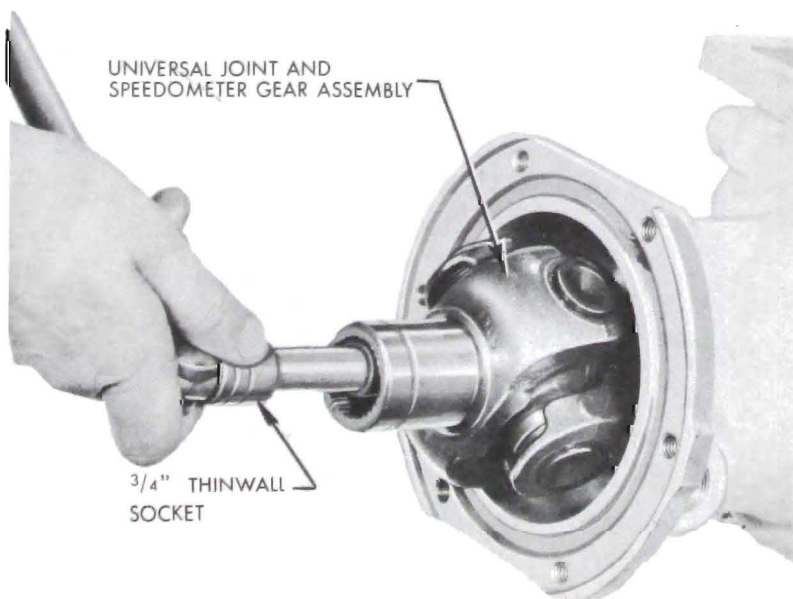
Examine sealing ring for cracks or defects that might cause leaks; discard if defective. Examine surface of inner torque ball retainer for score marks or roughness that could damage torque ball; discard if defective.

5-339



3. Remove inner torque ball retainer. Remove sealing ring, inner torque ball retainer to rear bearing retainer. Examine sealing ring; discard if defective.

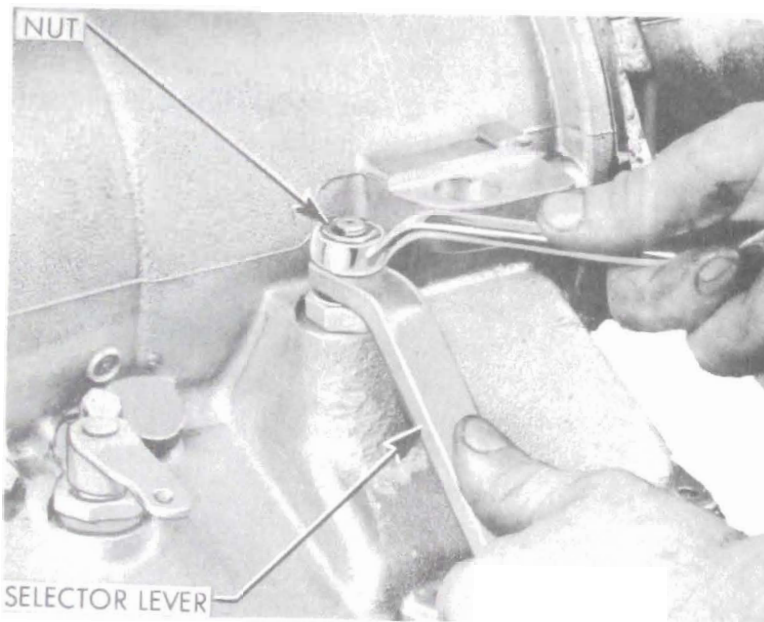
5-340



4. Engage parking lock pawl. Using a $\frac{3}{4}$ " thin wall socket, remove special drilled U-joint bolt, lock washer and plain washer. Remove U-joint and speedo gear assembly. Check U-joint for radial looseness (worn bearings). Discard U-joint if not serviceable. Refer to paragraph 5-51 for torque ball and U-joint installation.

5-341

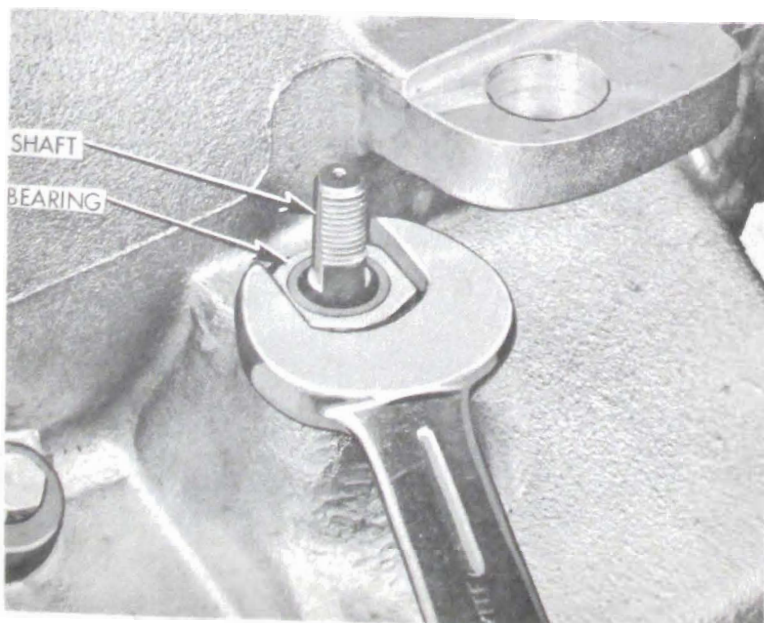
5-43 MANUAL CONTROL AND PARKING LOCK: REMOVAL, DISASSEMBLY, INSPECTION AND REASSEMBLY



a. Removal of Manual Control Shaft Lever Seal and Bearing

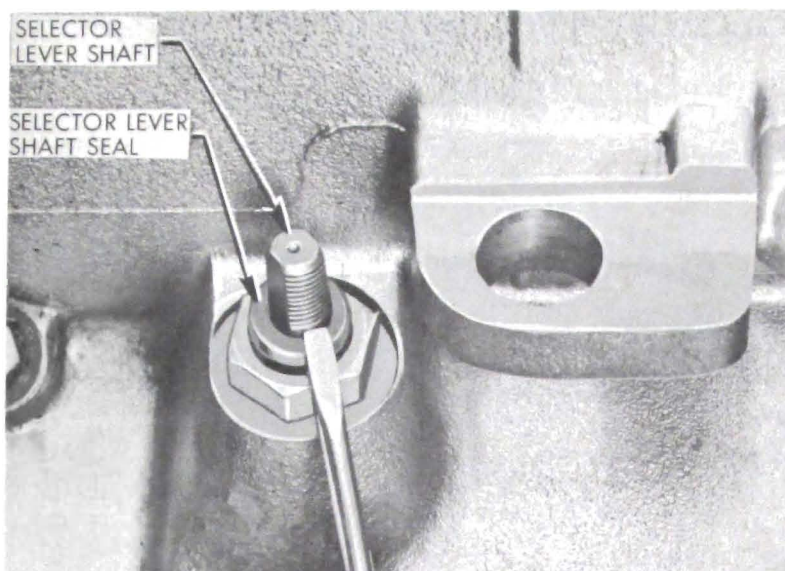
1. Remove transmission selector lever shaft nut ($\frac{5}{8}$ " wrench). Hold lever with hand while loosening nut to avoid damaging strain on internal parts.

5-342



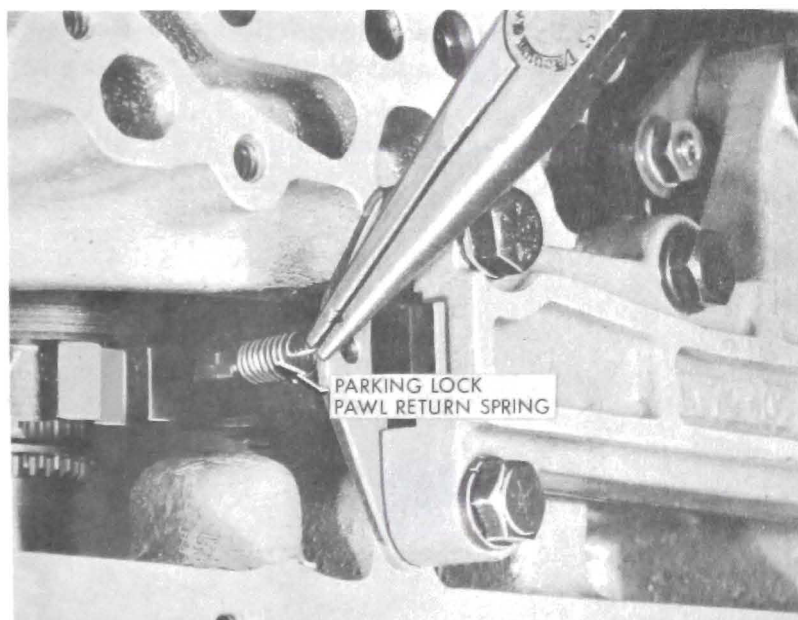
2. Remove selector lever shaft bearing and seal by threading bearing out of case. Examine bearing for evidence of wear. If bearing hole is out of round, replace the bearing and tighten to 40 ft. lbs. torque.

5-343



3. Check shaft seal for cracks or wear that might cause leaks; if seal is not serviceable, replace it. Install seal lip down in groove of shaft bearing by pressing in with screwdriver.

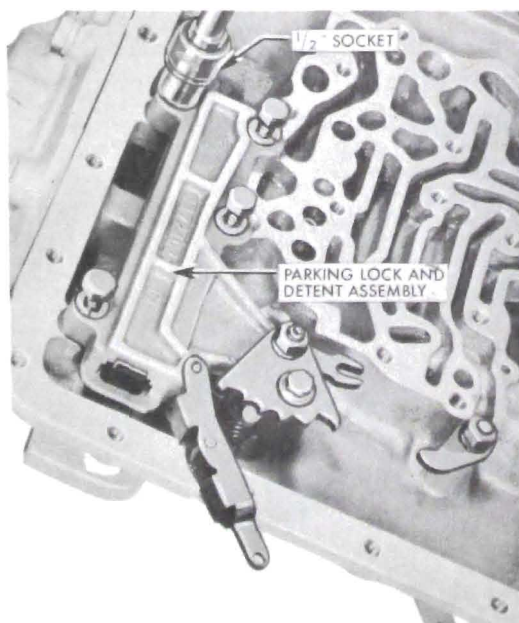
5-344



b. Removal of Manual Control and Parking Lock

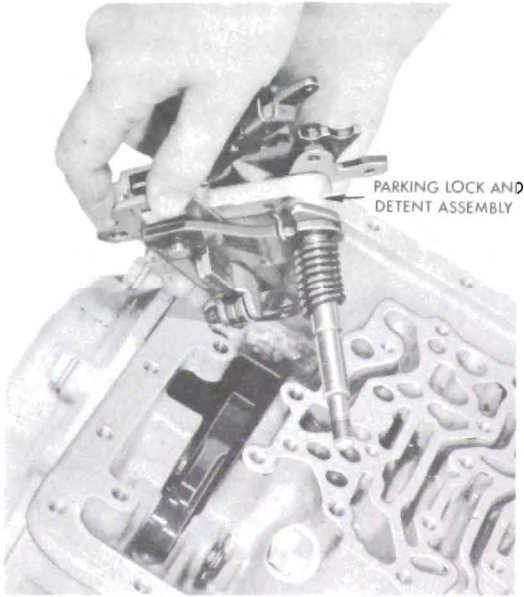
1. Remove parking lock pawl return spring using needle nose pliers.

5-345



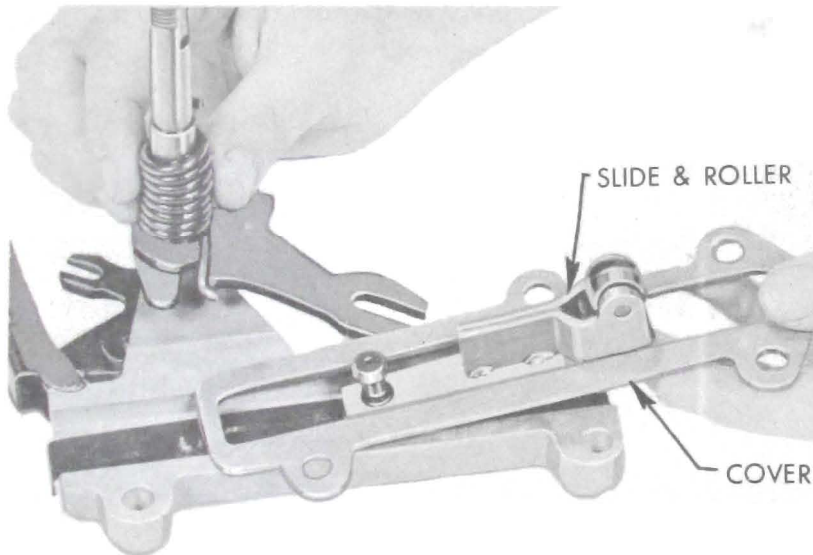
2. Remove four parking lock and detent assembly bolts ($\frac{1}{2}$ " socket).

5-346



3. Remove parking lock and detent assembly.

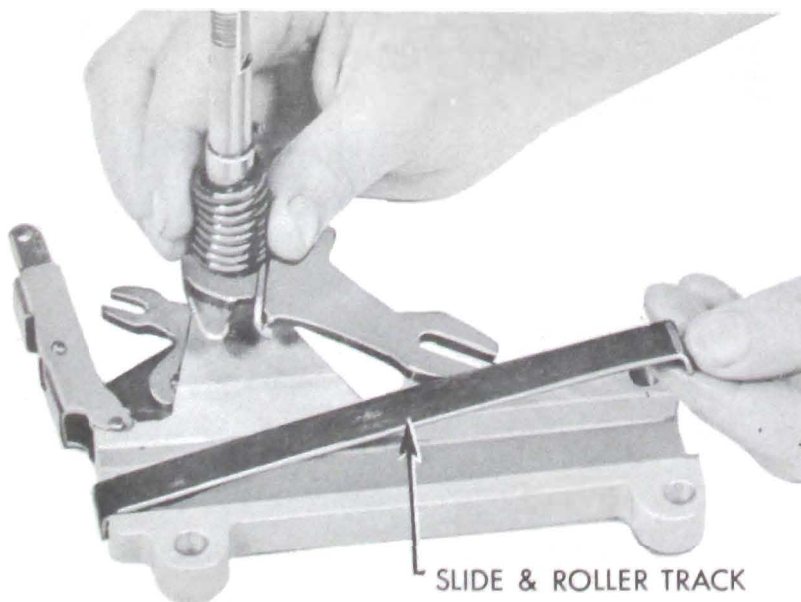
5-347



c. Disassembly, Inspection and Reassembly of Manual Control and Parking Lock

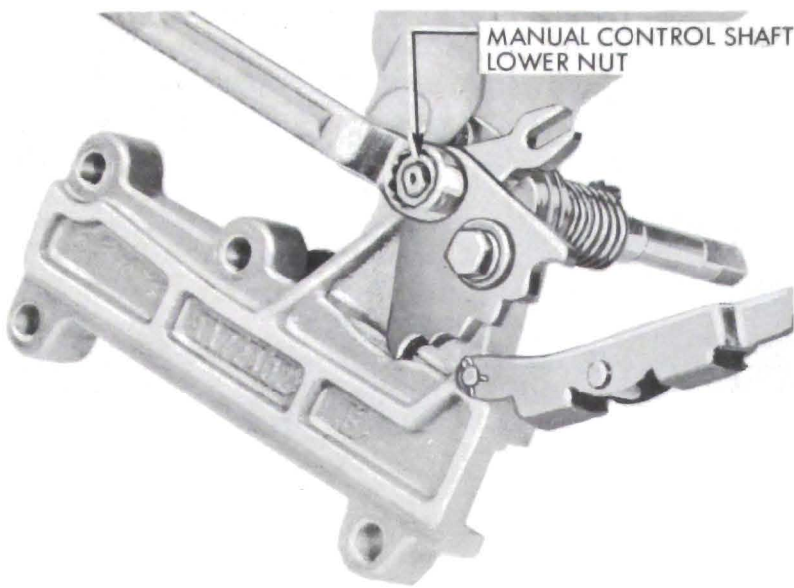
1. Remove slide and roller with slide and roller cover. Check for damaged or excessively worn rollers.

5-348



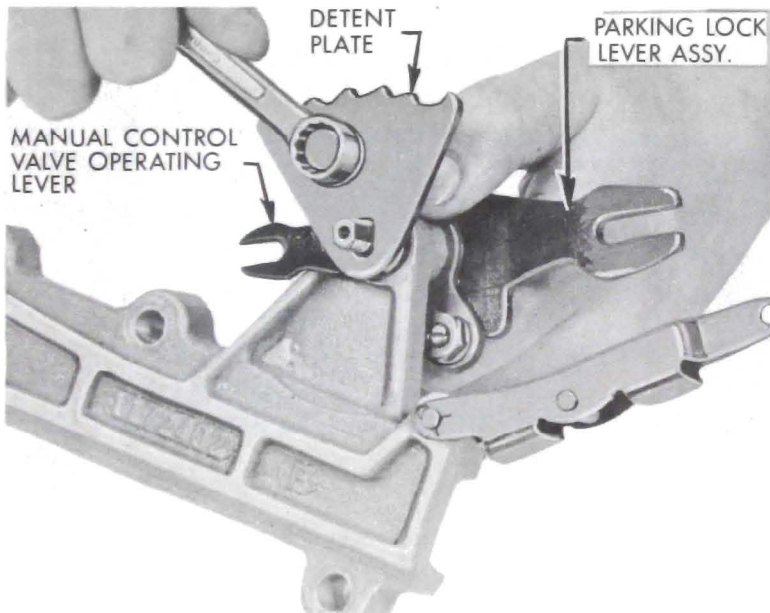
2. Remove slide and roller track. Check track for cracks or wear that could cause hard operation of the rollers.

5-349



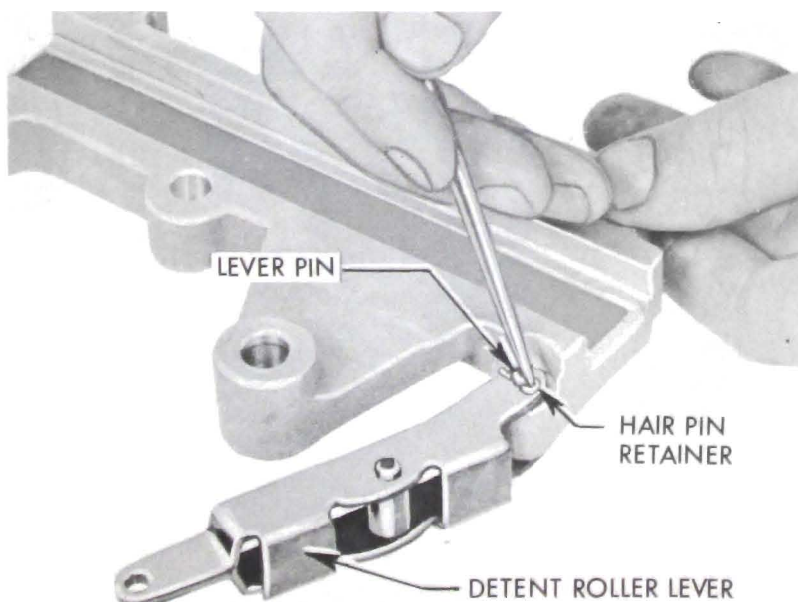
3. Remove manual control shaft lower nut (1/2" wrench).

5-350



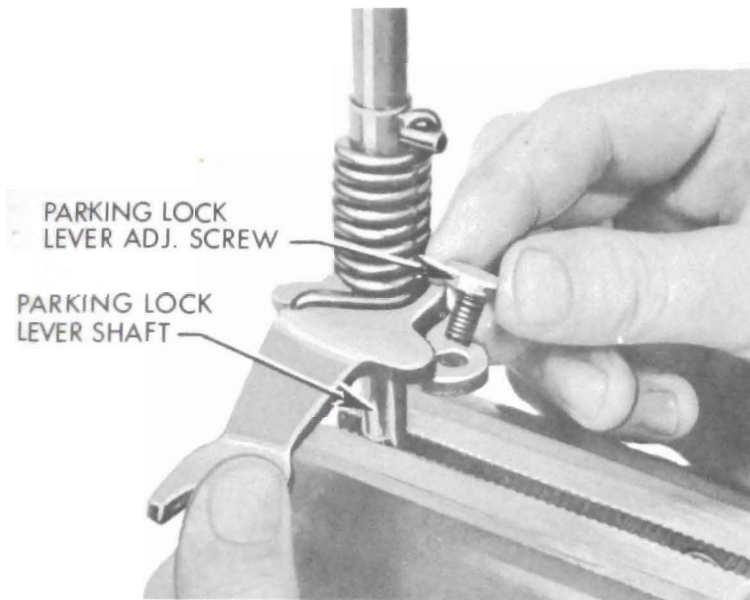
4. Remove bolt holding detent plate to manual control valve operating lever. Remove shaft and parking lock lever assembly from parking lock slide body.

5-351



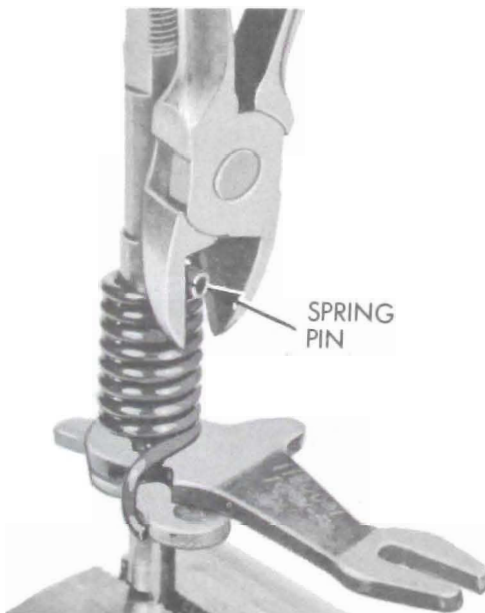
5. Remove hair pin retainer from detent roller lever pin, remove pin and roller lever. Check roller for excessive wear or free movement in lever.

5-352



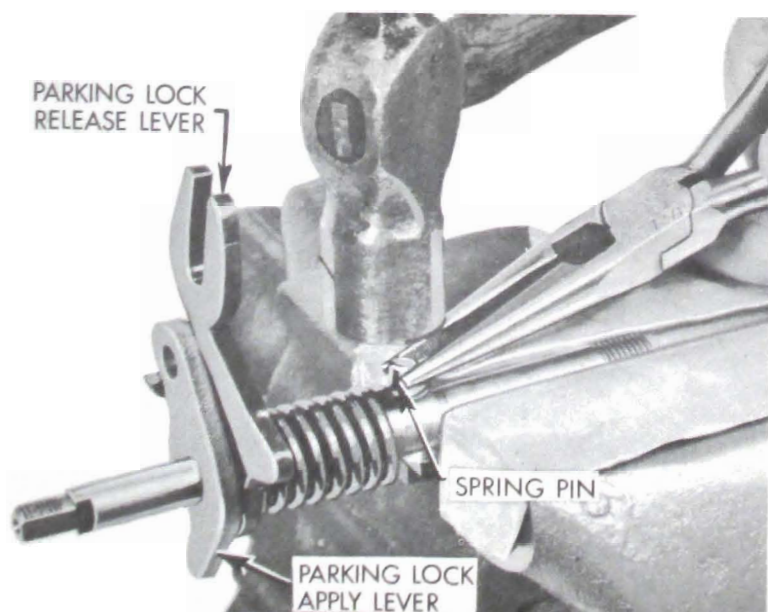
6. Clamp lower flats of parking lock lever shaft in vise, rotate lever against spring tension and remove nut from parking lock lever adjusting screw ($\frac{7}{16}$ " wrench). Remove screw.

5-353



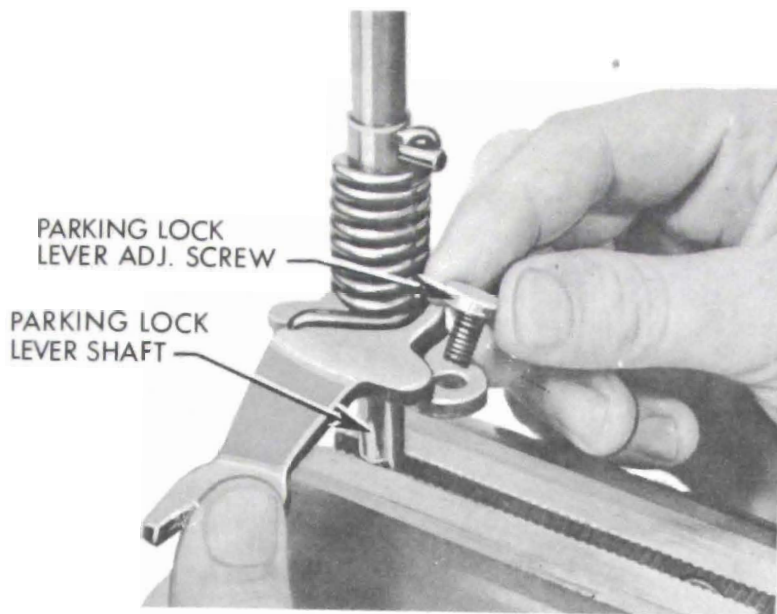
7. Rotate lever to release spring tension and pull pin from shaft. Remove spring and parking lock apply lever. Check parking lock apply lever for evidence of excessive wear. Check parking lock release lever for excessive wear in slot that would make linkage adjustment inaccurate.

5-354



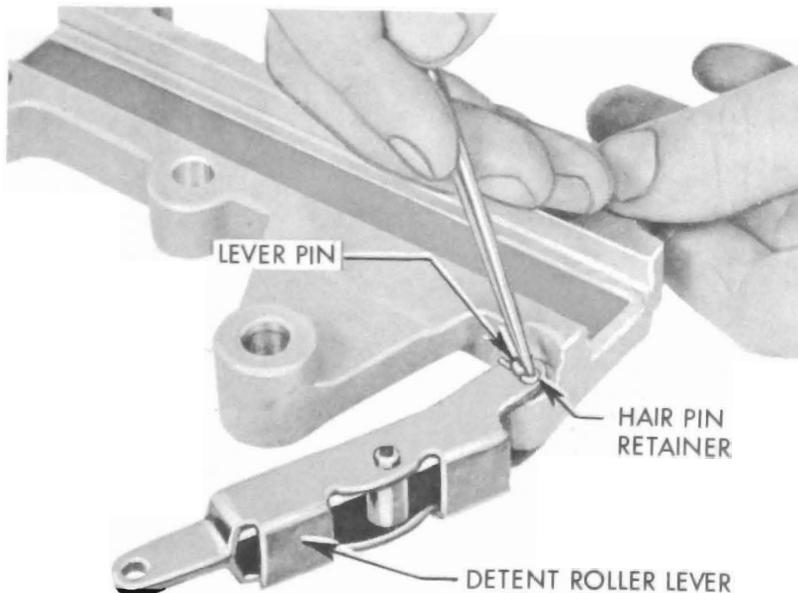
8. Assemble spring on shaft with levers as shown in Figure. Reinstall roll pin holding with pliers to start. Use soft jaws on vise to prevent damage to shaft.

5-355



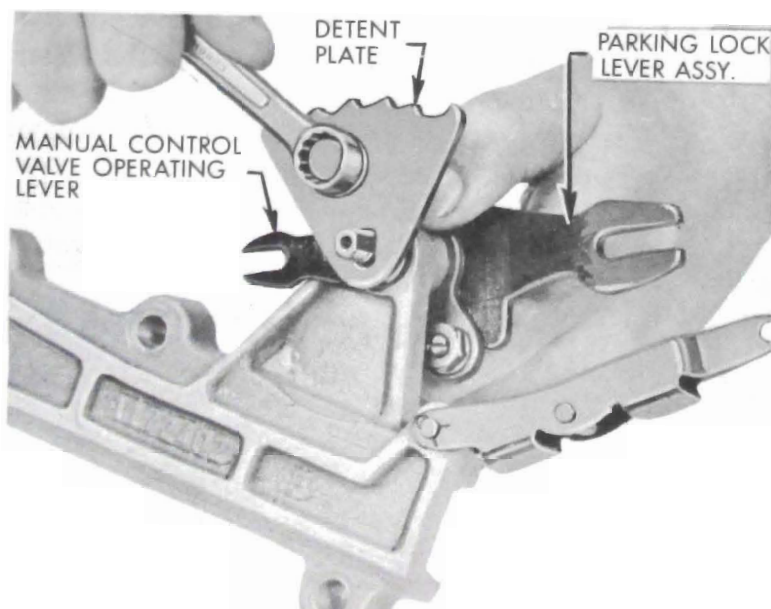
9. Clamp lower flats of parking lock lever shaft in vise, raise and rotate lever against spring tension and install parking lock lever adjusting screw, lock washer and nut. Do not tighten.

5-356



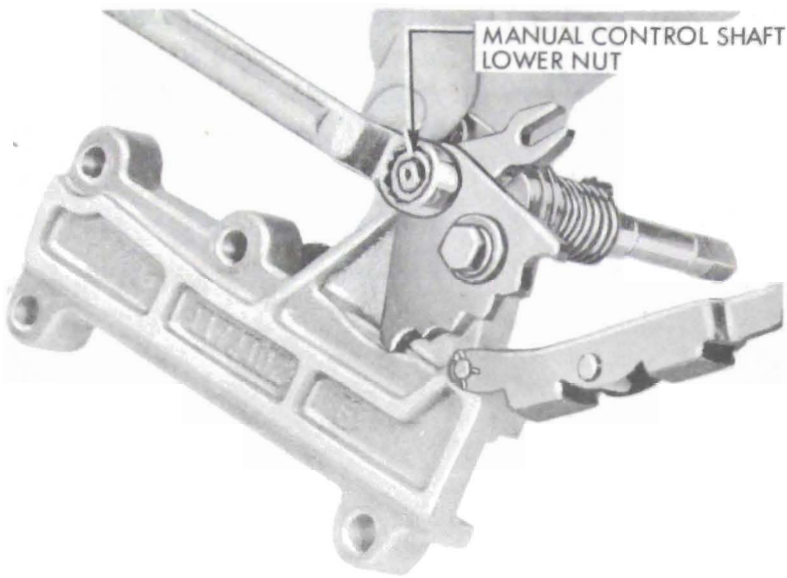
10. Assemble roller lever to slide body with pin and hair pin retainer.

5-357



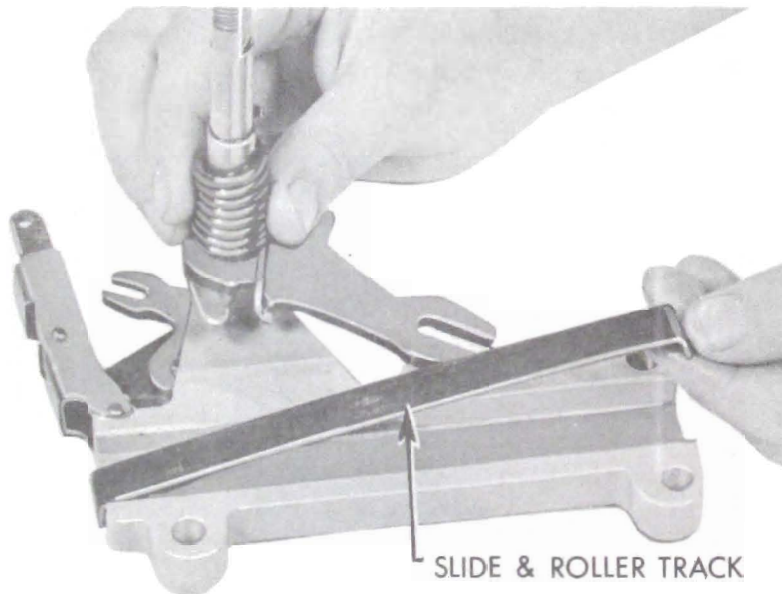
11. Assemble parking lock and shaft lever assembly to parking lock slide body. Assemble manual valve operating lever, then detent plate on shaft. (Bolt hole slot in detent plate must be closest to left side of detent plate). Install, bolt flat washer and lock washer, (detent plate to manual control valve operating lever) ($\frac{7}{16}$ " wrench.)

5-358



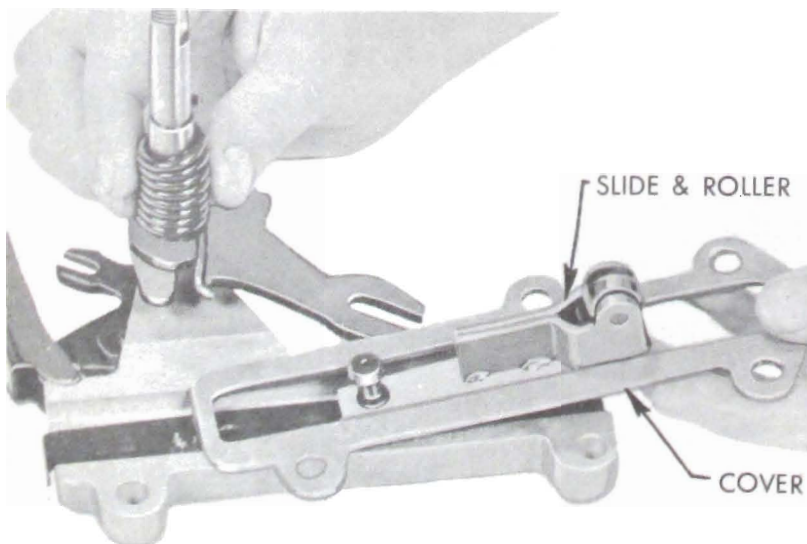
12. Install lower nut and lock washer on manual control shaft ($\frac{1}{2}$ " wrench).

5-359



13. Install slide and roller track in groove of slide body. Track must be in groove or proper installation of slide and roller is not possible.

5-360

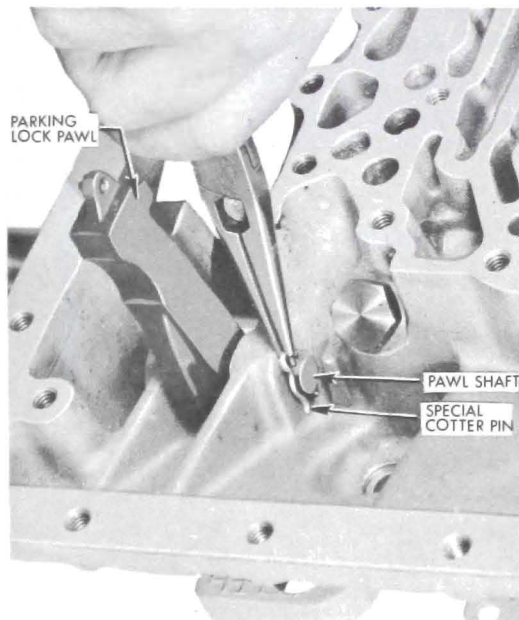


14. Install slide and roller and cover into slide body, rotate shaft and move slide and roller so slot in lever engages pin of slide and roller. If further work is to be done on transmission, set completed sub-assembly aside.

Refer to paragraph 5-50 for installation of manual control and parking lock assembly.

5-361

5-44 PARKING LOCK PAWL SHAFT AND PAWL REMOVAL

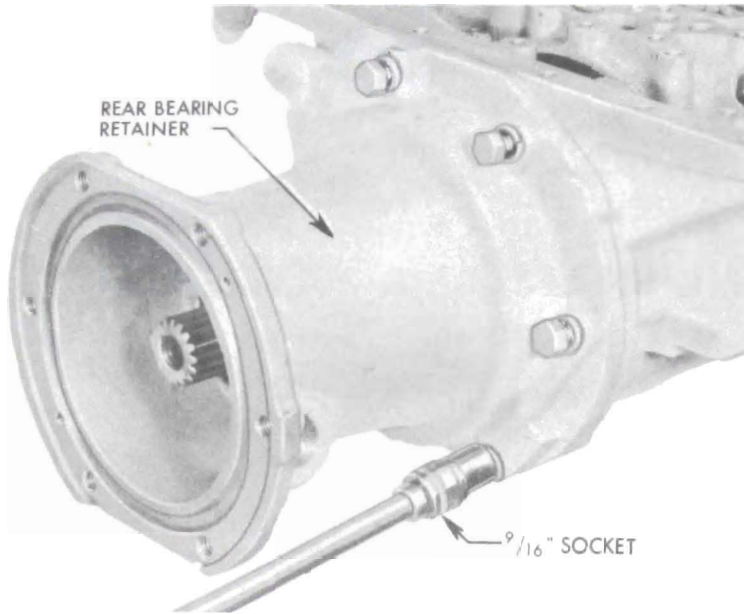


1. If the parking lock pawl or the pawl shaft require replacement, follow the instructions below. Otherwise, swing the pawl up out of the way.

Remove spring pin from parking lock pawl shaft. Slide shaft rearward. Remove pawl.

5-362

5-45 REAR BEARING RETAINER AND OIL TRANSFER FLANGE: REMOVAL, DISASSEMBLY, INSPECTION AND REASSEMBLY

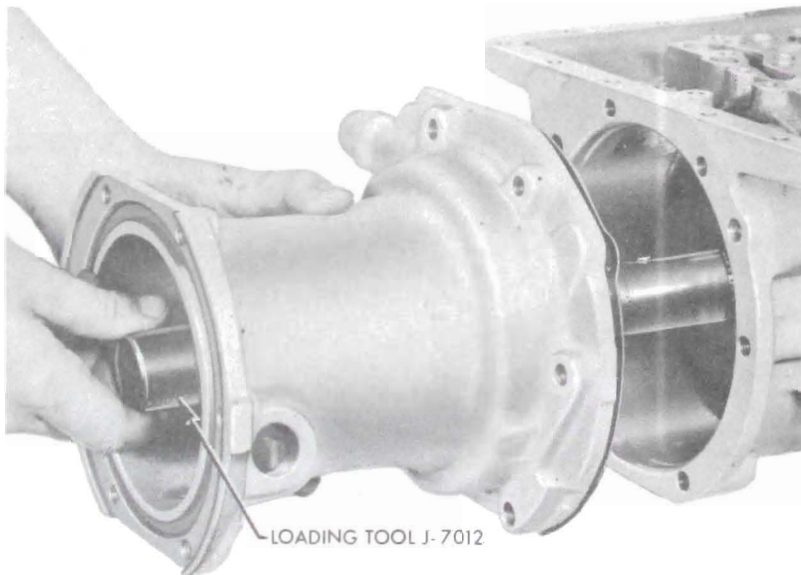


a. Removal of Rear Bearing Retainer Assembly

1. Remove six rear bearing retainer to case bolts ($\frac{9}{16}$ " socket).

IMPORTANT: A spacer and shim forward of the rear bearing ride on a shoulder of the output shaft. This spacer and shim will fall off the output shaft and lodge in the rear bearing retainer between the rear bearing and oil transfer flange if loading Tool J-7012 is not used.

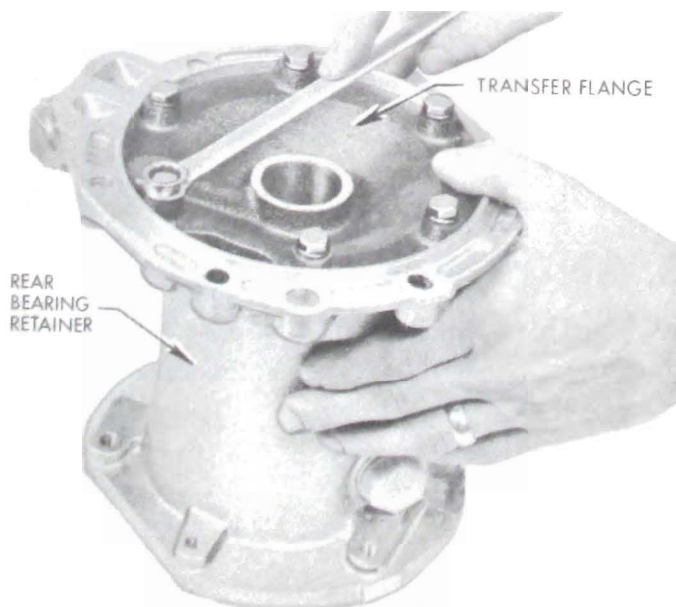
5-363



2. Insert loading Tool J-7012 in end of output shaft to prevent spacer and shim from falling. Hold loading tool forward while sliding rear bearing retainer and oil transfer flange assembly away from case. Shim and spacer will be transferred from output shaft to loading tool. Leave loading tool in rear bearing retainer assembly. Remove gasket. Examine gasket and gasket sealing area for evidence of leaking or damage.

If rear bearing is not to be inspected or replaced, leave loading tool in place and set assembly aside. Otherwise, proceed with rear bearing retainer—oil transfer flange disassembly.

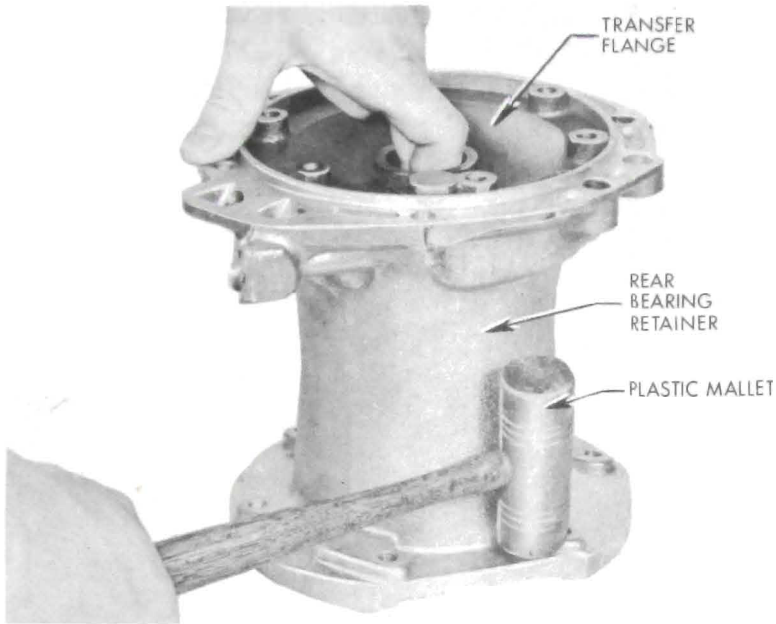
5-364



b. Rear Bearing Retainer—Oil Transfer Flange Disassembly, Inspection and Reassembly

1. Remove six oil transfer flange to rear bearing retainer bolts ($\frac{1}{2}$ " wrench).

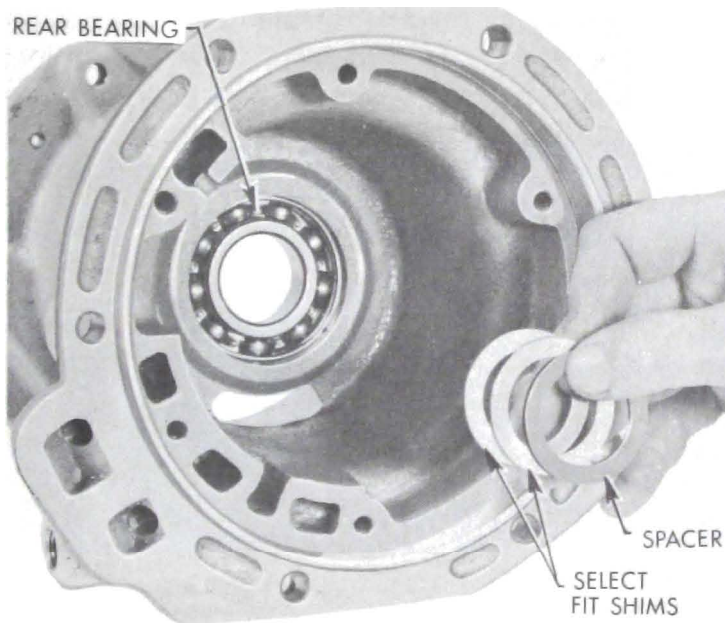
5-365



2. Remove loading Tool J-7012 from rear bearing retainer assembly. Separate oil transfer flange from rear bearing retainer by supporting assembly by flange and tapping rear bearing retainer with plastic mallet. Remove transfer flange and gasket.

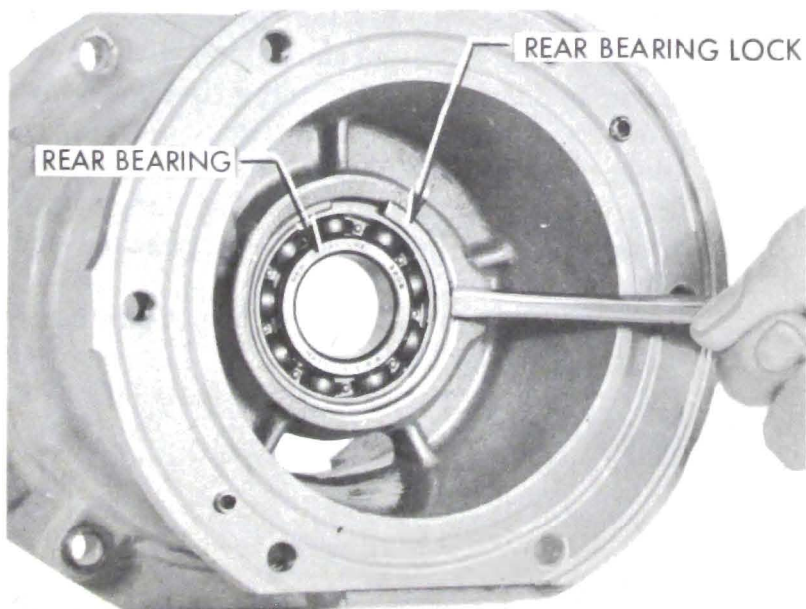
Examine gasket for evidence of leaking and examine transfer flange bore for evidence of scuffing or galling by output shaft oil rings.

5-366



3. Remove select fit shims and spacer from rear bearing retainer.

5-367



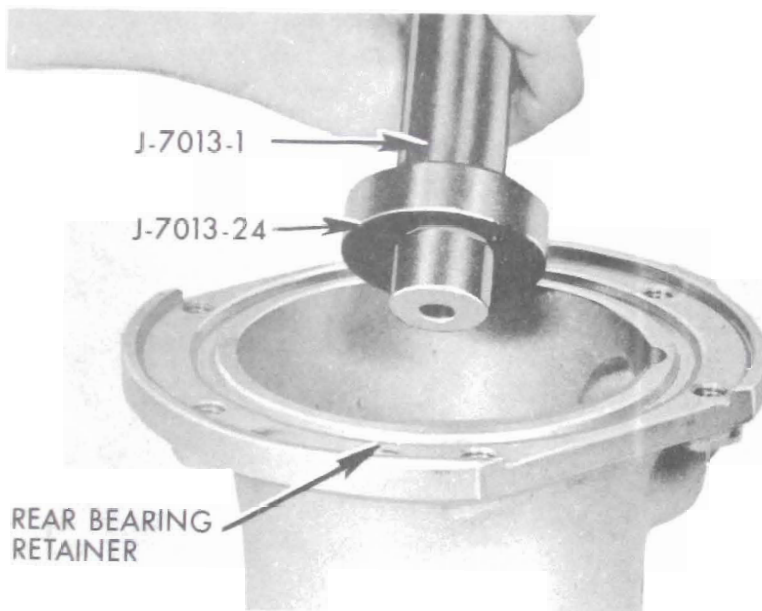
4. Using screwdriver, pry out rear bearing lock. Check rear bearing according to instructions given in paragraph 1-10 (b). If bearing requires replacement, proceed with steps 5, 6, and 7.

5-368



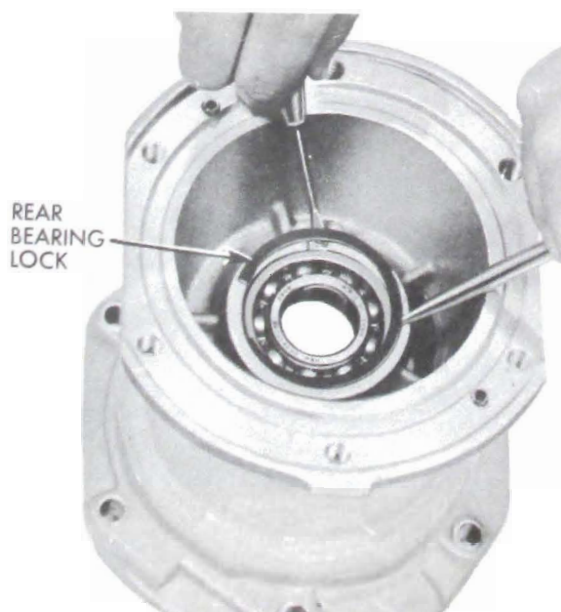
5. Support rear bearing retainer web with chamfered edge of Tool J-7077 and drive out bearing with hammer and drift. Drive from front to rear. The rear bearing races are damaged during removal and the bearing must not be reused.

5-369



6. Support rear bearing retainer web on chamfered edge of Tool J-7077 and install new bearing using J-7013-1 Handle and J-7013-24 Installer.

5-370



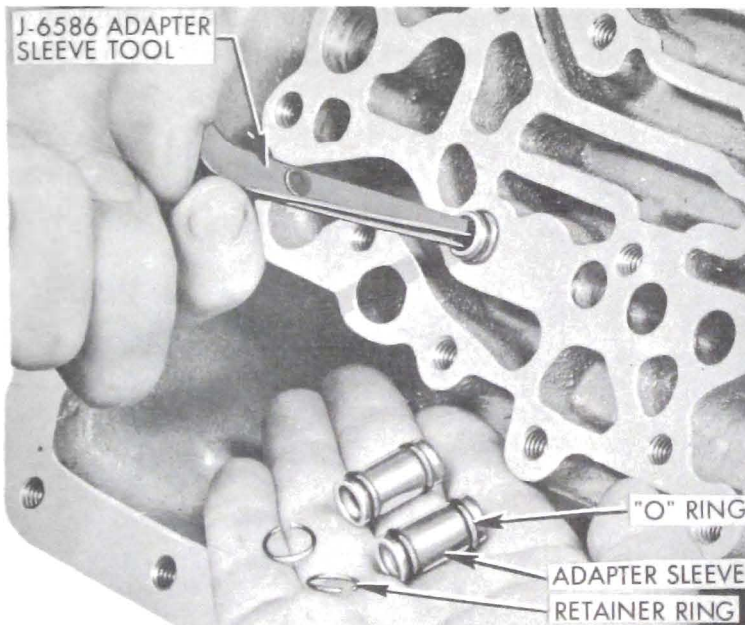
7. Install rear bearing lock behind rear bearing by prying in on one end of ring with screwdriver in drain slot and forcing ring down into groove with another screwdriver. Use care to avoid dropping aluminum chips in rear bearings. Do not install oil transfer flange until output shaft end play has been checked and brought within limits.

Refer to paragraph 5-49 for output shaft end play adjustment.

Refer to paragraph 5-49 for installation of rear bearing retainer assembly.

5-371

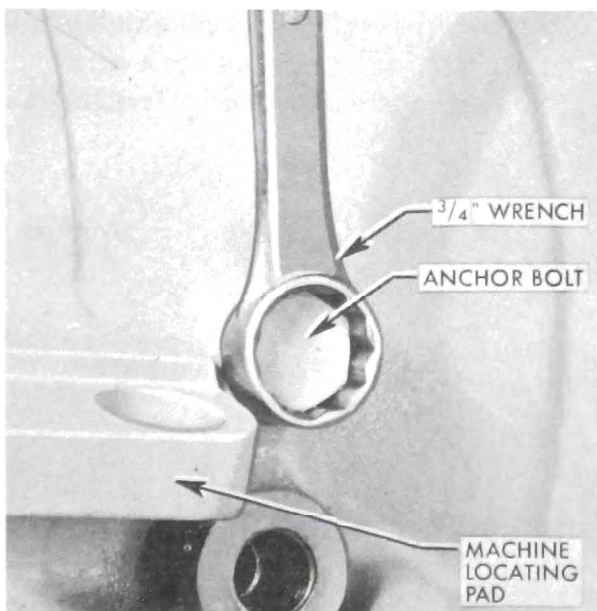
5-46 OUTPUT SHAFT, GEAR TRAIN, FIRST TURBINE SHAFT AND CLUTCHES: REMOVAL, DISASSEMBLY, INSPECTION AND REASSEMBLY



a. Removal of Output Shaft Assembly

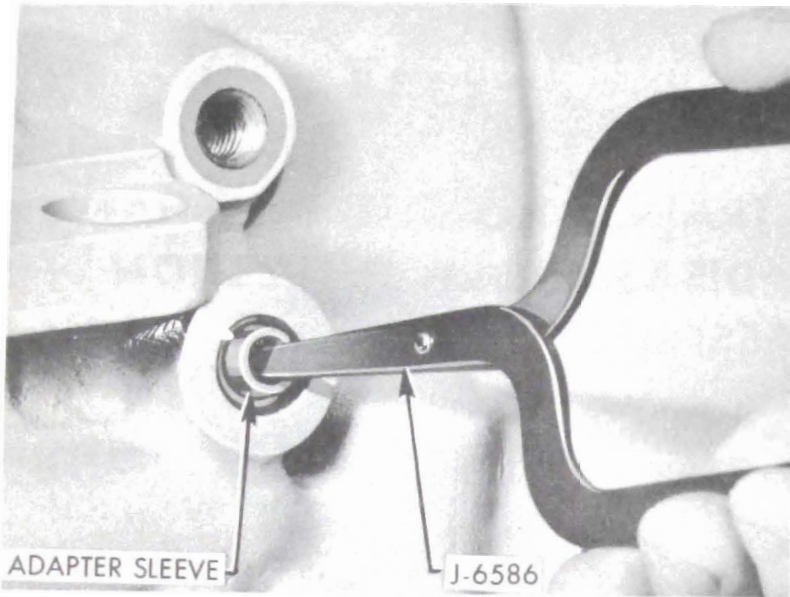
1. Remove three of the four adapter sleeves with retaining rings and "O" rings using J-6586 Adapter Sleeve Tool.

5-382



2. Remove one of the two output shaft support anchor bolts forward of right rear machine locating pad (outside case). Use $\frac{3}{4}$ " wrench.

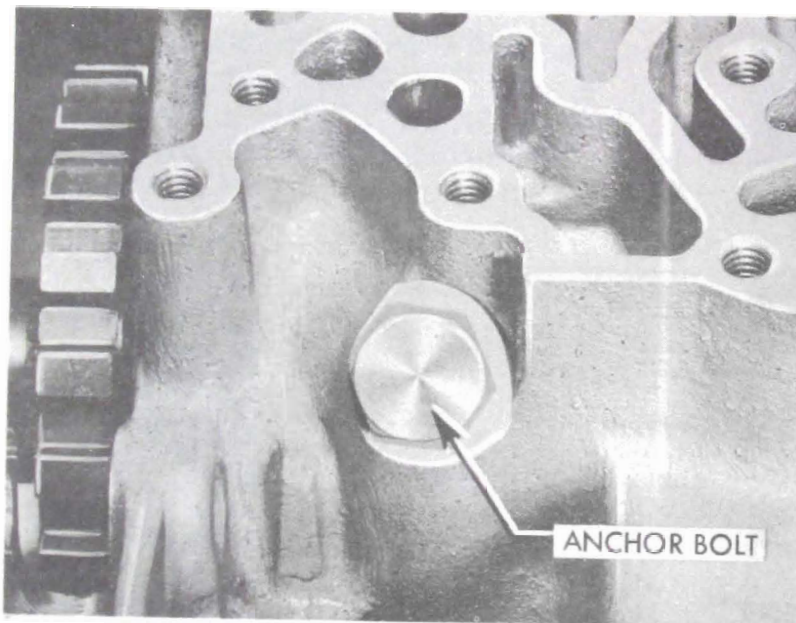
5-383



3. Remove fourth adapter sleeve with O rings at oil cooler return pipe location. (Next to anchor bolt location).

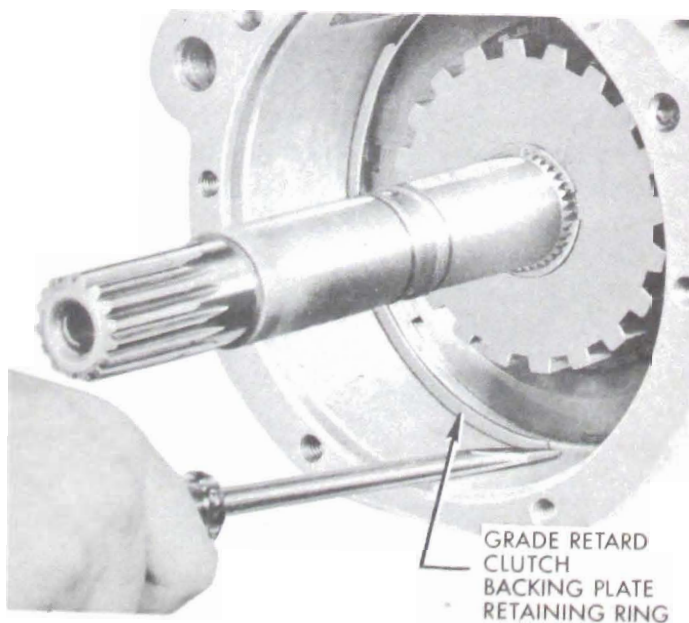
NOTE: *No retaining ring.*

5-384



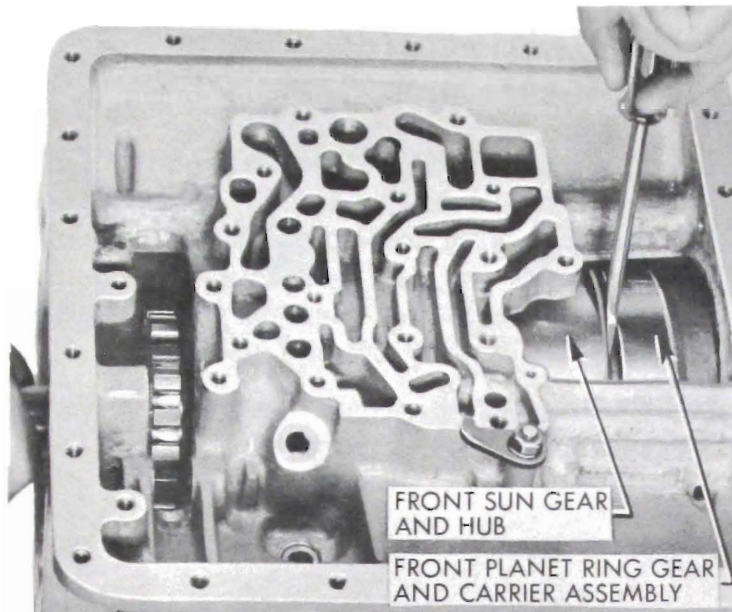
4. Remove second output shaft support anchor bolt forward of ratchet wheel (inside case) ($\frac{3}{4}$ " socket).

5-385



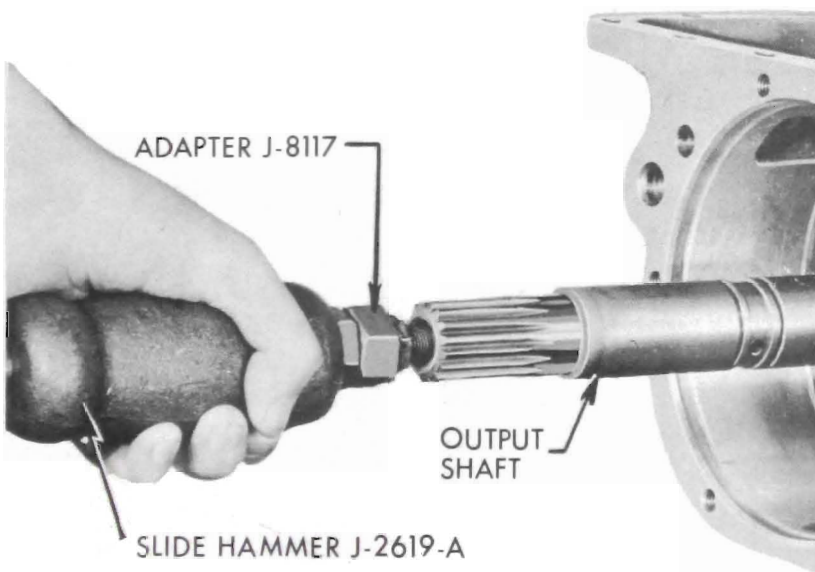
5. Remove retaining ring behind grade retard clutch backing plate using a screw driver to pry ring out of groove in transmission case.

5-386



6. To facilitate removal, carefully pry front sun gear and hub from front planet ring gear and carrier assembly.

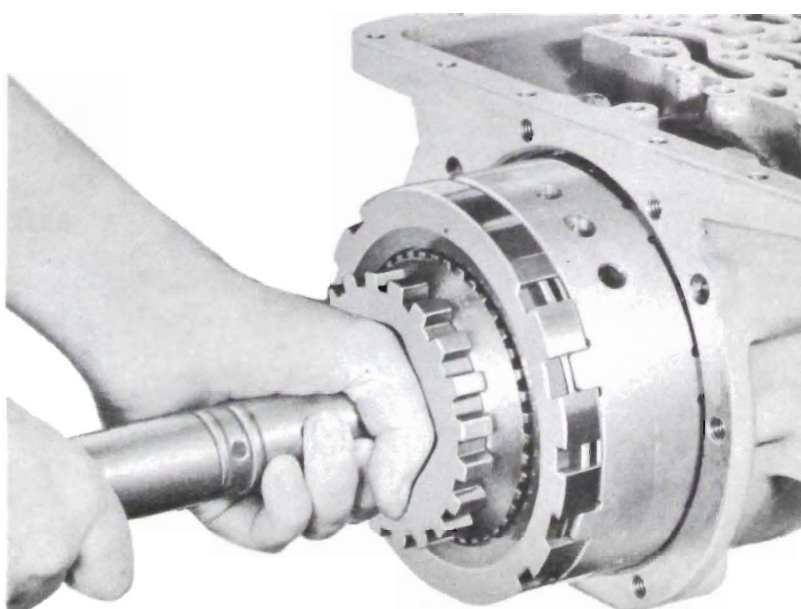
5-387



7. Install slide hammer J-2619-A and Adapter J-8117 in rear end of output shaft and hammer sharply to start grade retard clutch, output shaft support, forward clutch, free wheel clutches, rear planet set and front sun gear out of transmission case.

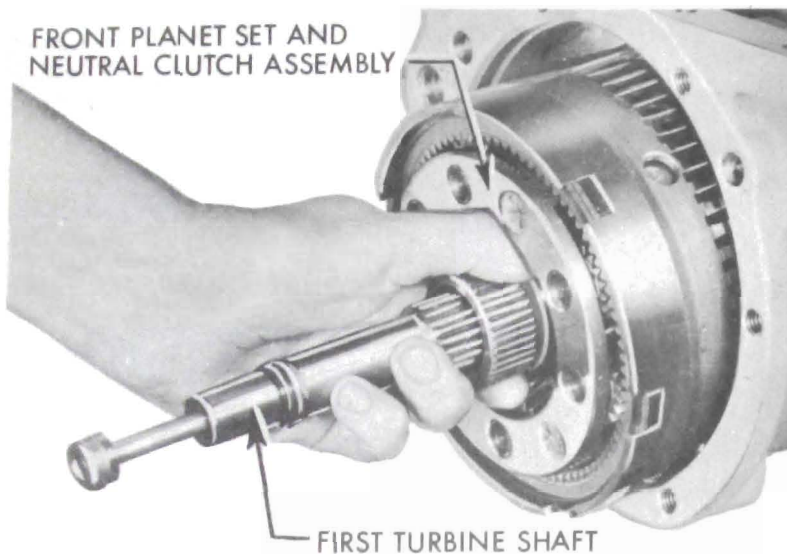
NOTE: The hammering may dislodge the reverse clutch plates, spring and pressure plate. If so, remove and set them aside.

5-388



8. After assembly has been moved part way with slide hammer, remove slide hammer and lift assembly from case and set on bench.

5-389

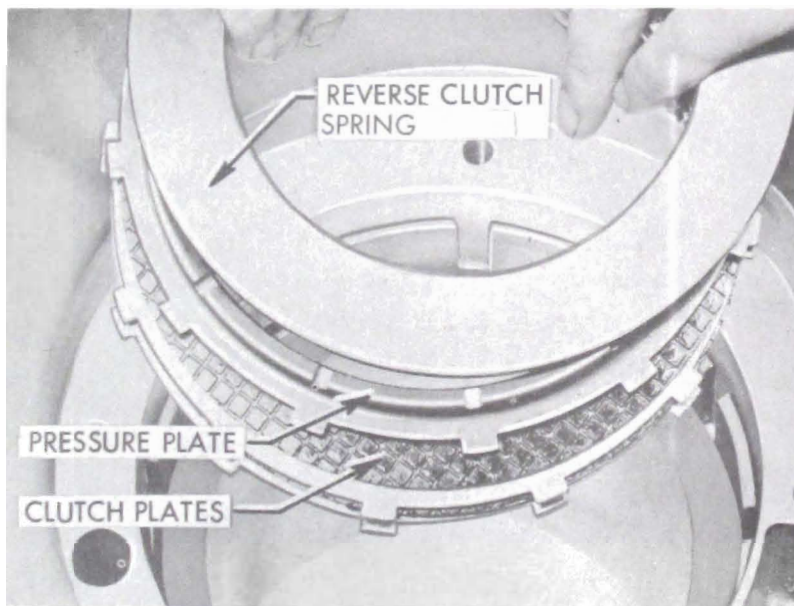


b. Removal of First Turbine Shaft and Front Planet Set—Neutral Clutch Assembly

1. Remove first turbine shaft and front planet set—neutral clutch assembly. Remove needle thrust bearing and cupped race (front planet ring gear carrier to reaction flange hub). This bearing and race may have been removed with front pump assembly.

NOTE: *First turbine shaft may have been removed with output shaft.*

5-390

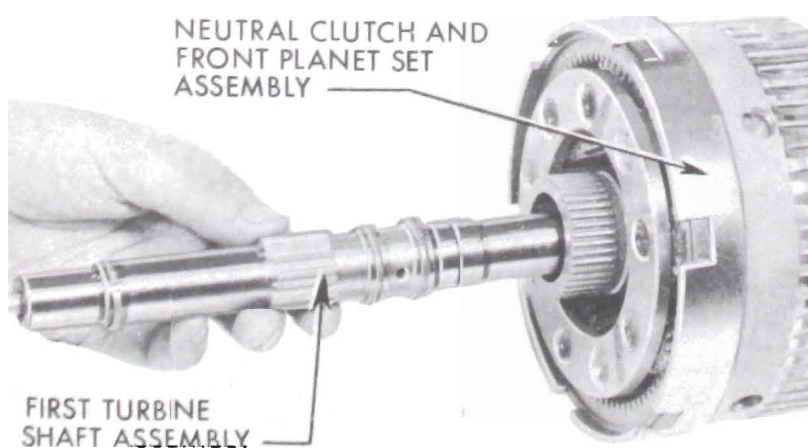


c. Removal of Reverse Clutch Plates, Pressure Plates and Spring

1. Remove reverse clutch spring, pressure plate, and clutch plates. Refer to Paragraph 5-48 for reverse clutch plate inspection and installation.

NOTE: *If case is to be replaced, transfer stator control lever, shaft, and bearing and begin reassembly. Refer to Paragraph 5-47.*

5-391



d. First Turbine Shaft Disassembly, Inspection and Reassembly

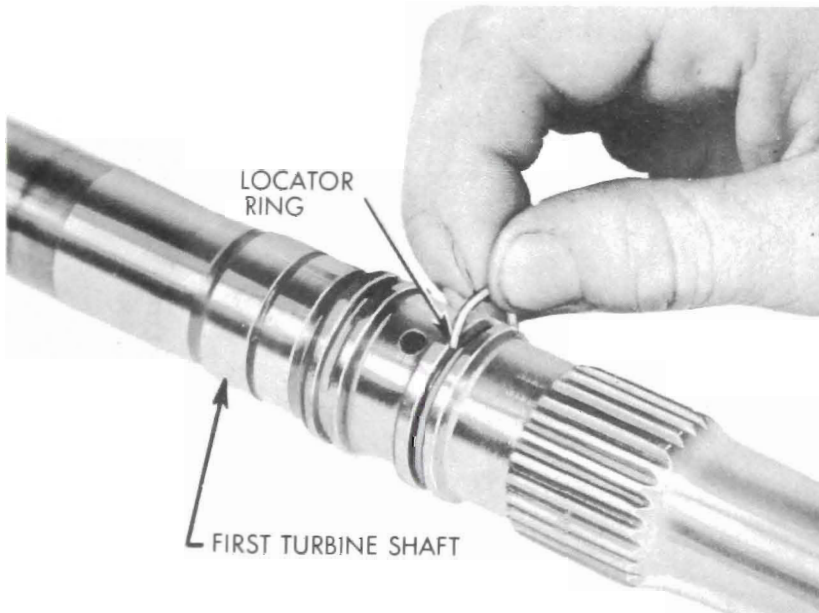
1. Slide first turbine shaft rearward out of neutral clutch and front planet set assembly if it was not removed with output shaft assembly.

5-392



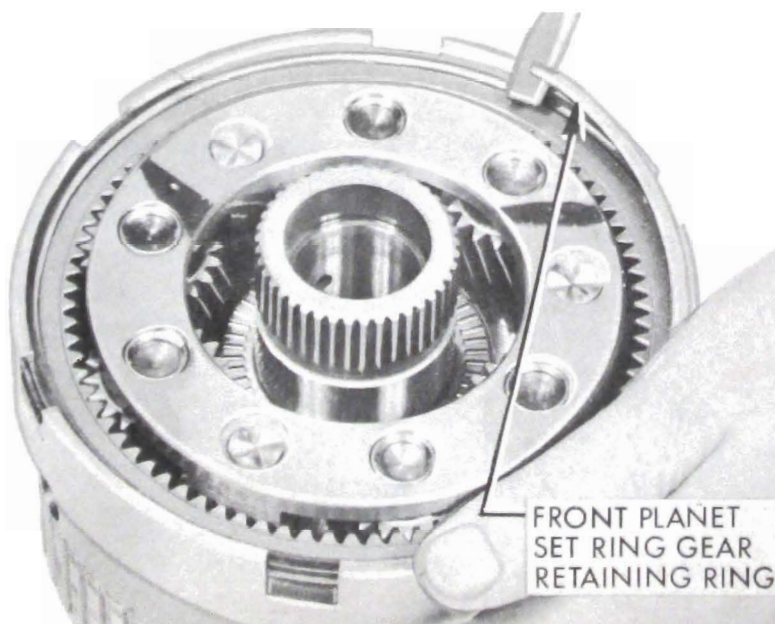
2. Carefully examine the shaft and oil rings for evidence of galling, excessive wear or broken oil rings. If the oil rings are worn or galled even slightly, replace them after being certain that locator rings are installed correctly in the two center oil ring grooves.

5-393



3. Be certain locator rings are installed in the two center oil ring grooves of the first turbine shaft before installing oil rings. After the four oil rings are installed and lubricated, set first turbine shaft assembly aside. Refer to Paragraph 5-47 for first turbine shaft installation.

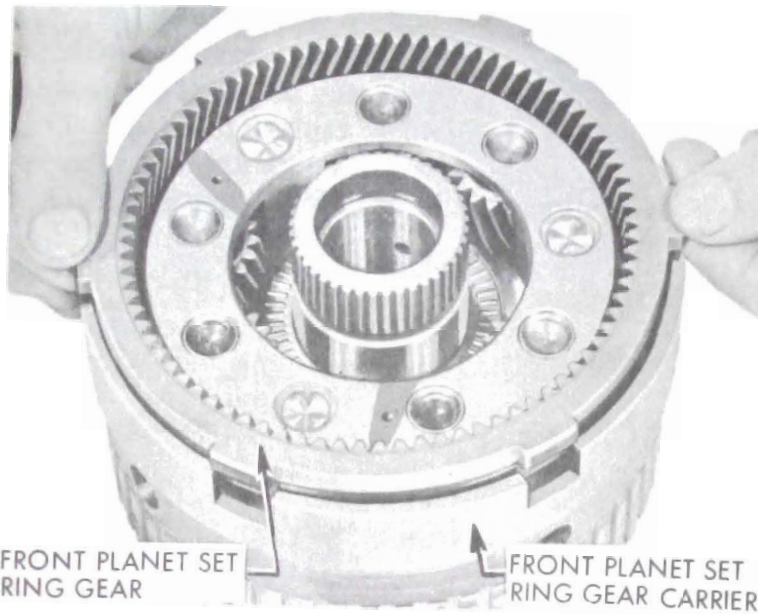
5-394



e. Disassembly, Inspection and Reassembly of Front Planet Set—Neutral Clutch Assembly

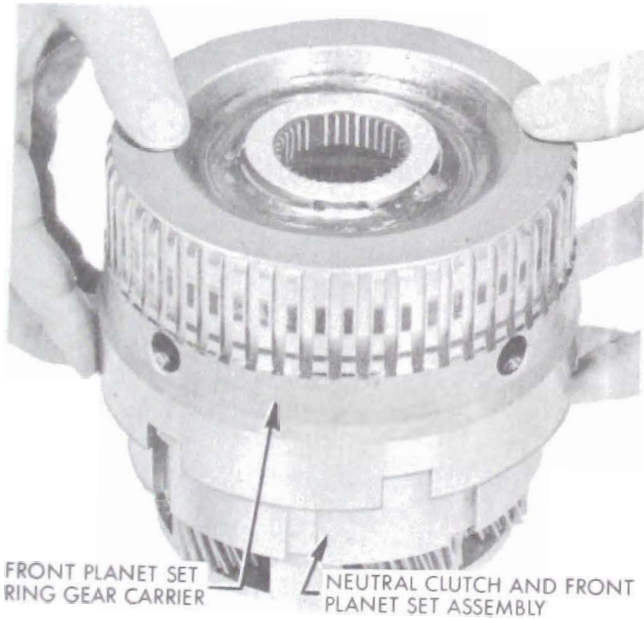
1. Remove front planet set ring gear retaining ring using a screwdriver to pry out of groove in front ring gear carrier.

5-395



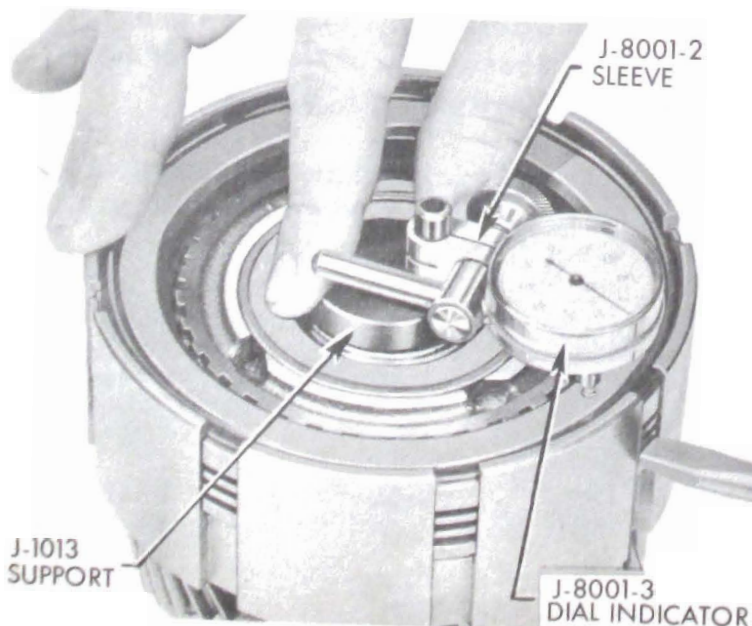
2. Remove ring gear from ring gear carrier.

5-396



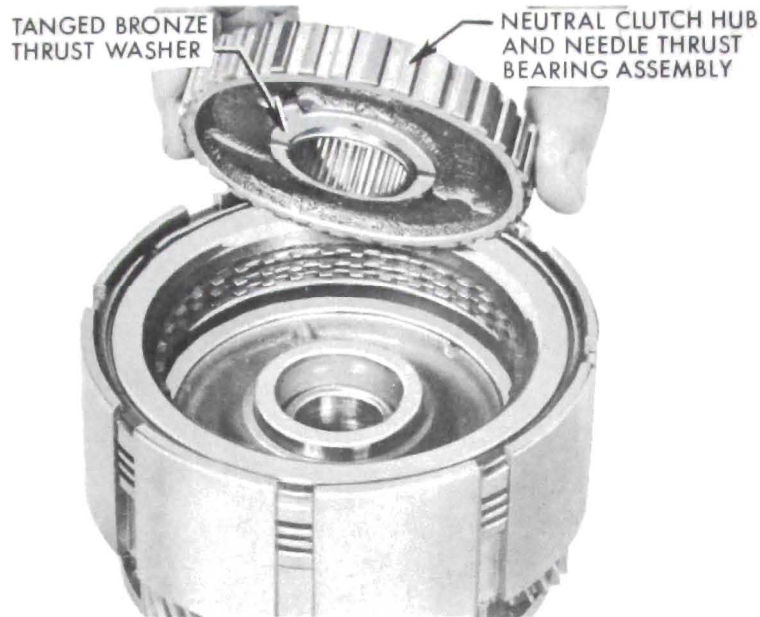
3. Invert assembly and remove ring gear carrier from neutral clutch and front planet set assembly.

5-397



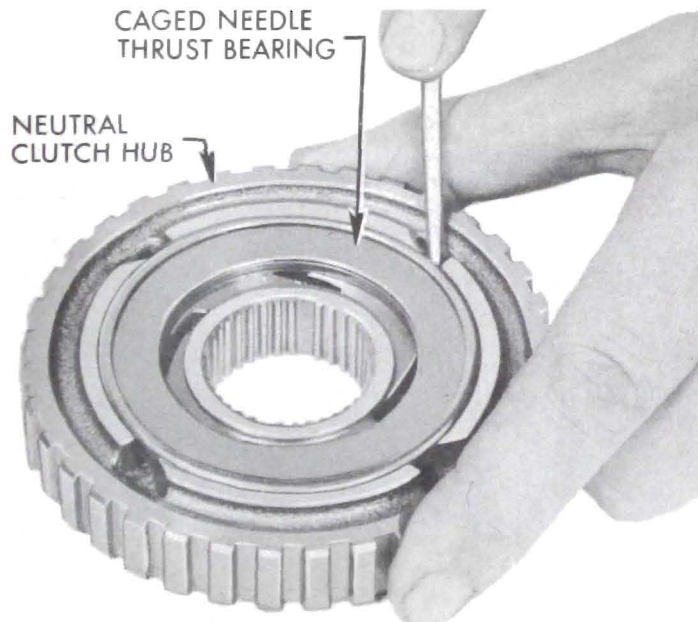
4. Check clearance in neutral clutch pack. Use a dial indicator with support J-1013 resting on hub. Set plunger of dial indicator on backing plate. Force plate pack down with fingers and note reading. Force plate pack up with screwdriver between neutral clutch spring snap ring and pressure plate and note clearance. Should be between .010" and .060". Clearance in excess of .060" usually indicates worn clutch plates.

5-398



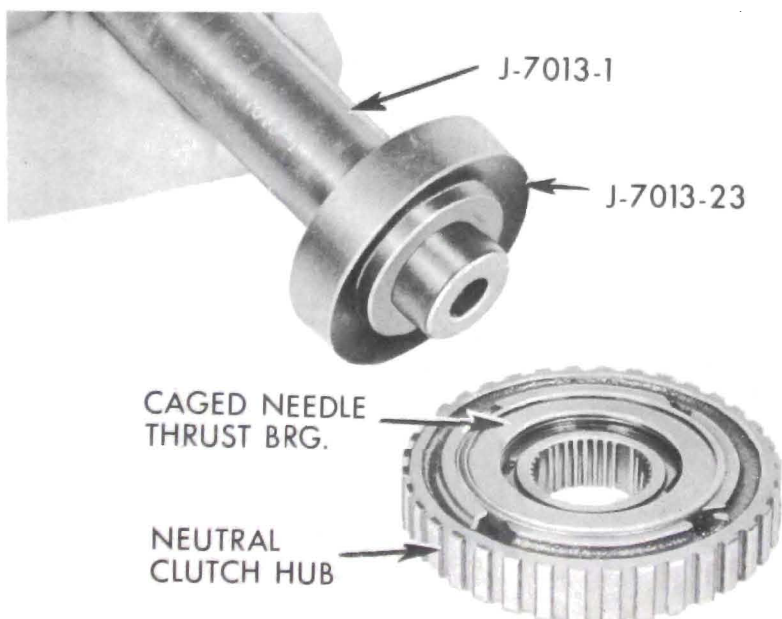
5. Remove neutral clutch hub, needle thrust bearing assembly and tanged bronze thrust washer from neutral clutch and front planet set assembly.

5-399



6. If necessary to replace, pry out caged needle thrust bearing with small screwdriver.

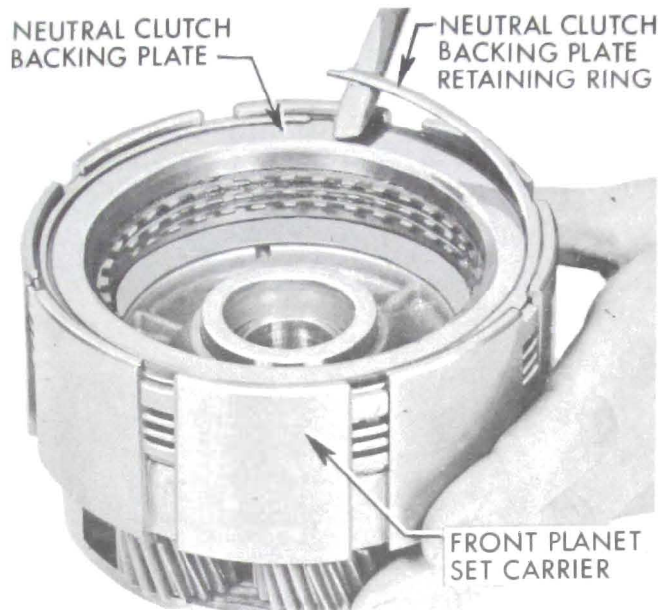
5-400



7. Install new caged needle bearing in neutral clutch hub using J-7013-1 Handle and J-7013-23.

NOTE: Be certain needle thrust bearing is installed squarely in neutral clutch hub and after installation, rotate race to check for free operation. Race must operate freely.

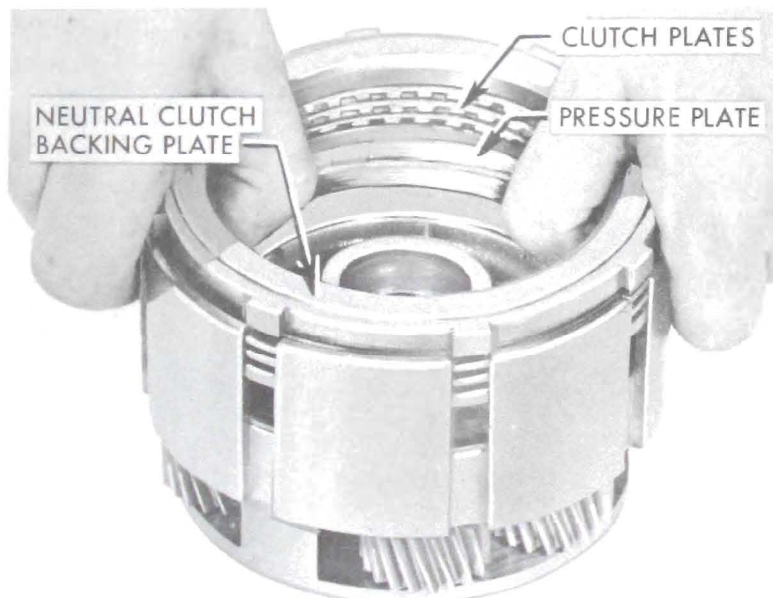
5-401



8. Remove retaining ring from neutral clutch backing plate to front planet set carrier using a screwdriver to pry ring out of groove in front planet set carrier.

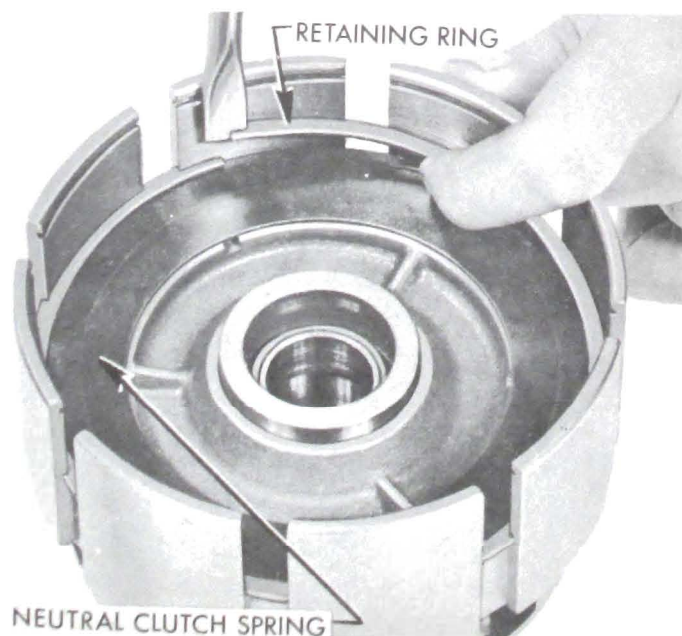
NOTE: Neutral clutch backing plate retaining ring is of heavier cross section than clutch spring retaining ring.

5-402



9. Remove neutral clutch backing plate, clutch plates and pressure plate from front planet set carrier. Examine plates for heat damage, galling or excessive wear.

5-403



10. Remove retaining ring (neutral clutch spring to front planet set carrier) using a screwdriver to pry ring out of groove in front planet set carrier.

NOTE: Neutral clutch spring retaining ring is smaller in cross section than the backing plate retaining ring.

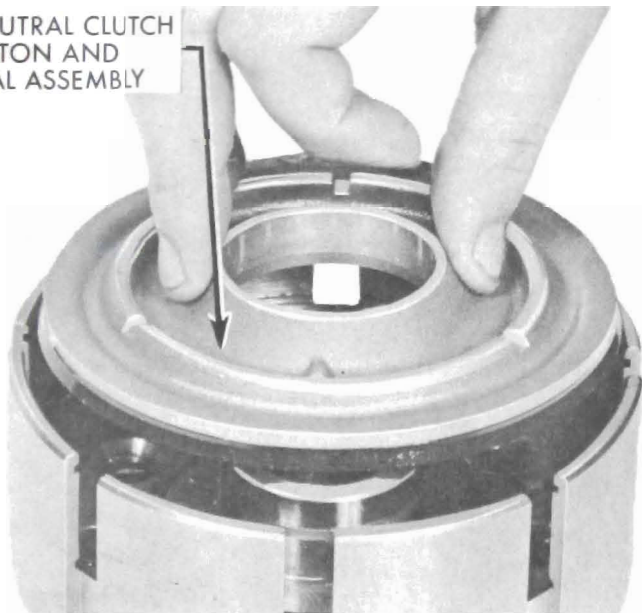
5-404



11. Remove neutral clutch spring from front planet carrier. Examine spring for heat damage, cracks, or excessive wear.

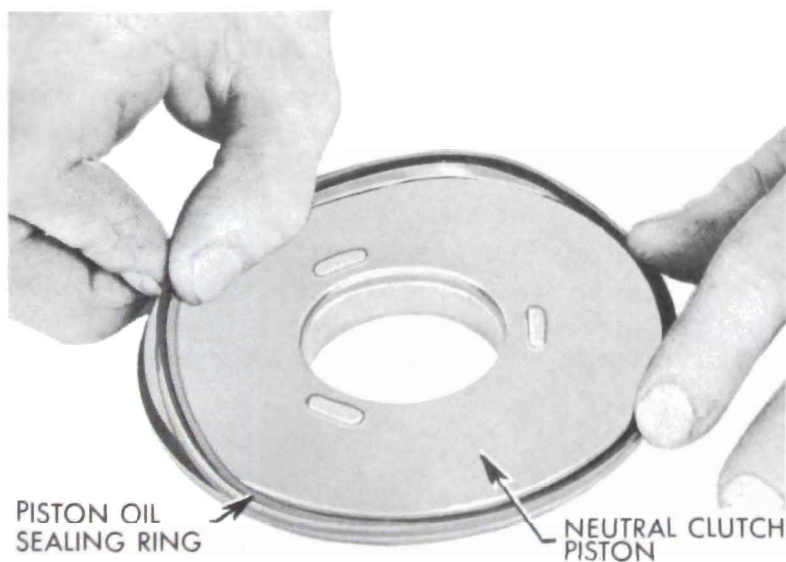
5-405

NEUTRAL CLUTCH PISTON AND SEAL ASSEMBLY



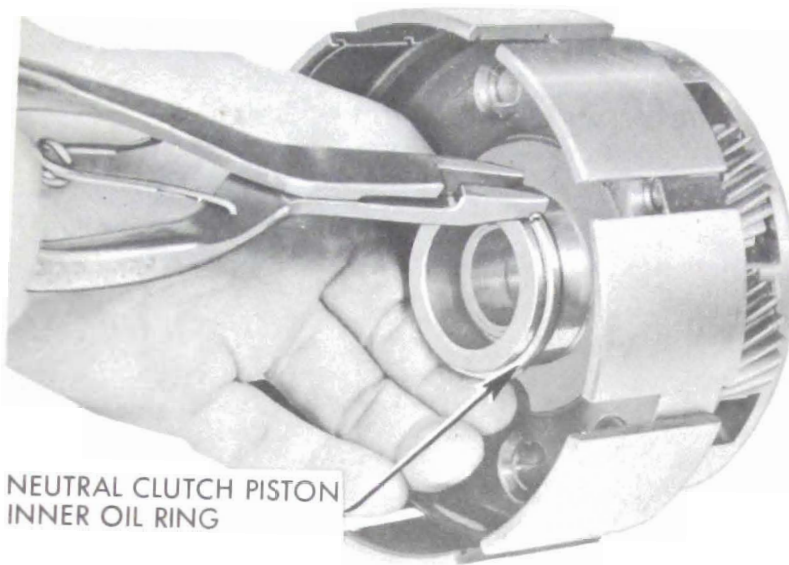
12. Remove neutral clutch piston and seal assembly.

5-406



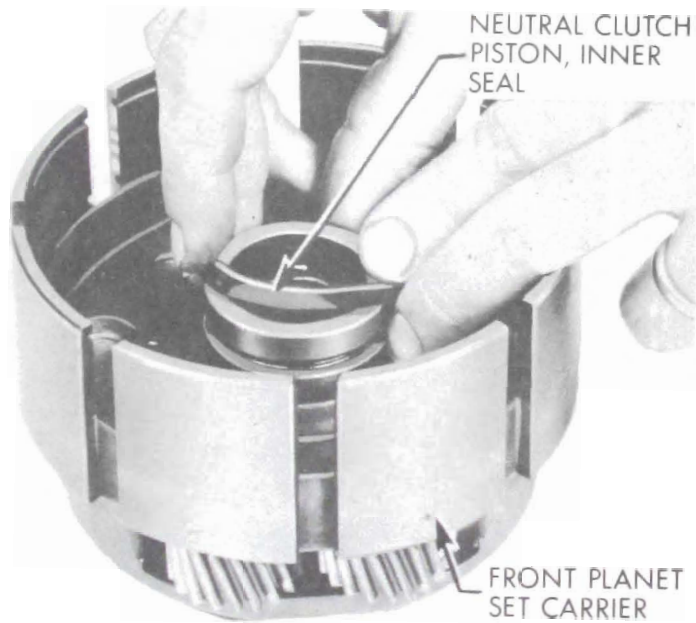
13. Remove neutral clutch piston outer rubber sealing ring. Examine seal for tears, nicks or wear that could cause leaks. Examine bore of piston for galling or roughness that could cause leaks.

5-407



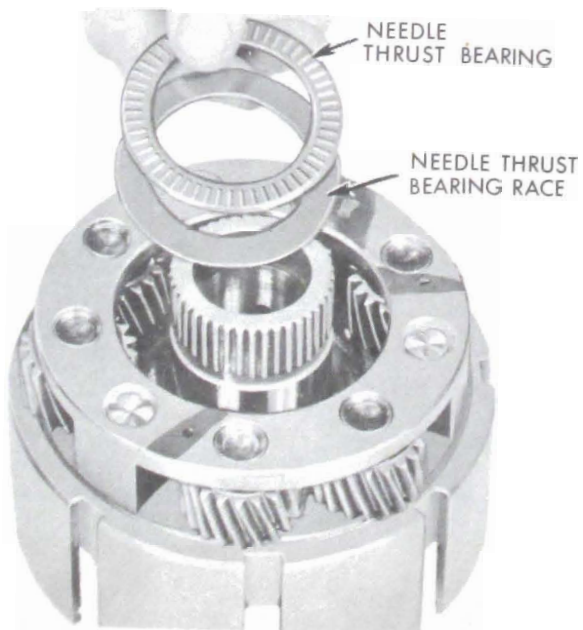
14. If the planet carrier is equipped with cast iron neutral clutch piston inner oil ring; examine ring for cracks, evidence of galling, or excessive wear. If ring is to be replaced, unhook, expand, and remove the ring.

5-408



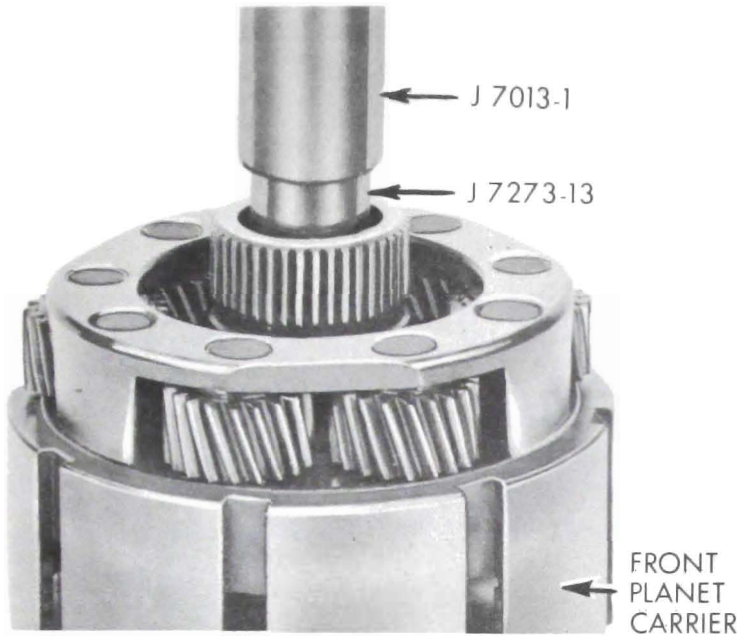
15. If planet carrier is equipped with rubber neutral clutch inner seal, examine the seal for evidence of heat damage, cracking or excessive wear. If necessary, remove inner piston seal.

5-409



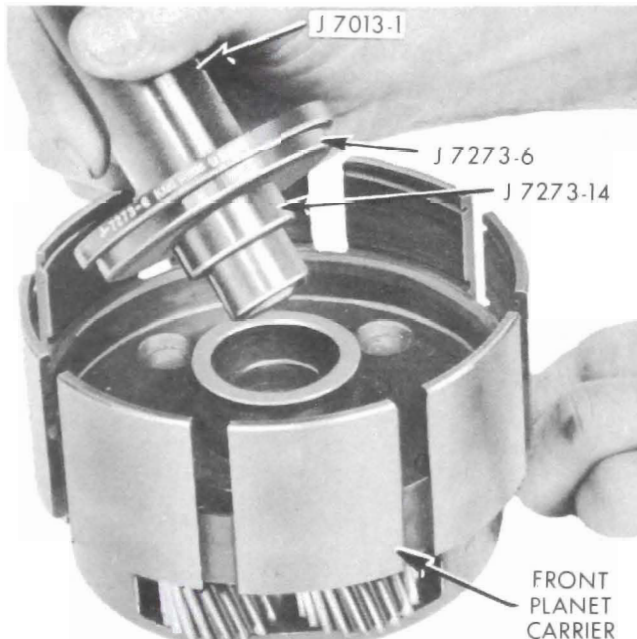
16. Remove needle thrust bearing and thrust bearing race from rear of front planet set carrier. It may be necessary to pry them loose from the suction created by oil. Use two very thin, sharp awls inserted between planet pinion gears and under-edge of race. Examine bearing and race for galling or excessive wear. Check planet pinion gears for wear and looseness on shafts. If gears are not serviceable, carrier assembly must be replaced.

5-410



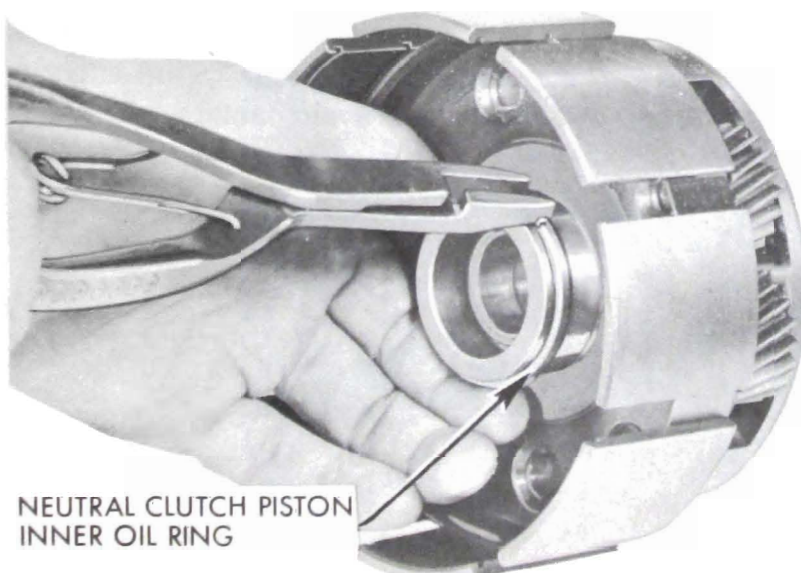
17. Examine front planet carrier bushing; if scored or excessively worn, drive out bushing from rear as shown, using remover J-7273-13 and handle J-7013-1.

5-411



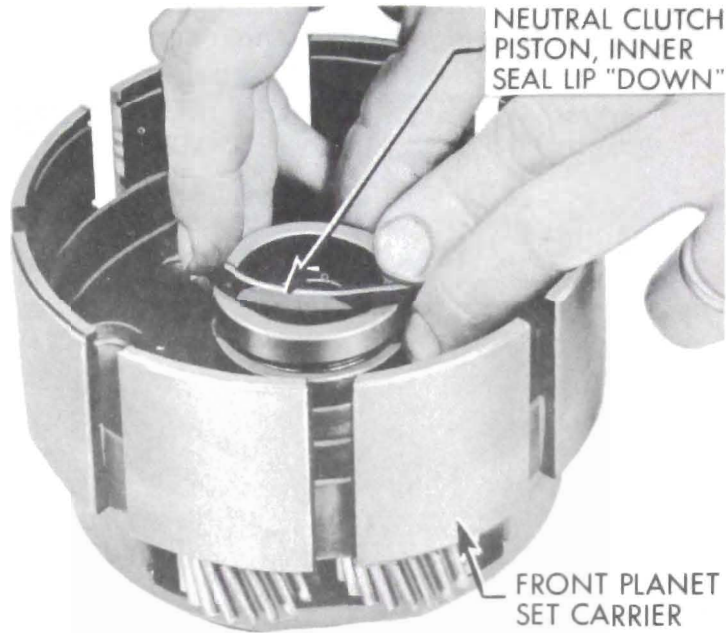
18. Install new bushing from front, using J-7013-1 handle and installer J-7273-14 with J-7273-6 (counterbore on 6 toward handle).

5-412



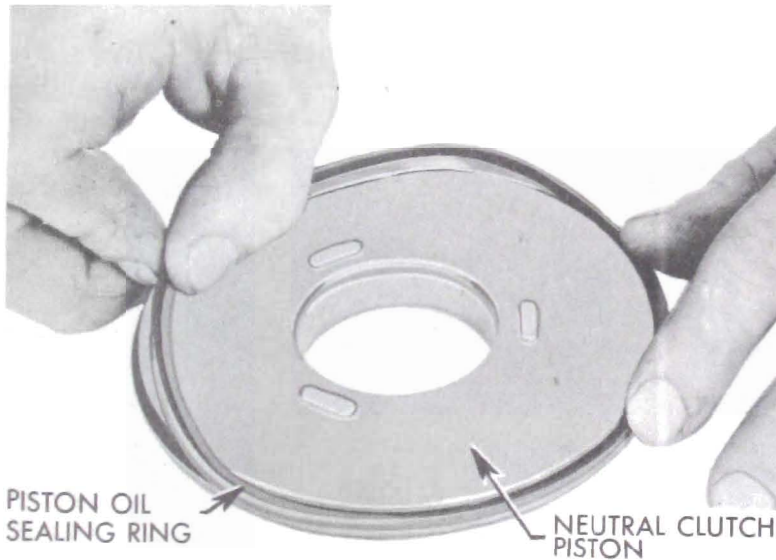
19. If planet carrier is cast iron oil ring equipped, and replacement is being made; expand and install new neutral clutch piston inner oil sealing ring on hub of front planet carrier. Hold one end of ring and work other end of ring around to hook.

5-413



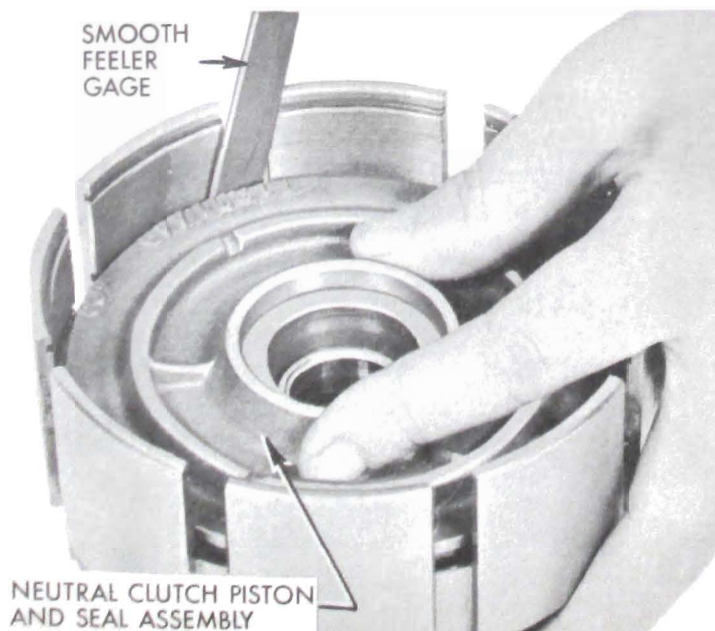
20. If planet carrier is rubber inner oil seal equipped, lubricate and install rubber seal lip "down" as shown. Use care to avoid damage to seal.

5-414



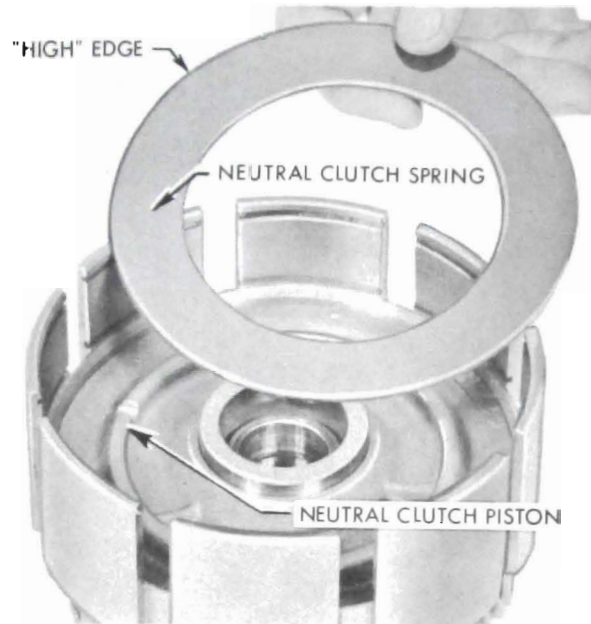
21. Install new neutral clutch piston sealing ring, lip away from hub.

5-415



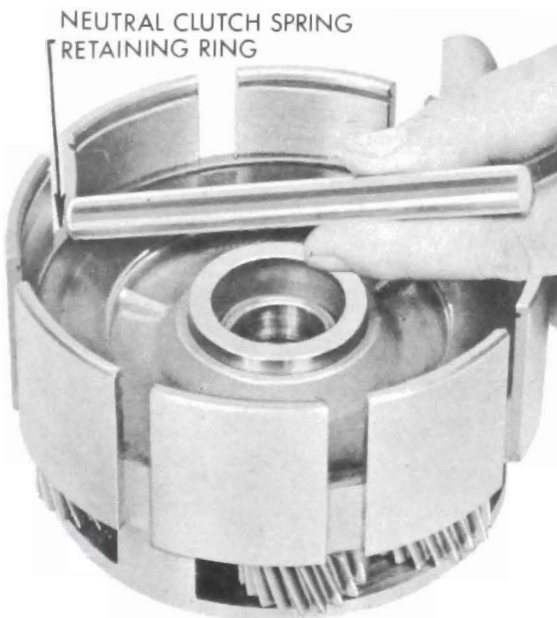
22. Lube and install neutral clutch piston and seal in bore of front planet set carrier using a smooth feeler gauge to aid entry of seal lip. Use care to avoid damage to seal.

5-416



23. Install neutral clutch spring on top of piston outer "high" edge up.

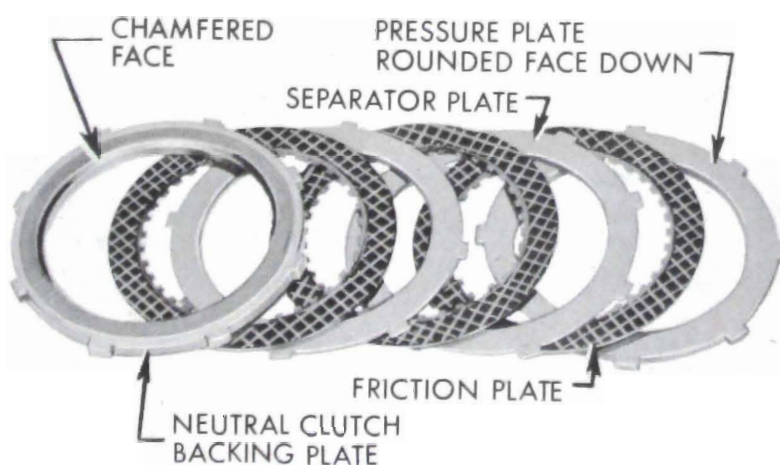
5-417



24. Install neutral clutch spring retaining ring by starting one end into groove and using plastic hammer and drift to force remainder of ring into groove.

NOTE: The neutral clutch spring retaining ring is smaller in cross section than the backing plate retaining ring although both have the same O.D.

5-418

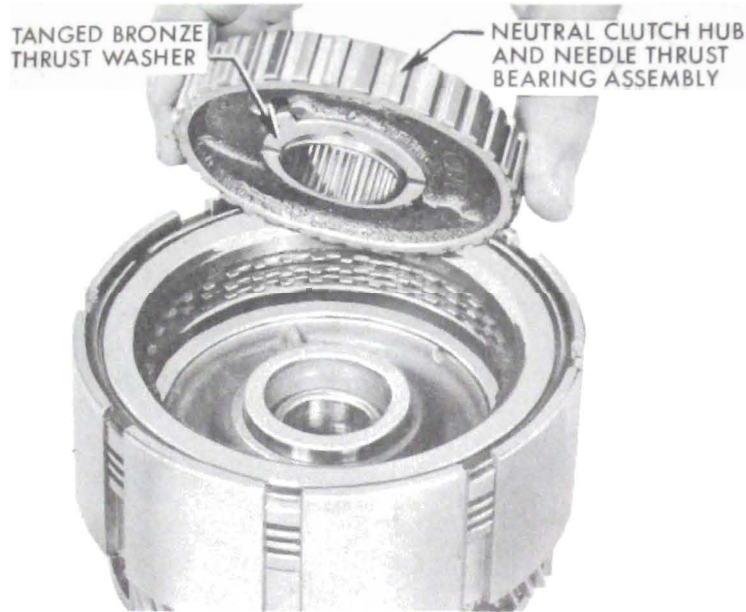


25. Install clutch plate pack with rounded face of pressure plate toward spring, then lubricate and install friction plate, separator plate, etc., and chamfered face of clutch backing plate "up" and on top.

NOTE: All clutch plates in neutral clutch pack are flat, three friction plates and two separator plates.

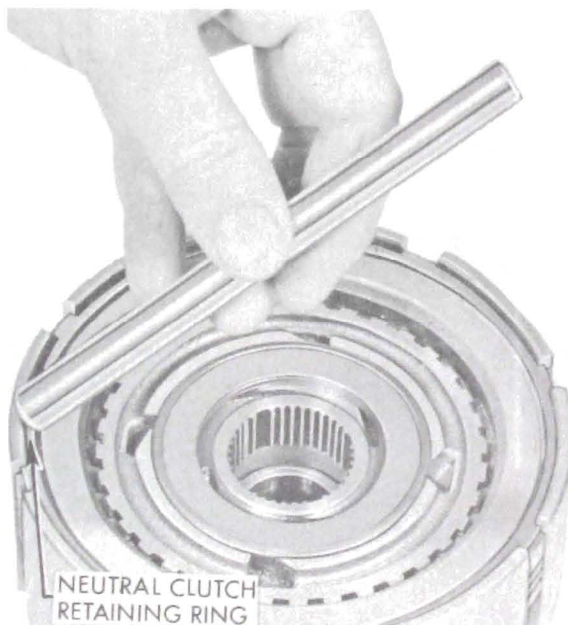
NOTE: It is important that all plates be lubricated with automatic transmission oil during assembly.

5-419



26. After sticking bronze thrust washer to hub and needle bearing assembly with heavy lube, line up grooves of friction plates and install hub in bore of front planet set carrier (needle bearing up). When neutral clutch hub is correctly installed, it will be below chamfered edge of neutral clutch backing plate.

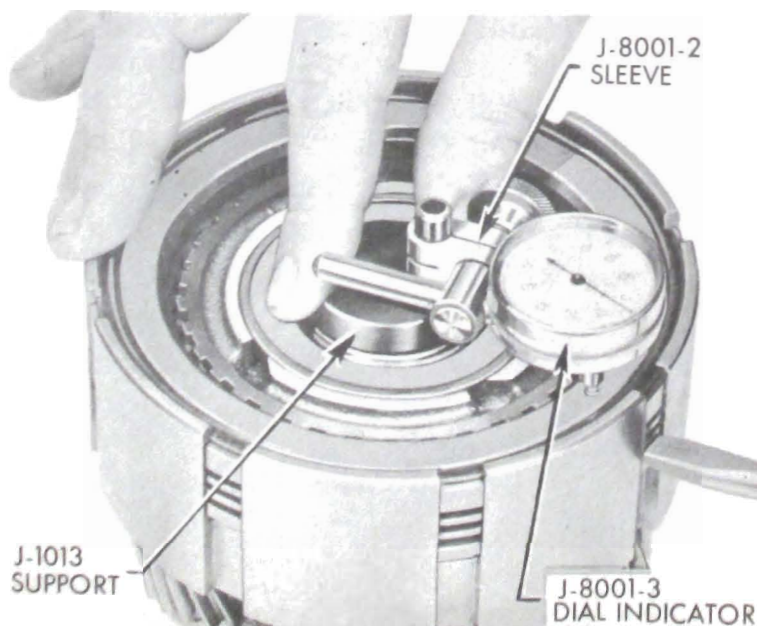
5-420



27. Install neutral clutch retaining ring in groove of front planet set carrier above backing plate. Tap solidly into groove with drift.

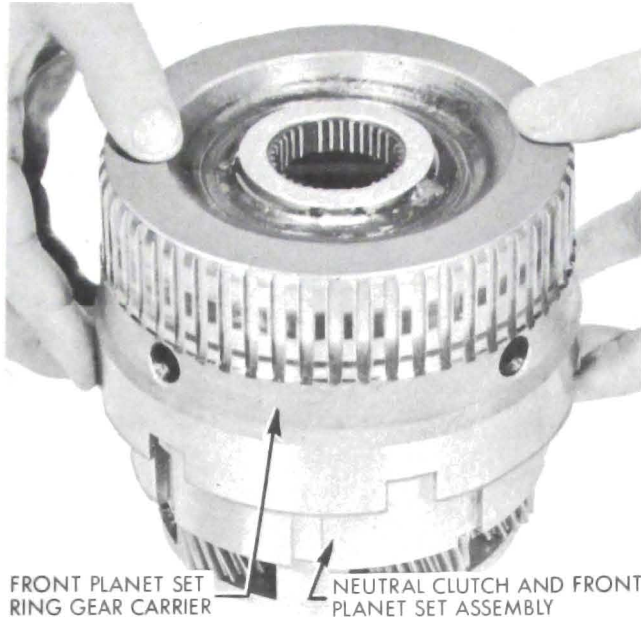
NOTE: The neutral clutch backing plate retaining ring is heavier in cross section than the clutch spring retaining ring although both have the same O.D. Care should be taken to be sure the heavier of the two rings is installed above the backing plate as shown.

5-421



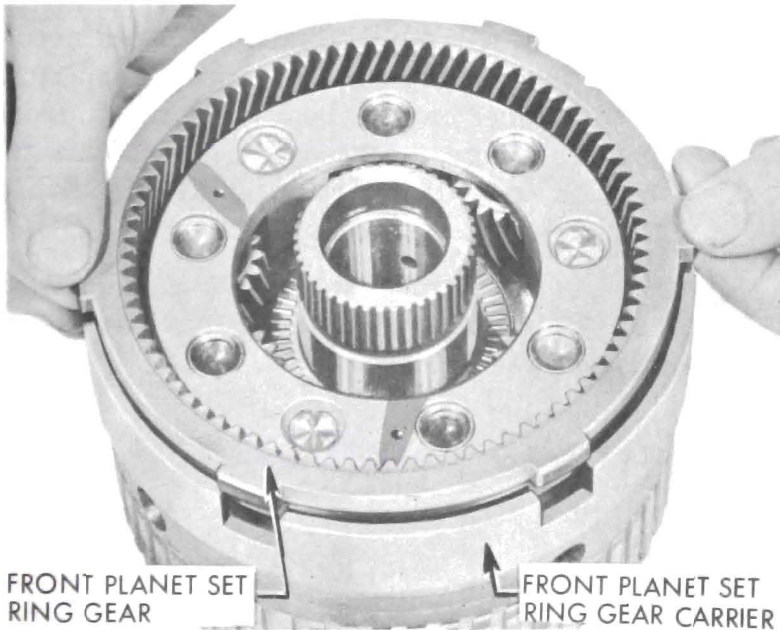
28. Check clearance in neutral clutch pack. Use a dial indicator with support J-1013 resting on hub. Set plunger of dial indicator on backing plate. Force plate pack down solidly with fingers and note reading. Force plate pack up with screwdriver between neutral clutch spring snap ring and pressure plate. Note reading. Difference between two readings (clearance) should be between .010" and .060".

5-422



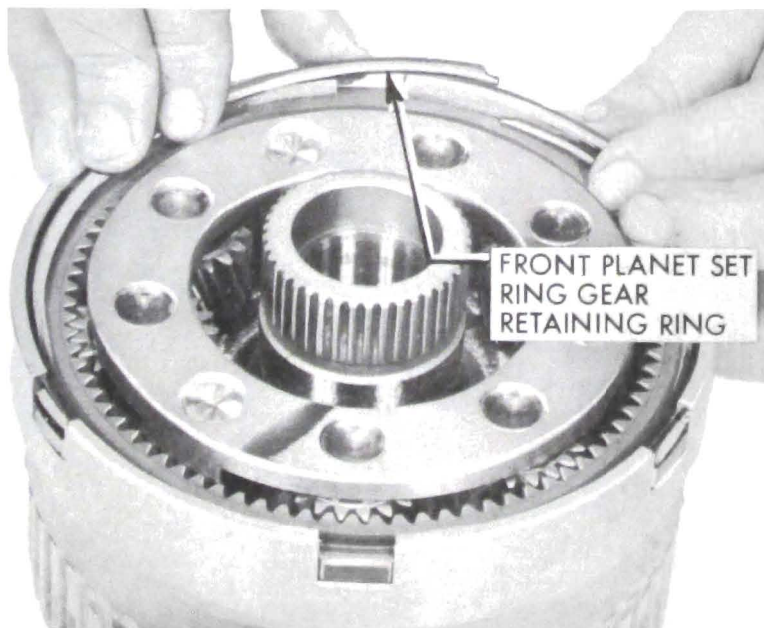
29. Install front ring gear carrier over neutral clutch and carrier assembly. Grasp carefully under the carrier and invert.

5-423



30. Mesh ring gear with planet gears and install in carrier with tangs up.

5-424



31. Install ring gear retaining ring and tap into groove of ring gear carrier.

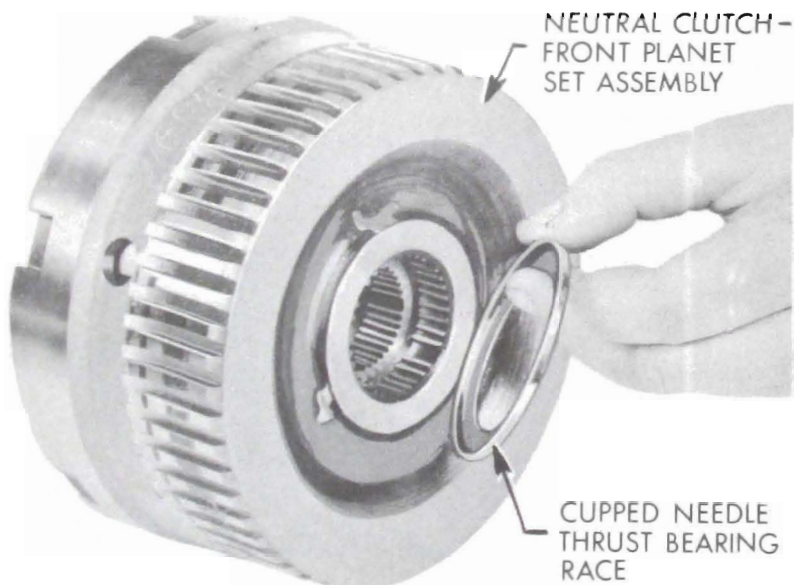
5-425



32. Apply heavy lube to needle bearing race and needle bearing (1 $\frac{3}{4}$ " x 2 $\frac{1}{2}$ ") (Between front sun gear and front planet carrier). Insert race first, then bearing into the bore of front planet set. Press down to seat.

NOTE: No race on top of needle bearing. Front of front sun gear acts as race. This bearing and race are smaller in I.D. and O.D. than the bearings used in the turbine build-up. Care should be used to avoid interchanging these bearings and races.

5-426



33. Invert assembly. Examine cupped needle bearing race; or worn or scored, replace it. Install upper needle bearing race on front planet ring gear carrier, or set it aside for installation with reaction shaft and flange assembly. (Paragraph 5-48)

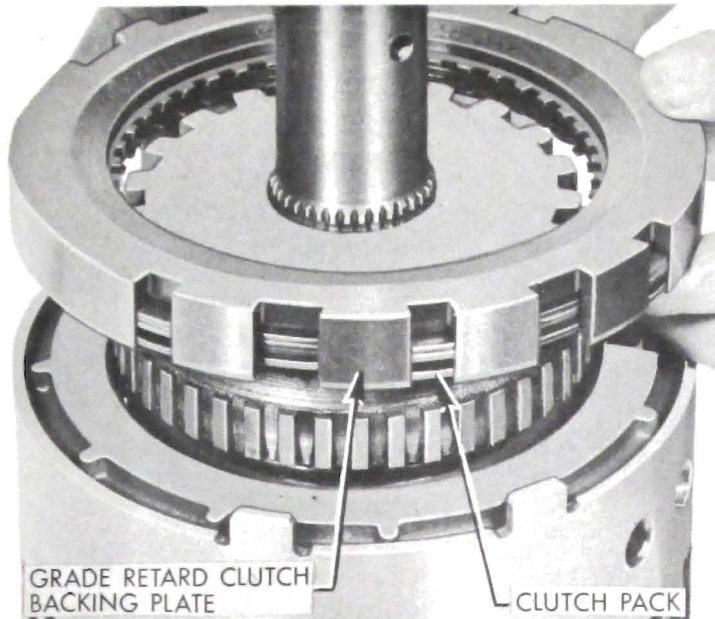
NOTE: This race may have remained on rear of stator reaction shaft when transmission was disassembled.

5-427



34. Front planet set-neutral clutch assembly. Refer to Paragraph 5-47 for front planet set-neutral clutch installation.

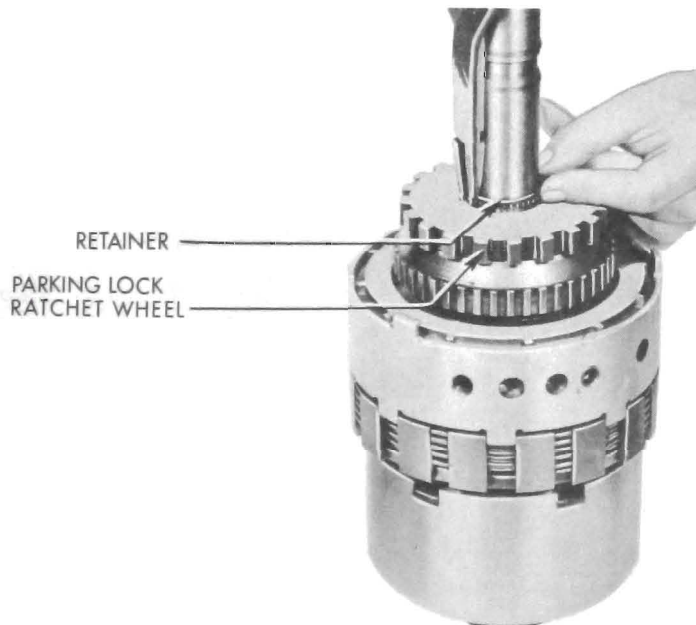
5-428



f. Disassembly, Inspection and Reassembly of Output Shaft Support Assembly

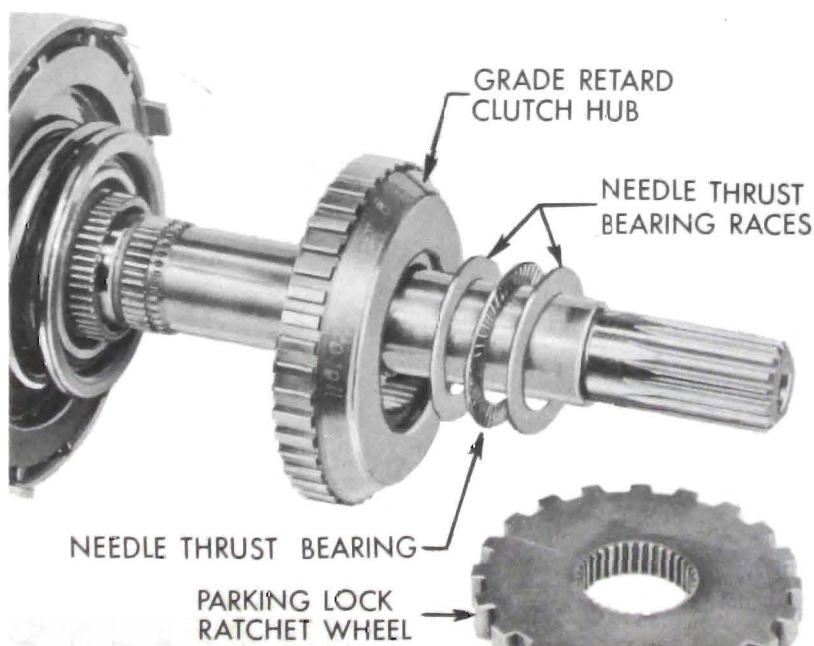
1. Slide grade retard clutch backing plate and clutch pack off clutch hub and output shaft. Set clutch pack and backing plate aside. Refer to Par. 5-48 for inspection and installation of grade retard clutch pack.

5-429



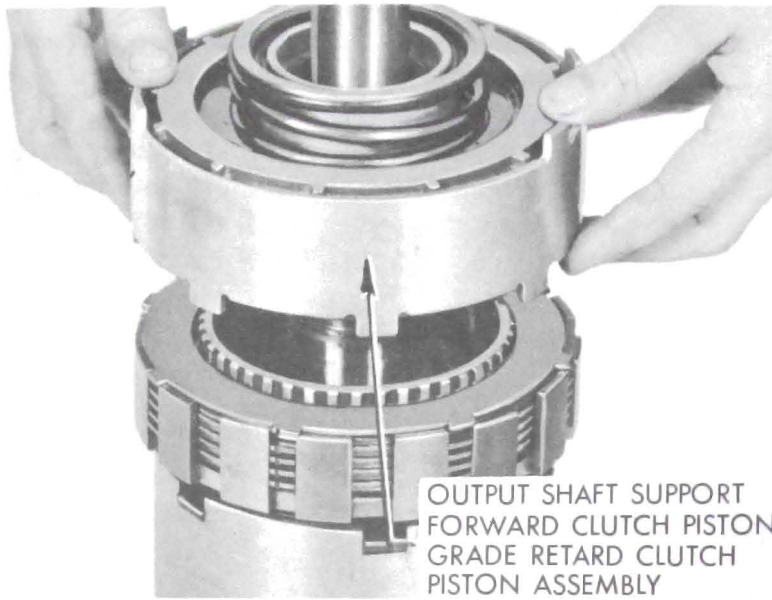
2. Expand and remove parking lock ratchet wheel retaining ring.

5-430



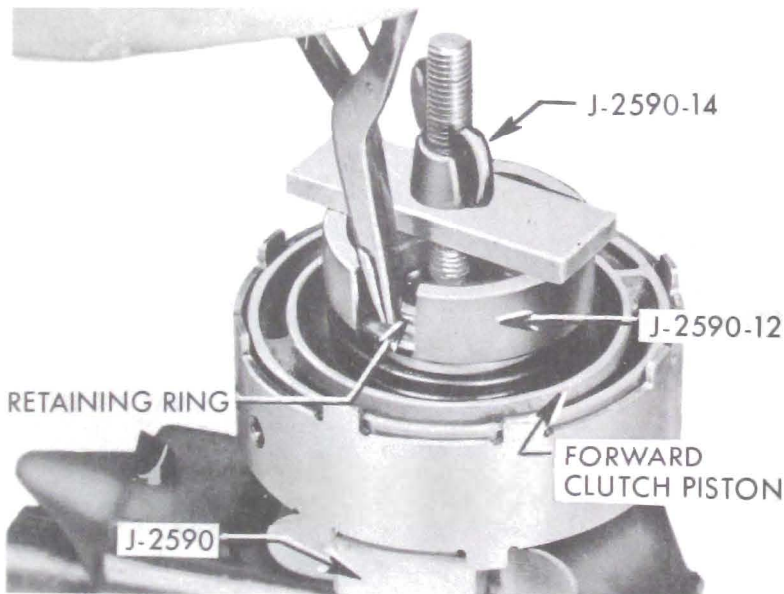
3. Remove and set aside parking lock ratchet wheel and grade retard clutch hub. Needle thrust bearing and two thrust bearing races will come off output shaft with grade retard hub. Refer to Par. 5-47 for inspection and reinstallation of clutch hub, ratchet wheel and needle thrust bearings.

5-431



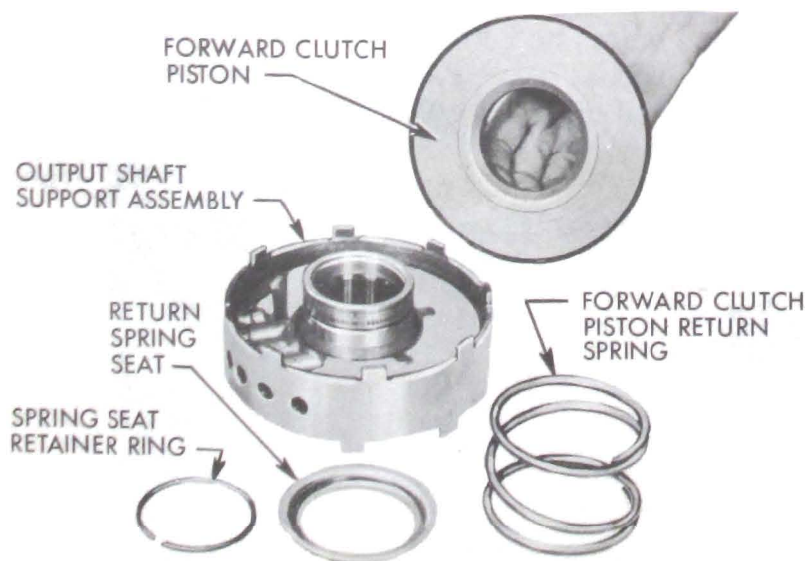
4. Slide output shaft support, forward clutch piston and grade retard piston assembly off output shaft.

5-432



5. From side of output support having eight lugs, remove forward clutch piston spring retainer ring using snap ring pliers and J-2590-12 and 14.

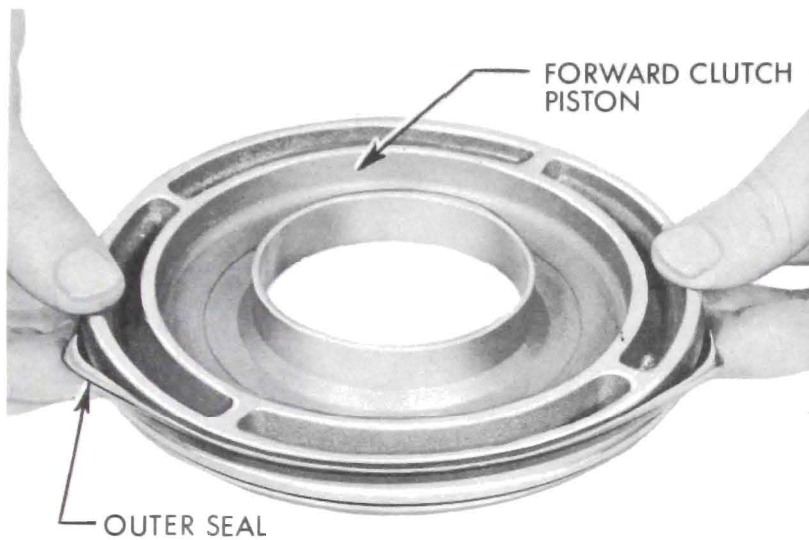
5-433



6. Remove tool, retainer ring, spring seat, spring and forward clutch piston from output shaft support.

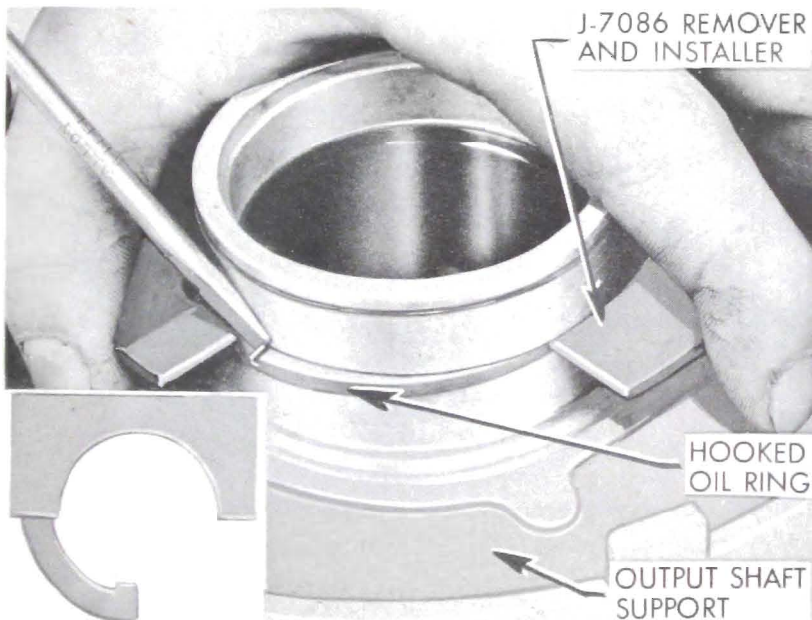
NOTE: *Wide chamfer on I.D. of piston.*

5-434



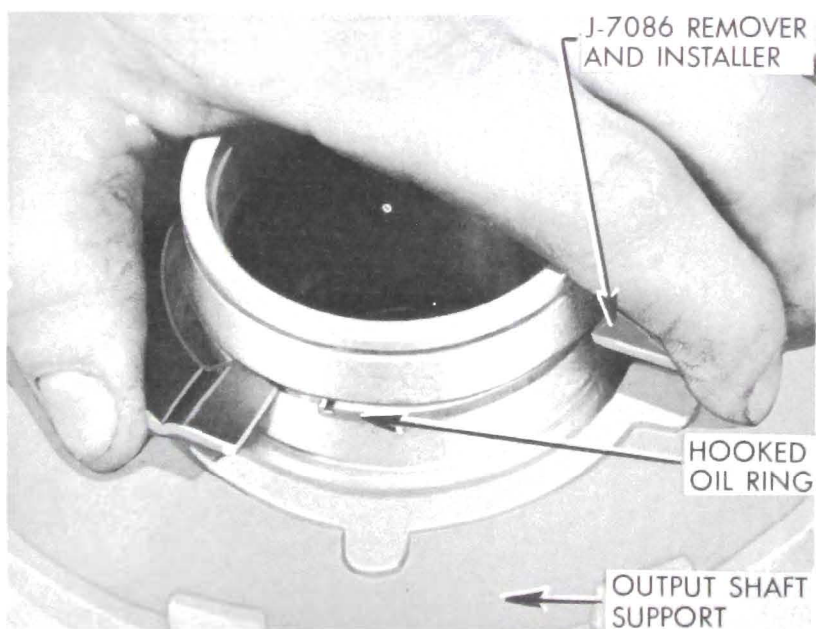
7. Remove rubber outer seal from forward clutch piston. Examine rubber outer seal for nicks, tears or excessive wear. Check bore of piston for galling or excessive wear. Replace parts if necessary.

5-435



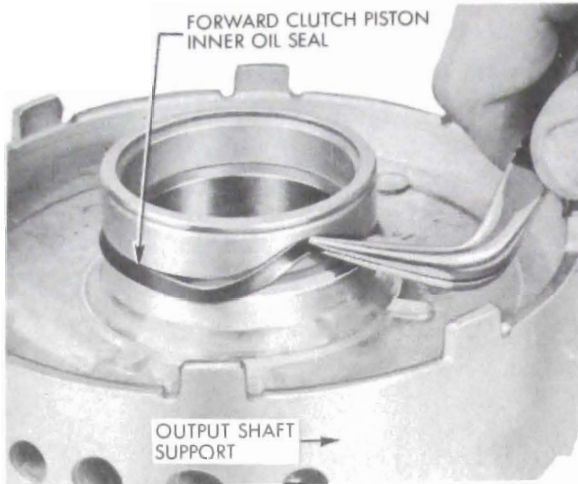
8. If output shaft support is cast iron oil ring equipped, check ring for wear or cracks. If ring requires replacement; assemble Tool J-7086 so forward clutch inner oil ring is forced solidly into groove. Press down the movable arm of Tool J-7086 and pry free end of the hooked oil ring out with screwdriver. Release movable arm of tool, expand and remove hooked oil ring from output shaft support.

5-436



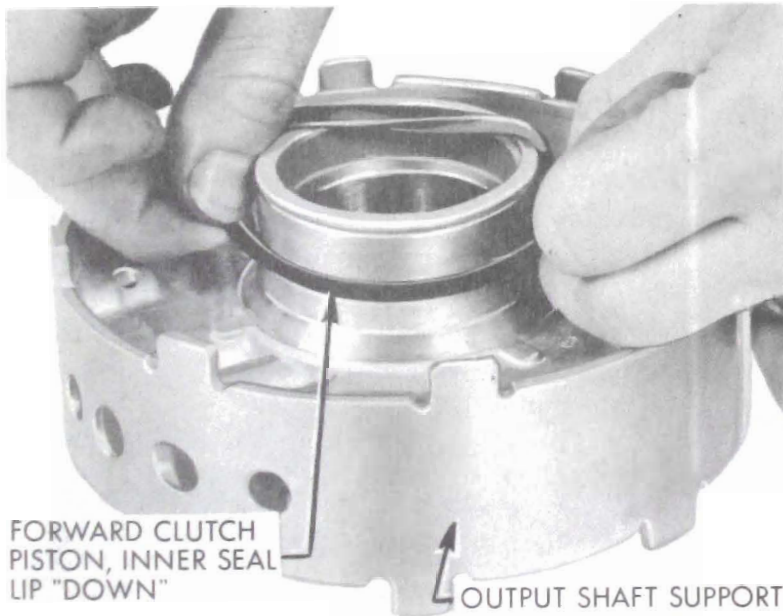
9. If cast iron oil ring was removed; expand and install new forward clutch piston inner oil ring in groove of output shaft support. Assemble Tool J-7086 to compress ring in groove. Press on movable arm of Tool J-7086, free end of ring will snap into hooked position.

5-437



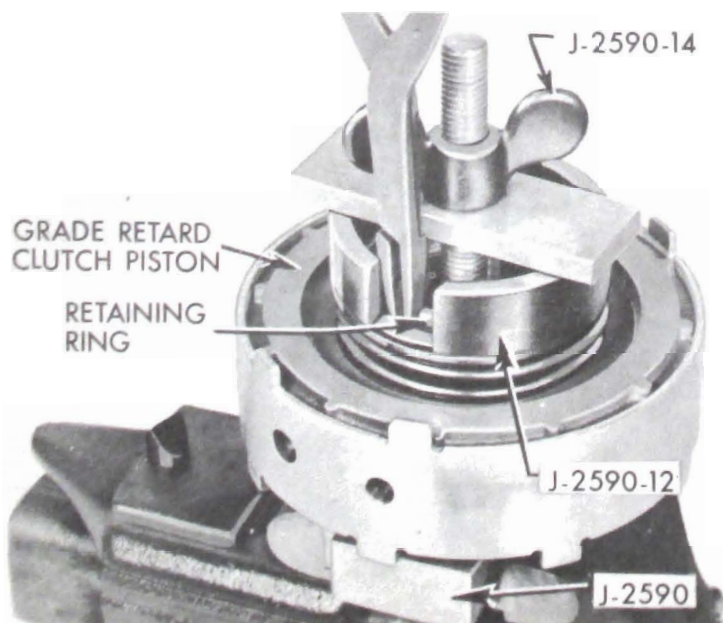
10. If output shaft support is equipped with rubber inner piston seals, check seal for evidence of excessive wear, cracks or tears. If seal is not serviceable remove it with needle nose pliers.

5-438



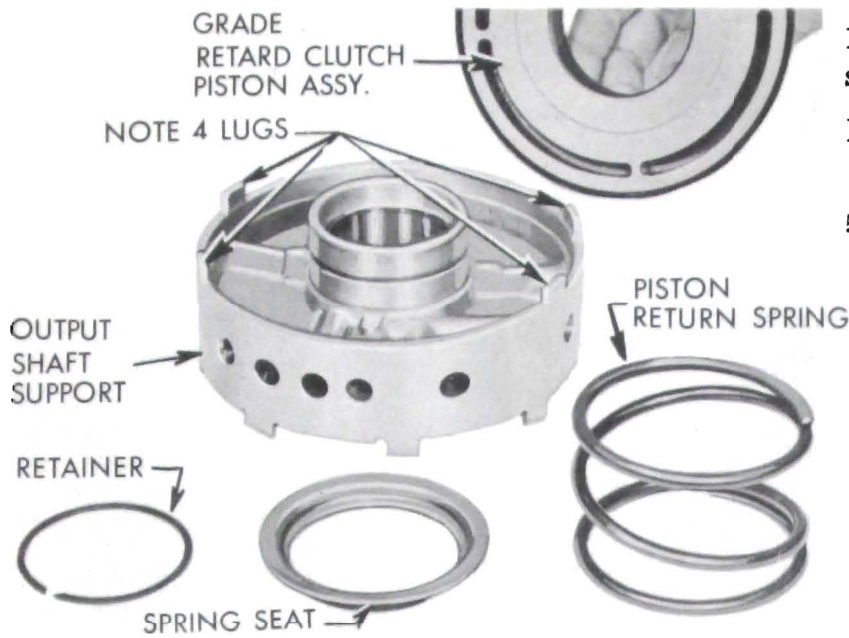
11. Install new forward clutch rubber inner oil seal, lip "down" as shown.

5-439



12. From side of output support having four lugs, remove grade retard spring retainer ring using snap ring pliers and Tool J-2590-12 and 14.

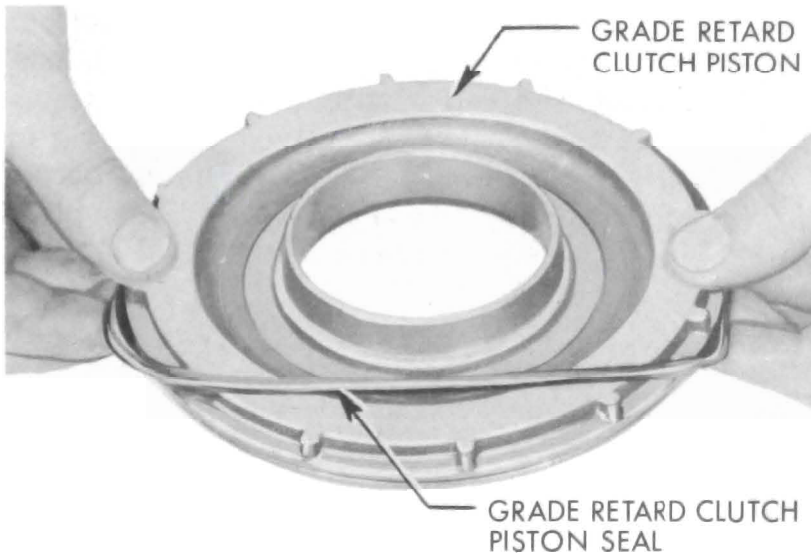
5-440



13. Remove tool, retainer ring, spring seat, spring and grade retard piston.

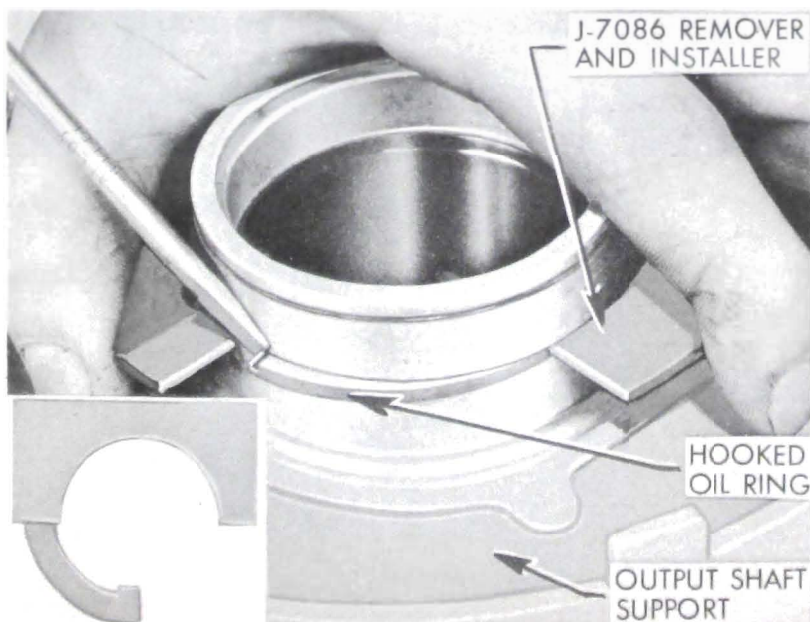
NOTE: *No chamfer on piston or on bore.*

5-441



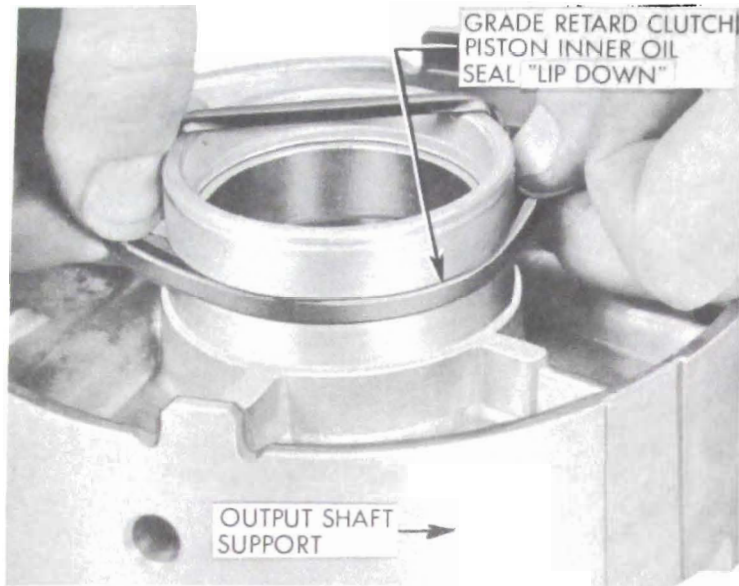
14. Remove rubber oil sealing ring from grade retard piston.

5-442



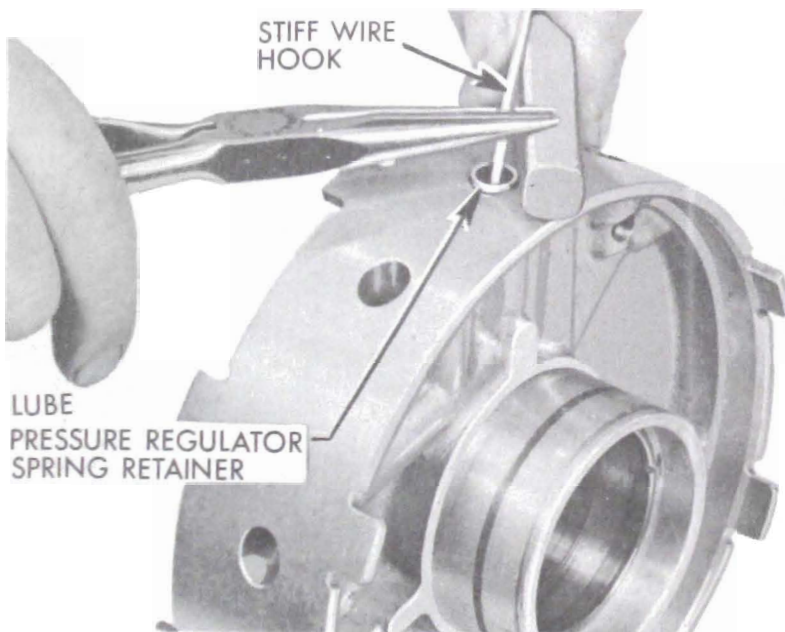
15. If output shaft support is cast iron oil ring equipped, check ring for wear or cracks. If ring requires replacement, remove and replace using Tool J-7086 and method used on forward clutch ring.

5-433



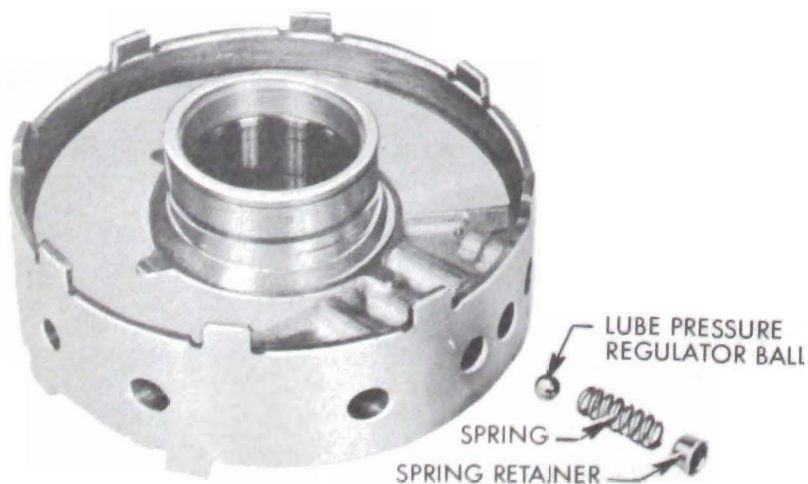
16. If output shaft support is equipped with rubber inner piston seals, check grade retard clutch inner seal for evidence of wear, cracks or tears. If seal is not serviceable remove and replace it.

5-444



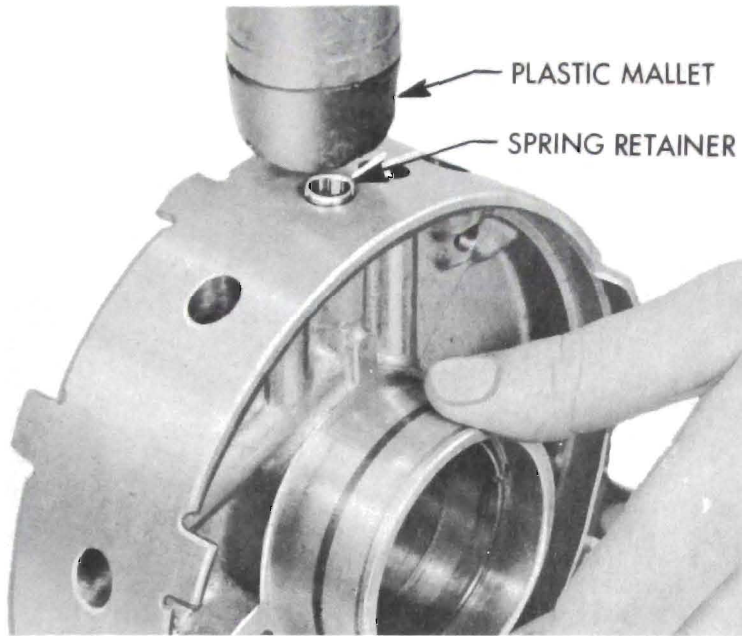
17. Using hook made of stiff wire pull out lube pressure regulator spring retainer, spring and ball. Examine output shaft support bushing and steel sleeve. If bushing or sleeve is worn, loose or scored the output shaft support must be replaced as neither the bushing nor sleeve is replaceable.

5-445



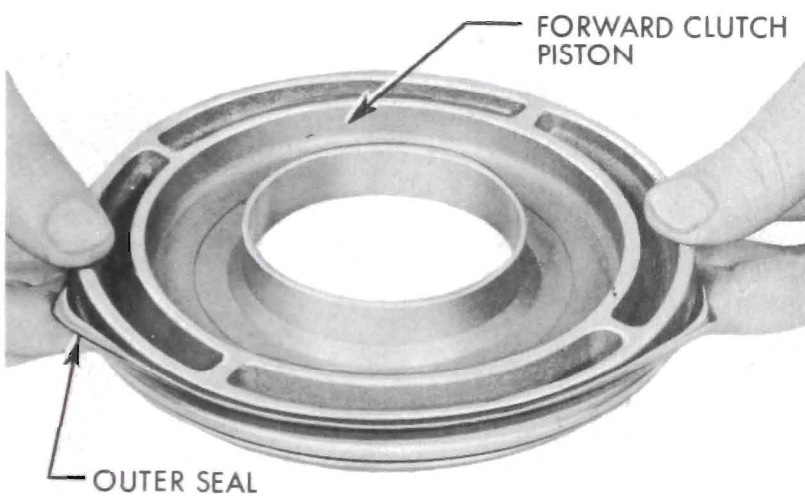
18. Examine ball. If worn or scored, install new ball in lube pressure hole of output shaft support, then spring, then retainer, small hole down.

5-446



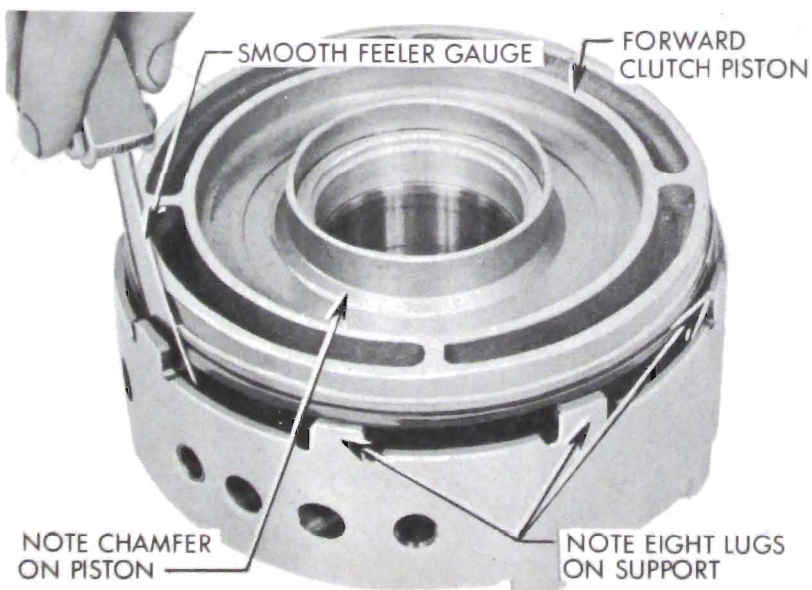
19. Using a plastic or rawhide mallet, drive lube pressure regulator spring retainer flush with surface of support to .010" below.

5-447



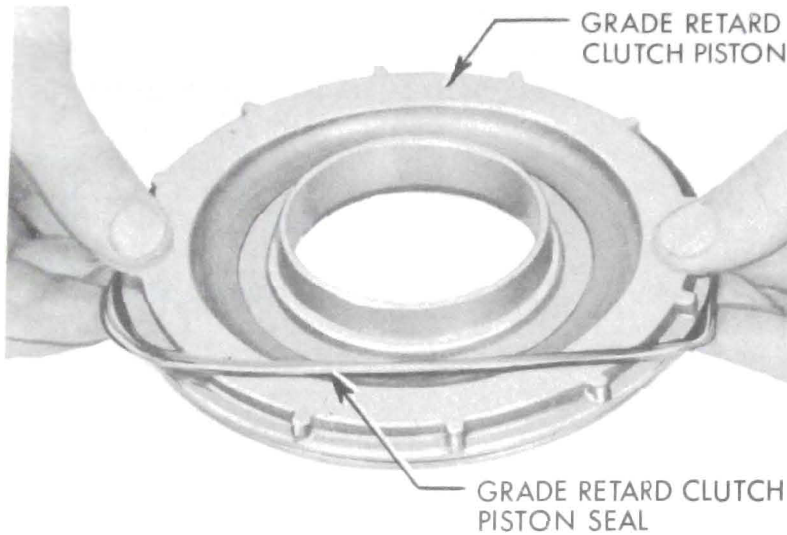
20. Install new rubber sealing ring on forward clutch piston. (Forward clutch piston has wide chamfer in bore.)

5-448



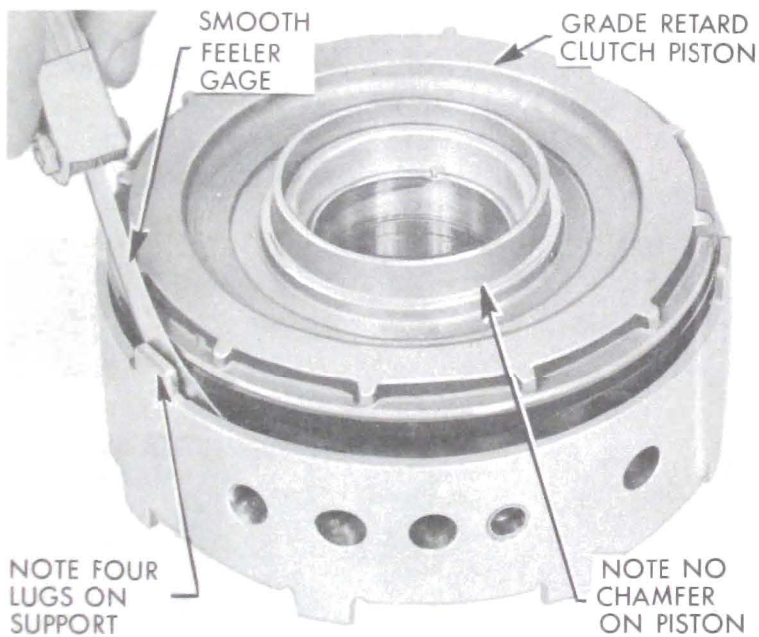
21. Lubricate seals and use smooth edge feeler gauge to hold lip of rubber ring down while inserting piston assembly into output shaft support.

5-449



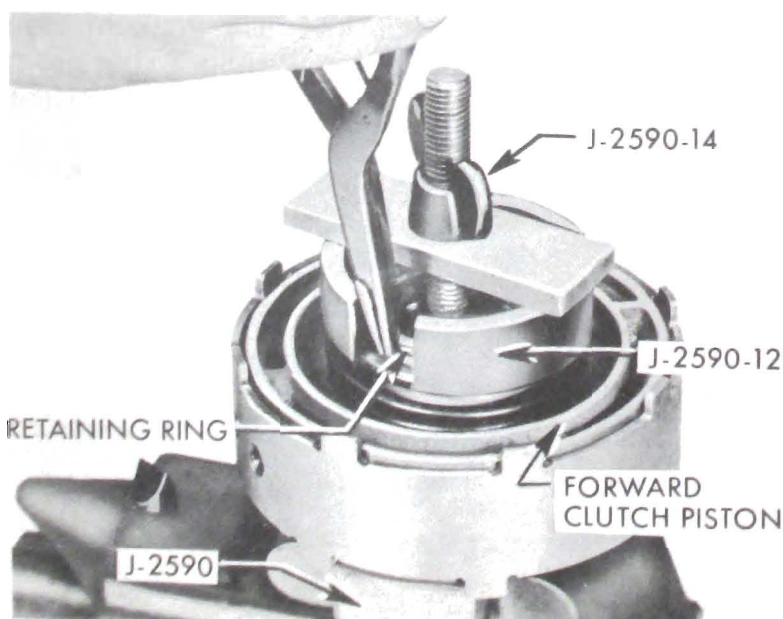
22. Install new rubber sealing ring on grade retard piston.

5-450



23. Lubricate seals and use smooth edged feeler gauge to hold lip of rubber ring down while inserting piston assembly into output shaft support.

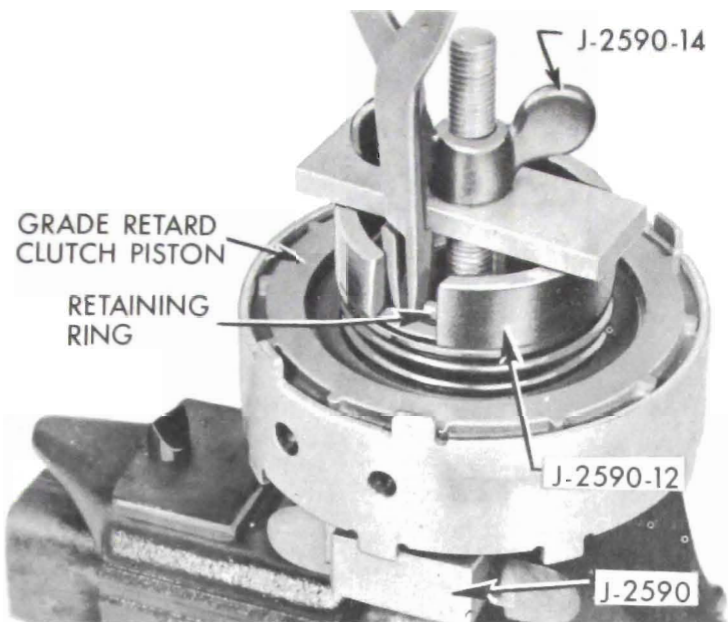
5-451



24. Install forward clutch spring, retainer and snap ring using Tool J-2590-12 and 14, and snap ring pliers.

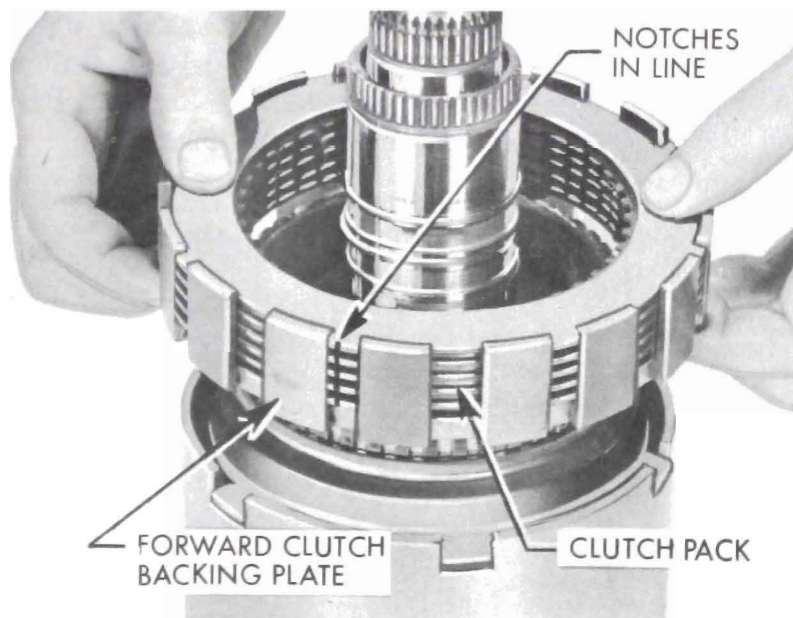
NOTE: Spring, retainer and snap ring are interchangeable with grade retard spring, retainer and snap ring.

5-452



25. Install grade retard clutch spring, retainer and snap ring using Tool J-2590-12 and 14 and snap ring pliers. Refer to Par. 5-47 for installation of output shaft support assembly.

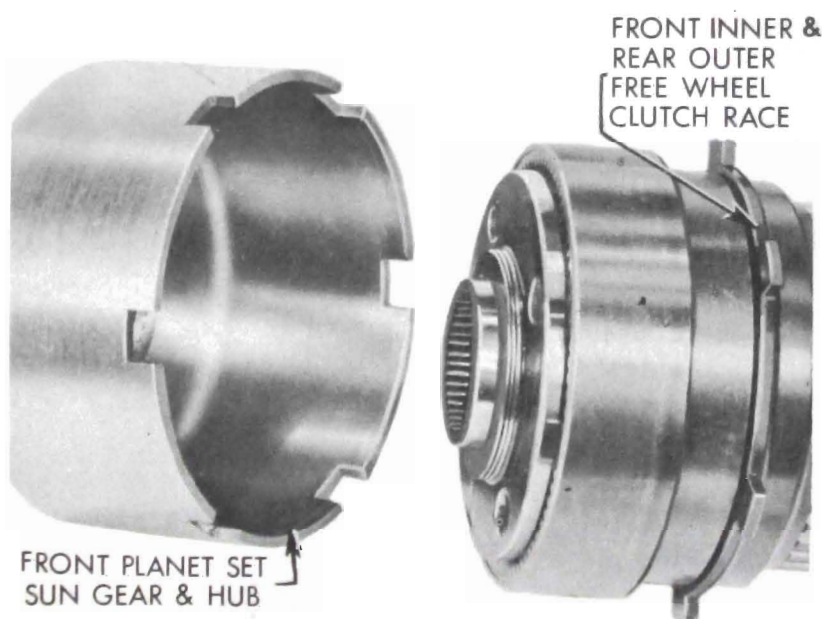
5-453



**g. Removal of Forward Clutch Pack;
Removal and Inspection of Front Planet
Set Sun Gear and Hub**

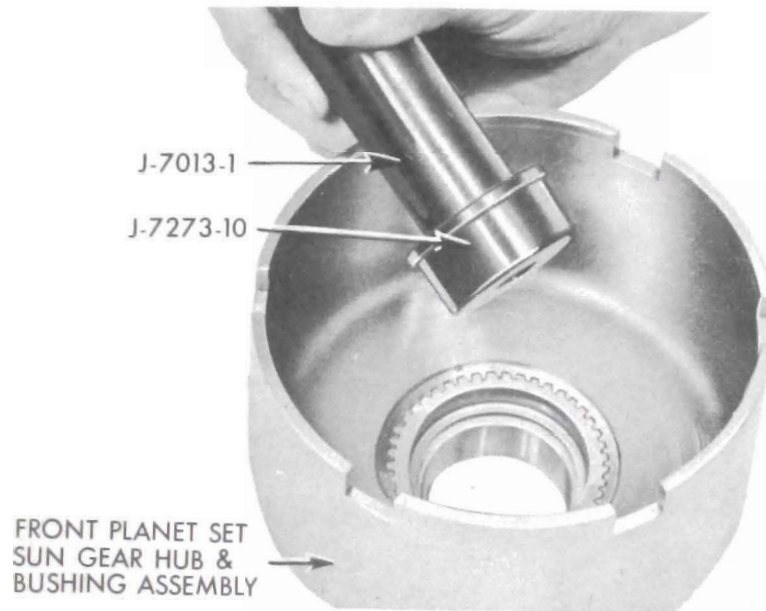
1. Slide forward clutch backing plate and clutch pack off forward clutch hub and output shaft. Refer to Par. 5-47 for installation of forward clutch backing plate and clutch pack.

5-454



2. Separate front planet set sun gear and hub from tangs of front inner and rear outer free wheel race by prying with a screwdriver. Remove sun gear and hub. Examine sun gear. If gear teeth are worn excessively, nicked or broken, replace the gear and hub assembly.

5-455



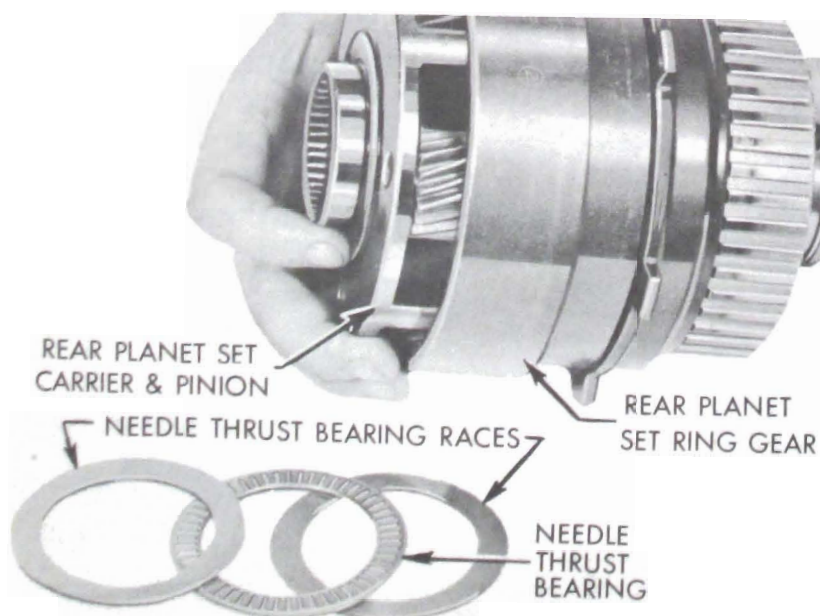
3. Examine front sun gear bushing. If worn or scored, drive bushing out using J-7013-1 Handle and J-7273-10 Remover.

5-456



4. Install new front sun gear bushing using J-7013-1 Handle and J-7273-6-10 Installer. (Counterbore on 6 toward 10.) Refer to Par. 5-47 for installation of front sun gear.

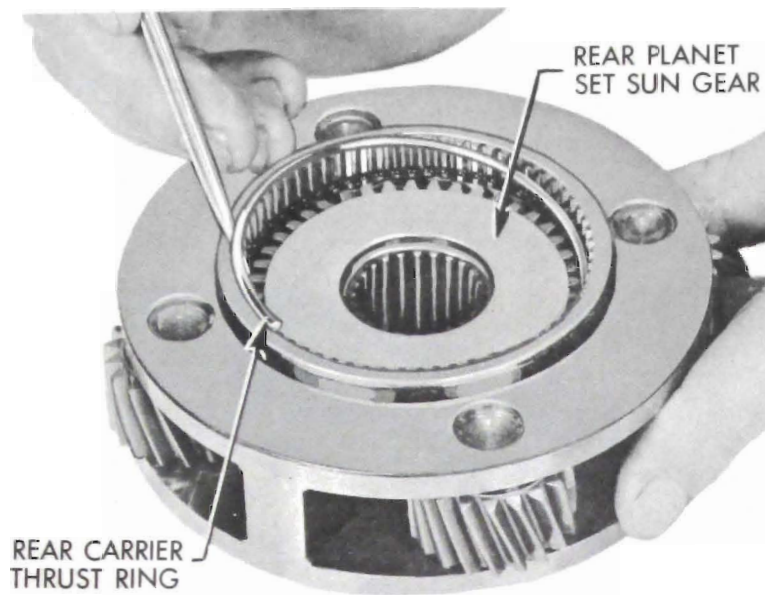
5-457



h. Disassembly, Inspection and Reassembly of Rear Planet Set

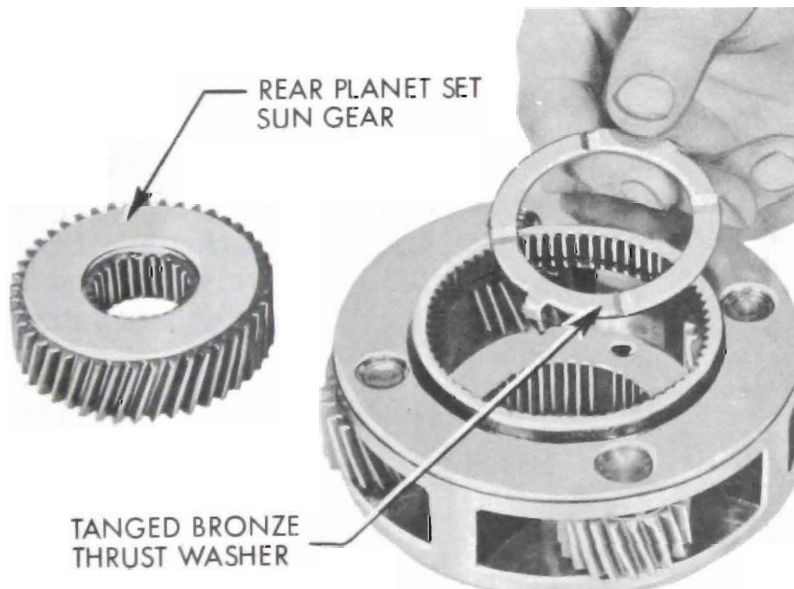
1. Remove rear planet set carrier needle thrust bearing and two thrust bearing races from hub of carrier. Examine bearing and races for excessive wear or galling; replace if necessary. Grasp carrier and slide carrier and planet assembly out of rear planet set ring gear. It may be necessary to pry to start out.

5-458



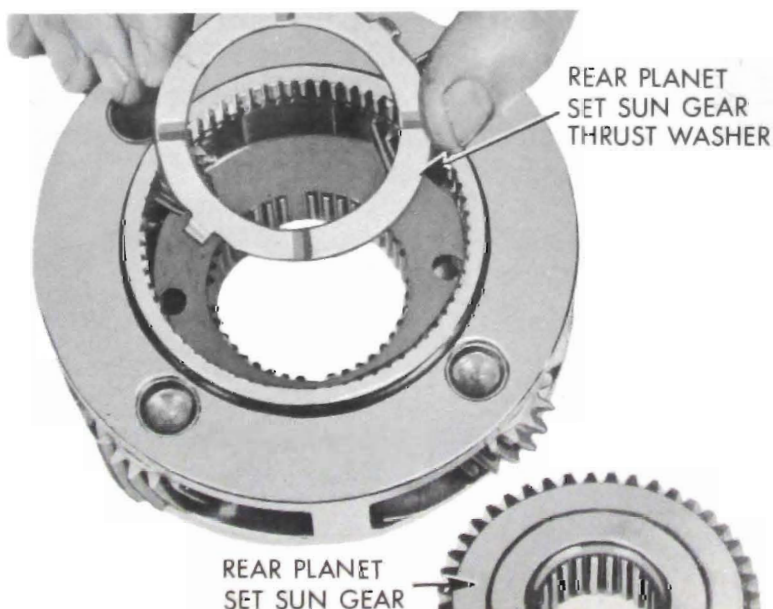
2. Pry rear carrier thrust ring out of groove in carrier. Remove ring.

5-459



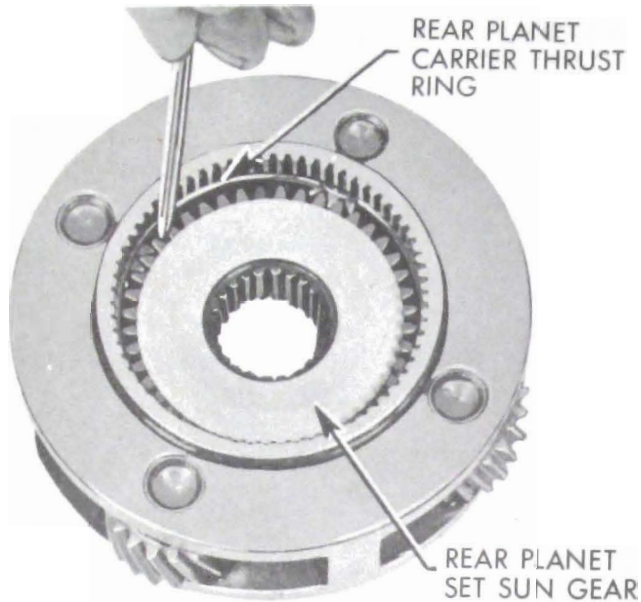
3. Remove rear planet set sun gear and tanged bronze thrust washer (between rear sun gear and rear planet carrier) from rear planet set. Examine gears for nicks or excessive wear. If planet pinion gears are damaged or loose on the shaft, the carrier assembly must be replaced.

5-460



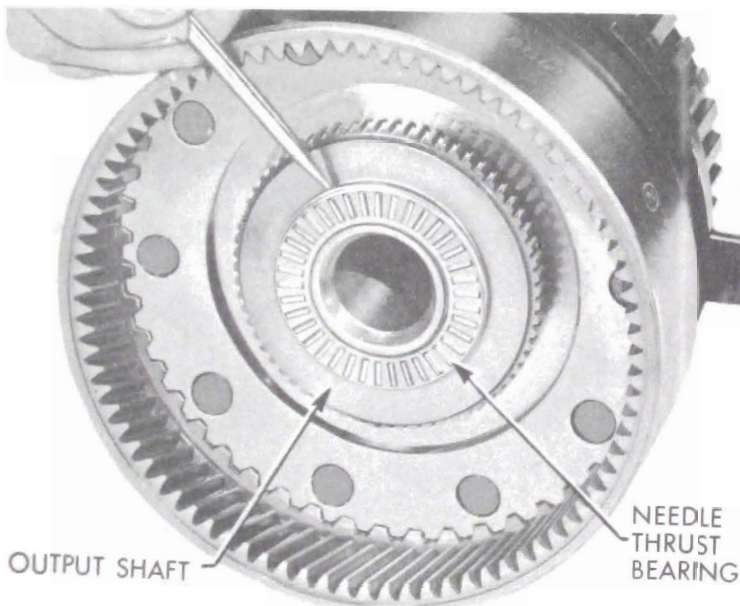
4. Check thrust washer for evidence of excessive wear; replace if necessary. Apply heavy lube to new rear planet set sun gear thrust washer. Position in carrier, tangs down in holes. Install sun gear either end up.

5-461



5. Install rear carrier thrust ring solidly in groove above sun gear. Refer to Par. 5-47 for installation of rear planet set assembly and needle thrust bearing.

5-462

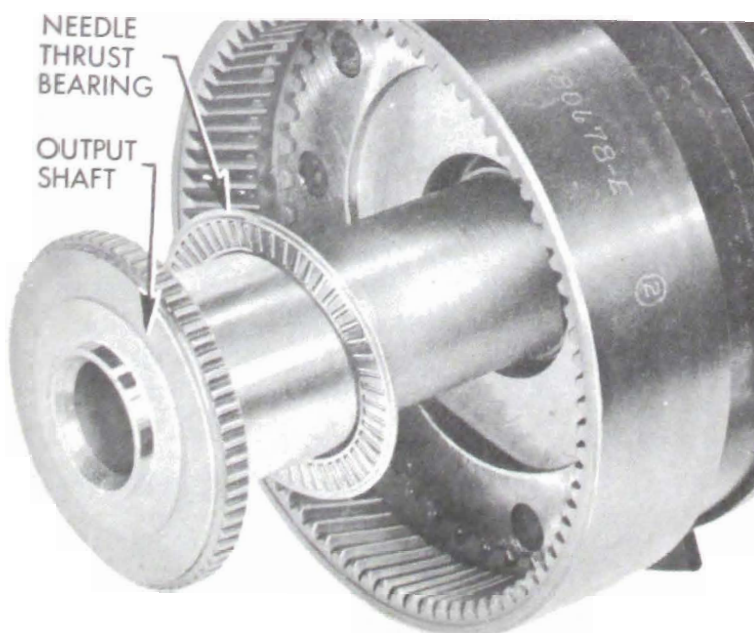


i. Inspection of Output Shaft and Output Shaft Bushing, Oil Ring Removal and Replacement

1. Remove needle thrust bearing (between rear sun gear and output shaft) from front of output shaft. Examine bearing and front of output shaft for excessive wear or galling. Replace bearing if worn; replace output shaft if galled or rough.

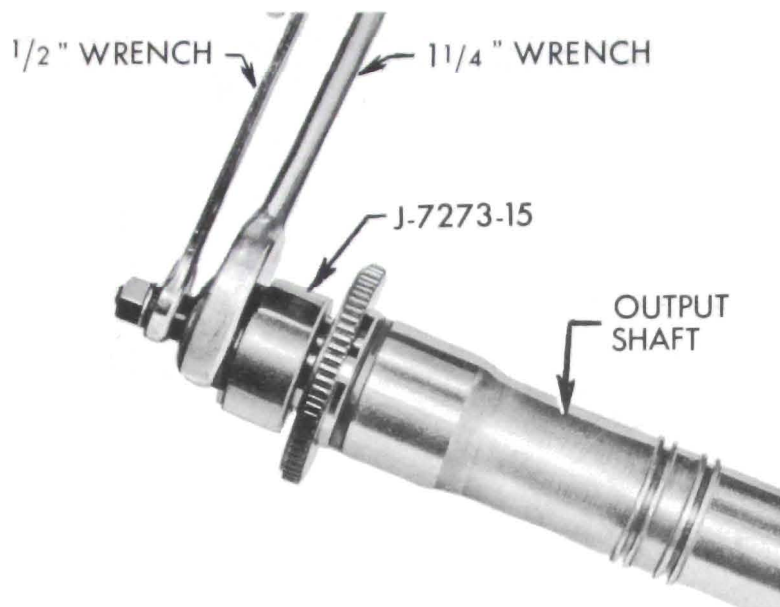
NOTE: No separate needle bearing races used at this point.

5-463



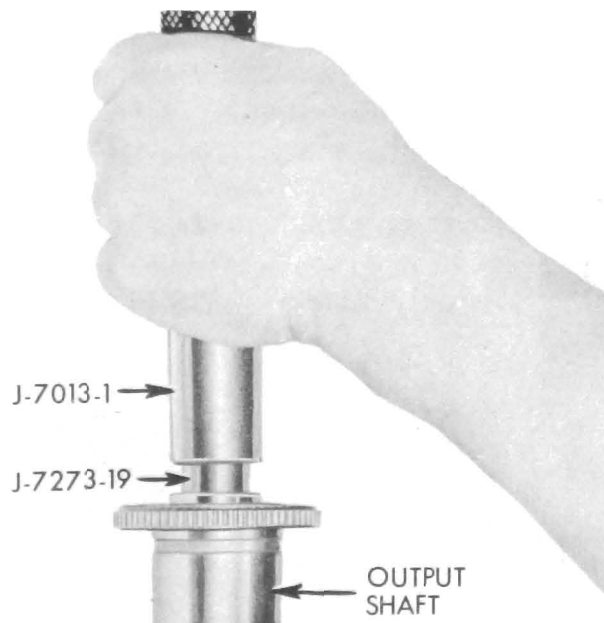
2. Slide output shaft forward through grade retard reaction shaft. Needle thrust bearing (between grade retard reaction shaft and output shaft) has no separate races. Remove needle thrust bearing.

5-464



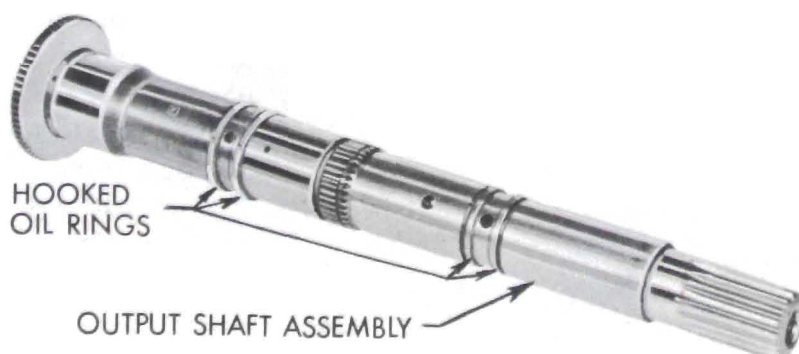
3. Examine output shaft bushing. If worn or scored, pull bushing using J-7273-15 with output shaft in vise equipped with soft jaws. Slip puller into position in output shaft. Expand puller by holding shaft with 1/2" wrench and turning 5/8" nut. Hold puller shaft with 1/2" wrench and turn, 1 1/4" nut to pull bushing.

5-465



4. Install new output shaft bushing using J-7013-1 Handle and J-7273-19 Installer.

5-466

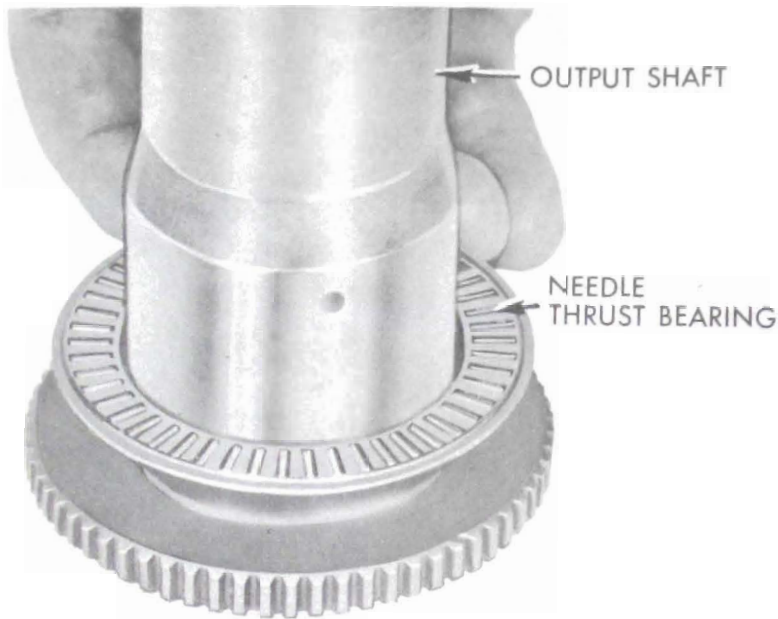


5. Examine and if necessary to replace, unhook, expand and remove four hooked oil rings on output shaft.

Expand and install four new hooked oil rings in grooves of output shaft.

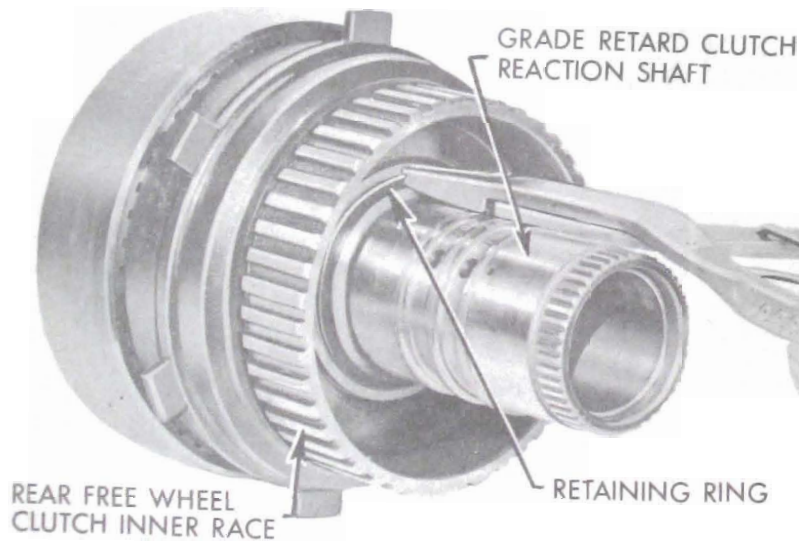
Blow compressed air through rear end of output shaft to clean small oil bleed hole and screen in output shaft.

5-467



6. Examine needle thrust bearing and bearing surface of output shaft. If bearing is excessively worn, replace it. If output shaft bearing surface is galled or rough the shaft must be replaced. Apply heavy lube to output shaft to grade retard reaction shaft needle thrust bearing ($1\frac{3}{4}$ " I.D. x $2\frac{1}{2}$ " O.D.) and place in position on output shaft. Refer to Par. 5-47 for output shaft installation.

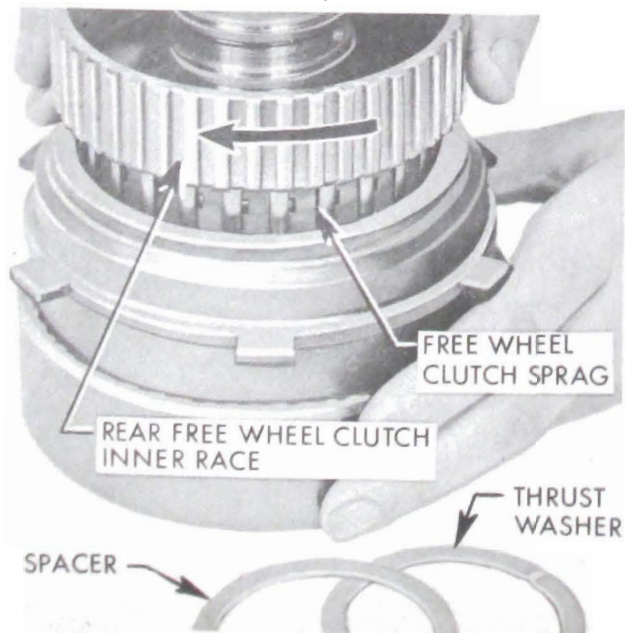
5-468



j. Disassembly, Inspection and Reassembly of Grade Retard Clutch Reaction Shaft and Free Wheel Clutch Assembly

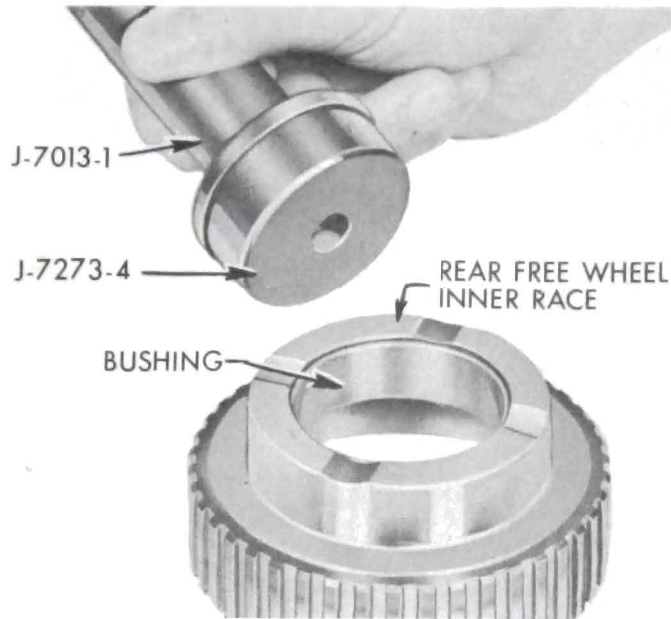
1. Expand and remove rear free wheel inner race to grade retard reaction shaft retaining ring.

5-469



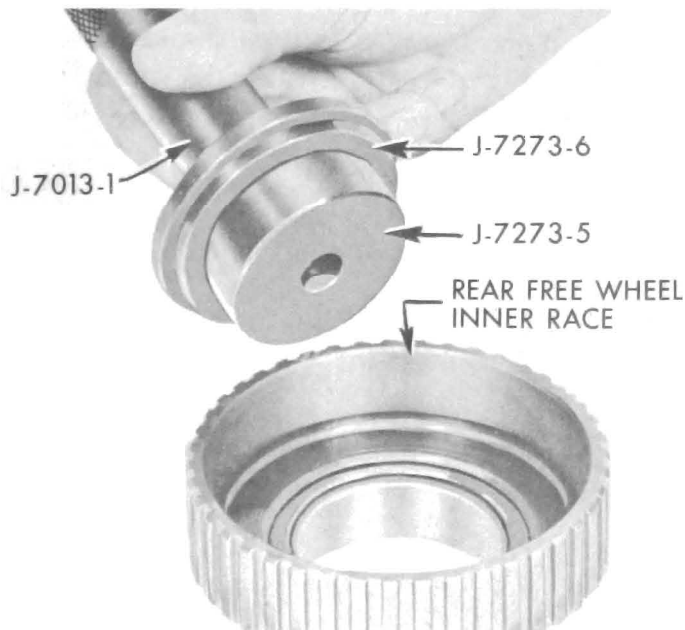
2. Remove rear free wheel clutch inner race thrust washer and spacer (between rear free wheel race and retaining ring). Rotate race clockwise and slide sprag and race out of rear free wheel outer race. Remove and examine sprag and races. If races are galled radially they should be replaced, but if only slight depressions are evident around the races they are serviceable and should not be replaced. If sprag is worn excessively or galled it should be replaced.

5-470



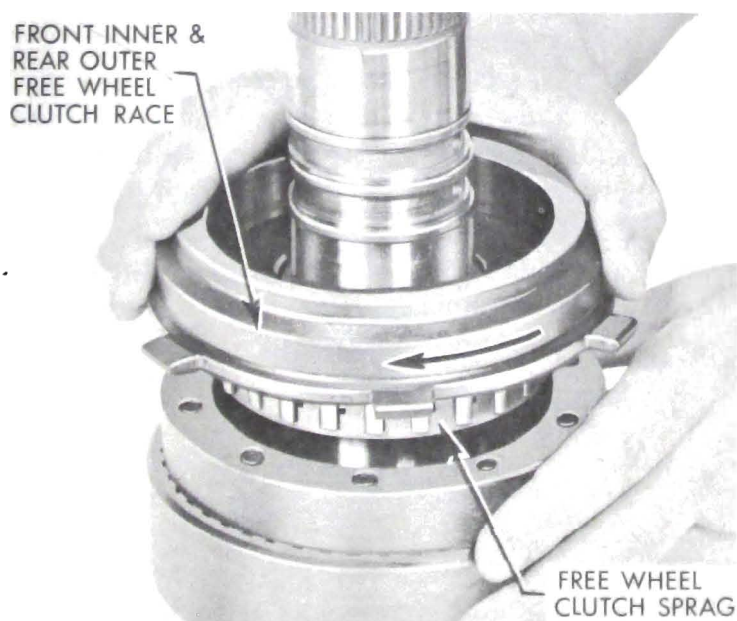
3. Examine rear free wheel clutch inner race bushing. If worn or scored, drive bushing out using J-7013-1 Handle and J-7273-4 Remover.

5-471



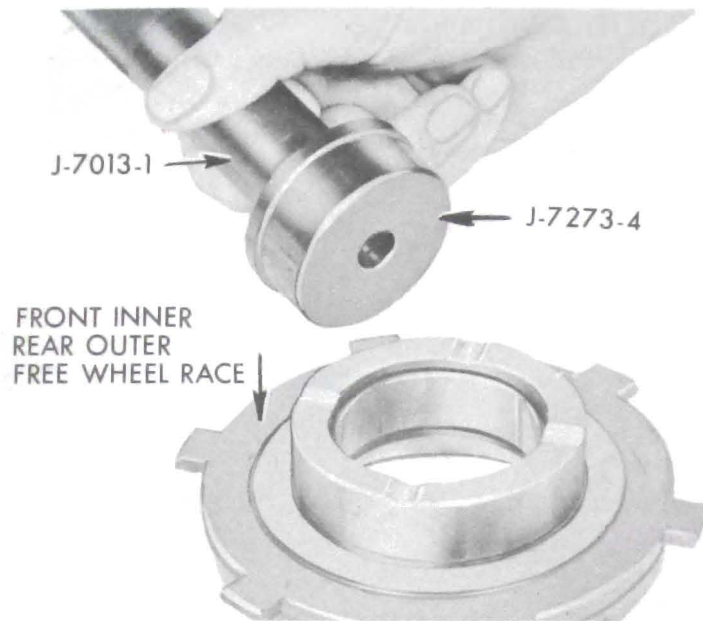
4. Install new rear free wheel clutch inner race bushing using J-7013-1 Handle and J-7273-5-6. (Counterbore on 6 toward handle.)

5-472



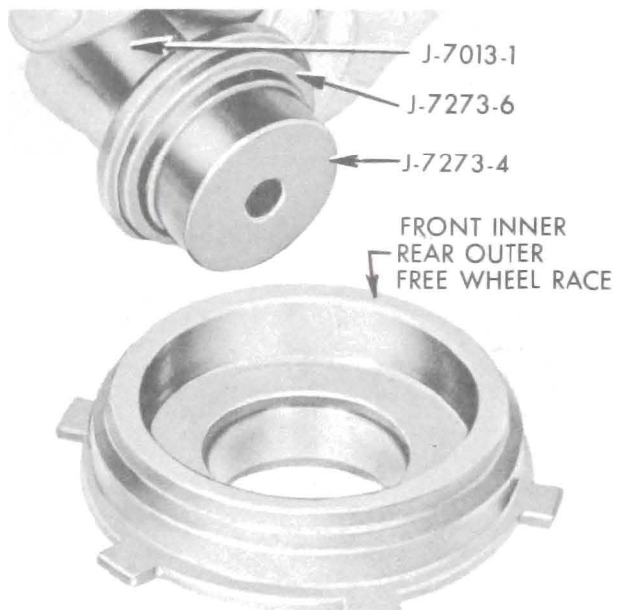
5. Rotate front inner and rear outer free wheel clutch race clockwise and slide race and sprag out of rear planet ring gear—front free wheel clutch outer race. Remove and examine sprag and races. If races are galled radially they should be replaced, but if only slight depressions are evident around the races they are serviceable and should not be replaced. If sprag is worn excessively or galled, it should be replaced.

5-473



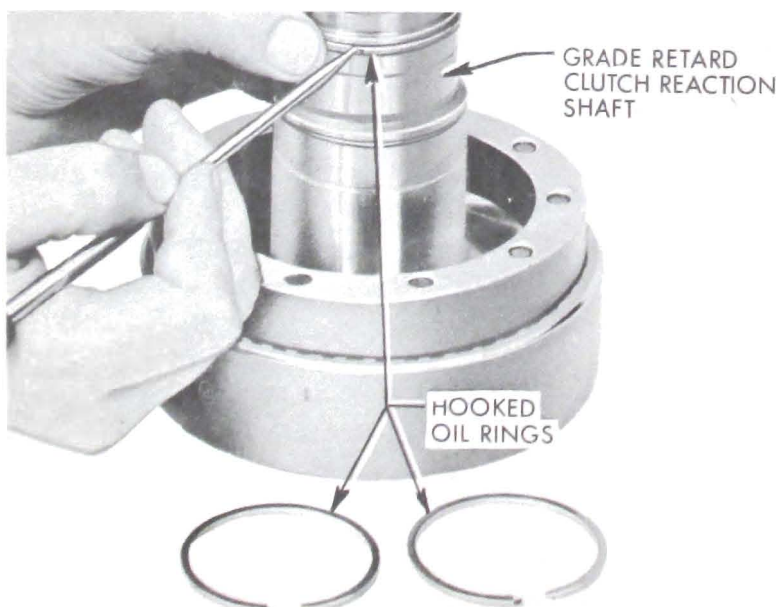
6. Examine front inner and rear outer free wheel clutch race bushing. If worn or scored, drive bushing out using J-7013-1 Handle and J-7273-4 Remover.

5-474



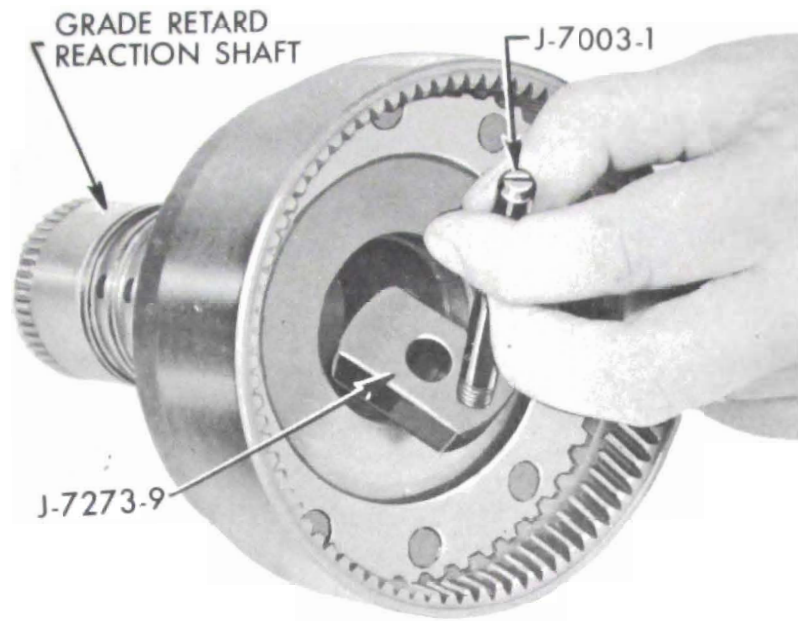
7. Install new front inner and rear outer free wheel clutch race bushing, using J-7013-1 and J-7273-4-6. (Counterbore on 6 toward handle.)

5-475



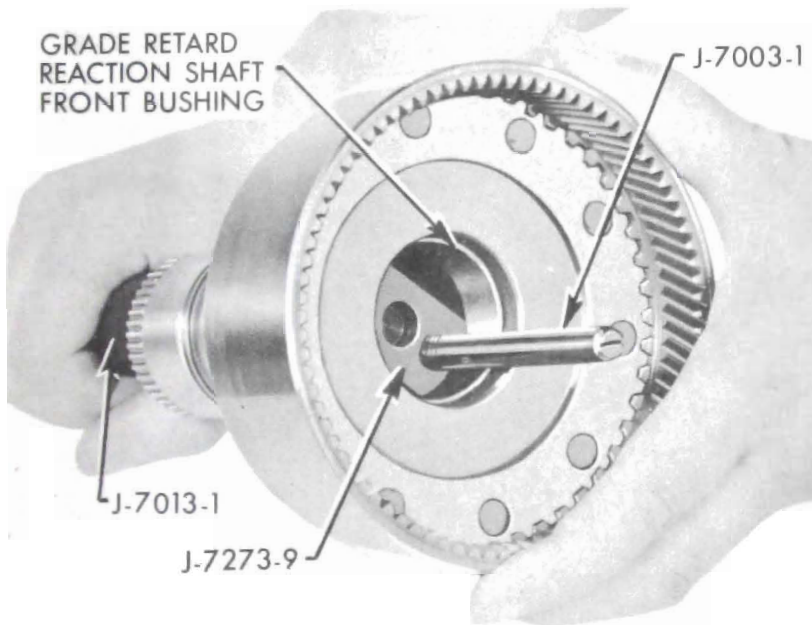
8. Examine rear planet set ring gear. If gear is excessively worn or scored the gear and shaft assembly must be replaced. Examine and if necessary to replace, unhook, expand and remove three oil rings from grade retard reaction shaft. Expand and install three new oil rings in grooves of grade retard reaction shaft, hook ends.

5-476



9. Examine front grade retard reaction shaft bushing. If worn or scored, assemble J-7003-1 Guide Pin to J-7273-9 Remover. Tilt remover to assemble behind front bushing.

5-477



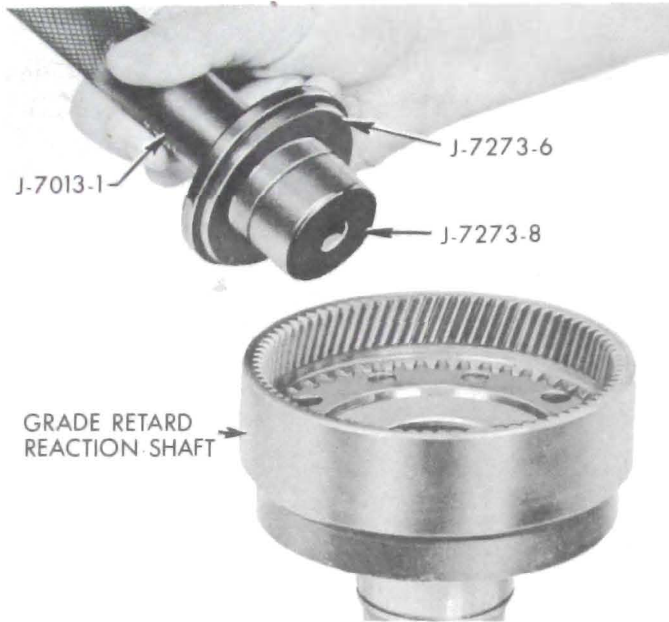
10. Insert J-7013-1 Handle through rear of reaction shaft to enter J-7273-9 Remover.

5-478



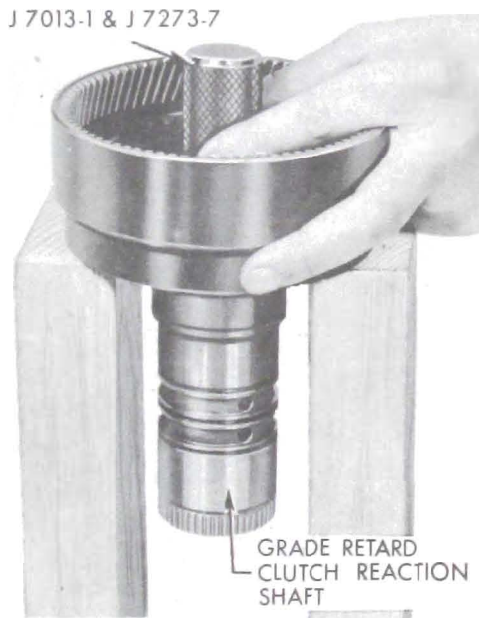
11. Drive out bushing.

5-479



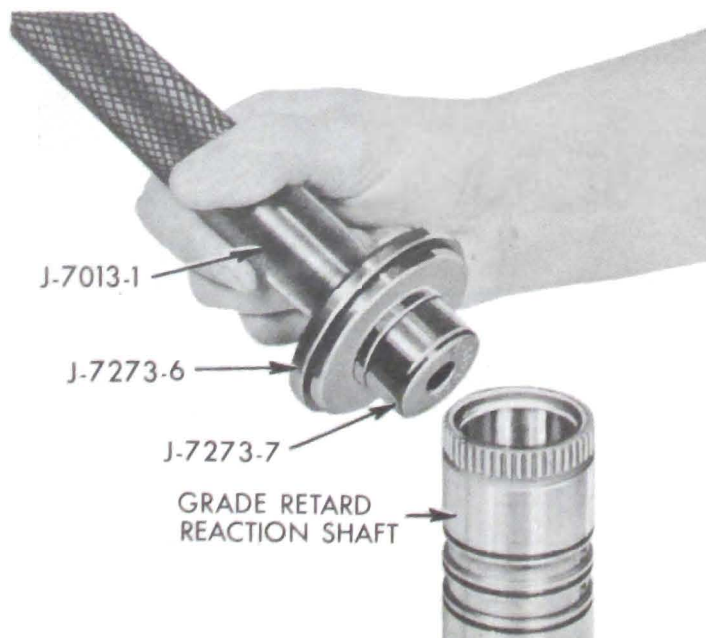
12. Install new grade retard reaction shaft front bushing using J-7013-1 Handle and J-7273-6-8. (Counterbore on 6 toward handle.)

5-480



13. Examine grade retard reaction shaft rear bushing. If worn or scored, drive out bushing using J-7013-1 and J-7273-7 Remover.

5-481



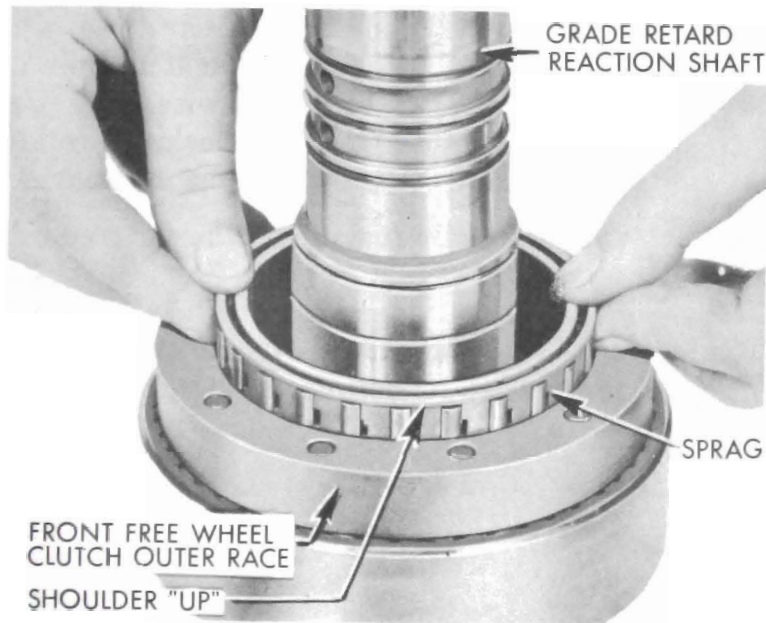
14. Install new grade retard reaction shaft rear bushing using J-7013-1 Handle and J-7273-6-7. (Counterbore on 6 toward handle.)

5-482

15. Front free wheel clutch sprags have an inner cage $\frac{1}{32}$ " longer than the outer cage and no bronze drag strips. If a rear sprag is inadvertently installed in the front free wheel clutch, severe damage to the outer race will result.



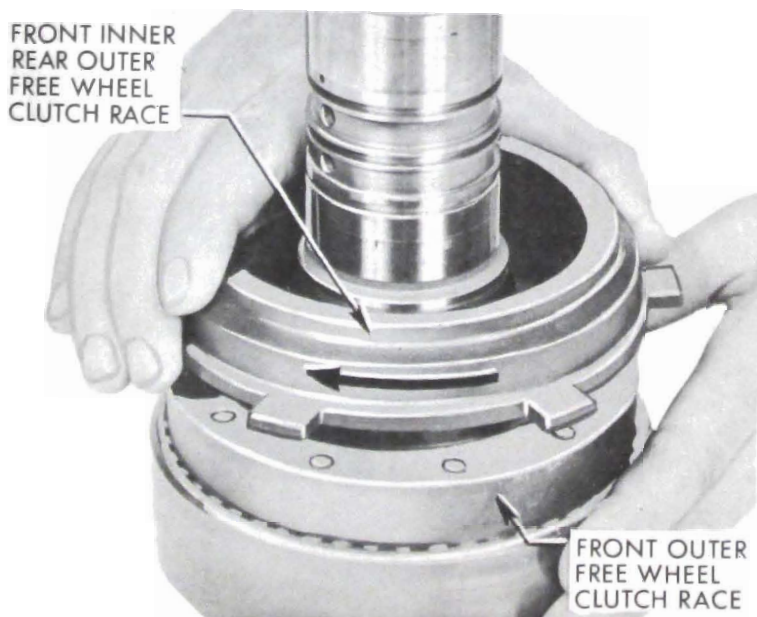
5-483



16. Lubricate and slip front sprag into front free wheel clutch outer race. (No bronze drag strips on front sprag.)

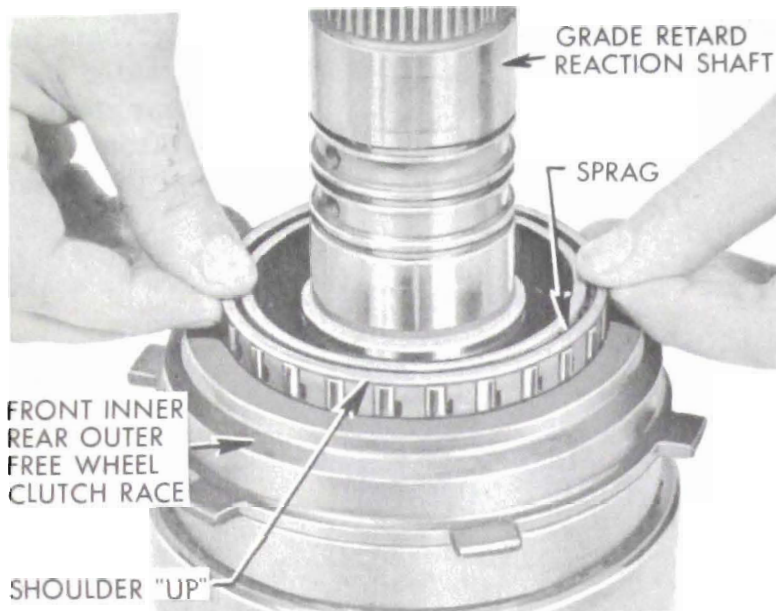
NOTE: *Extended inner cage "down."*

5-484



17. Lubricate and insert front free wheel clutch inner race into sprag while rotating clockwise. The inner race must rotate freely on clockwise rotation and lock on counter-clockwise rotation. When correctly installed, the front inner free wheel race will be approximately $\frac{1}{16}$ " from front outer race.

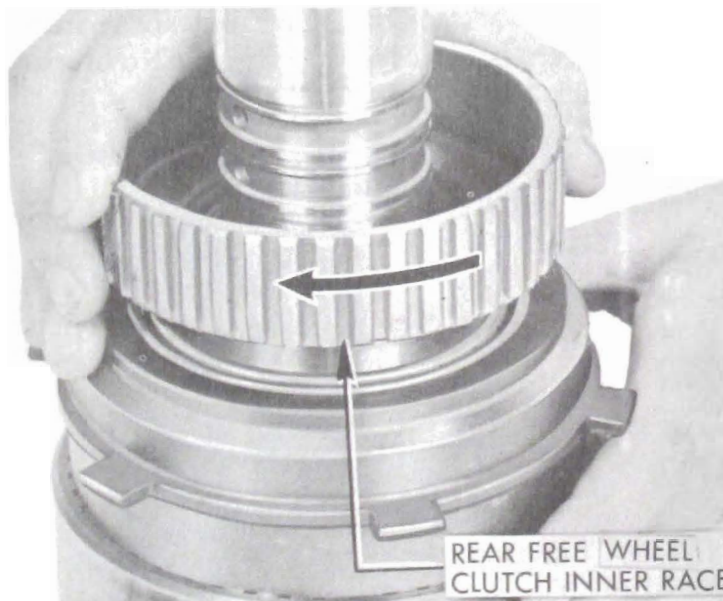
5-485



18. Lubricate and insert rear free wheel clutch sprag into rear outer race.

NOTE: *Bronze drag strips on rear sprag.*

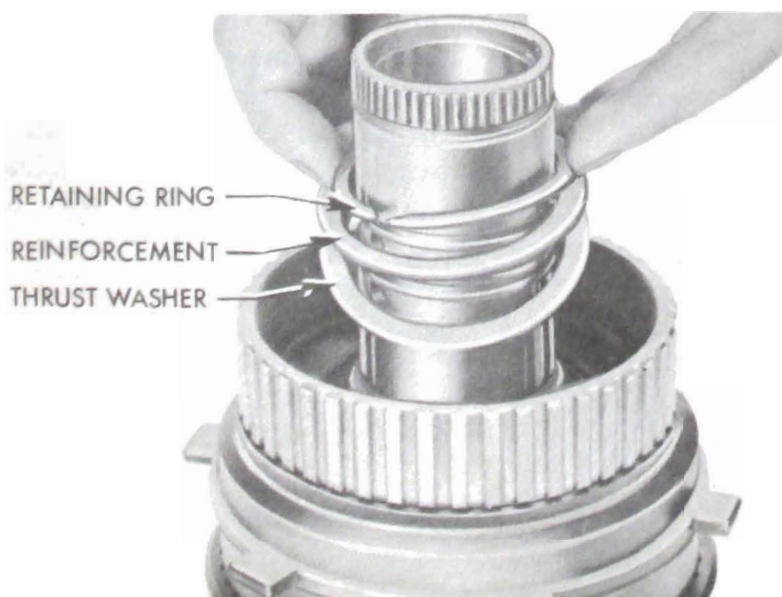
5-486



19. Lubricate and insert rear free wheel clutch inner race-forward clutch hub into sprag while rotating clockwise. The inner race must rotate freely on clockwise rotation and lock on counterclockwise rotation.

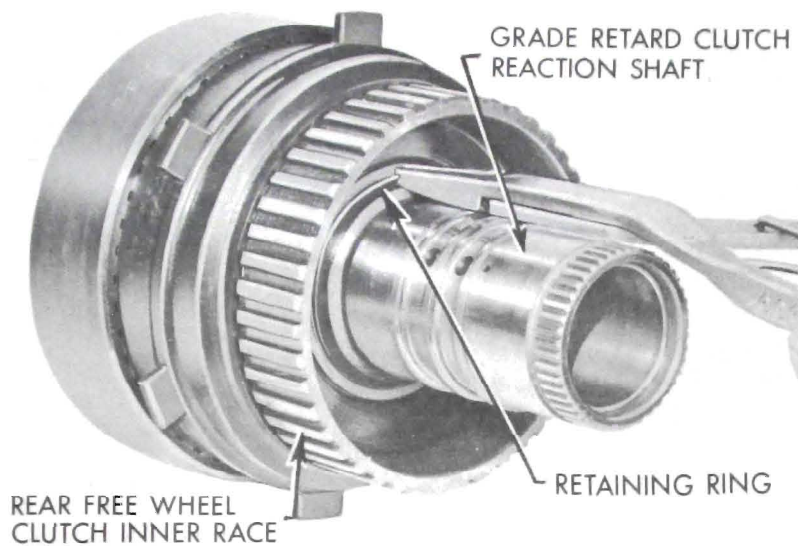
When correctly installed, the rear free wheel inner race should contact front inner rear outer race. If approximately $\frac{1}{8}$ " clearance exists rear inner race may be hanging up on bronze strip at bottom of sprag assembly.

5-487



20. Lubricate and assemble new rear free wheel clutch inner race thrust washer first, then reinforcement and retaining ring on grade retard reaction shaft.

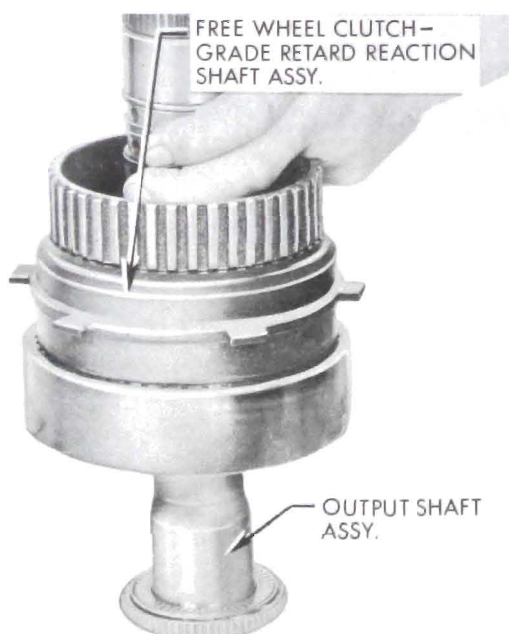
5-488



21. Expand and install retaining ring solidly in groove of reaction shaft. Refer to Par. 5-47 for installation of reaction shaft—rear free wheel clutch assembly.

5-489

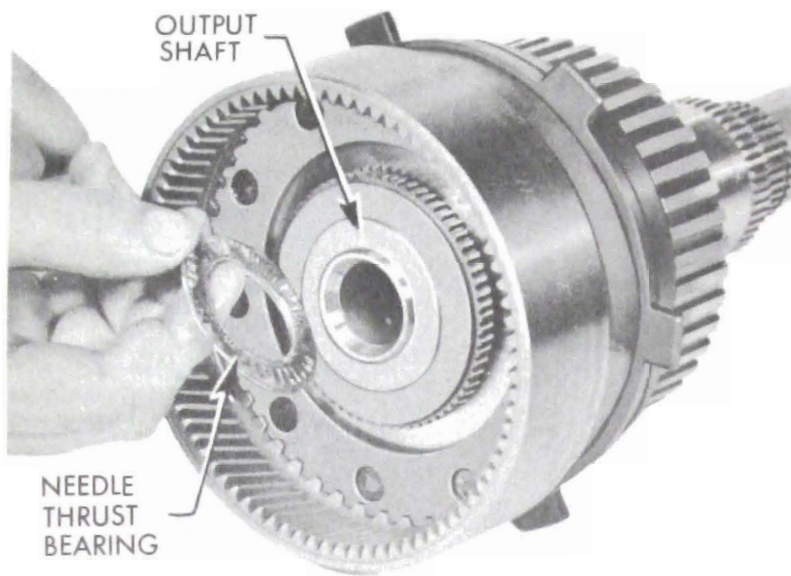
5-47 OUTPUT SHAFT, GEAR TRAIN, FIRST TURBINE SHAFT AND CLUTCHES: ASSEMBLY AND INSTALLATION



a. Assembly of Output Shaft and Grade Retard Reaction Shaft and Free Wheel Clutch Assembly

1. Liberally lubricate grade retard reaction shaft bushings and slide shaft and free wheel-clutch assembly over output shaft with lubricated needle thrust bearing in place.

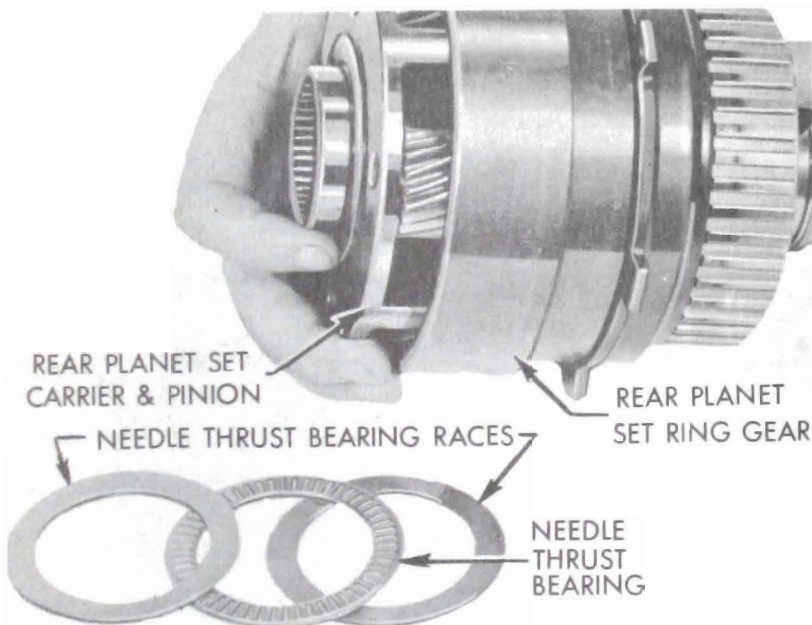
5-490



2. Apply heavy lube to output shaft to rear planet sun gear needle thrust bearing ($1\frac{3}{16}$ " I.D. x $1\frac{7}{8}$ " O.D.) and set on forward end of output shaft.

NOTE: No separate races used at this location.

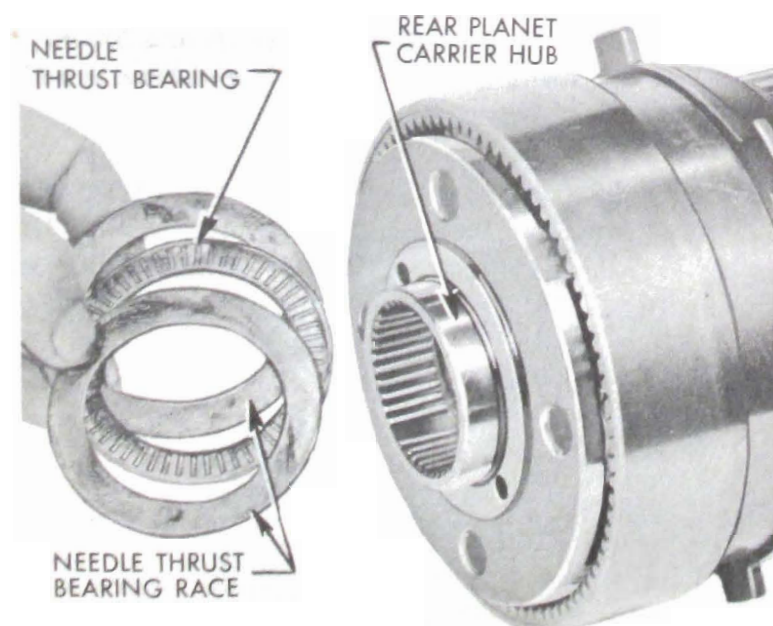
5-491



b. Assembly of Rear Planet Set and Front Sun Gear and Hub

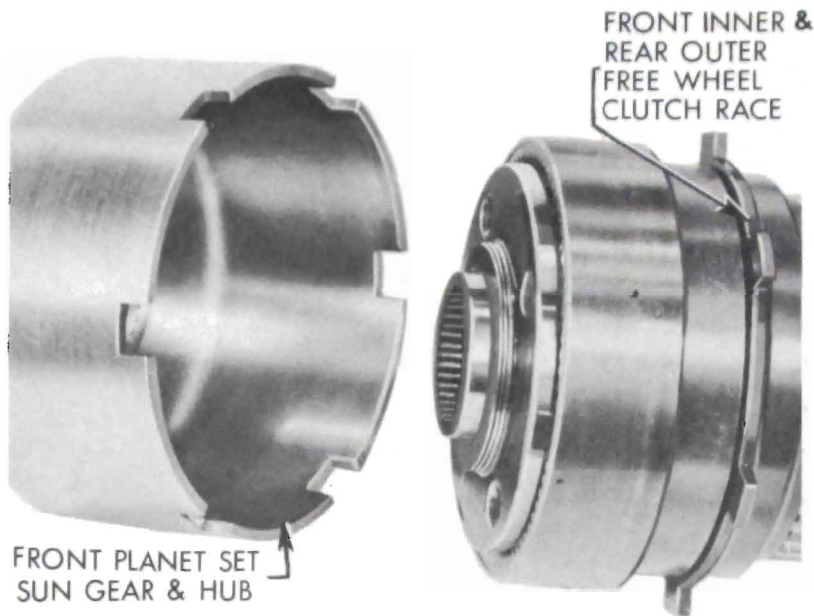
1. Insert rear planet set and sun gear assembly into rear planet ring gear assembly.

5-492



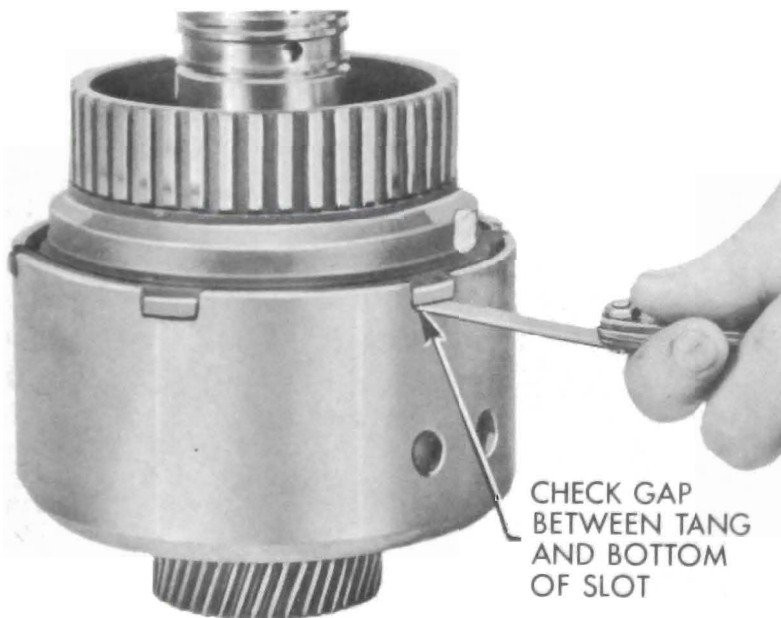
2. Apply heavy lube to rear planet set carrier, to front sun gear needle thrust bearing (2 " I.D. x $2\frac{3}{4}$ " O.D.) and two bearing races. Position on hub of carrier.

5-493



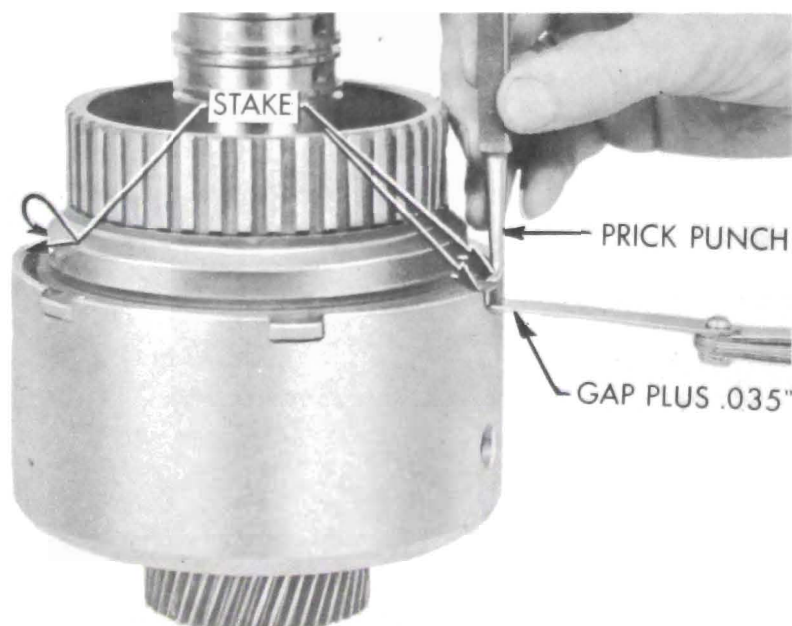
3. Install front planet set sun gear and hub over front of rear planet set and free wheel clutch assembly. Do not lift assembly by end of output shaft as thrust washer, etc., may fall out of position. It is best to make this installation with the assembly horizontal and it may be necessary to tap the front sun gear and hub into position.

5-494



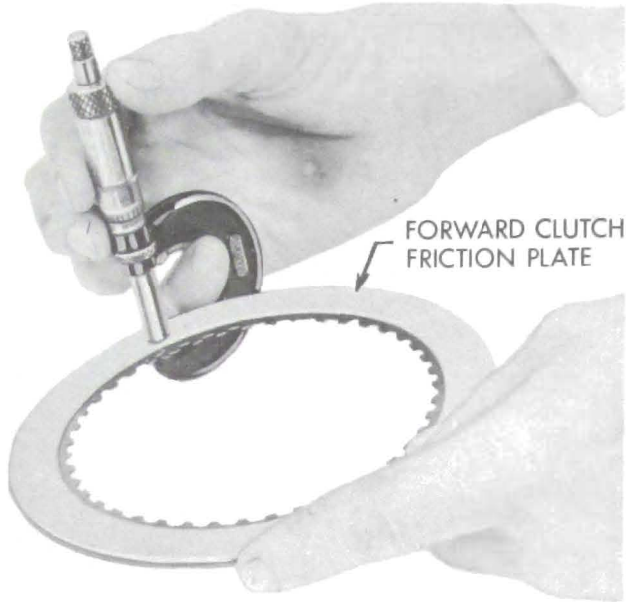
4. Carefully set assembly upright so as not to dislodge needle thrust bearing at forward end of output shaft. Measure gap between slot in sun gear hub and tang of free wheel race with feeler gauge.

5-495



5. Add .035" feeler to measurement taken in step 4 and insert feelers in slot of sun gear hub under tang. Securely stake sun gear hub on both sides of slot over tang. Repeat operation on opposite side of the sun gear hub so two tangs opposite each other are retained.

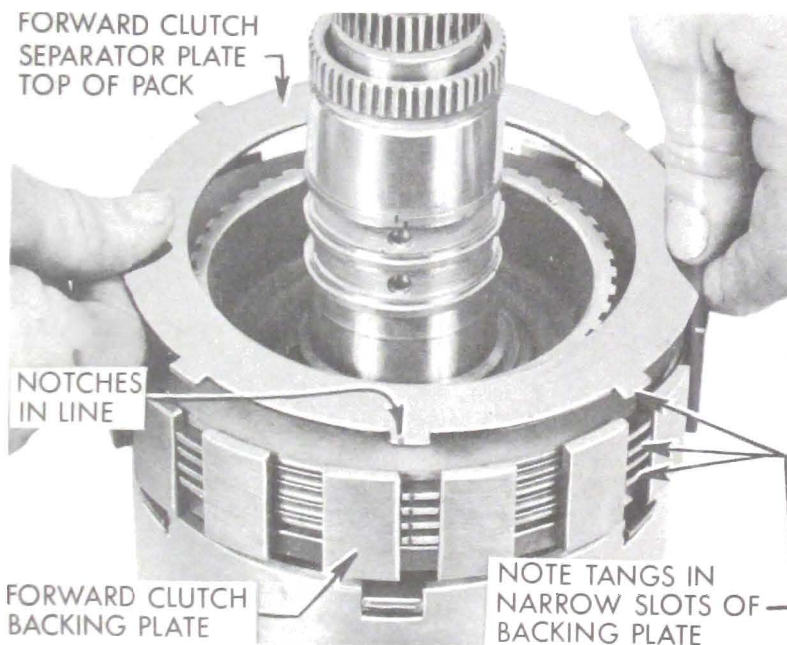
5-496



c. Inspection and Assembly of Forward Clutch Backing Plate and Clutch Pack

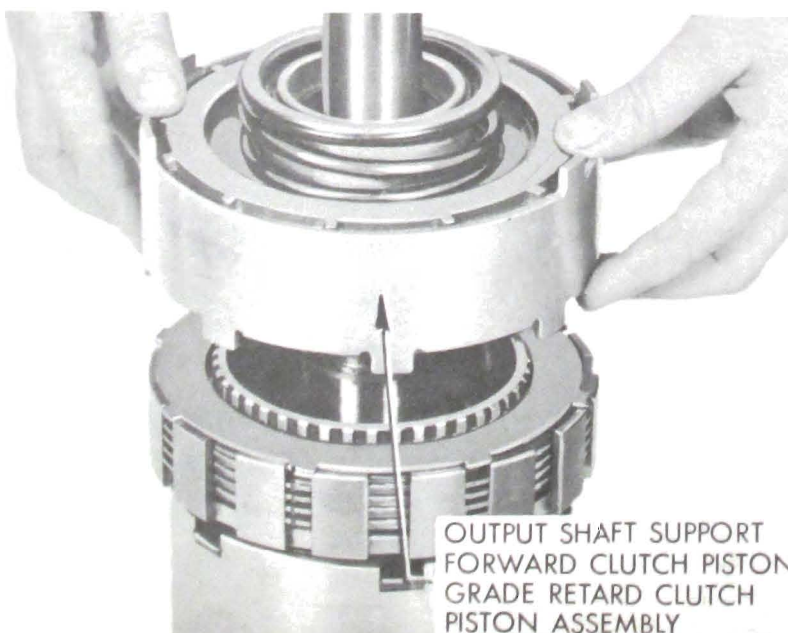
1. Examine the forward clutch plates. If they are worn, scored or burned, replace them. Forward clutch friction plates when new are .098" to .102" thick. Plates worn thinner than .088" thick should be replaced.

5-497



2. Install forward clutch backing plate over rear free wheel clutch inner race. Lubricate with automatic transmission oil and install a friction plate next to the backing plate. Engage the tangs of a separator plate in the narrow slots of the backing plate and continue the build-up by alternately assembling a friction plate and a separator plate with all five separator plate notched tangs in the same backing plate narrow slot and all notches in line.

5-498

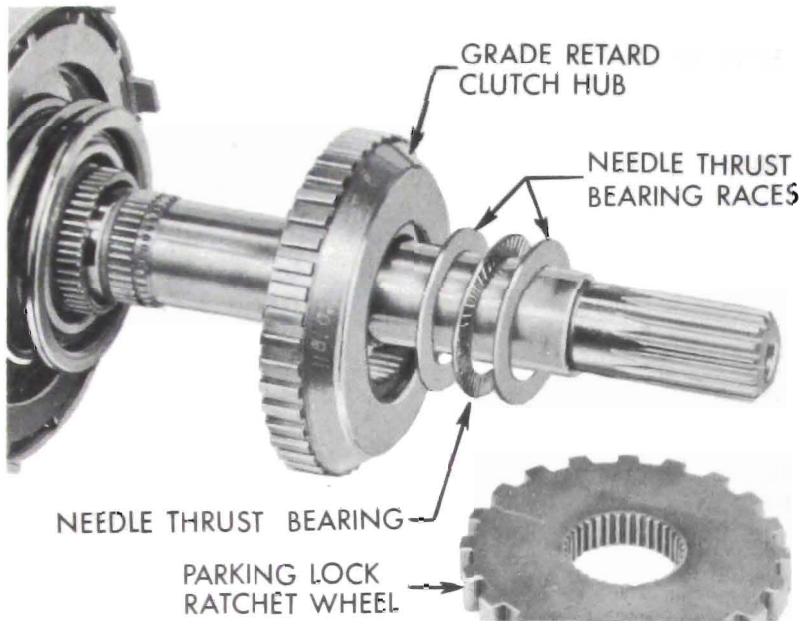


d. Assembly of Output Shaft Support Assembly

1. Lube and install output shaft support assembly on output shaft, eight lugs down and four lugs toward end of output shaft. Engage eight lugs in wide slots of forward clutch backing plate.

NOTE: It is important that the output shaft to output shaft support bushing be lubricated during assembly.

5-499

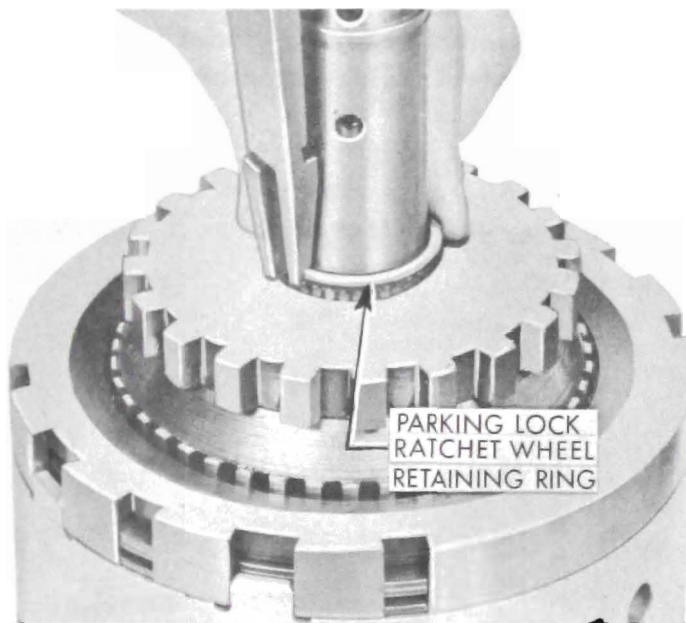


e. Assembly of Grade Retard Clutch Hub, Bearing and Parking Lock Ratchet Wheel

1. Install grade retard clutch hub, needle thrust bearing (1½" I.D. x 2¾₁₆" O.D.) and two thrust bearing races, one on each side of needle thrust bearing.

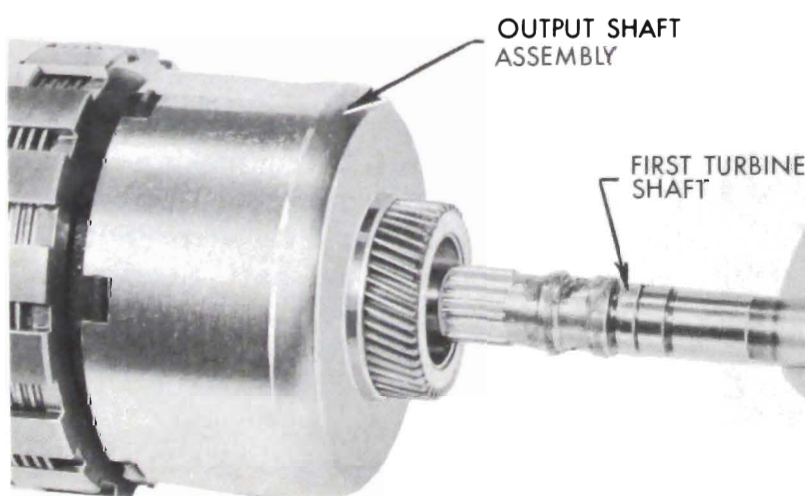
NOTE: *Lube bearing with automatic transmission oil.*

5-500



2. Slip on parking lock ratchet wheel. Expand and install retaining ring solidly in groove of output shaft.

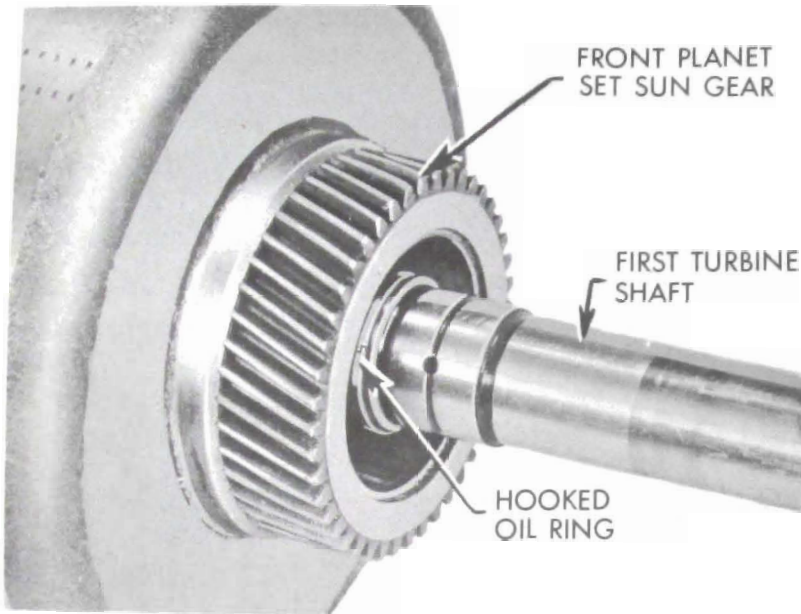
5-501



f. Assembly of First Turbine Shaft

1. Lube oil rings on first turbine shaft, rotate shaft to line up splines and insert in output shaft assembly until last oil ring is inside front planet set sun gear.

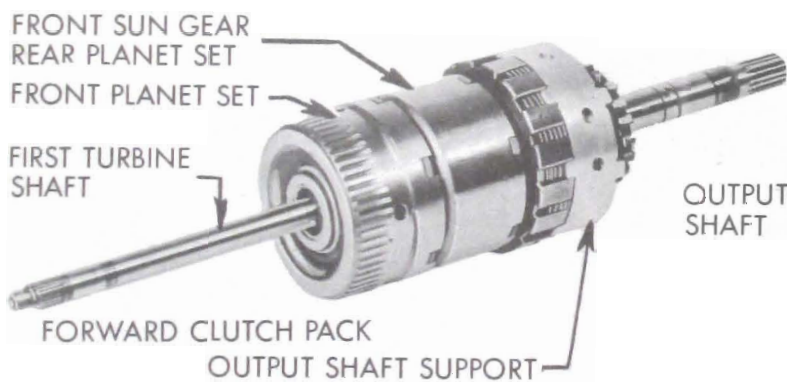
5-502



2. First turbine shaft correctly installed in front end of output shaft assembly.

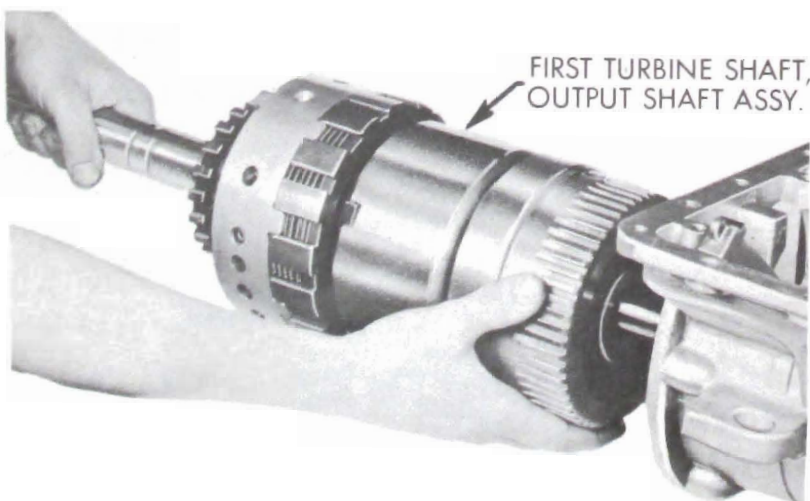
5-503

g. Assembly of Front Planet Set—Neutral Clutch Assembly



1. Assemble front planet set—neutral clutch assembly to front sun gear. Make sure front sun gear fully meshes with front planet set.

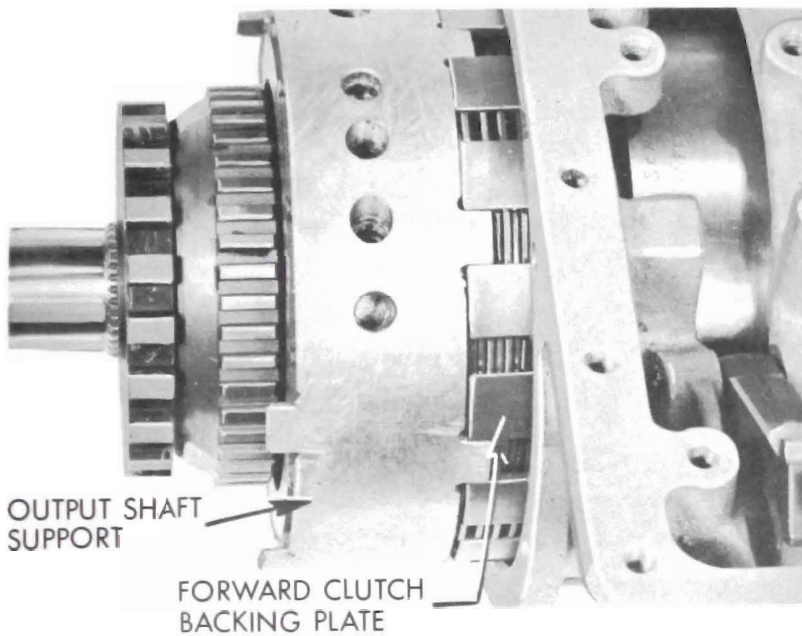
5-504



h. Installation of Output Shaft—First Turbine Shaft Assembly and Grade Retard Clutch Pack and Backing Plate

1. Liberally lubricate inside of case in output shaft support area after making certain there is *no* dirt or burrs present. Lift assembly carefully. Do not lift by or put any weight on first turbine shaft. Start assembly into rear end of case.

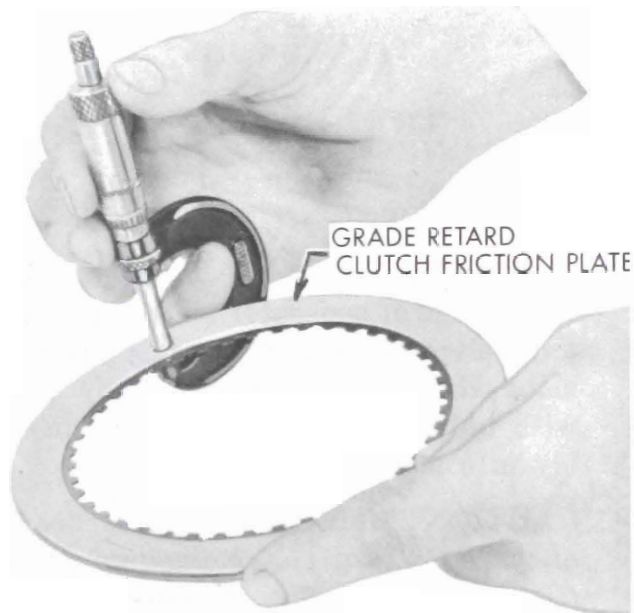
5-505



2. Push into case till assembly is in position pictured. Check forward clutch backing plate to be certain it is in contact with output shaft support. Be certain clutch plates are properly positioned in slots in backing plate and oil sleeve holes are "up."

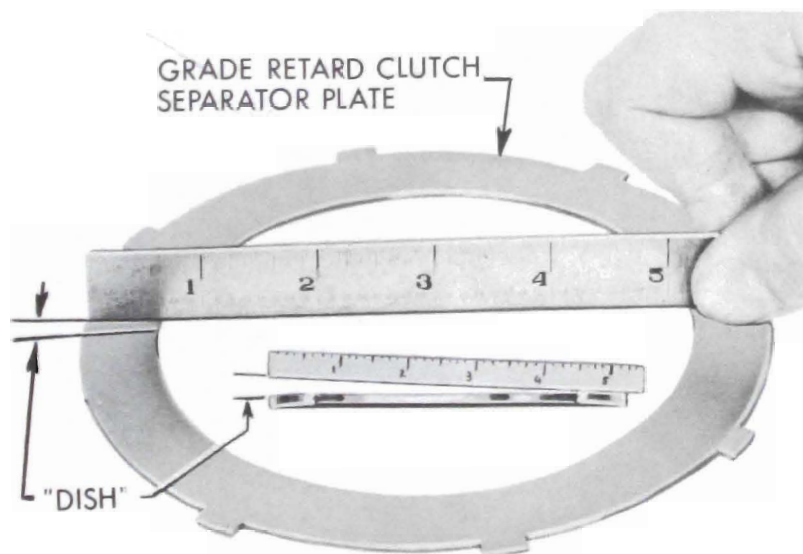
NOTE: Before proceeding with installation, read the following FIVE steps:

5-506



3. Examine the grade retard clutch plates. If they are scored, burned or worn excessively, replace them. Grade retard clutch friction plates are .075" to .080" thick when new. Plates worn to .065" must be replaced.

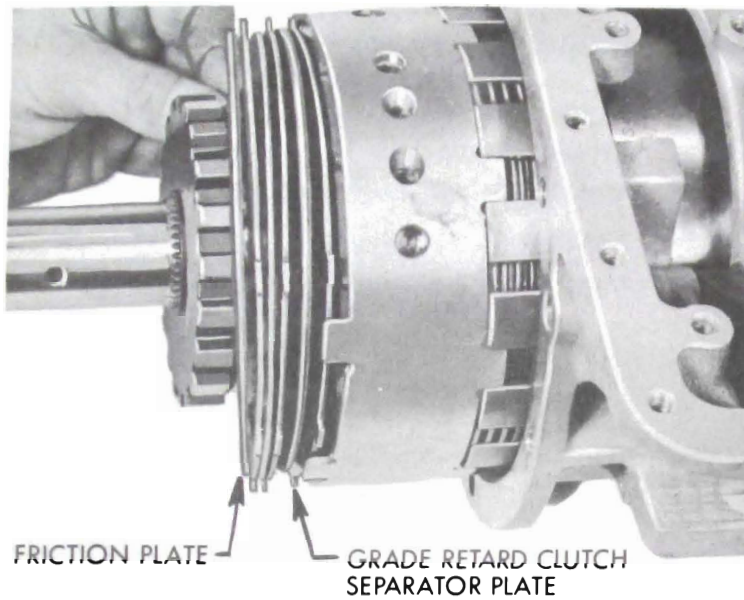
5-507



4. Check three grade retard clutch separator plates for dish. It makes no difference whether separator plates are installed with dish "in" or "out" but all must be installed same way.

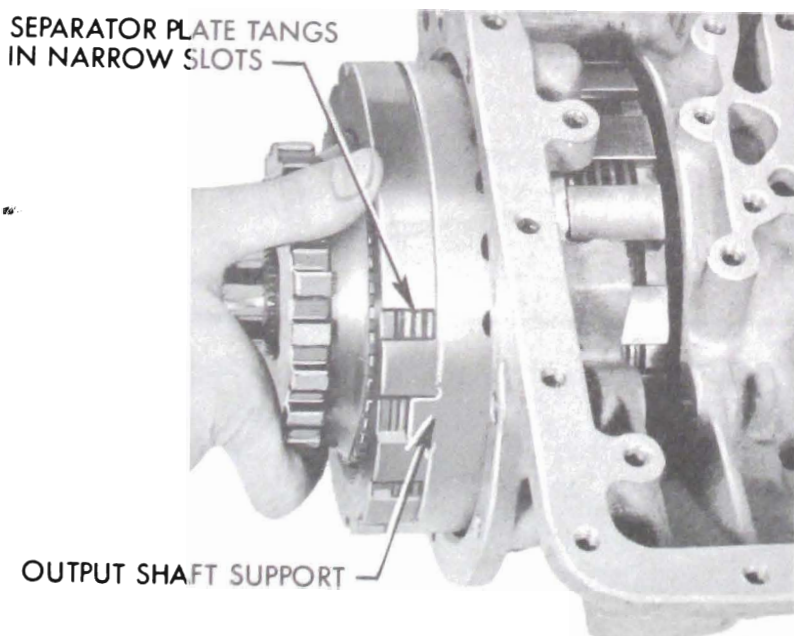
NOTE: If one narrow tang of the separator plates is notched it is unnecessary to check the plates for dish. Install the notches in line in same narrow slot of backing plate.

5-508



5. Lubricate and install grade retard clutch separator plate next to piston with center tang of three tangs between lugs of support, then friction plate, separator plate and so on, until three separator plates and three friction plates are installed.

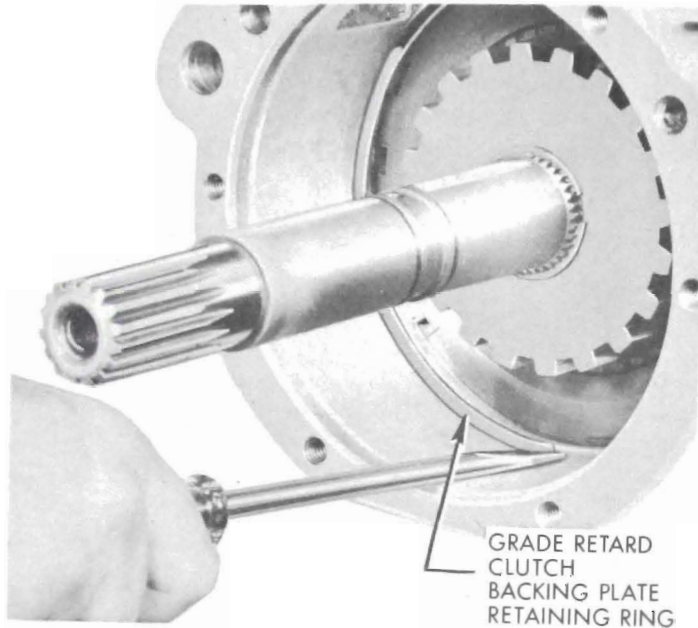
5-509



6. Install grade retard clutch backing plate with tangs of separator plates in narrow slots and tangs of output shaft support in wide slots. Hold backing plate firmly in contact with output shaft support and slide assembly into position.

CAUTION: *Maintain hand pressure forward on grade retard clutch backing plate at all times until assembly is correctly positioned in case and backing plate retainer ring is installed. If backing plate is allowed to separate from support, clutch pack will fall out of position and complete assembly must be removed from case and reassembled according to instructions. Do not push assembly into case farther than is necessary to install grade retard clutch backing plate retaining ring.*

5-510



7. Install grade retard clutch backing plate retaining ring solidly in groove of case.

5-511

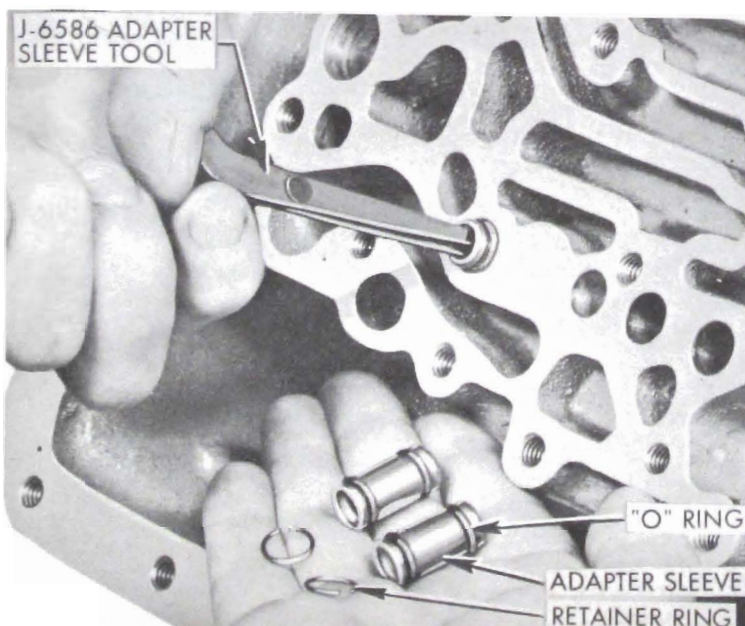
i. Installation of Adapter Sleeves and Anchor Bolts

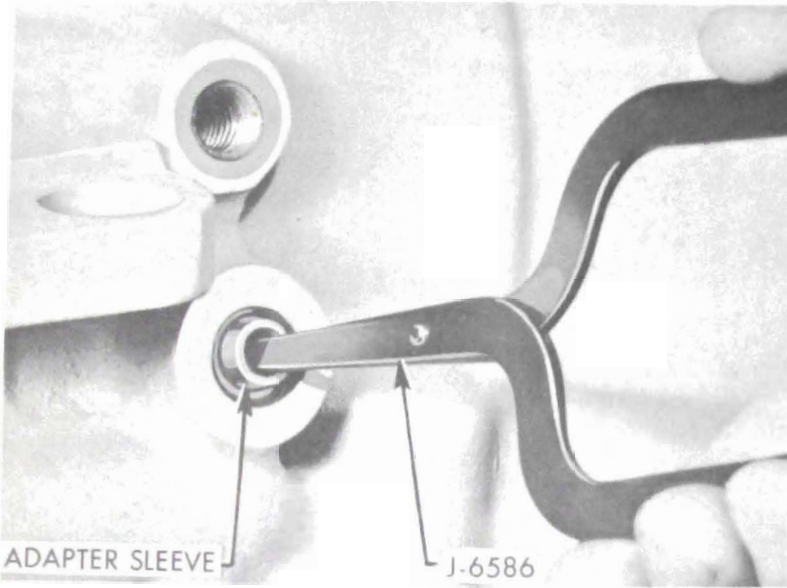
1. Use smooth punch inserted in anchor bolt hole to accurately line up oil sleeve adapter holes in support with holes in case. Do not use oil adapter sleeve holes for this purpose.

Lube and install three adaptor sleeves with new O-rings into valve body portion of transmission case using Tool J-6586. Push down firmly to seat adapter sleeves in output shaft support. Install retainer rings above the O-ring sleeve assemblies using a screwdriver to seat retainer rings against sleeve assemblies.

NOTE: *Center adapter sleeve does not enter case as far as outer two.*

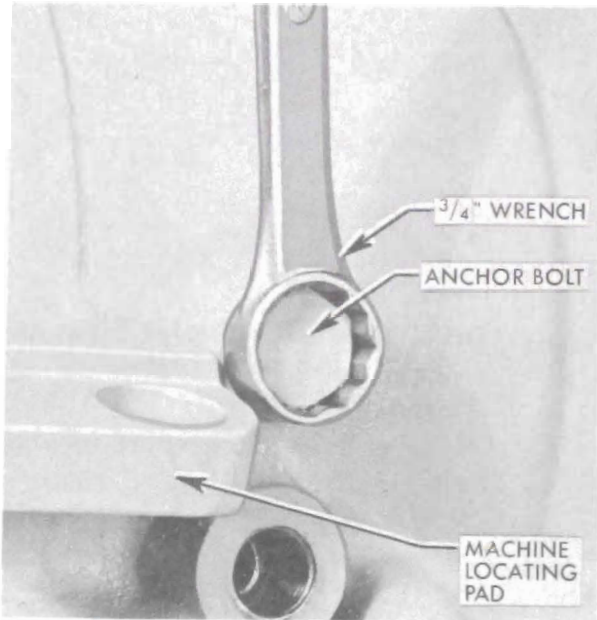
5-512





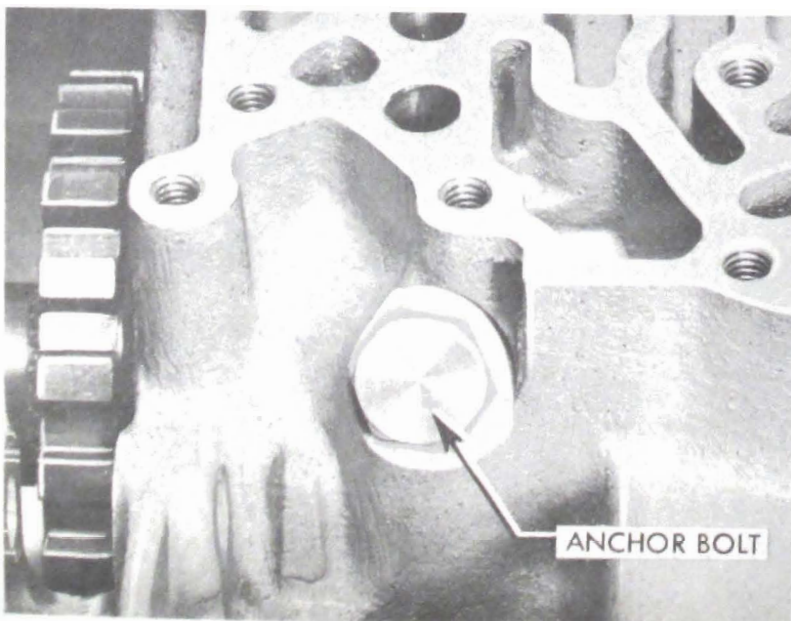
2. Lube and install fourth adapter sleeve with new O-rings at oil cooler return line location using Tool J-6586. Oil adapter sleeve retainer ring is *not* used at this location.

5-513



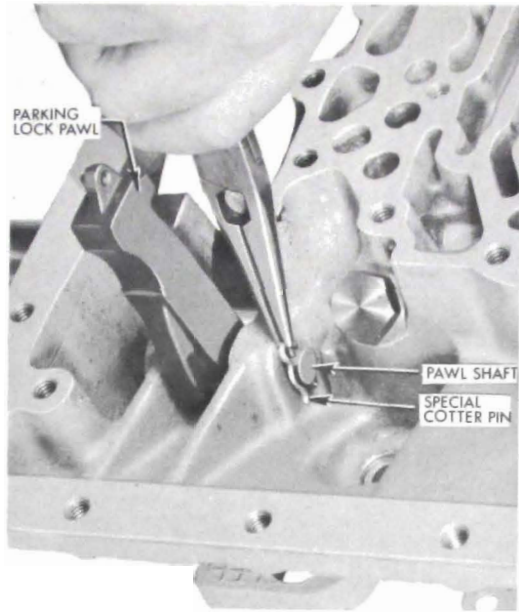
3. Install outer anchor bolt. Torque to 35-40 ft. lbs. ($\frac{3}{4}$ " wrench).

5-514



4. Install inner anchor bolt. Torque to 35-40 ft. lbs.

5-515

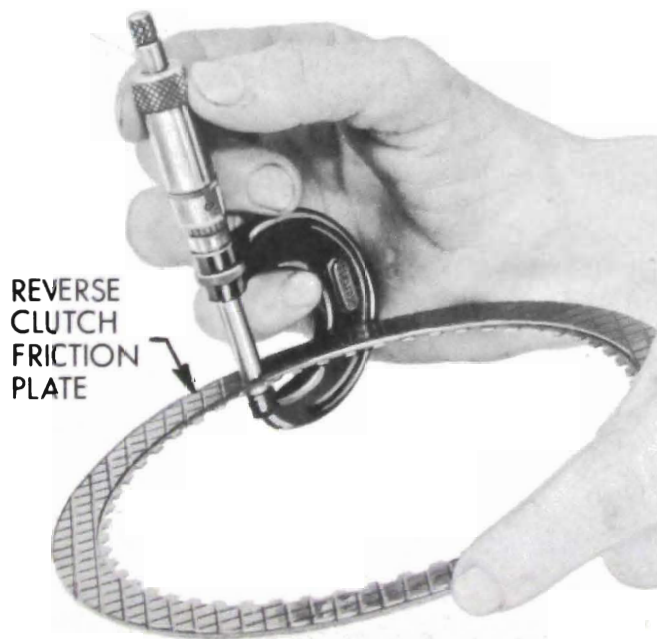


**j. Installation of Parking Lock Pawl,
Pawl Shaft and Retaining Pin**

1. If parking lock pawl and shaft were removed, install parking lock pawl, pawl shaft and retaining pin.

5-516

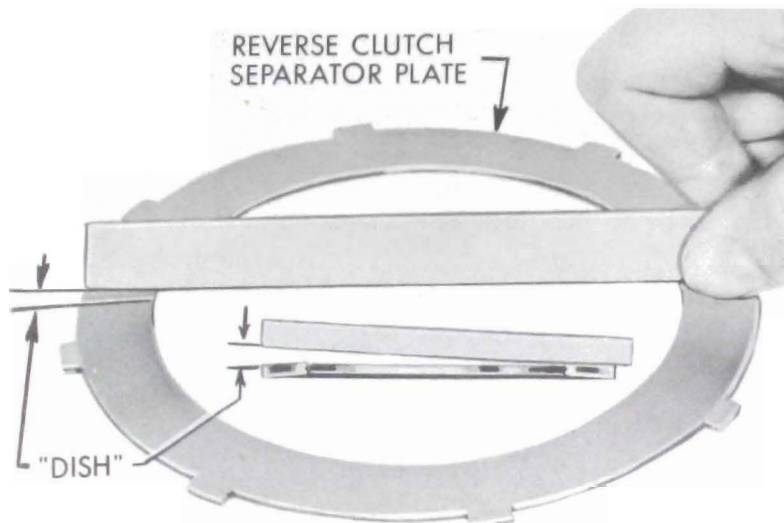
5-48 INSTALLATION OF REVERSE CLUTCH PACK AND OIL PUMP— REVERSE CLUTCH PISTON—REACTION SHAFT AND FLANGE ASSEMBLY



**a. Inspection and Installation of Reverse
Clutch Pack**

1. Inspect reverse clutch plates. If they are scored, burned, or excessively worn, replace them. Reverse clutch friction plates when new are .098" to .102" thick. Plates worn to .088" thick must be replaced.

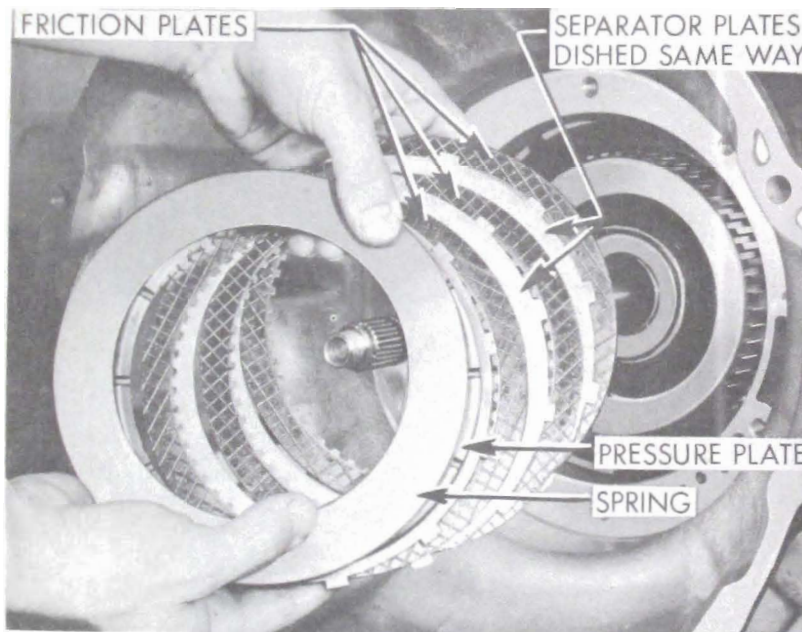
5-517



2. Check "dish" of two reverse clutch separator plates.

NOTE: If one tang of reverse clutch separator plates is notched, it is not necessary to check plates for dish; install plates with notches in line in same slot of backing plate.

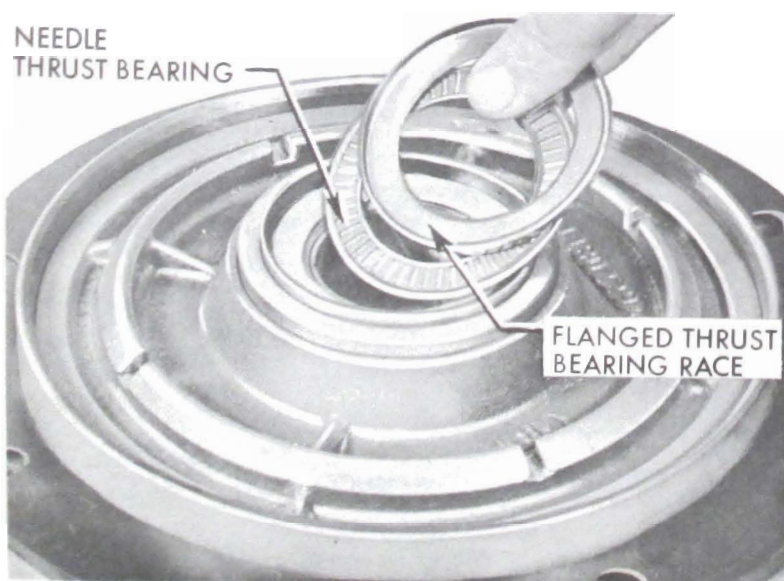
5-518



3. With transmission front end "up" lubricate and install a reverse clutch friction plate into reverse clutch backing plate, then a separator "dished" same as first, then last friction plate. Install reverse clutch pressure plate, rounded edge up and reverse clutch spring, center high edge up.

NOTE: Both reverse clutch separator plates must be "dished" same way.

5-519

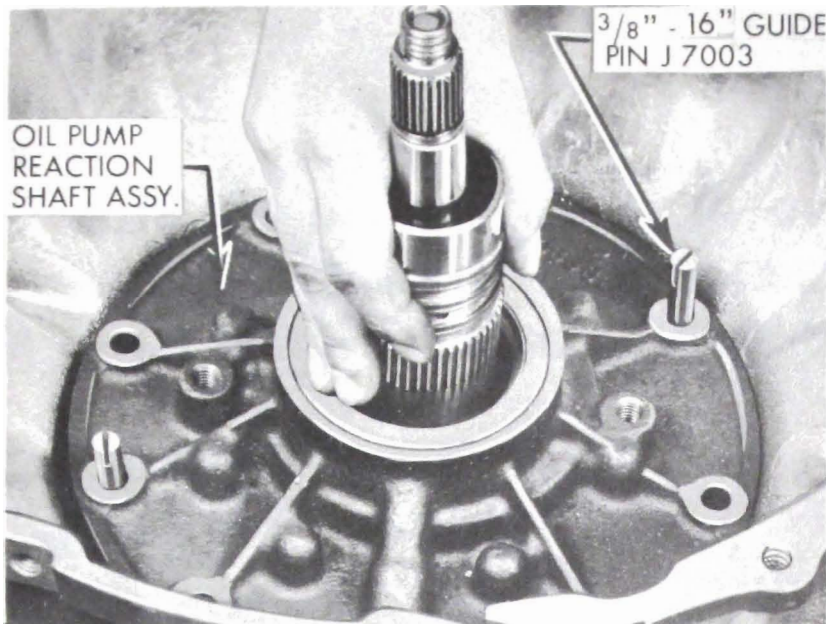


b. Installation of Oil Pump—Reverse Clutch Piston—Reaction Shaft and Flange Assembly

1. Apply heavy lube to needle thrust bearing and flanged race and stick them to rear of reaction flange hub.

NOTE: The flanged needle thrust bearing race may be assembled on top of front planet ring gear carrier, whichever may be most convenient.

5-520

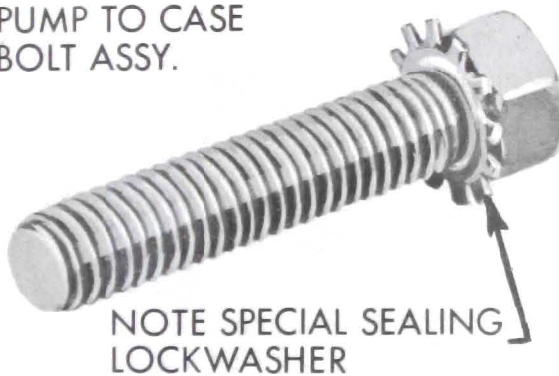


2. Install new reaction flange to case gasket in transmission case. Be absolutely certain that gasket holes line up properly. Install two $\frac{3}{8}$ "-16 Guide Pins J-7003 in transmission case, liberally lube rubber seal on pump assembly with heavy lube, and slip pump and reverse clutch piston assembly into case so that the three closely spaced holes are at bottom of case. Tap the assembly evenly and solidly in position in case with brass drift and plastic hammer.

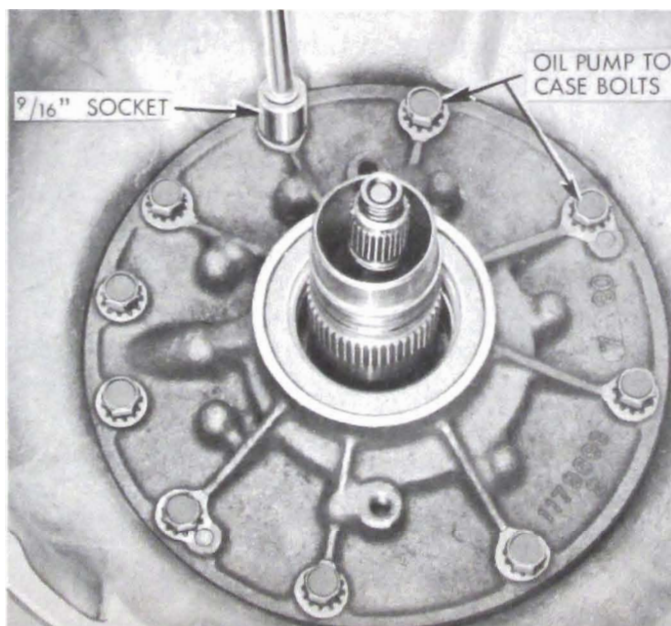
CAUTION: *Never attempt to draw the pump assembly into position with pump bolts as transmission case threads will almost certainly be stripped.*

5-521

3. Install eight pump to case bolts and draw down lightly.

PUMP TO CASE
BOLT ASSY.

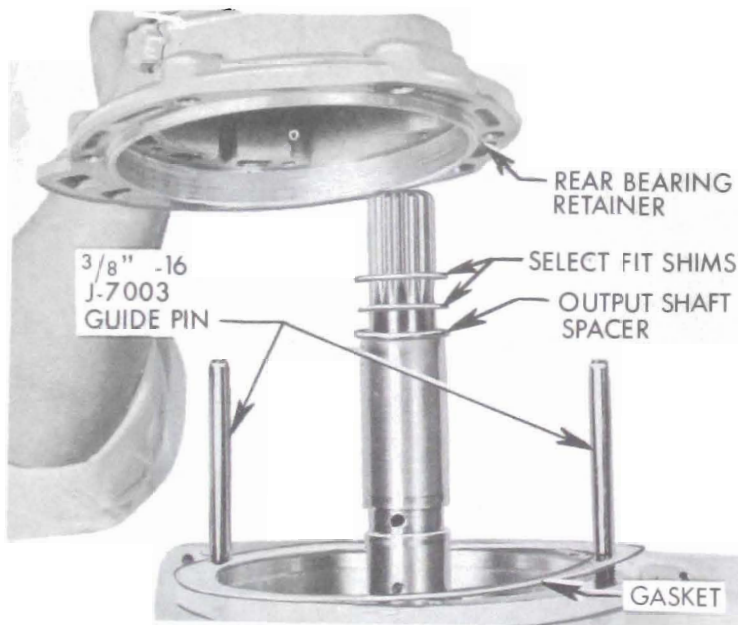
5-522

NOTE SPECIAL SEALING
LOCKWASHER

4. Remove guide pins and install remaining two pump to case bolts. Torque to 30 to 35 ft. lbs. after preliminary tightening by criss-crossing from one bolt to another ($\frac{9}{16}$ " socket).

5-523

5-49 OUTPUT SHAFT END PLAY MEASUREMENT AND ADJUSTMENT. INSTALLATION OF REAR BEARING RETAINER—OIL TRANSFER FLANGE ASSEMBLY

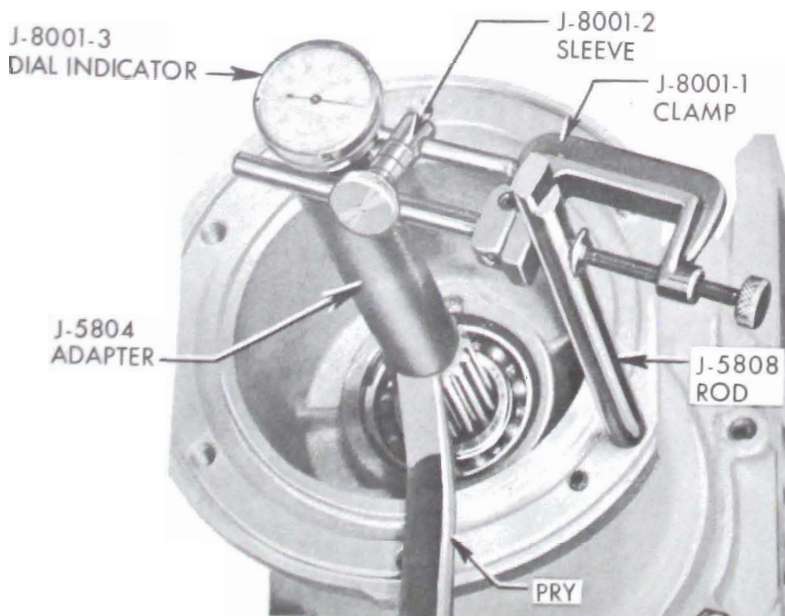


a. Output Shaft End Play Measurement and Adjustment

1. If oil transfer flange and loading tool were removed from rear bearing retainer, install .120" spacer on output shaft with shims removed from output shaft when transmission was disassembled. Install two guide pins $\frac{3}{8}$ "-16, J-7003, gasket and rear bearing retainer without oil transfer flange.

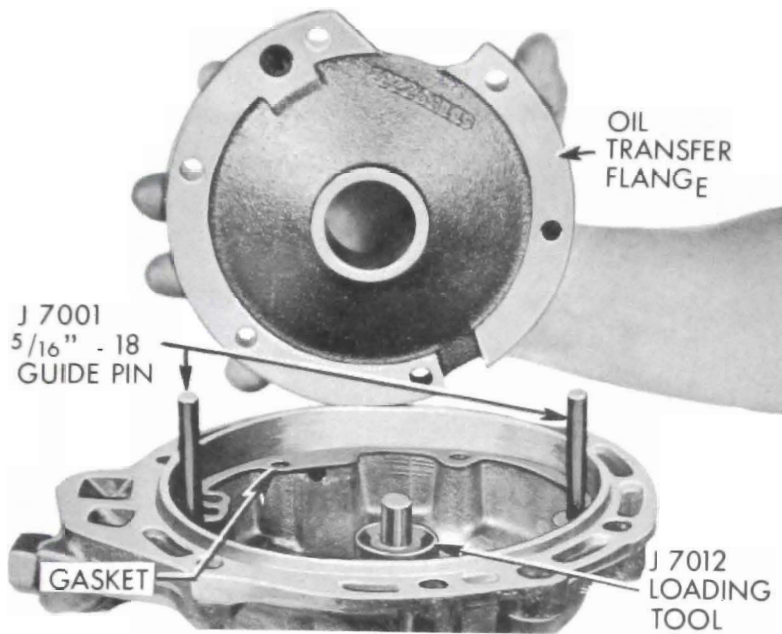
If transfer flange and loading tool were not removed from rear bearing retainer, proceed with step 3 of sub-paragraph b below.

5-524



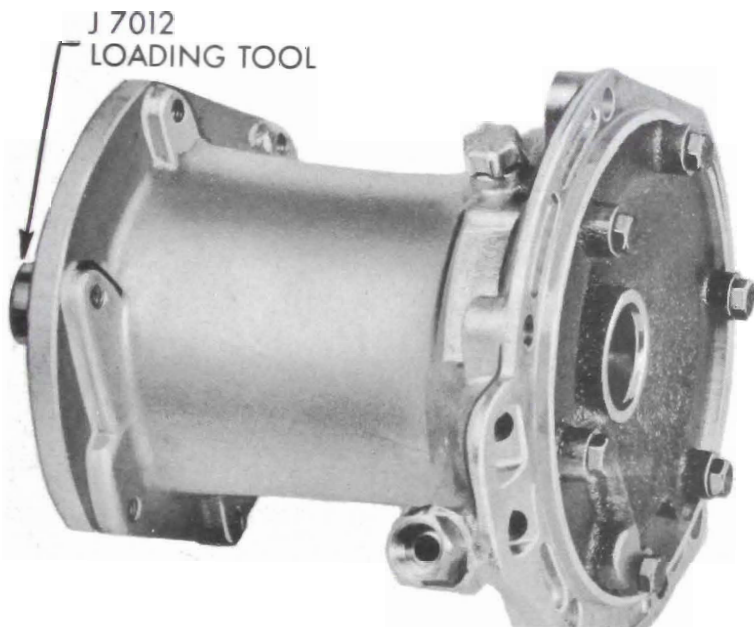
2. Check output shaft end clearance with rear bearing retainer bolted to case with at least two bolts as shown and transmission upside down. Tap several times on output shaft to squeeze out lube used on thrust bearings during assembly. Use J-8001-3 Dial Indicator, Tool 5804 threaded into output shaft and Tool J-5808 threaded into rear bearing retainer. Use pry bar under edge of J-5804 to move output shaft. End play should be .005" to .020". If output shaft end clearance is less than .005", remove rear bearing retainer and install a thinner shim on output shaft. If output shaft end clearance is more than .020", remove rear bearing retainer and install a thicker shim.

5-525



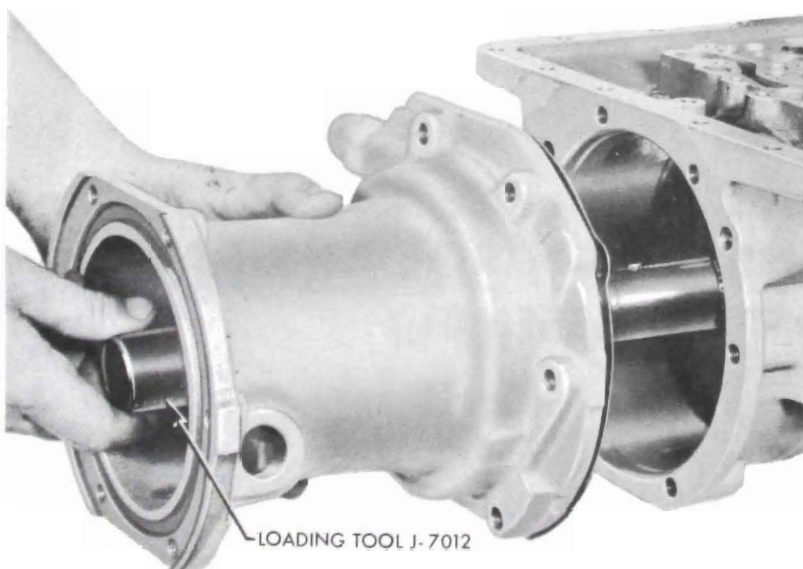
3. When output shaft end play has been measured and brought within limits, remove end play gage setup and remove rear bearing retainer from case. Insert loading tool J-7012 in rear of rear bearing retainer through rear bearing. Slip correct shims and spacers from output shaft onto loading tool with shim next to bearing. Install two $\frac{5}{16}$ "-18 guide pins J-7001 in rear bearing retainer. Install new oil transfer flange to rear bearing retainer gasket; observe openings in flange and openings in rear bearing retainer and assemble flange to rear bearing retainer with six $\frac{5}{16}$ "-18 bolts. Torque bolts to 15-20 ft. lbs.

5-526



4. Completed rear bearing retainer, oil transfer flange assembly with loading tool in place.

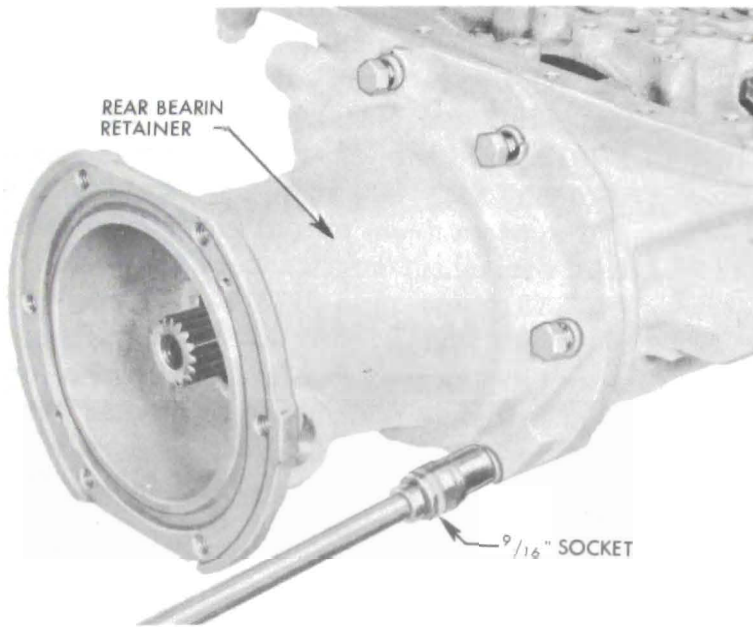
5-527



b. Installation of Rear Bearing Retainer— Oil Transfer Flange Assembly

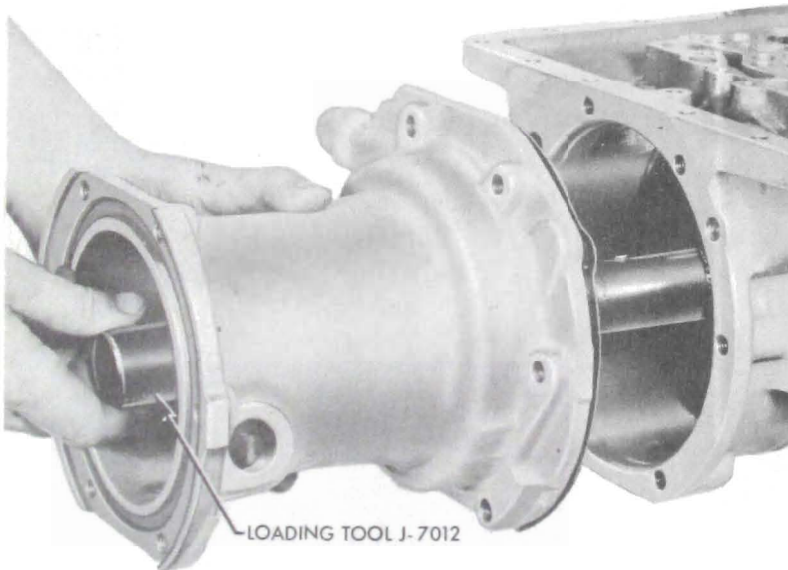
1. With rear bearing retainer to case gasket in place assemble rear bearing retainer—oil transfer flange assembly to case. Hold loading tool forward while sliding bearing retainer onto output shaft to transfer spacer and shims onto output shaft.

5-528



2. Remove loading tool and install six rear bearing retainer to case bolts. Torque alternately and evenly to 30-35 ft. lbs.

5-529

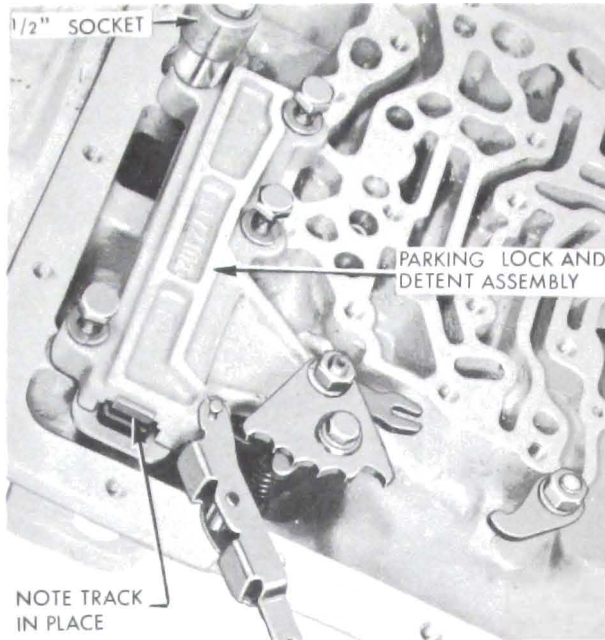


3. IF OIL TRANSFER FLANGE WAS NOT REMOVED from rear bearing retainer and loading tool was left in rear bearing retainer, assemble rear bearing retainer to transmission case with new gasket and at least two bolts (9/16" socket). Hold loading tool forward during assembly of rear bearing retainer. Check output shaft end clearance as outlined above. If output shaft end clearance is within .005" to .020" limits, install remaining bolts and torque all six bolts alternately and evenly to 30-35 ft. lbs.

If end clearance is not within limits, rear bearing retainer and transfer flange must be removed and end clearance corrected as outlined in step 2 of subparagraph a, above.

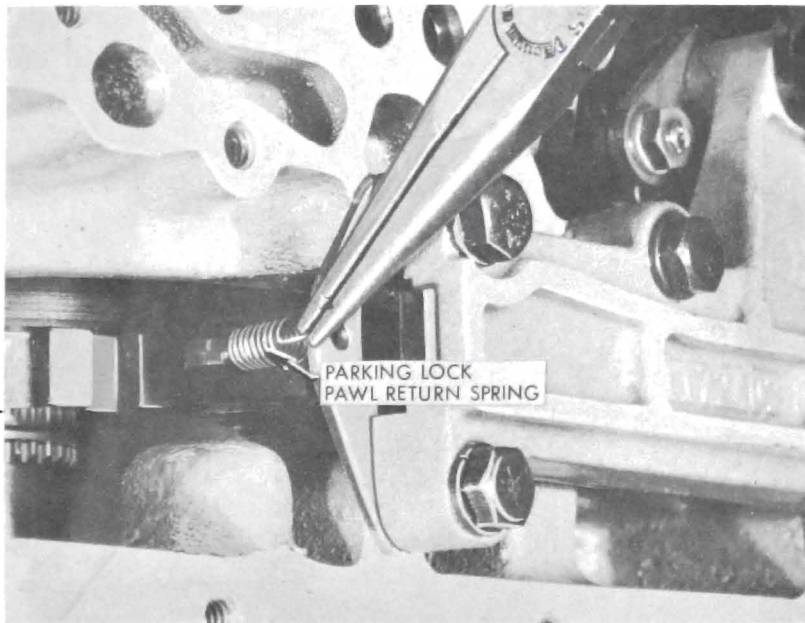
5-530

5-50 INSTALLATION OF MANUAL CONTROL AND PARKING LOCK AND DETENT ASSEMBLY



1. Install properly assembled parking lock mechanism to case with four bolts $\frac{5}{16}$ "-18. Torque bolts to 15-20 ft. lbs. ($\frac{1}{2}$ " socket).

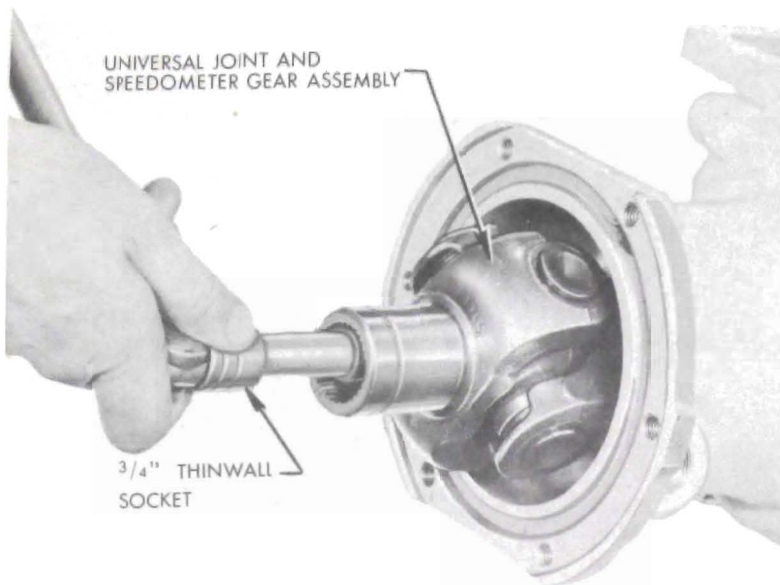
5-531



2. Install parking lock pawl return spring. Refer to paragraph 5-53 for adjustment of manual control and parking lock and detent assembly.

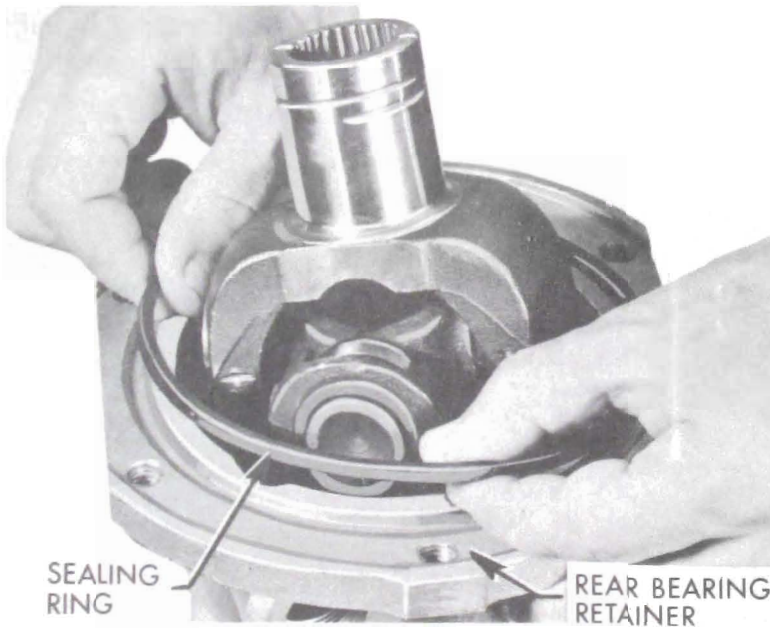
5-532

5-51 INSTALLATION OF UNIVERSAL JOINT, TORQUE BALL AND TORQUE BALL RETAINERS



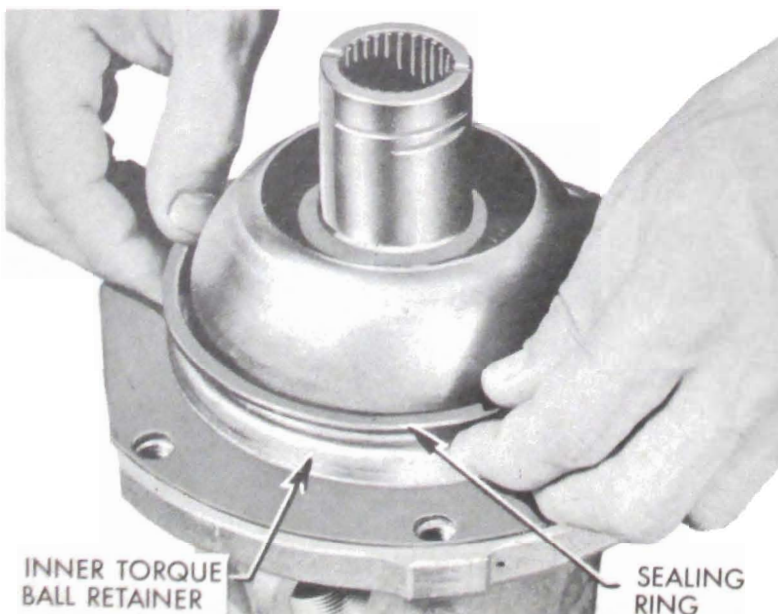
1. Engage parking lock pawl. Install U-joint and speed gear assembly with special drilled U-joint bolt, lock washer and plain washer using $\frac{3}{4}$ " thin wall socket. Torque to 50-55 ft. lbs.

5-533



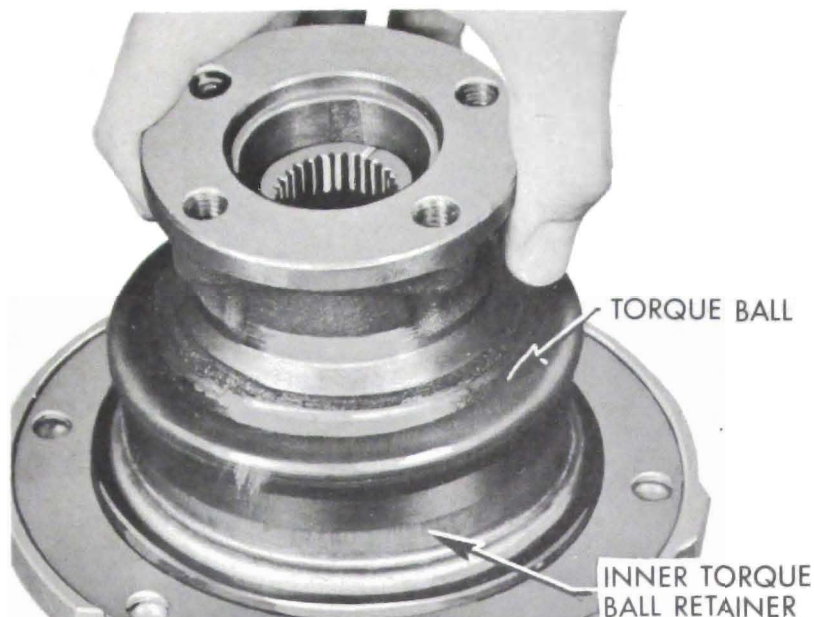
2. With transmission rear end "up," use heavy lube and install inner torque ball retainer to rear bearing retainer sealing ring in groove of rear bearing retainer. Install inner torque ball retainer on rear bearing retainer.

5-534



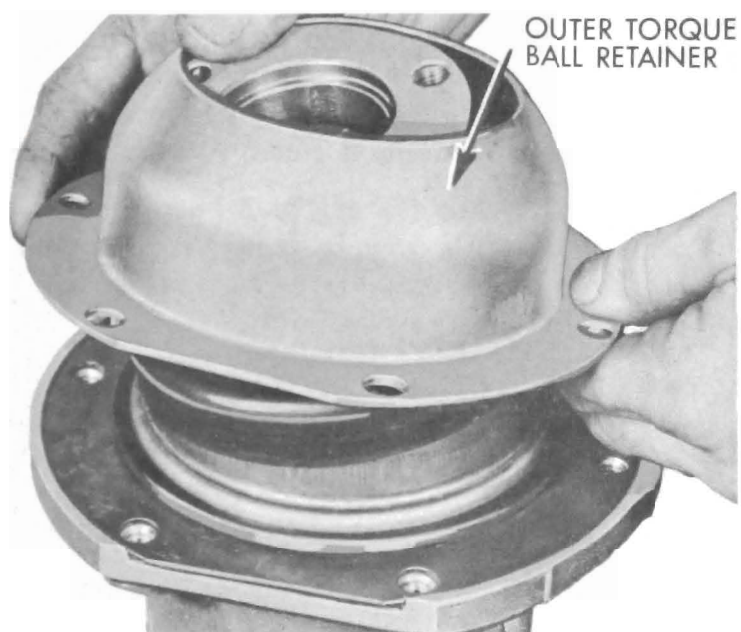
3. Install sealing ring on outside of inner torque ball retainer.

5-535



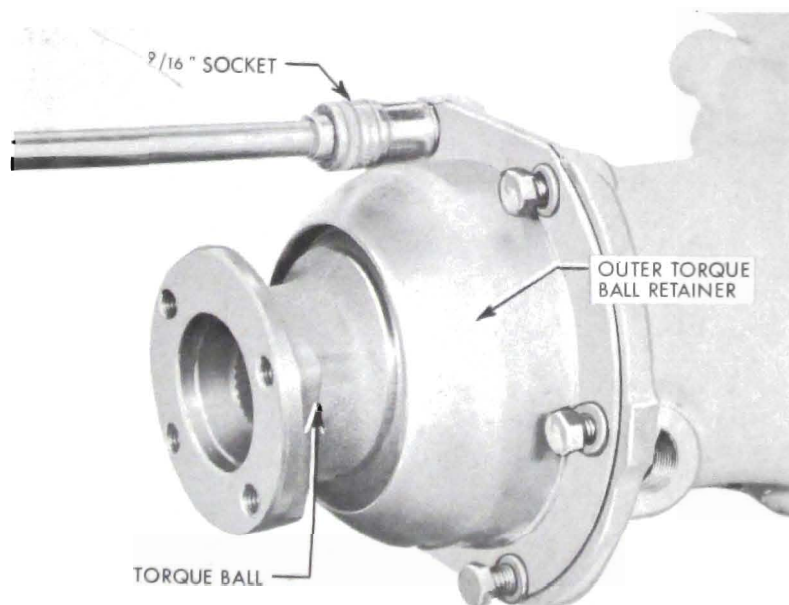
4. Liberally lubricate inside of torque ball and install over U-joint and inner torque ball retainer. Position torque ball with drain slot down as transmission is installed in car.

5-536



5. Install outer torque ball retainer over torque ball.

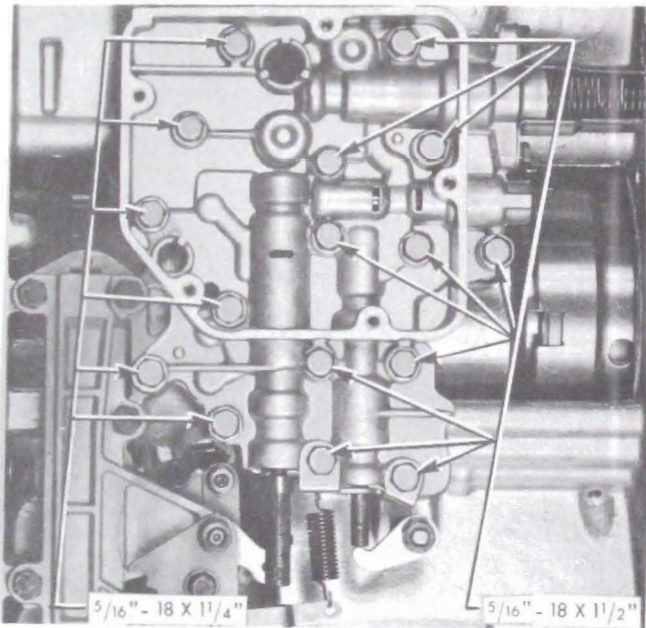
5-537



6. Install torque ball bolts using $\frac{9}{16}$ " socket but do not tighten until transmission is installed in car to facilitate coupling of torque tube and propeller shaft. (Refer to paragraph 4-12.)

5-538

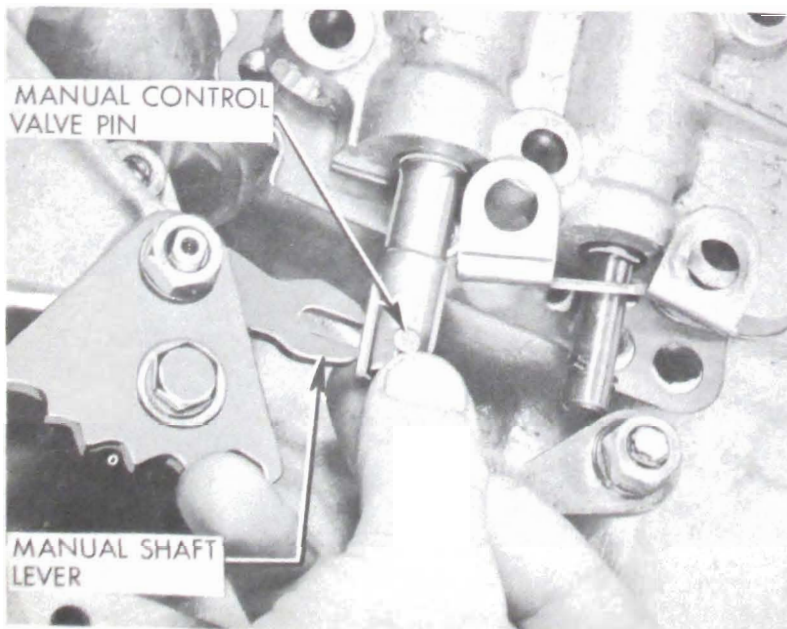
5-52 INSTALLATION OF VALVE BODY ASSEMBLY



1. With transmission upside down, use new gasket and carefully install valve body assembly. Engage slot in shift lever with slot and pin in manual control valve.

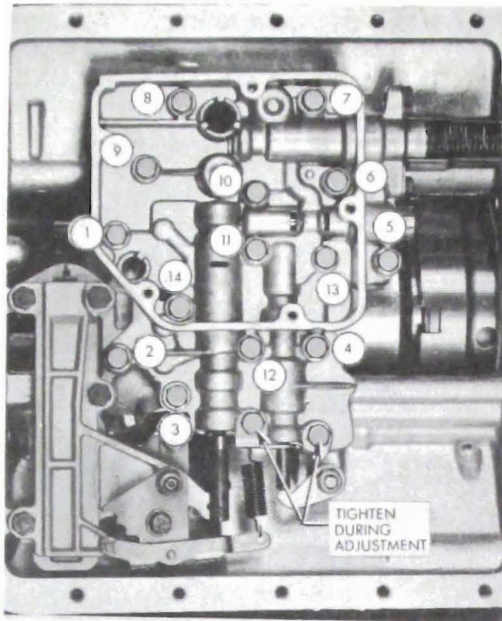
NOTE: Surface of valve body, gasket, and valve body section of transmission case must be free of dirt.

5-539



2. Install bolts as shown but do not tighten.

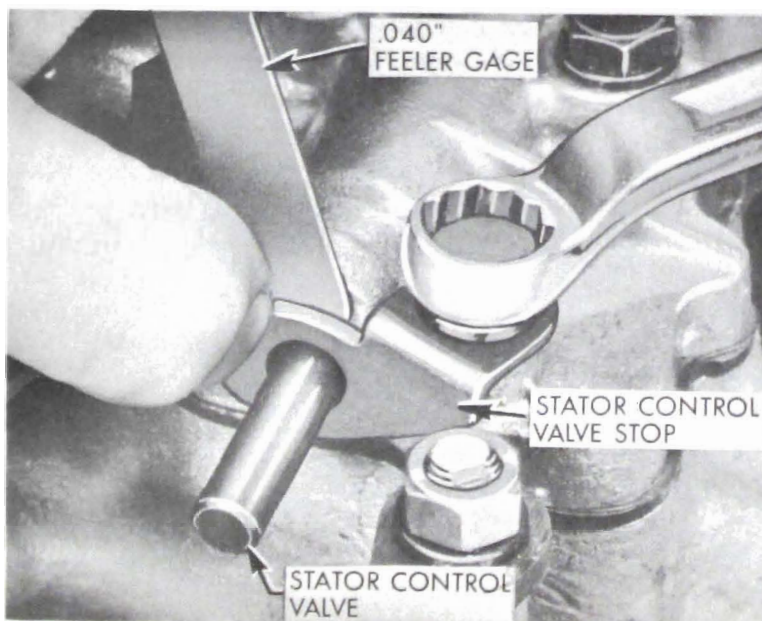
5-540



3. Torque all valve body bolts to 15-20 ft. lbs. in sequence shown except two bolts on stator stop ($\frac{1}{2}$ " socket). Check for free operation of shift control valve.

5-541

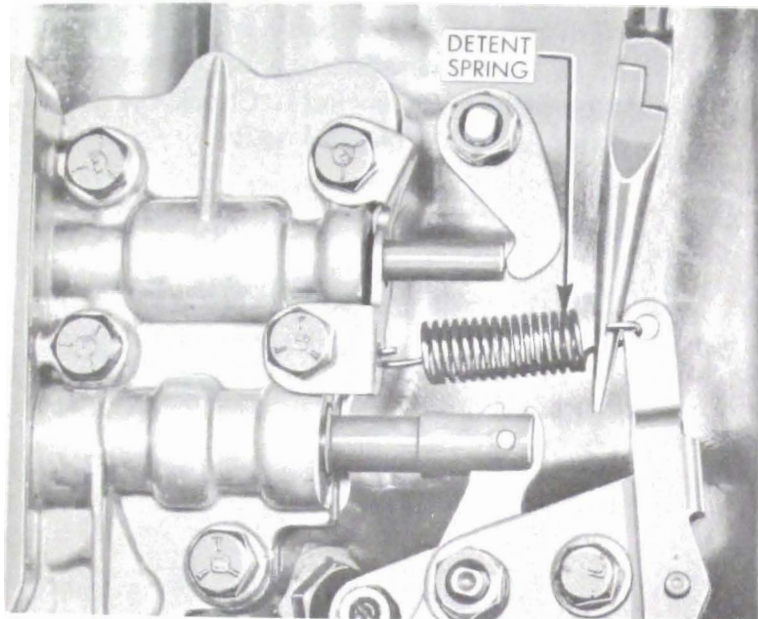
5-53 STATOR VALVE, PARKING LOCK AND MANUAL CONTROL VALVE ADJUSTMENT



a. Stator Valve Stop Adjustment

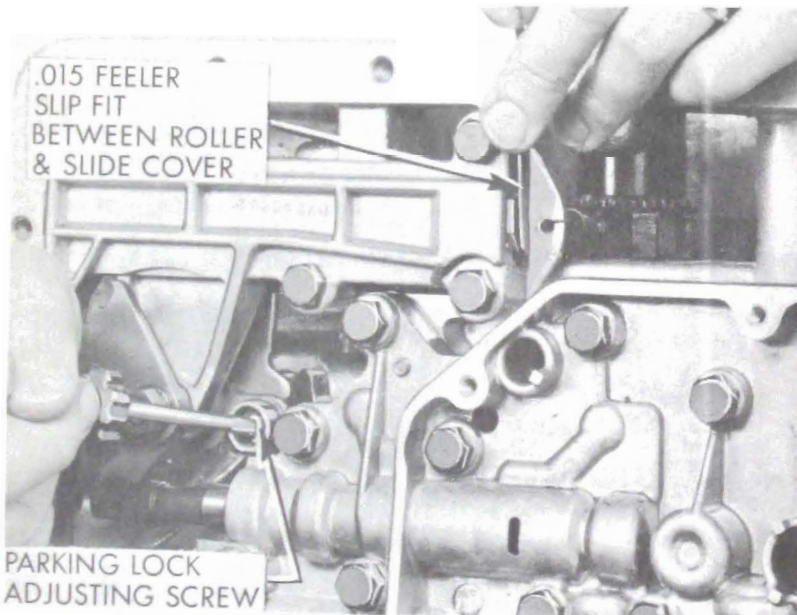
1. Slip .040" feeler gage into position between valve body and valve stop. Press stator valve stop toward valve body and hold in this position by tightening bolts as shown ($\frac{1}{2}$ " wrench).

5-542



2. Install detent spring.

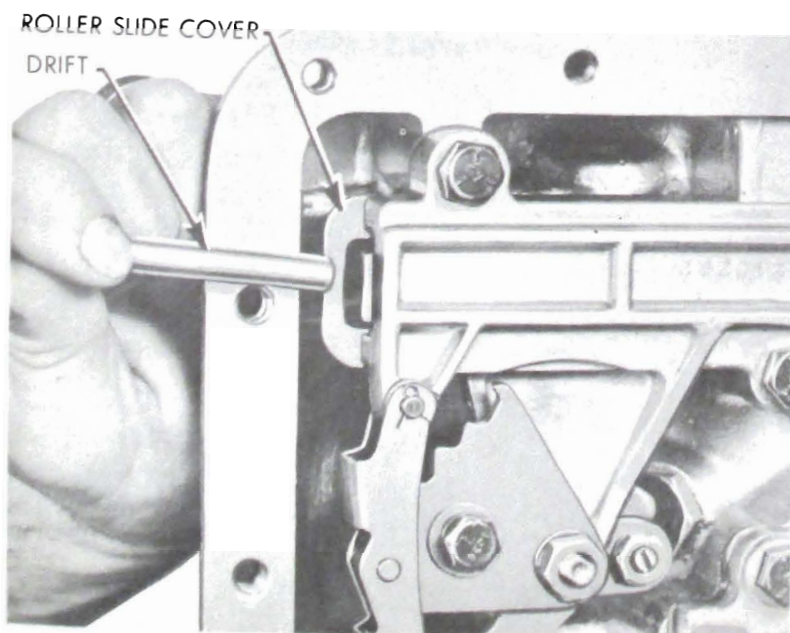
5-543



b. Parking Lock Adjustment

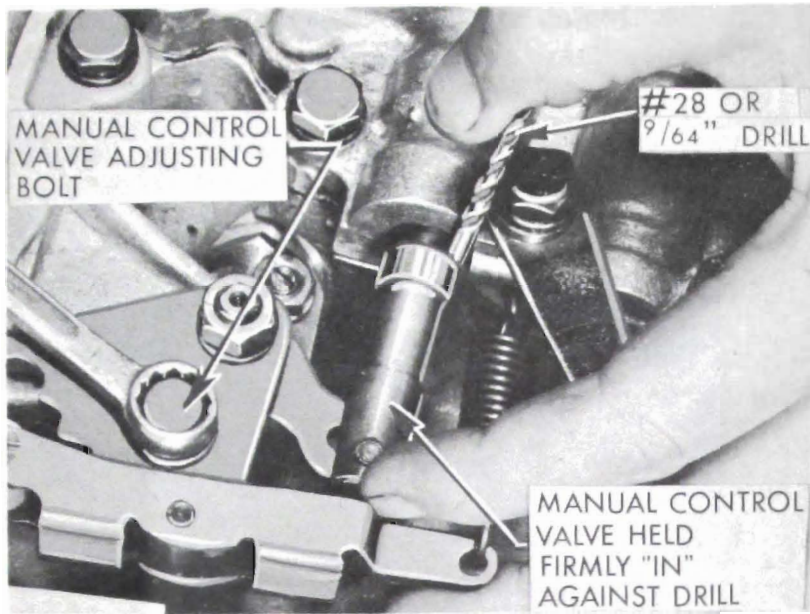
1. Loosen parking lock and detent assembly bolts slightly. Tap roller slide cover "in" fully. Retighten bolts.

5-544



2. With transmission in park position, loosen parking lock adjusting screw — insert .015" feeler gauge between roller and slide cover. Turn eccentric screw to give .015" slip fit between roller and slide cover. Place transmission in reverse range, turn parking lock ratchet wheel, make sure clearance exists between pawl and ratchet wheel.

5-545



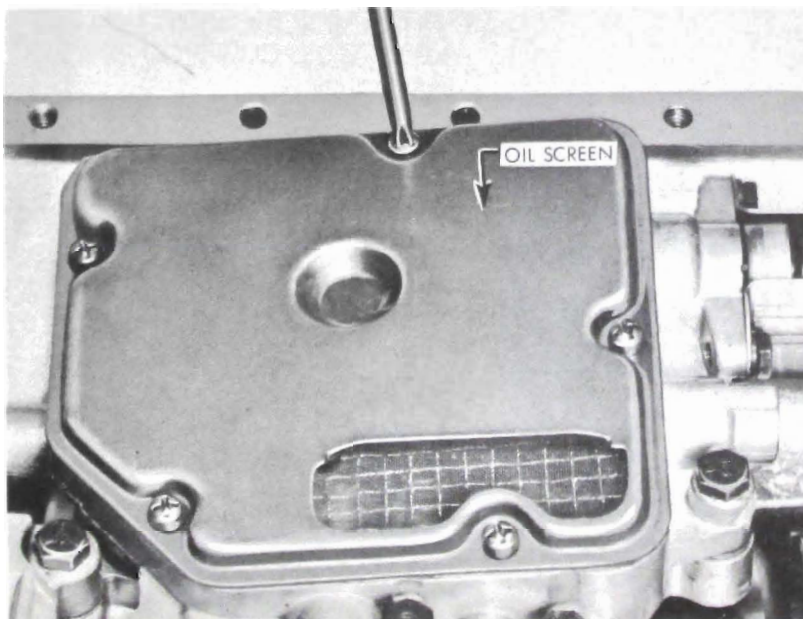
c. Manual Control Valve Adjustment

1. With transmission in "Park" position, (detent plate rotated rearward to last notch) loosen manual control valve adjusting bolt ($\frac{7}{16}$ " wrench), insert $\frac{9}{64}$ " drill between inner edge of first land of manual valve and valve body; hold valve "in" toward valve body with drill in position; at same time hold detent lever solidly in notch, and tighten adjusting bolt with valve in this position.

NOTE: Drill should rest against portion of valve body above valve. If drill is extended too far down, it will rest against a raised boss and be tilted, thus preventing accurate adjustment of the valve.

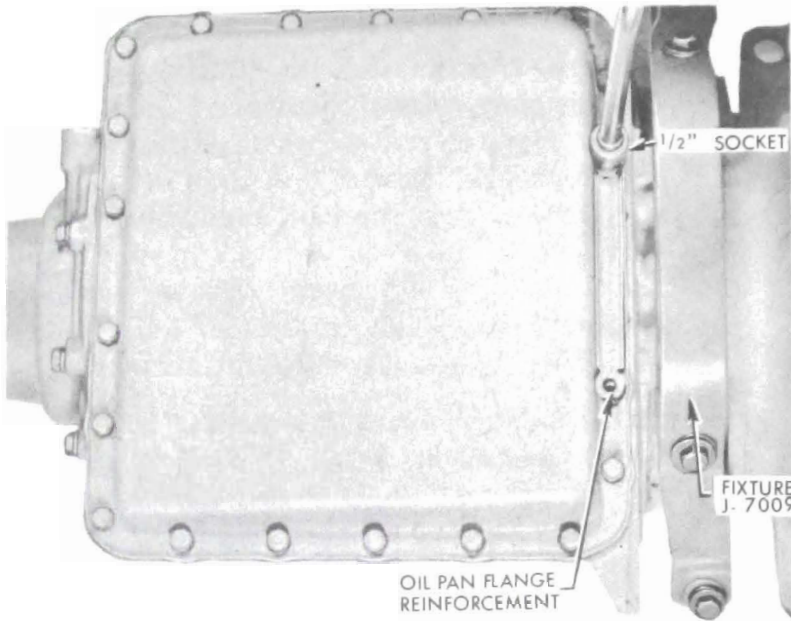
5-546

5-54 INSTALLATION OF OIL SCREEN, OIL PAN AND SELECTOR LEVER.



1. Install oil screen and five oil screen screws.

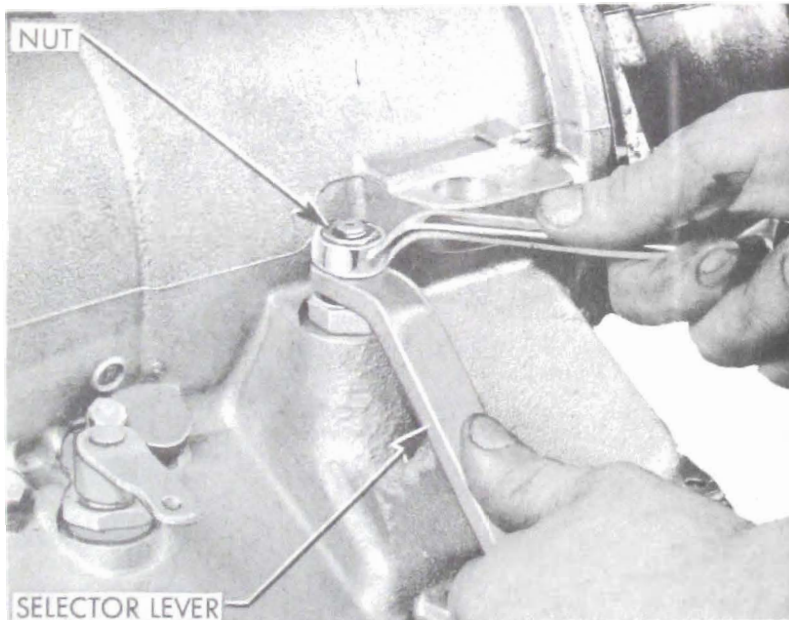
5-547



2. Install new oil pan gasket, oil pan, oil pan flange reinforcement and 20 oil pan bolts (1/2" socket). Torque to 10-12 ft. lbs.

NOTE: Oil pan gasket must be installed with "sharp corner of gasket at front right corner of pan flange (Transmission upside down and viewed from rear).

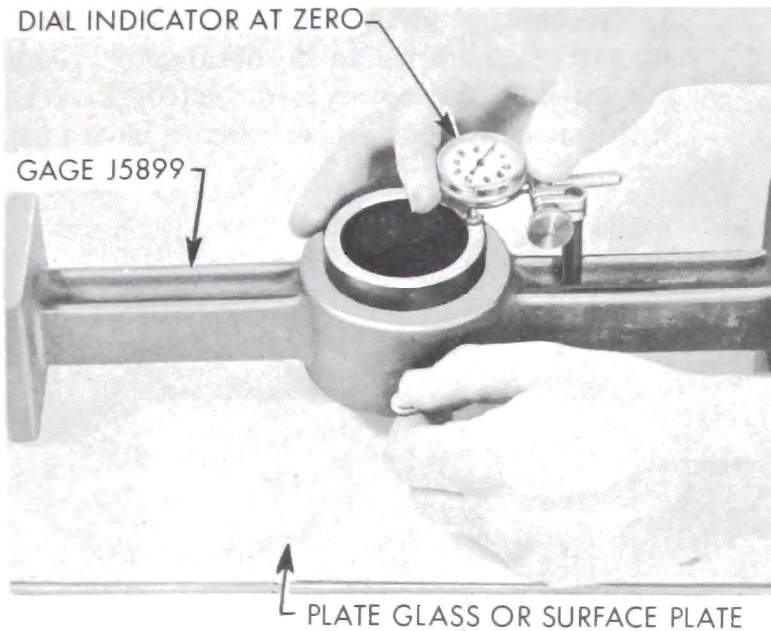
5-548



3. Make sure selector lever shaft seal is properly positioned in shaft bearing. Install lever and nut, being careful not to put any strain on internal linkage while tightening nut.

5-549

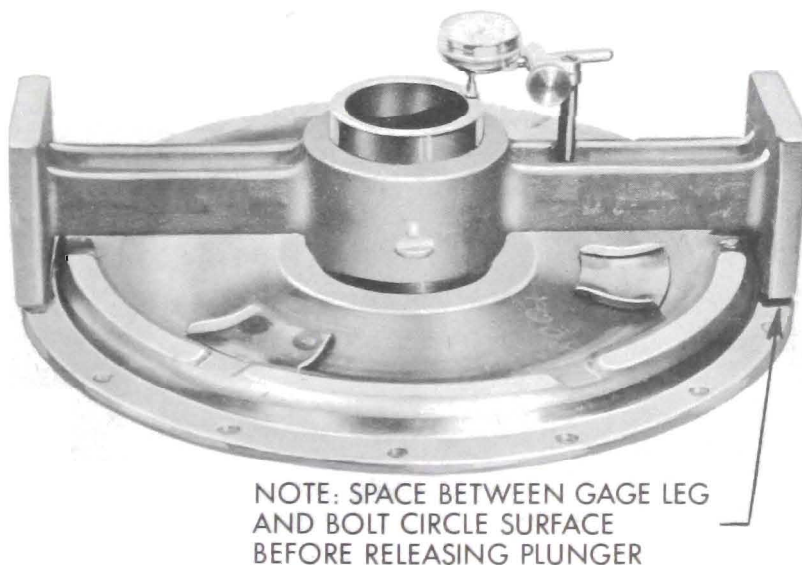
5-55 CONVERTER CLEARANCE MEASUREMENT AND ADJUSTMENT



a. Measurement of Converter Pump Cover Deflection

1. "Zero" the converter clearance gauge on a piece of plate glass or surface plate. Tighten plunger set screw. Adjust height of dial indicator so indicator plunger may move "in" at least .100". Set indicator at zero.

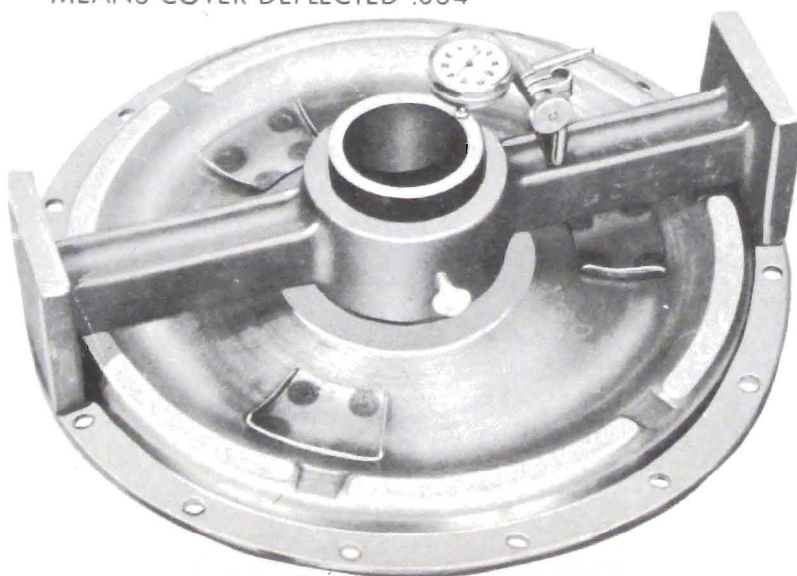
5-550



2. Set gauge on cover. The center bearing surface is higher than the outer bolt circle, so gauge is supported by plunger. A space will exist between legs of gauge and cover.

5-551

EXAMPLE: INDICATOR READING .066"
MEANS COVER DEFLECTED .034"

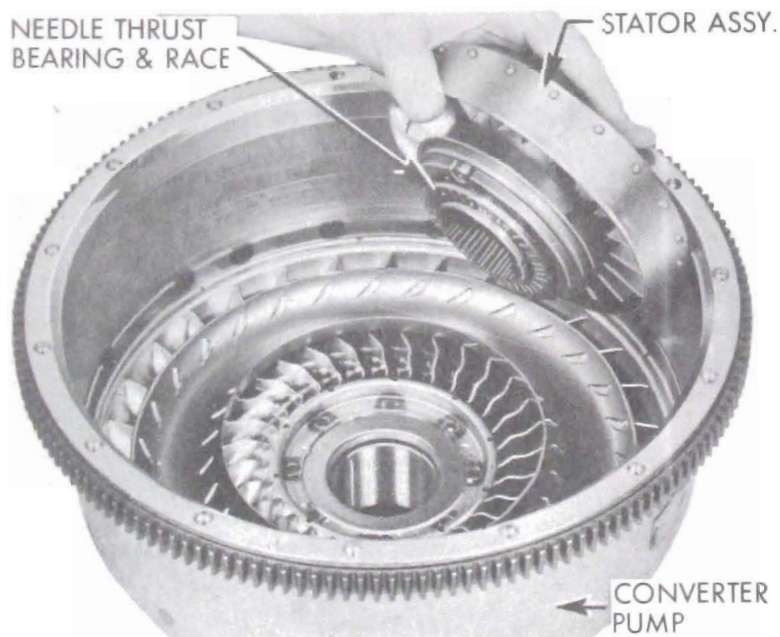


3. Release plunger set screw. Allow gauge to lower slowly until outer legs rest on cover. Be certain there are no burrs around the bolt holes through the cover as a burr will upset the accuracy of the measurement. Carefully note indicator reading. A new cover or one with no deflection will be approximately .100" higher at the inner bearing surface than at the outer bolt circle. However, all covers must be checked before being assembled.

5-552

Indicator Reading	Cover Deflection	Select Bearing Races to Obtain Clearance of:	
More than .090"	.000" to .010"	.002" clearance to .011" compression	5-553
.060" to .089"	.011" to .040"	.004" to .017" clearance.	
.059" or less	excess of .041"	discard cover	

4. The table at left will designate the proper converter clearance to be obtained depending on how far cover is deflected. Proceed with measurement of converter clearance.



b. Measurement and Adjustment of Converter Clearance

1. Set converter pump over hole in bench. Place stator assembly in pump with needle thrust bearing and race in place.

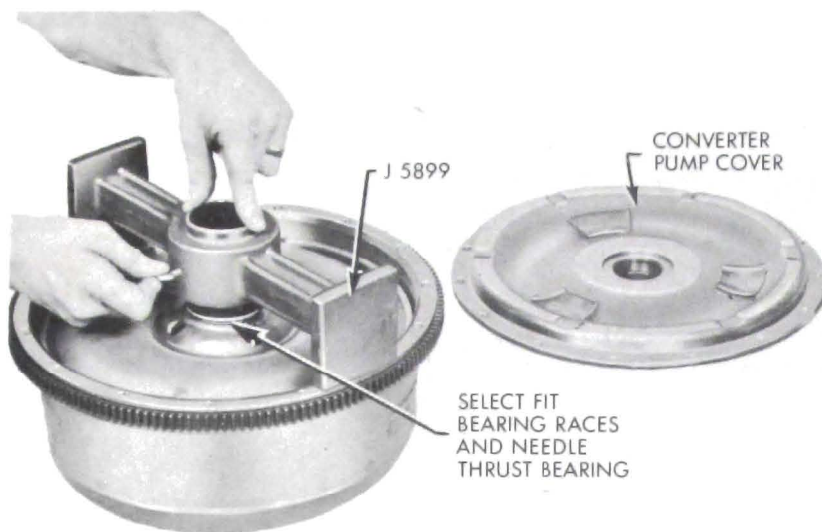
5-554



2. Set first, second, and third turbine assembly in place on top of stator.

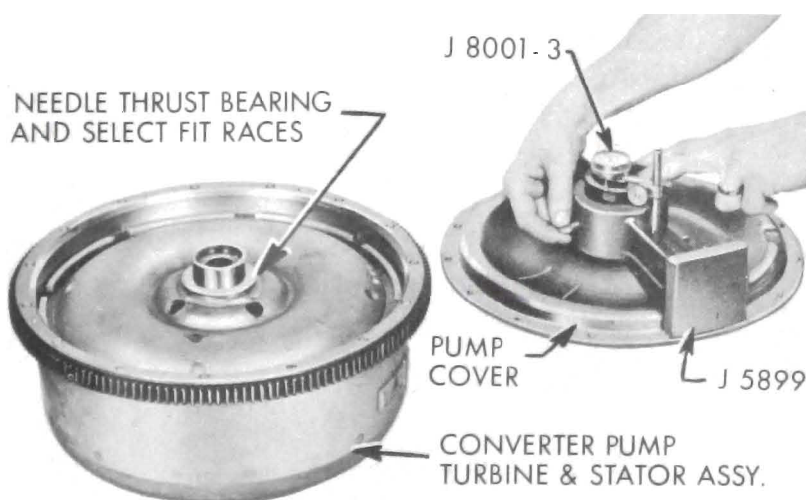
NOTE: Be certain needle thrust bearing and races are in place between second turbine hub and stator assembly.

5-555



3. Place needle thrust bearing and races on top of first turbine disc and hub. Place gage J-5899 in position on top of pump-turbine assembly with small diameter end of gage plunger "up." Loosen plunger set screw and press plunger down; tighten set screw.

5-556

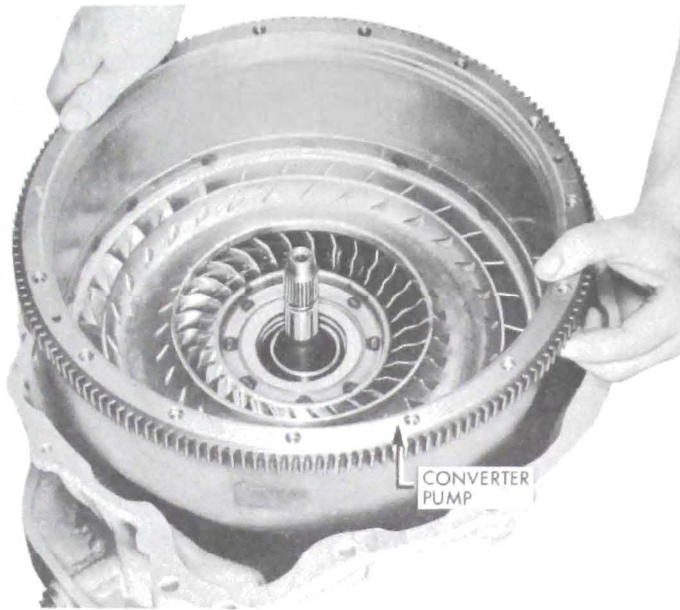


4. Invert gage J-5899 and place it on converter pump cover (large diameter end of gage plunger "up"). Assemble post and dial indicator so indicator bears on gage plunger. "Zero" indicator and release plunger thumb screw. Total indicator needle movement is converter clearance. Refer to sub paragraph a, above (Figure 5-553) to determine what combination of select fit bearing races to use to obtain the required converter clearance.

NOTE: If necessary, an additional bearing race may be used to obtain required clearance. Races are available in .030", .040", and .050" thicknesses.

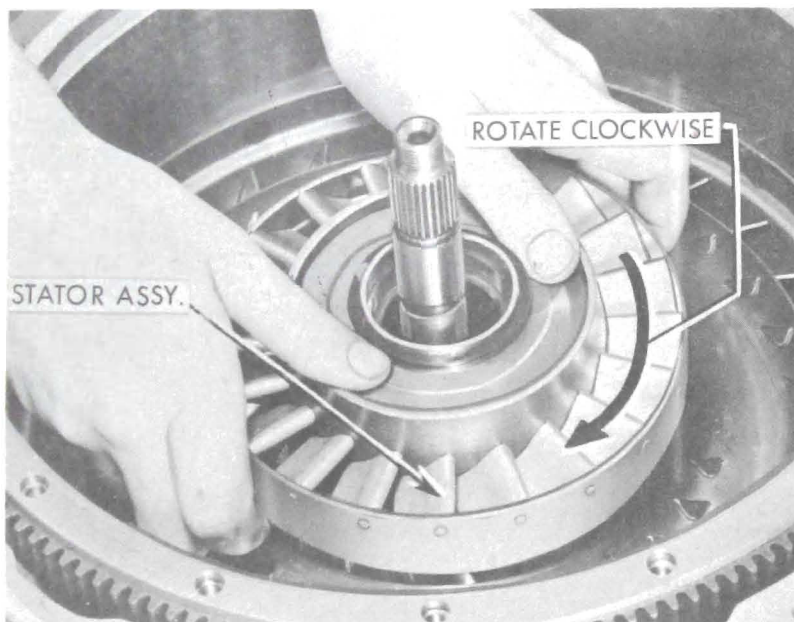
5-557

5-56 INSTALLATION OF CONVERTER



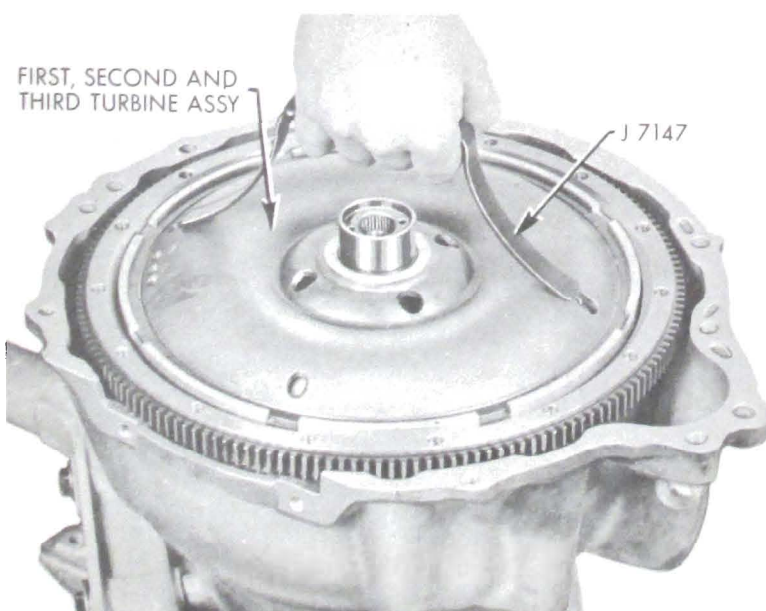
1. With transmission front end up, carefully install converter pump in transmission case and rotate to engage lugs of pump hub with oil pump drive gear. Use care when lowering pump into case to avoid damage to pump seal.

5-558



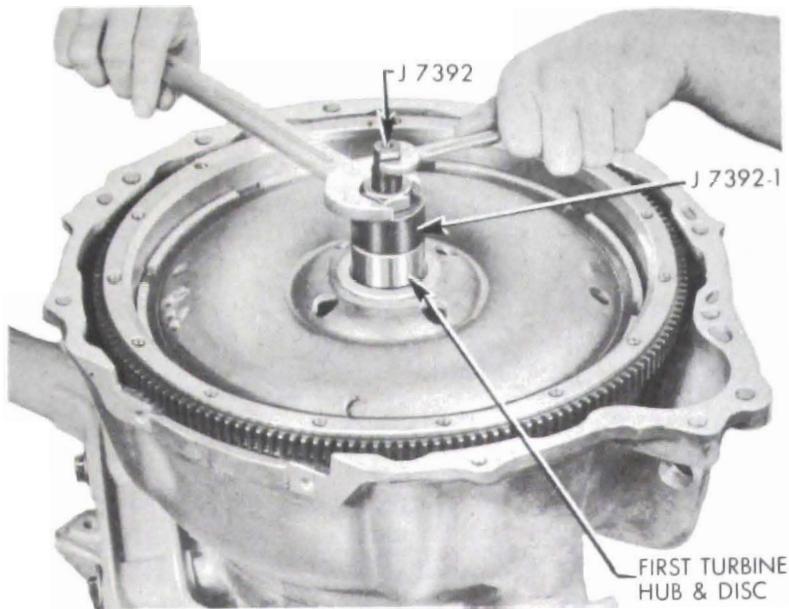
2. With needle thrust bearing ($2\frac{1}{4}$ " I.D. x 3" O.D.) and race in place, install stator assembly on reaction shaft. Stator must rotate clockwise and lock on counterclockwise rotation. Press down and rotate stator.

5-559



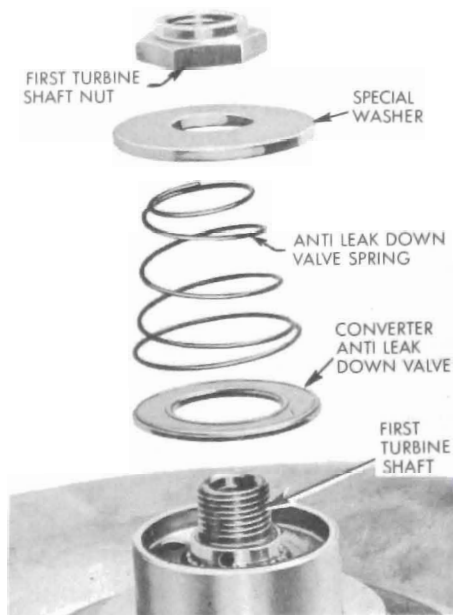
3. Carefully lower 1st, 2nd and 3rd turbine assembly into place with flanged needle thrust bearing and .050" bearing race held in place on second turbine hub with heavy lube. Rotate turbine assembly to align splines.

5-560



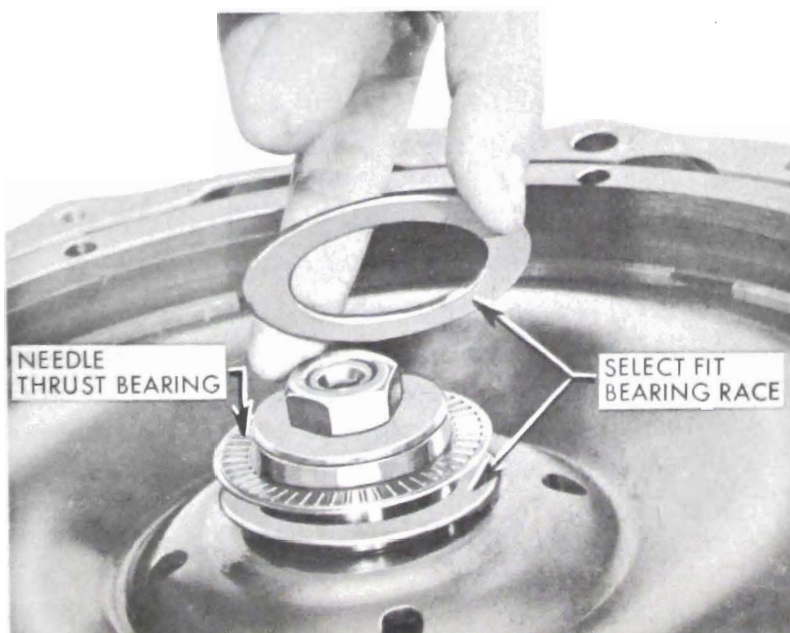
4. When all splines are aligned and first turbine shaft has engaged splines of first turbine hub, set J-7342-1 on first turbine hub. Insert J-7392-2 through hub and thread onto first turbine shaft fully. Hold J-7392-2 stationary and turn nut to press first turbine hub onto first turbine shaft.

5-561



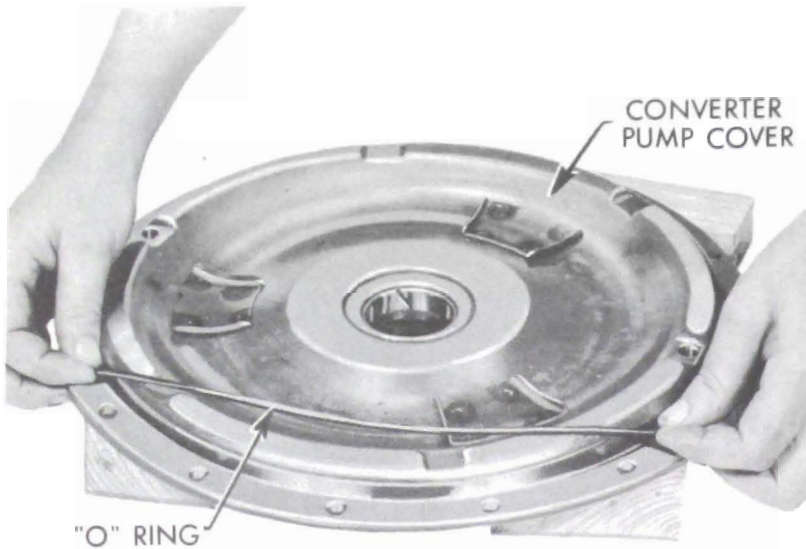
5. Assemble first turbine shaft nut, special washer, converter anti-leak down valve spring (large end toward valve), and converter anti-leak down valve as shown. Torque nut to 45-50 ft. lbs. Be certain that the special washer seats fully against the turbine hub. Any clearance at this point will result in converter leak down.

5-562



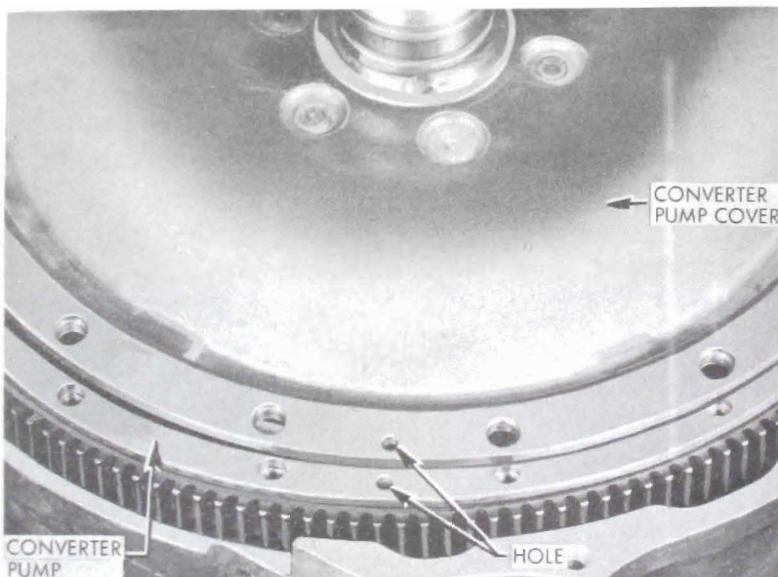
6. Position select fit bearing races selected as outlined in paragraph 5-55 on hub with needle bearing $1\frac{3}{4}$ " I.D. x $2\frac{1}{2}$ " O.D. between the races. If it is necessary to use three races to obtain proper clearance, two races may be assembled on either side of the needle bearing.

5-563



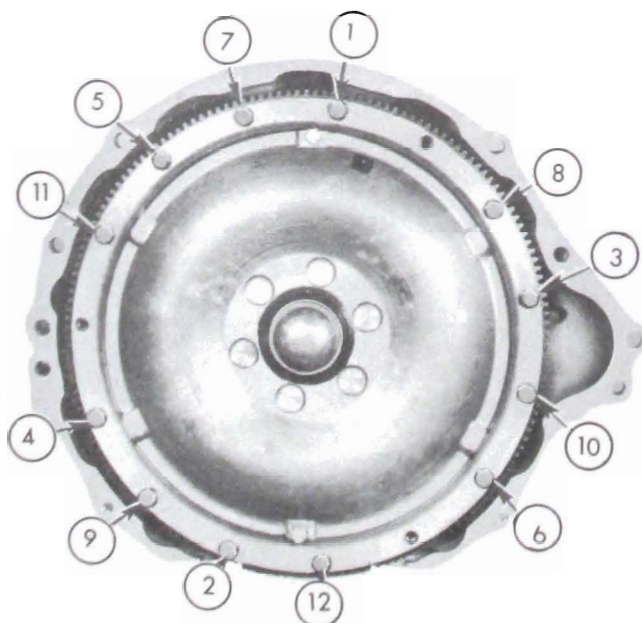
7. Install new O-ring on converter pump cover.

5-564



8. Assemble converter pump cover to pump with hole drilled through cover lined up with hole drilled part way through pump flange.

5-565

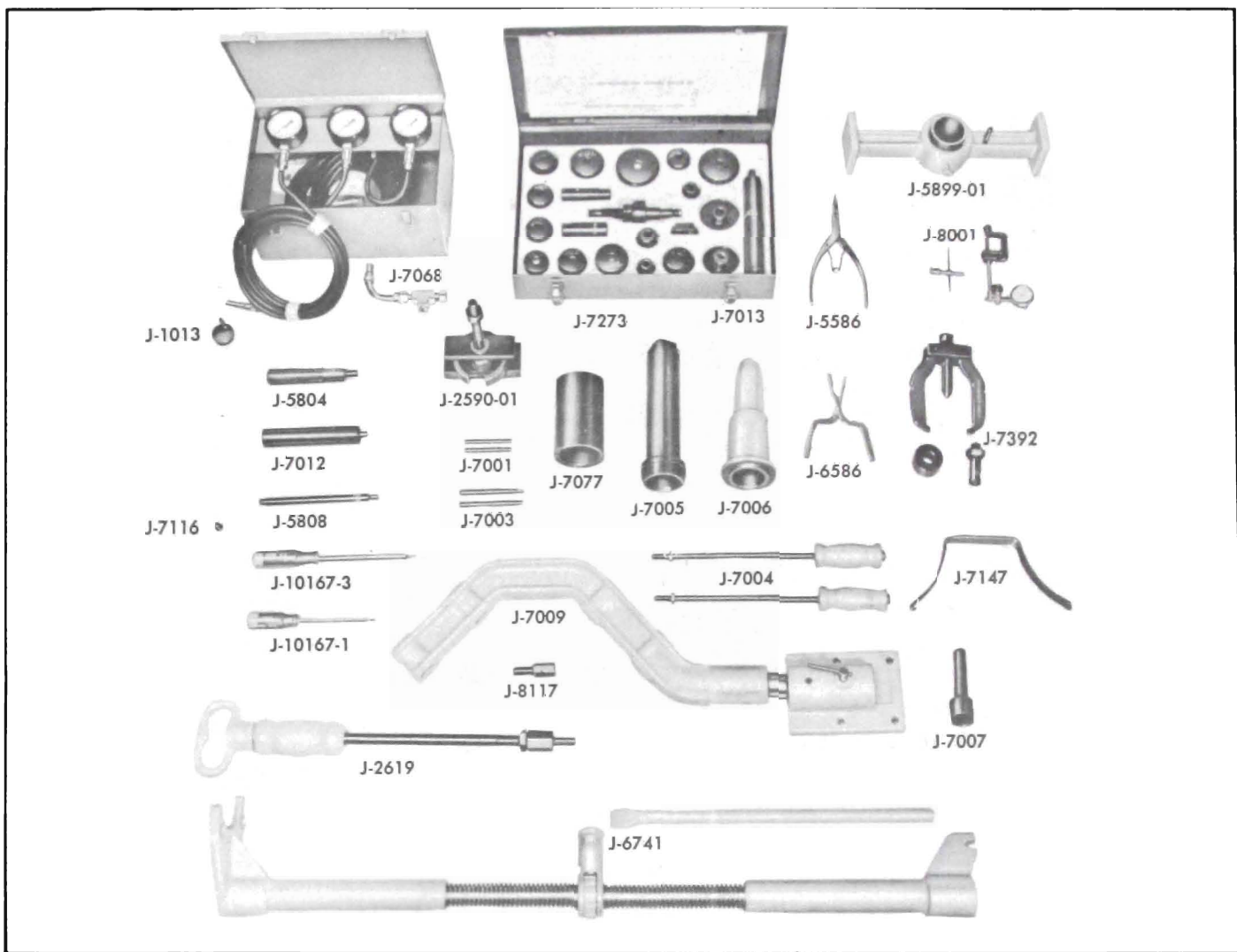


9. Install converter pump cover to pump bolts and tighten in sequence as shown. Torque to 30-35 ft. lbs.

NOTE: Only 300M bolts may be used at this location and at the flywheel to ring gear location. 300M bolts may be identified by six radial marks on the bolt head.

NOTE: Under no circumstances is the transmission to be tilted forward after the converter is assembled. The converter assembly will fall out and damage to the first turbine shaft and front planet carrier will result.

5-566



Triple Turbine Transmission Tools

- | | | | |
|------------------|---|------------------|--|
| J-2590-01 | Clutch Spring Compressor | J-7012 | Rear Bearing Retainer Spacer & Bearing Assembly Tool |
| J-1013 | Indicator Support | J-7013 | Bearing Driver Set |
| J-2619 | Slide Hammer Assembly | J-7068 | 3 Gauge Pressure Gauge Set |
| J-3289-20 | Base for J-7009 Holding Fixture | J-7077 | Rear Bearing Retainer Support |
| J-5804 | Transmission End Play Gauge | J-7086 | Oil Ring Assembly and Disassembly Tool |
| J-5808 | Dial Indicator Support Rod | J-7089 | Gauge |
| J-5899-01 | Converter Cover Clearance Gauge | J-7100 | Oil Ring Assembly and Disassembly Tool |
| J-6586 | Oil Delivery Sleeve Remover & Installer | J-7116 | Stator Piston Shim Selector Gauge |
| J-6741 | Axle Jack | J-7147 | Turbine Cover Remover & Installer |
| J-7001 | Guide Pin Set (Pump to Rear Bearing Retainer) | J-7273 | Bushing Service Set |
| J-7003 | Guide Pin Set (Front Pump to Case) | J-7392 | Turbine Cover Remover |
| J-7004 | Front Pump Assembly Removers (Pair) | J-8001 | Dial Indicator Set |
| J-7005 | Front Pump Oil Seal Remover
Use With J-2619 Slide Hammer | J-8117 | Output Shaft Remover (Use with J-2619) |
| J-7006 | Front Pump Oil Seal Installer | J-10167-1 | Palm Grip Clutch Head Screw Driver 5/32" |
| J-7007 | Pressure Regulator Valve Spring Assembly Tool | J-10167-3 | Palm Grip Clutch Head Screw Driver 1/4" |
| J-7009 | Transmission Holding Fixture
Use with J-3289-20 Base | J-5586 | Snap Ring Pliers |

Figure 5-567—Triple Turbine Special Tools