

SECTION 3B

STEERING

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MANUAL STEERING GEARS

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OVERHAUL OPERATIONS

Disassembly (Figs. 3B-1 through 3B-4)

As with any ball bearing unit the steering gear parts must be kept free of dirt. Clean paper or rags should be spread on the workbench before starting disassembly of the steering gear.

1. Place the steering gear in a vise, clamping onto one of the mounting tabs. The wormshaft should be in a horizontal position.

2. Rotate the wormshaft from stop to stop, counting the total number of turns. Then turn back exactly half way, placing the gear on center (the wormshaft flat should be at

the 12 o'clock position). Loosen locknut.

3. Place a pan under the assembly to catch the lubricant and remove the three self locking bolts attaching the side cover to the housing.

4. Tap lightly on the end of the pitman shaft with a plastic hammer and lift the side cover and pitman shaft assembly from the gear housing (fig. 3B-5).

NOTE: If the pitman shaft sector does not clear the opening in the housing easily, turn the wormshaft by hand until the sector will pass through the opening in the housing.

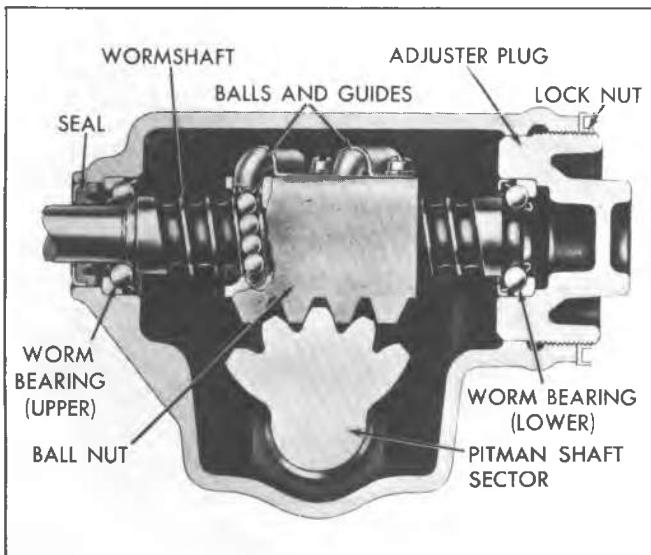


Fig. 3B-1--Steering Gear (Except Corvette)

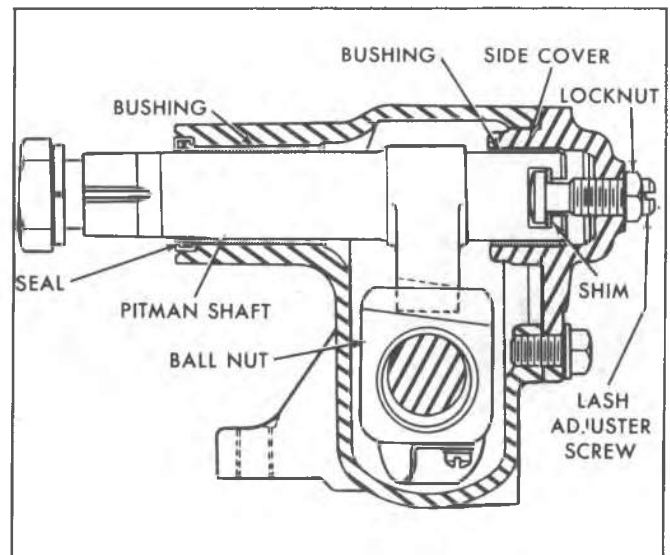


Fig. 3B-2--Steering Gear (Except Corvette and G10-30 Series Trucks)

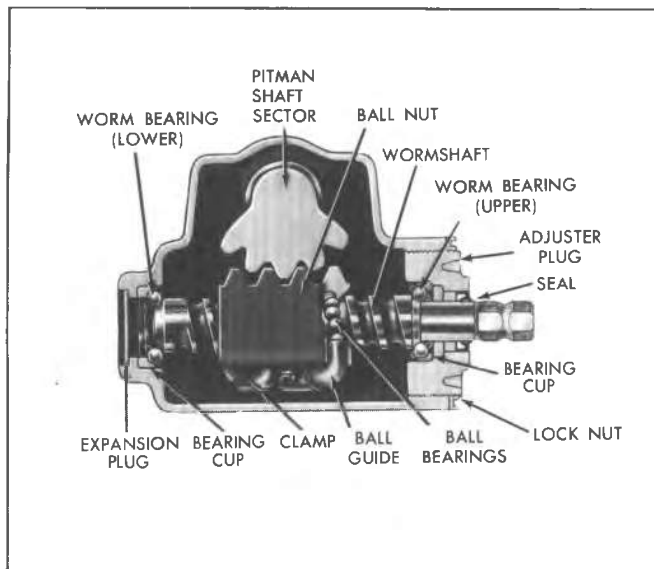


Fig. 3B-3--Steering Gear--Corvette

5. Remove the adjuster plug and locknut assembly (incorporates the lower wormshaft bearing and race on all except Corvette - upper wormshaft bearing race on Corvette).

6. Draw the wormshaft and ball nut assembly from the housing (fig. 3B-6).

CAUTION: Use care that the ball nut does not run down to either end of the worm. Damage will be done to the ends of the ball guides if the nut is allowed to rotate until stopped at the end of the worm.

7. **All Except Corvette--** Remove the upper bearing from the wormshaft.

Corvette-- Remove lower bearing from inside the gear housing.

8. **All except Corvette--** Using a suitable size screw driver, pry the lower bearing retainer from the adjuster plug housing and remove the bearing (fig. 3B-7).

9. Remove the locknut from the lash adjuster screw in

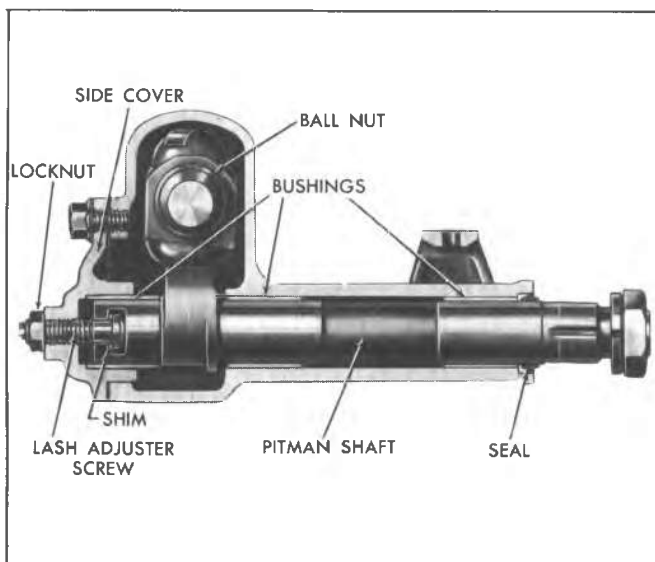


Fig. 3B-4--Steering Gear (Corvette and G10-30 Series Trucks)

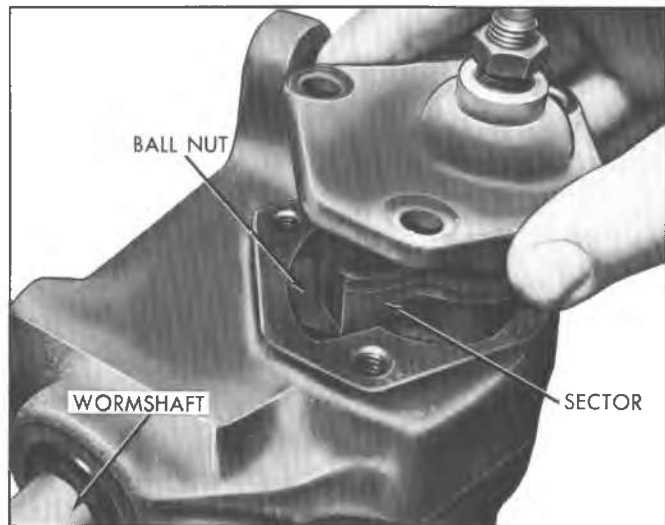


Fig. 3B-5--Removing Pitman Shaft Assembly--Typical

the side cover. Remove the lash adjuster screw from the side cover by turning the screw clockwise. Slide the adjuster screw and shim out of the slot in the end of the pitman shaft.

10. Pry out and discard both the pitman shaft and wormshaft seals.

Inspection

With the steering gear completely disassembled, wash all parts in cleaning solvent. Dry them thoroughly with air. With a magnifying glass inspect the bearings and bearing races for signs of indentation. Also check for any signs of chipping or breakdown of the surface. Any parts that show signs of damage should be replaced.

Inspect all seals. Any seal that is worn or has been removed should be replaced.

Inspect the fit of the pitman shaft in its bushing in the side cover. If this bushing is worn, a new side cover and bushing assembly should be installed.

Check steering gear wormshaft assembly for being bent or damaged in any way. Never attempt to salvage steering parts by welding or straightening.



Fig. 3B-6--Removing the Wormshaft and Ball Nut--Typical



Fig. 3B-7--Removing Lower Bearing Retainer--Except Corvette

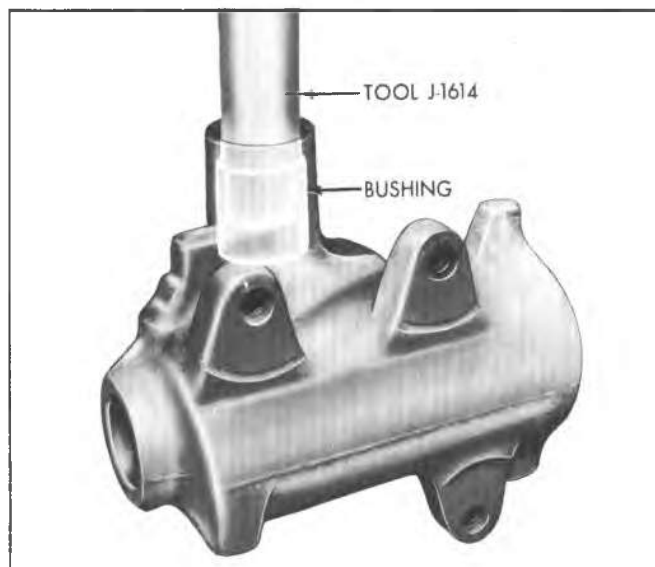


Fig. 3B-8--Removing Pitman Shaft Bushing--Typical

Repairs

Pitman Shaft and/or Wormshaft Seal Replacement

The double lipped pitman shaft and wormshaft seals should be replaced each time a defective seal is indicated or the steering gear is disassembled.

1. If the seals were not removed at disassembly, pry out the old seals using a suitable size screw driver.

CAUTION: Before installing new seals, check the condition of the pitman shaft bushing(s) and the upper wormshaft bearing race.

2. A suitable size socket, pressing on the outer diameter of the seal, may be used to install new seals.

CAUTION: Care should be taken to insure that the new seals are not assembled in a cocked position.

Pitman Shaft Bushing Replacement

1. Support the steering gear housing in an arbor press and press the pitman shaft bushing (2 bushings on Corvette and G10-30 Series Trucks) from the housing using Tool J-1614, inserted from the lower end of the housing (fig. 3B-8).

2. Press the new bushing(s) into position using Tool J-1614. Position the Corvette and G10-30 Series Truck bushings as shown in Figure 3B-4.

NOTE: Service bushings are diamond bored to size and require no further reaming.

Side Cover Bushing Replacement

The entire side cover assembly, including bushing, is serviced as a unit and should be replaced when it is desired to replace the bushing.

Wormshaft Bearing Race Replacement

ADJUSTER PLUG RACES

1. **All Except Corvette--** Remove the wormshaft bearing race using Tool J-5822 and a Slide Hammer as shown in Figure 3B-9.

Corvette-- Using a hammer and punch, drive the bearing race out of the adjuster plug.

2. Press the new bearing race into position using Tool J-5755.

HOUSING RACES

1. **Corvette only--** Using a drift or punch (inserted into the housing from the adjuster plug end) drive the sheet metal

expansion plug out of the lower end of the housing.

2. All Series - Using a drift or punch, drive the bearing race out of the housing.

3. Press the new bearing race into position using Tool J-5755 (fig. 3B-10).

4. **Corvette only--** Install a new expansion plug into the lower end of the housing. Press on the center of the plug to deform it inward and secure it in the housing. Make sure the plug is tight or lubricant leakage could result.

Ball Nut Servicing

As a rule, disassembly of the ball bearing nut will not be necessary if it is perfectly free with no indication of binding or tightness when rotated on the worm. However, if there is any indication of binding or tightness, the unit should be disassembled, cleaned and inspected as follows:

1. Remove screws and clamp retaining the ball guides in nut. Draw guides out of nut.

2. Turn the nut upside down and rotate the wormshaft back and forth until all the balls have dropped out of the nut into a clean pan. With the balls removed, the nut can be pulled endwise off the worm.

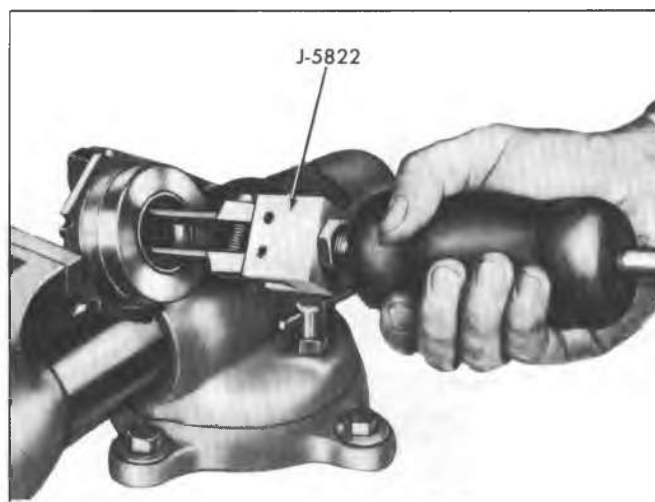


Fig. 3B-9--Removing Adjuster Plug Bearing Race

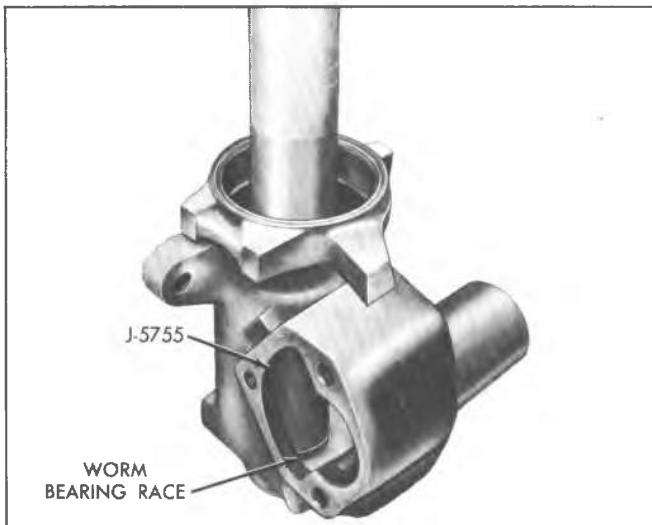


Fig. 3B-10--Installing Wormshaft Bearing Race-Typical

3. Wash all parts in cleaning solvent and dry them thoroughly with air. Using a magnifying glass inspect the worm and nut grooves and the surface of all balls for signs of indentation. Check ball guides for damage at ends where they deflect or pick up the balls from the helical path. Any parts that show signs of damage should be replaced.

4. All Except Corvette (fig. 3B-11):

a. Place the wormshaft flat on the bench and slip the nut over the worm with the ball guide holes up and the shallow end of the ball nut teeth to the left from the steering wheel position. Align the grooves in the worm and nut by sighting through the ball guide holes.

b. Place two ball guide halves together and insert them into the upper circuit in the ball nut. Place the remaining two guides together and insert them in the lower circuit.

c. Count 24 balls into a suitable container. This is the proper number of balls for one circuit.

d. Load the balls into one of the guide holes while turning the wormshaft gradually away from that hole. When all of the balls have been installed, the circuit is complete.

e. Fill the remaining ball circuit in the same manner as described for the first circuit in Steps c and d above.

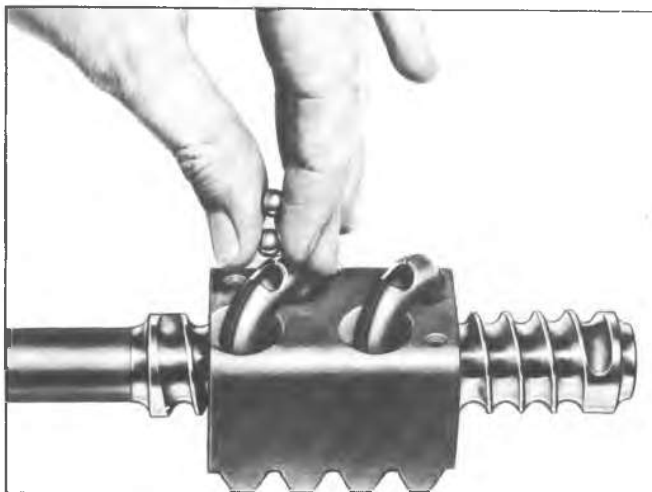


Fig. 3B-11--Filling Ball Circuits--Except Corvette

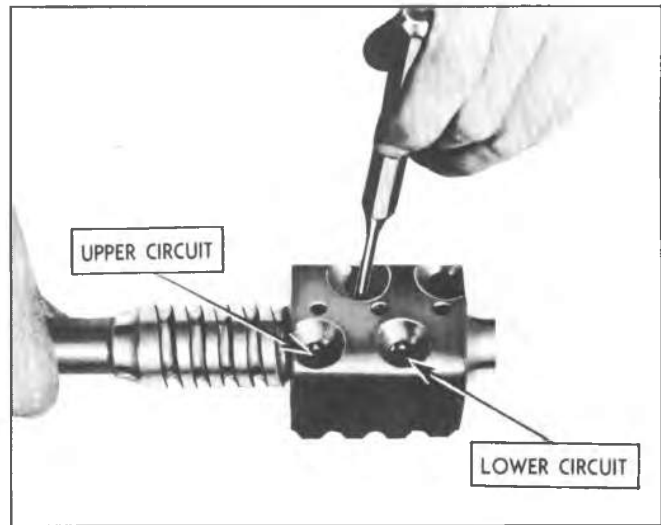


Fig. 3B-12--Filling Ball Circuits--Corvette

5. Corvette only (figs. 3B-12 and 3B-13):

a. Place the wormshaft flat on the bench and slip the nut over the worm with the ball guide holes up and the shallow end of the rack teeth to the left from the steering wheel position. Align the grooves in the worm and nut by sighting through the ball guide holes.

b. Count 27 balls into a suitable container. This is the proper number of balls for half the circuit. Place these balls into one of the guide holes while turning the worm gradually away from that hole.

c. Lay one-half of the ball guide, groove up, on the bench and place the remaining balls from the count container in it.

d. Close this half of guide with the other half. Hold the two halves together and plug each open end with petroleum jelly so that balls will not drop out while installing the guide.

e. Push the guide into the guide holes of the nut. This completes one circuit of balls. If the guide does not push all the way down easily, tap it lightly into place with the wooden handle of a screw driver.

f. Fill the second ball circuit in the same manner. Continue until the ball circuit is full from the bottom of one



Fig. 3B-13--Filling Ball Guides--Corvette

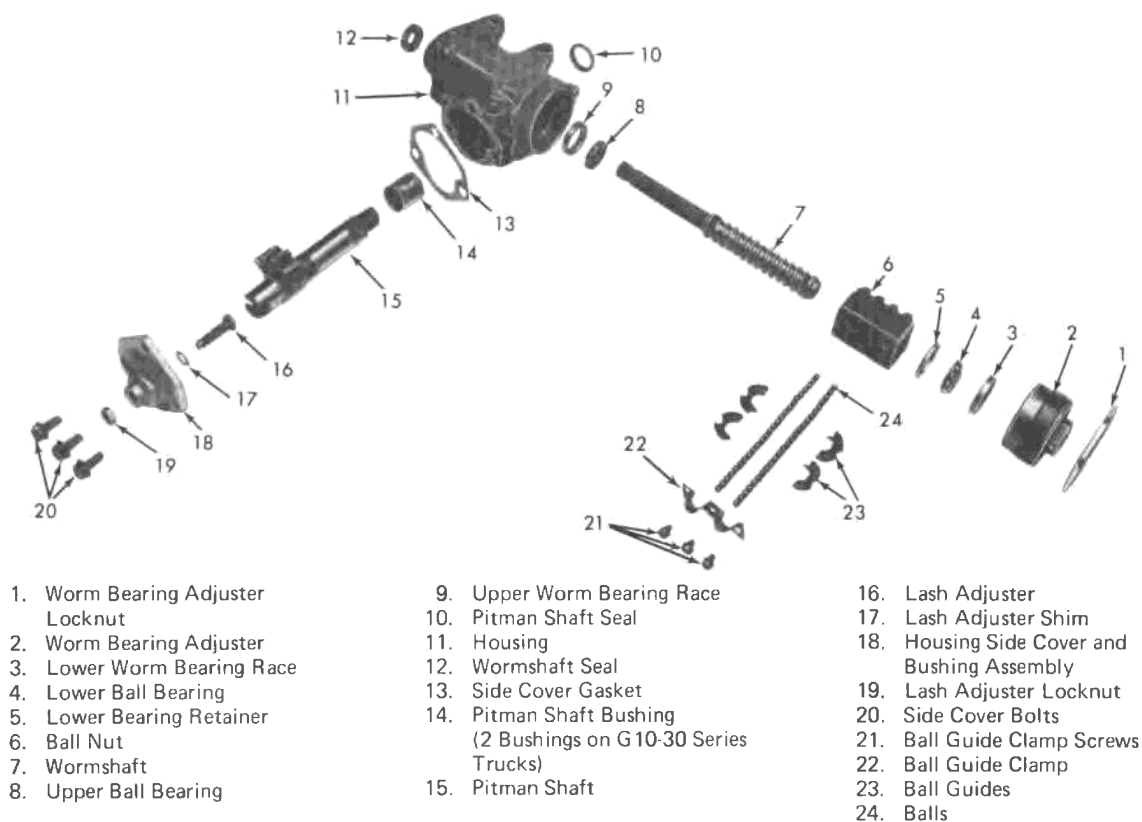


Fig. 3B-14--Steering Gear--Except Corvette

guide hole to the bottom of the other or until stopped by reaching the end of the worm.

NOTE: In cases where the balls are stopped by the end of the worm, hold down those balls already dropped into the nut with the blunt end of a clean rod or punch (fig. 3B-12) and turn the worm in the reverse direction a few turns. The filling of the circuit can then be continued. It may be necessary to work the worm back and forth, holding the balls down first in one hole and then the other, to close up the spaces between the balls and fill the circuit completely and solidly.

6. Assemble the ball guide clamp to the ball nut and tighten the screws to specified torque.

Check the assembly by rotating the nut on the worm to see that it moves freely. Do not rotate the nut to the end of the worm threads as this may damage the ball guides. If there is any "stickiness" in the motion of the nut, some slight damage to the ends of the ball guides or to other gear components may have been overlooked.

Assembly (Fig. 3B-14 and 3B-15)

After a major service overhaul, steering gear lubricant meeting GM Standard GM 4673M (or equivalent) should be

applied to the pitman shaft and bearings, wormshaft and bearings and the ball nut teeth.

1. Place the steering gear housing in a vise with the wormshaft bore horizontal and the side cover opening up.

2. With the pitman shaft and wormshaft seals, pitman shaft bushings and wormshaft bearing races installed, and the ball nut installed on the wormshaft, proceed to Step 3 or 4.

3. All Except Corvette--

a. Slip the upper ball bearing over the wormshaft and insert the wormshaft and nut assembly into the housing, feeding the end of the shaft through the upper ball bearing race and seal.

b. Place a ball bearing in the adjuster race and press the stamped retainer into place with a suitable socket.

c. Install the adjuster and locknut into the lower end of the housing (being careful to guide the end of the wormshaft into the bearing) until nearly all end play has been removed from the wormshaft.

4. Corvette--

a. Place a wormshaft bearing in the housing race. Slide the other bearing and the adjuster plug assembly over the upper end of the wormshaft.

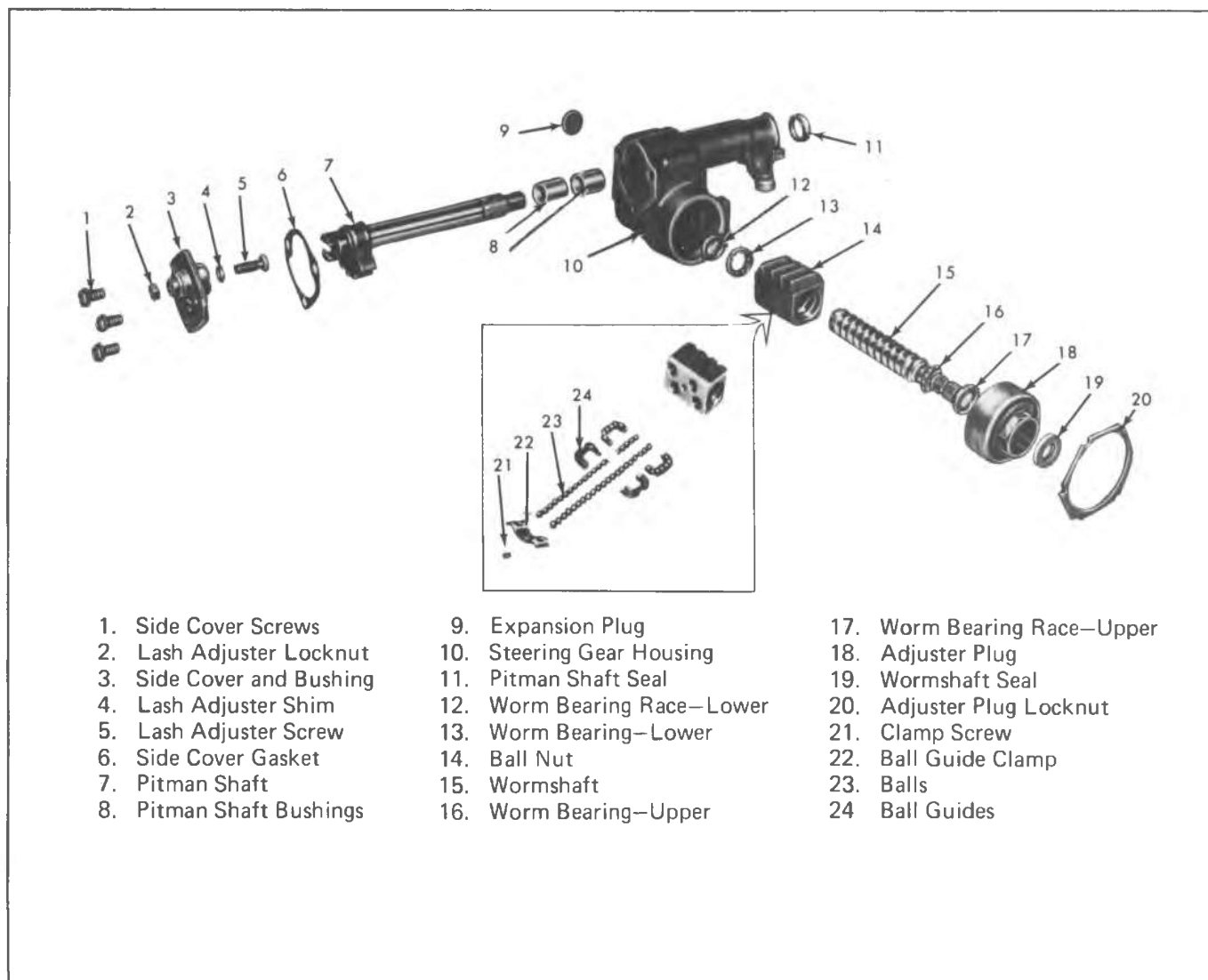


Fig. 3B-15—Steering Gear—Corvette

b. Insert the wormshaft, nut and adjuster assembly into the housing, guiding the lower end of the wormshaft into the housing bearing.

c. Thread the adjuster into the housing until nearly all end play is removed from the wormshaft.

5. Position the lash adjuster (with shim) in the slotted end of the pitman shaft. Check the end clearance, which should not be greater than .002" (fig. 3B-16). If clearance is greater than .002", a steering gear lash adjuster shim unit is available. It contains four shims—.063", .065", .067" and .069" thick.

6. Lubricate the steering gear with 11 oz. of lubricant meeting GM Specification GM 4673 (or equivalent). Rotate the wormshaft until the ball nut is at the end of its travel and then pack as much new lubricant into the housing as possible without losing it out the pitman shaft opening. Rotate the wormshaft until the ball nut is at the other end of its travel and pack as much lubricant into the opposite end as possible.

7. Rotate the wormshaft until the ball nut is about in the center of travel. This is to make sure that the pitman shaft sector and ball nut will engage properly, with the center tooth of the sector entering the center tooth space in the ball nut.

8. Insert the pitman shaft assembly (with lash adjuster

screw and shim but without side cover) into the housing so that the center tooth of the pitman shaft sector enters the



Fig. 3B-16—Checking Lash Adjuster End Clearance

center tooth space of the ball nut.

9. Pack the remaining portion of lubricant into the housing.

10. Place the side cover gasket on the housing.

11. Install the side cover onto the pitman shaft by reaching through the side cover with a screwdriver and turning the lash adjuster screw counterclockwise until the screw bottoms; back the screw off one-half turn. Loosely install a new locknut onto the adjuster screw.

12. Install and tighten the side cover bolts to specifications.

CAUTION: *If new side cover bolts are used at installation, be sure to use specified bolts which are self locking.*

Adjustment on Bench

1. Tighten the adjuster plug until all end play has been removed and then loosen one-quarter turn.

2. Using an 11/16" 12-point socket and an in. lb. torque wrench, carefully turn the wormshaft all the way to the right

turn stop and then turn back about one-half turn.

3. Tighten the adjuster plug until the proper thrust bearing preload is obtained; (See the Specifications at the rear of this Manual). Tighten the adjuster plug locknut to specifications.

4. Turn the wormshaft from one stop all the way to the other, counting the number of turns. Then turn the shaft back exactly half the number of turns to the center position.

5. Turn the lash adjuster screw clockwise to remove all lash between the ball nut and sector teeth. Tighten the locknut.

6. Again using the 11/16" 12-point socket and an in. lb. torque wrench, observe the highest reading while the gear is turned through center position. See the Specifications Section for proper over-center adjustment.

7. If necessary, readjust lash adjuster screw to obtain proper torque. Tighten the locknut to 23 ft. lb. torque and again check torque reading through center of travel.

POWER STEERING PUMP

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OVERHAUL OPERATIONS

CAUTION: *If when overhauling a power steering gear or pump, broken components or foreign material are encountered, the remaining components of the entire hydraulic system should be disassembled, inspected, thoroughly cleaned and flushed before servicing is completed.*

Disassembly (Fig. 3B-17)

Clean the outside of the pump in a Nontoxic Solvent before disassembly.

1. Remove pump pulley by using tool J-25034 as shown in Figure 3B-18.

2. Place the pump in a vise and remove the union and "O" ring seal assembly.

CAUTION: *In clamping pump in vise, be careful not to exert excessive force on the pump front hub as this may distort the shaft bushing.*

3. Remove the pump reservoir retaining studs.

4. Remove the reservoir from the pump housing by tapping lightly on the outer edge of the reservoir with a soft hammer. Remove the "O" ring seal from the pump housing and discard seal.

5. Remove magnet from housing assembly.

6. Remove the mounting stud square ring seals and the flow control valve square ring seal and discard.

7. On Corvette, remove filter and filter cage; discard filter element.

8. Remove the end plate retaining ring. Compress the end plate retaining ring by inserting a small punch in the 1/8" diameter hole in the pump housing. When the ring is in compressed position, remove with a screw driver as shown in Figure 3B-19.

9. Remove the end plate. The end plate is spring loaded and will generally sit above the housing level. If sticking should occur, a slight rocking action or light tapping with a soft hammer will free the plate. Remove the end plate spring.

10. With the pump still in a vise, remove the shaft woodruff key and tap end of shaft gently with a soft hammer until the shaft pressure plate, pump ring, rotor assembly and thrust plate can be removed as a unit (fig. 3B-20).

11. Separate the parts removed in Step 9 above. If inspection shows the shaft to be defective, separate it from the rotor by removing the retainer snap ring. Discard the snap ring.

12. Remove the end plate and pressure plate "O" rings from the pump housing and discard "O" rings.

13. Remove the dowel pins.

14. Remove the flow control valve and spring assembly.

15. Pry the shaft seal out of the pump housing being careful not to damage the housing bore, discard the shaft seal.

Inspection

Clean all metal parts in a nontoxic solvent and inspect as follows:

1. Flow control valve must slide freely in housing bore. If sticking is observed, check for dirt and burrs.

2. Check cap screw in the end of the flow control valve for looseness; if loose, tighten, being careful not to damage machined surfaces.

3. Be sure that pressure plate and pump plate surfaces are flat and parallel with pump ring. Check all of these parts for cracks and scoring.

NOTE: A high polish is always present on rotor pressure

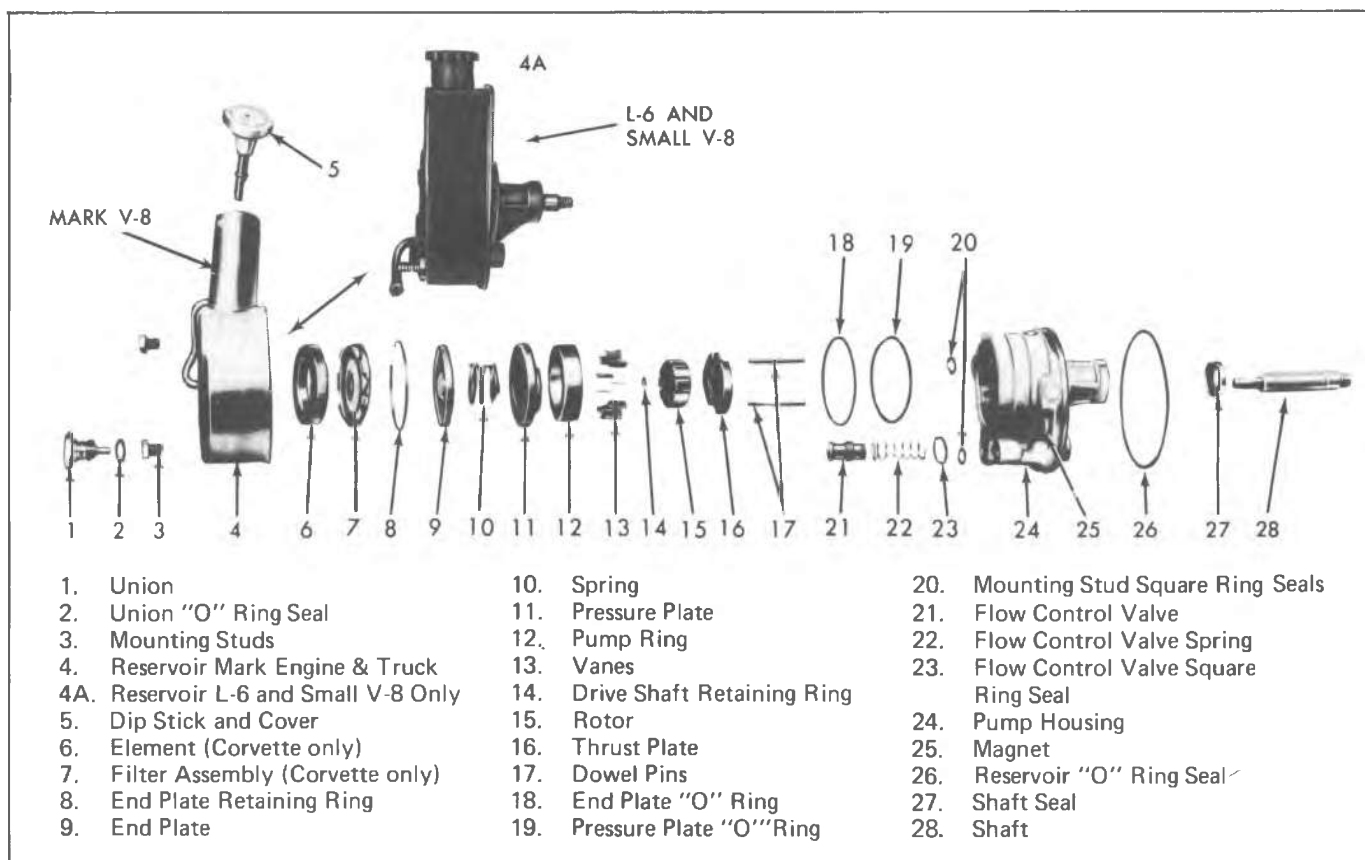


Fig. 3B-17--Power Steering Pump--Exploded View

plate and thrust plate as a result of normal wear. Do not confuse this with scoring.

4. Make certain vanes were installed with rounded edge toward pump ring and see that they move freely in rotor slots.

5. If the flow control plunger is determined to be faulty, install a new part. This part is serviced as a unit only and is factory calibrated.

6. Check drive shaft for worn splines, breaks, bushing material pickup, etc.

7. Always replace all rubber seals and "O" rings when

pump is dismantled.

8. Check reservoir, studs, casting, etc. for burrs and other faults which would impair proper operation.

Assembly (Fig. 3B-21)

Be sure all parts are clean during reassembly.

NOTE: In the following text, Power Steering Fluid is noted for use in lubricating components upon reassembly.

1. Install a new shaft seal in the pump housing, using Tool J-22670 as shown in Figure 3B-22.



Fig. 3B-18--Power Steering Pump Pulley--Removal



Fig. 3B-19--Removing End Plate Ring



Fig. 3B-20--Impeller Unit Removal

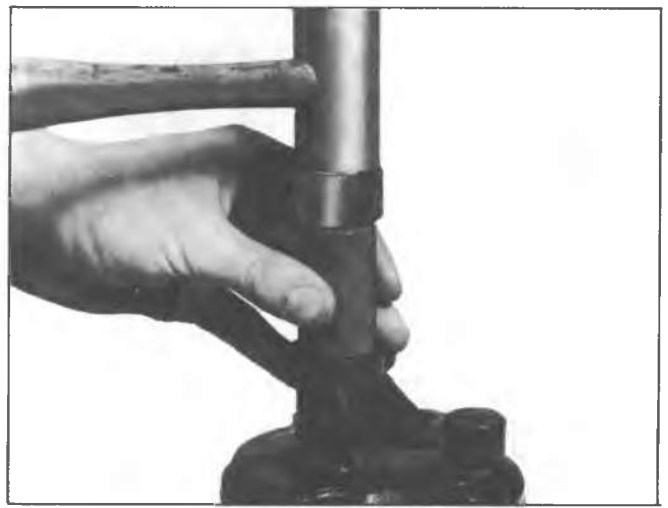


Fig. 3B-22--Installing Seal Using Tool J-22670

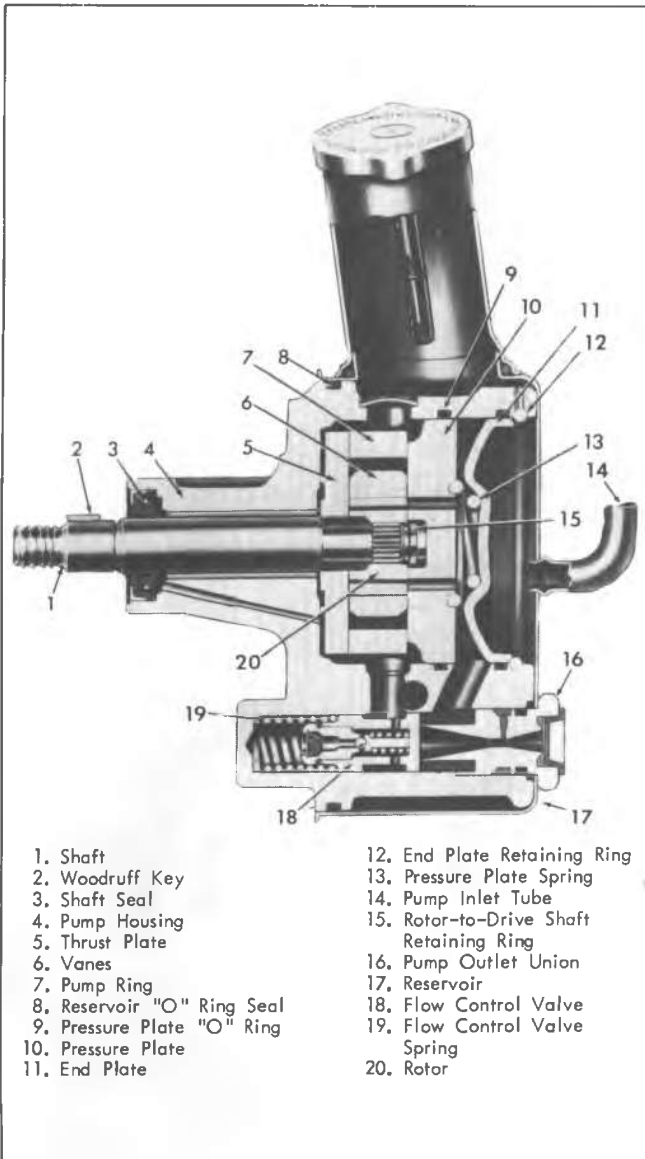


Fig. 3B-21--Power Steering Pump--Typical

2. Install both dowel pins in the pump housing and install a new pressure plate "O" ring lubricated with Power Steering Fluid.

CAUTION: Do not use a "C" ring to replace the full diameter ring. Be sure the retaining ring is firmly seated in the shaft groove before proceeding.

3. Install the thrust plate on the shaft with the ported face towards the splined end of the shaft (fig. 3B-23).

4. Install the rotor, which must be free on the shaft splines, with the countersunk side towards the thrust plate.

5. Install a new shaft retaining ring by placing the ring on the end of the shaft and using first a drift and then a 3/8" socket to tap the NEW ring into place (fig. 3B-24).

6. Place pump housing in a vise and install shaft, thrust plate and rotor assembly into housing, aligning the holes in the thrust plate with the dowel pins as shown in Figure 3B-25.

7. Install the pump ring onto the dowel pins with the direction of rotation arrow to the rear of the housing (fig. 3B-26). Rotation is clockwise as viewed from the pulley end of the shaft.

8. Install the vanes into the rotor slots with the radius edge towards the pump ring and the square edge towards the



Fig. 3B-23--Installing Thrust Plate

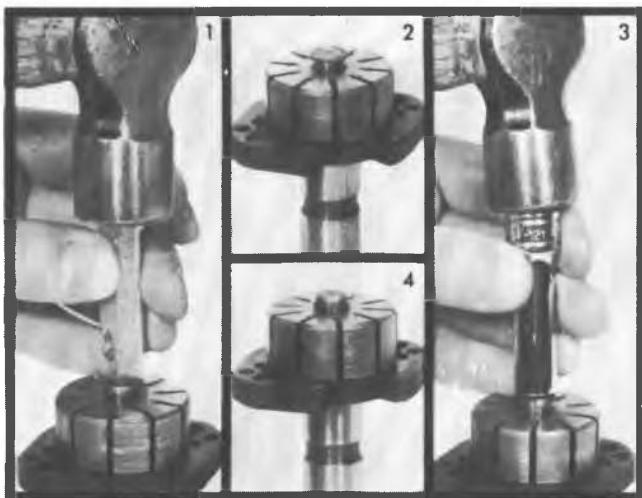


Fig. 3B-24--Installing Shaft Snap Ring

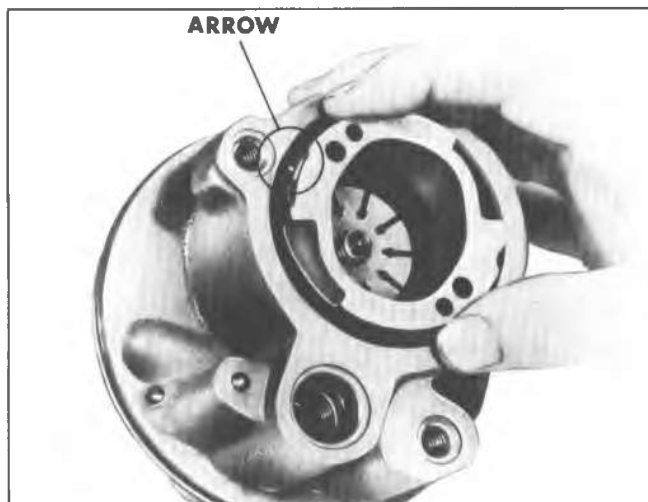


Fig. 3B-26--Installing Pump Ring

rotor as shown in Figures 3B-27 and 3B-28.

9. Lubricate the outside diameter and chamfer of the pressure plate with Power Steering Fluid, to ensure against damaging the pressure plate "O" ring, and install the pressure plate onto the dowel pins with the ported face towards the pump ring. Seat the pressure plate by placing a large socket on top of the plate and pressing down by hand (pressure plate will travel approximately 1/16" to seat).

10. Install the pressure plate spring in the center groove of the pressure plate (fig. 3B-29).

11. Lubricate a new end plate "O" ring with Power Steering Fluid and install in housing groove.

12. Lubricate the outside diameter and chamfer of the end plate with Power Steering Fluid, to ensure against damaging the "O" ring, and install into the housing using an arbor press as shown in Figure 3B-30.

NOTE: Place the end of the ring so that it is near the valve bore in the housing.

13. Install the flow control spring and flow control plunger. Be sure the hex head screw goes into the bore first (fig. 3B-31).

14. On Corvette, install cage and a new filter.

15. Place magnet into proper position on housing assembly (Fig. 3B-17).

16. Install new mounting stud and union square ring seals.

17. Install a new reservoir "O" ring seal, lubricated with Power Steering Fluid, onto housing.

18. Lubricate reservoir sealing edge with Power Steering Fluid and place reservoir onto housing in the normal position. Press down on reservoir until it seats onto housing; check position of stud and union seals.

19. Place a new "O" ring seal, lubricated with Power Steering Fluid, onto union and install union assembly and studs.

20. Install pump pulley by inserting tool J-25033 through pulley hub and threading the bolt into the power steering pulley shaft as shown in figure 3B-32.

NOTE: Pulley must be flush with end of shaft.

CAUTION: *DO NOT hammer on pump shaft. Use special tools to prevent possible damage to internal pump components.*

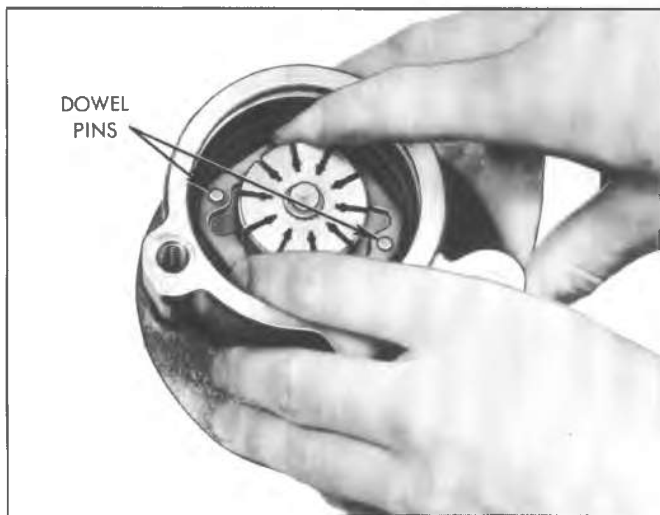


Fig. 3B-25--Installing Shaft, Thrust Plate, and Rotor Assembly

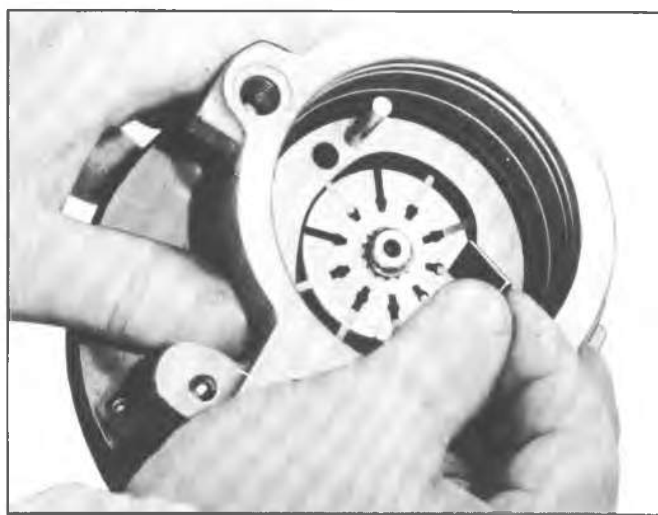


Fig. 3B-27--Installing Vanes

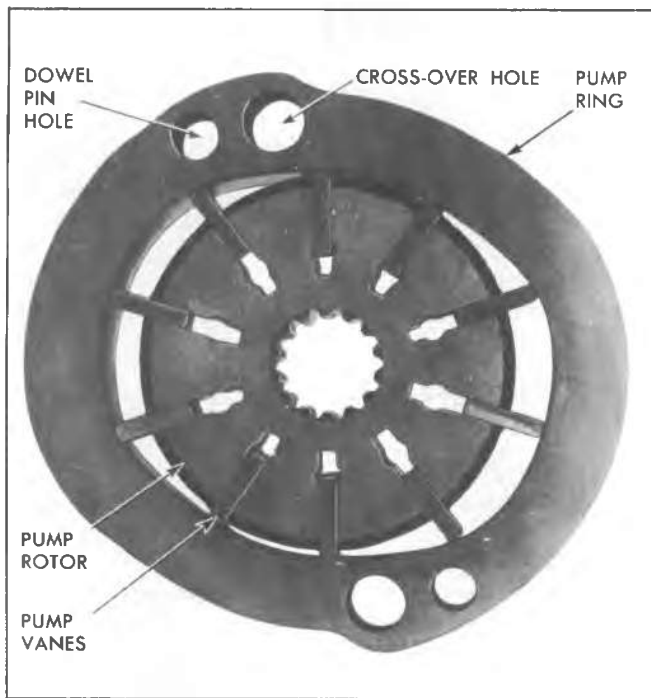


Fig. 3B-28--Correct Vane Assembly



Fig. 3B-29--Installing Pressure Plate Spring



Fig. 3B-30--Installing End Plate Retaining Ring



Fig. 3B-31--Installing Flow Control Valve



Fig. 3B-32--Power Steering Pump Pulley - Installation

INTEGRAL POWER STEERING GEAR

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OVERHAUL OPERATIONS

NOTE: In the following text, Power Steering Fluid is noted for use in lubricating components upon reassembly.

CAUTION: If when overhauling a power steering gear or pump, broken components or foreign material are encountered, the remaining components of the entire hydraulic system should be disassembled, inspected, thoroughly cleaned and flushed before servicing is completed.

Disassembly (Fig. 3B-33)

In many cases, complete disassembly of the gear will not be necessary since most of the components can be removed without complete disassembly.

NOTE: Disassembly of the major components within the gear must be performed on a clean workbench. The work area, tools and parts must be kept clean at all times.

1. Rotate end cover retainer ring so that one end of the ring is over the hole in the side of the housing. Force the end of the ring from its groove and remove ring (fig. 3B-34).

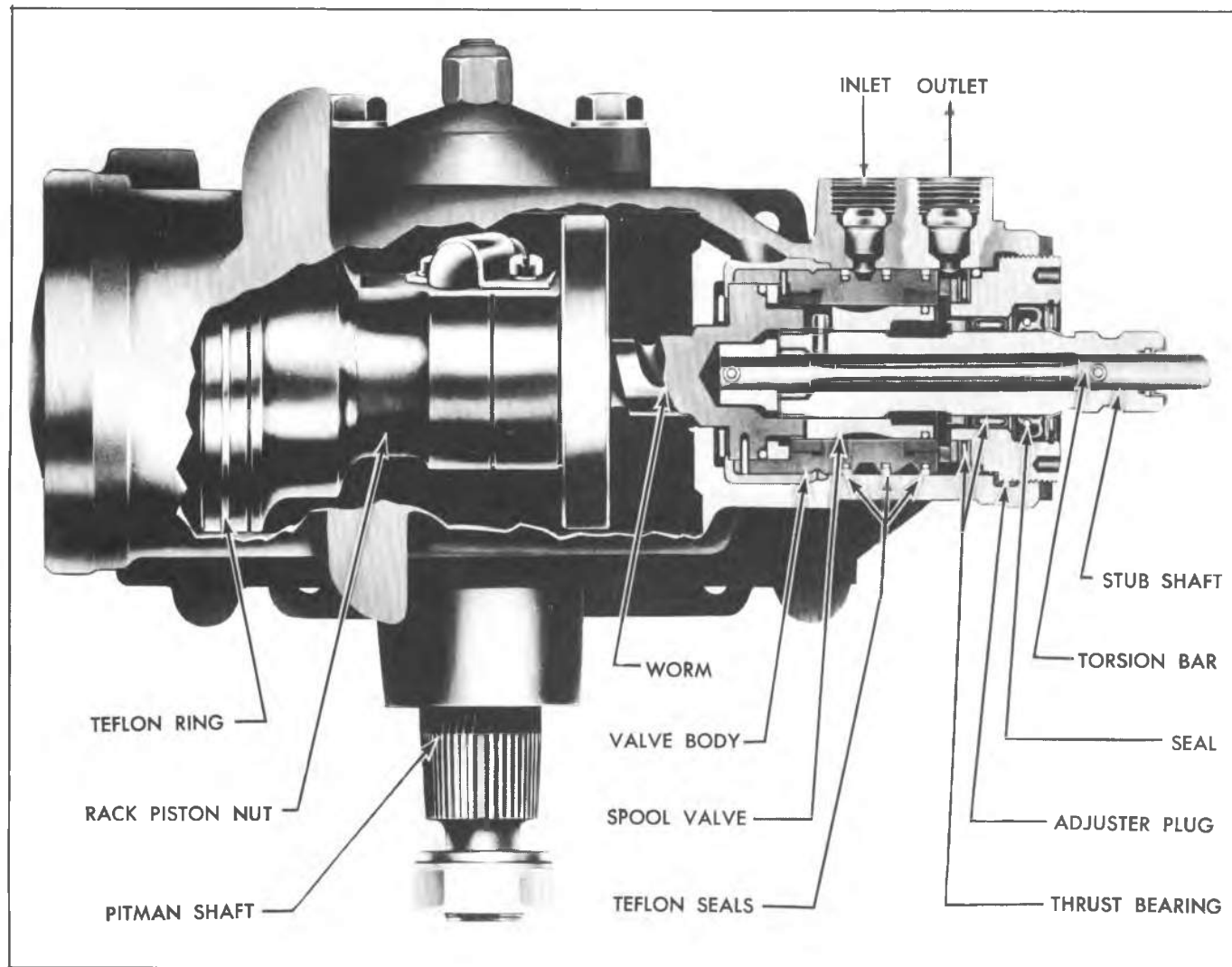


Fig. 3B-33--Power Steering Gear--Typical

2. Turn the stub shaft counter-clockwise until the rack-piston just forces end cover out of housing. Remove cover and discard "O" ring.

CAUTION: *DO NOT* turn the stub shaft any further than absolutely necessary to remove the end plug, or balls from rack-piston and worm circuit may escape and lay loose inside the rack-piston chamber.

3. Remove the rack-piston end plug as shown in Figure 3B-35.

NOTE: To aid in loosening end plug, strike end plug with a brass drift.

4. Remove the pitman shaft and side cover as follows:

a. Loosen the over-center adjusting screw locknut and remove the 4 side cover attaching bolts and lock washers.

b. Rotate the side cover until the rack-piston and pitman shaft teeth are visible, then turn the stub shaft until the pitman shaft teeth are centered in the housing opening. Tap the pitman shaft with a soft hammer and remove the pitman shaft and side cover from the housing. Remove the side cover "O" ring and discard.

5. Remove the rack-piston as follows:

a. Insert Ball Retainer Tool J-7539 into the rack-piston bore with pilot of tool seated in the end of the worm (fig. 3B-37). Turn the stub shaft counter-clockwise while holding tool tightly against worm. The rack-piston will be forced onto the tool.

b. Remove the rack-piston with Ball Retainer Tool J-7539 from gear housing.

6. Remove the adjuster plug as follows:

a. Loosen the adjuster plug locknut and remove.

b. Remove adjuster plug assembly with Spanner Wrench J-7624 (fig. 3B-38). Remove and discard the plug "O" ring.

7. Grasp the stub shaft and pull the valve and shaft assembly from the housing bore. Separate worm and shaft and remove the stub shaft cap "O" ring and discard.

8. If the worm or the lower thrust bearing and race remained in the gear housing, remove them at this time.

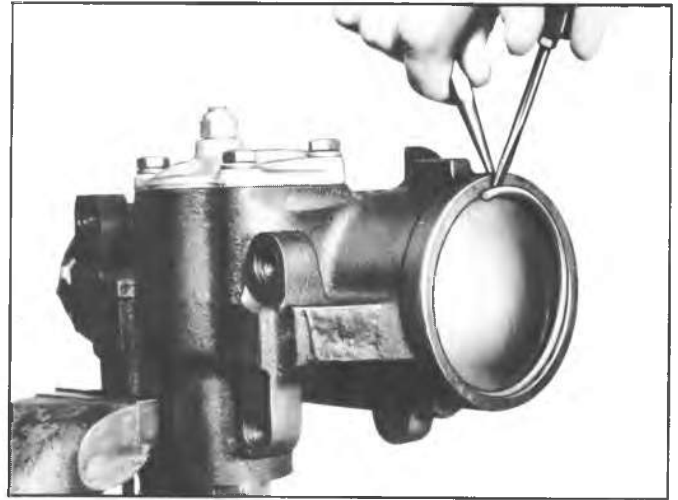


Fig. 3B-34--Removing End Cover Retaining Ring

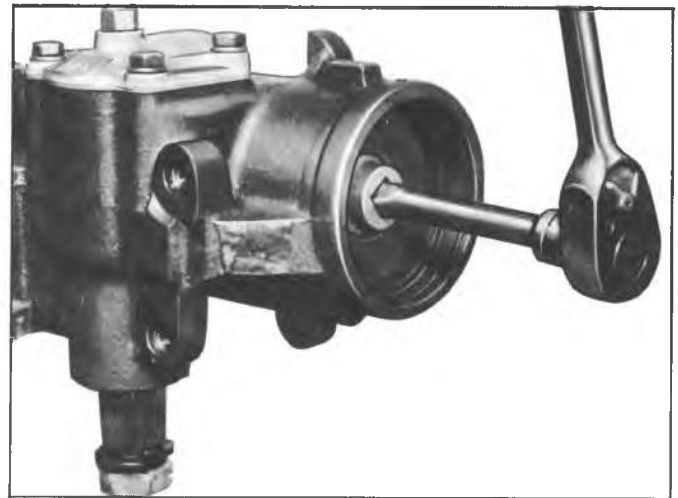


Fig. 3B-35--Removing End Plug

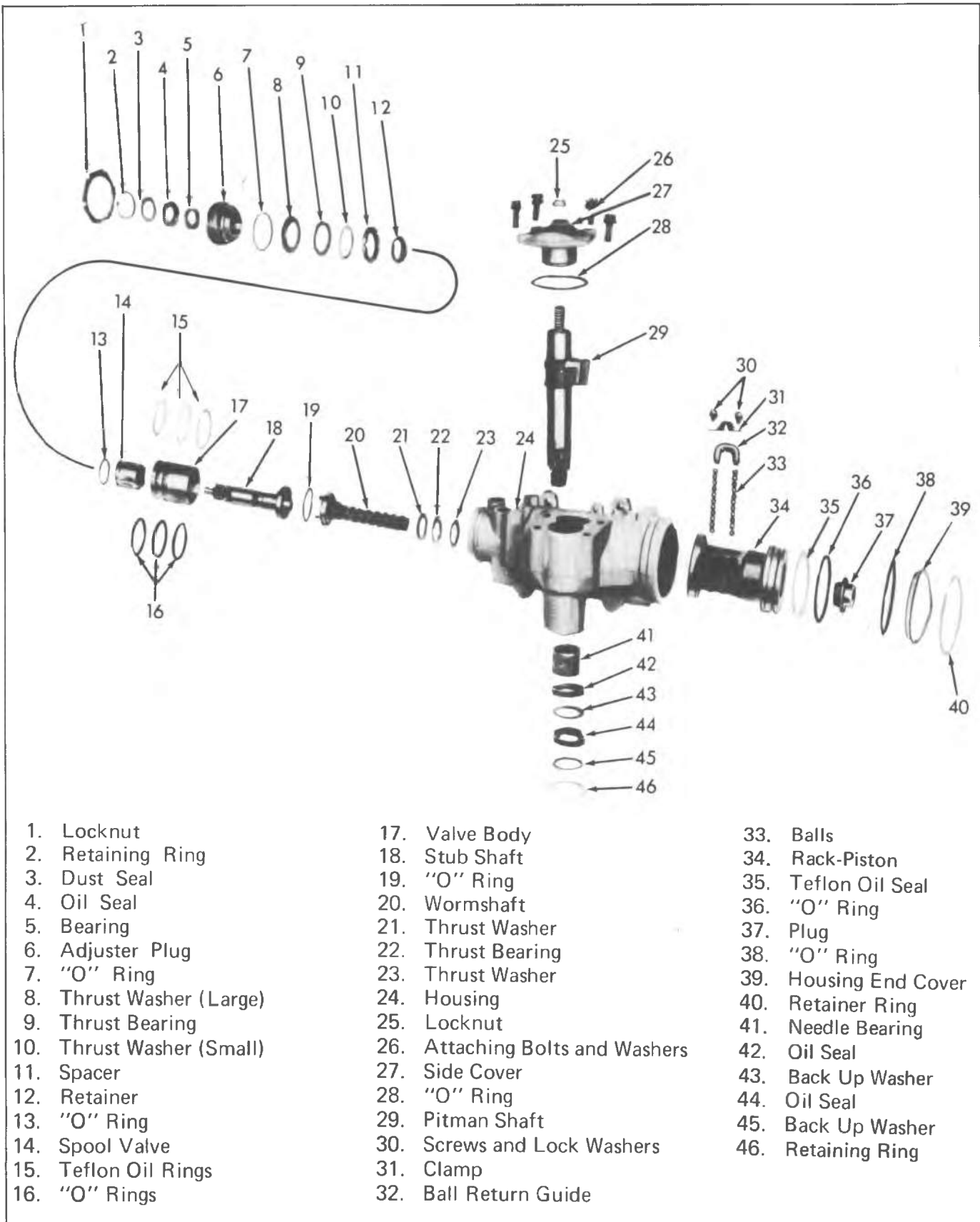


Fig. 3B-36--Power Steering Gear--Exploded View



Fig. 3B-37--Removing Rack-Piston

OVERHAULING INDIVIDUAL UNITS

Adjuster Plug Assembly

Disassembly

1. If the oil seal **ONLY** is to be replaced, and not the bearing, install the adjuster plug loosely in the gear housing. Remove the retaining ring with Internal Pliers J-4245. With a screw driver, pry the dust seal and oil seal from the bore of the adjuster plug being careful not to score the needle bearing bore (fig. 3B-39). Discard the oil seal.

2. If the thrust bearing **ONLY** is to be removed, pry the thrust bearing retainer at the two raised areas with a small screw driver (fig. 3B-40). Remove the spacer, thrust bearing race, thrust bearing and the flanged thrust bearing race.

3. If the needle bearing is to be replaced, remove the retaining ring using Internal Pliers J-4245. Remove thrust bearing as outlined in Step 2 above. Drive needle bearing, dust seal and oil seal from adjuster plug using Bearing Remover J-8524-2 and Driver J-7079-2 as shown in Figure 3B-41. Discard the oil seal.

4. Wash all parts in clean solvent and dry parts with

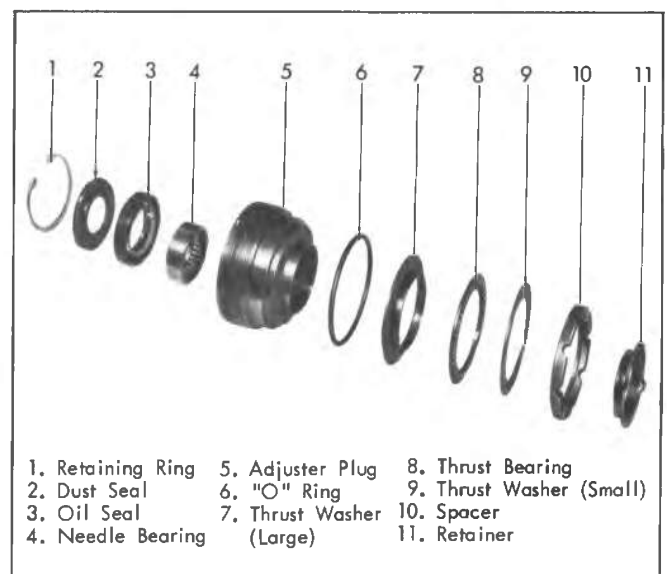


Fig. 3B-39--Adjuster Plug--Exploded View

compressed air.

5. Inspect thrust bearing spacer for wear or cracks. Replace if damaged.

6. Inspect thrust bearing rollers and thrust races for wear, pitting or scoring. If any of these conditions exist, replace the bearing, thrust races, spacer and retainer.

Assembly

CAUTION: Place a block of wood under the adjuster plug to protect the thrust bearing surface.

1. If the needle bearing was removed, place new needle bearing over Tool J-8524-1 and J-7079-2, with the bearing manufacturer's identification toward the tool, and drive the bearing into the adjuster plug until the tool bottoms in the housing (fig. 3B-42).

2. Place dust seal and a new oil seal on Tool J-8524-1 (lip of seal away from tool). Lubricate seal with Power Steering Fluid and drive or press seals into adjuster plug until seated (fig. 3B-43). When properly installed, the stub shaft seal under the dust seal and the inner dust seal lip is not

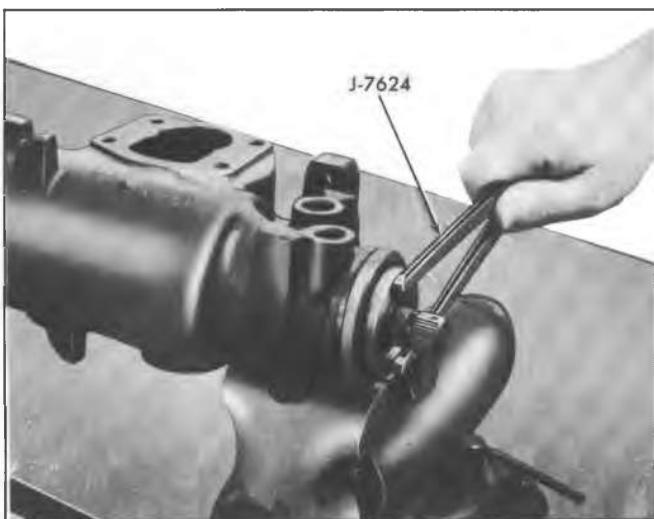


Fig. 3B-38--Removing Adjuster Plug

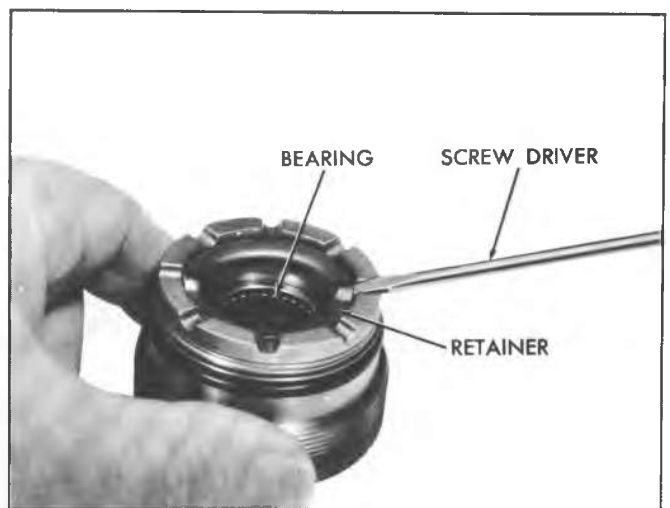


Fig. 3B-40--Removing Retainer

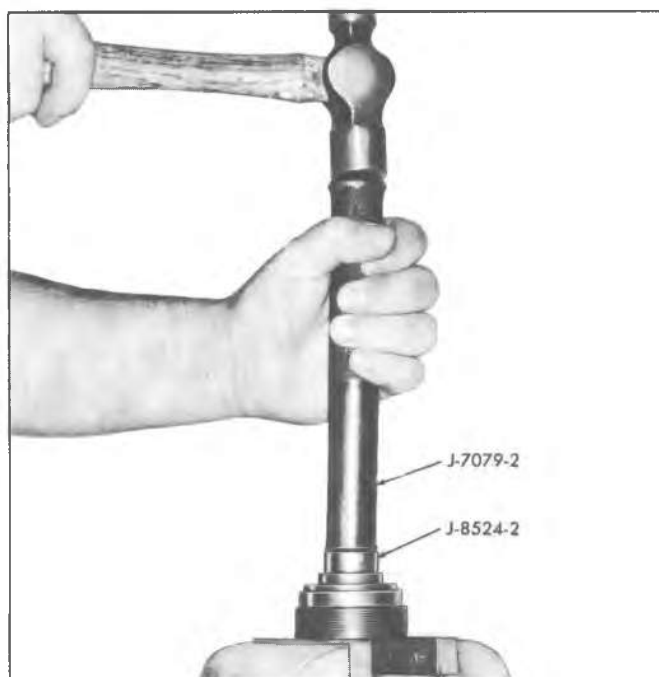


Fig. 3B-41--Removing Bearing and Seal

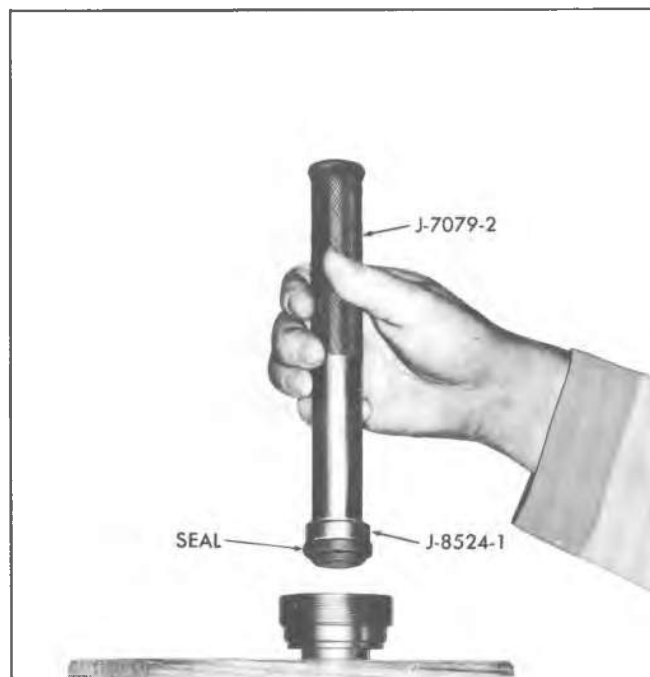


Fig. 3B-43--Installing Adjuster Plug Seal

bottomed on the stub shaft assembly.

3. Install retaining ring with Internal Pliers J-4245.

4. Lubricate the thrust bearing assembly with Power Steering Fluid. Place the flanged thrust bearing race on the adjuster plug hub, then install the thrust bearing, small bearing race (flanged side up) and spacer (grooves of spacer away from bearing).

5. Install a new bearing retainer on the adjuster plug by carefully tapping on the flat surface of the retainer (fig. 3B-44).

NOTE: The projections must not extend beyond the spacer when the retainer is sealed to prevent interference with the valve body. The spacer must be free to rotate.

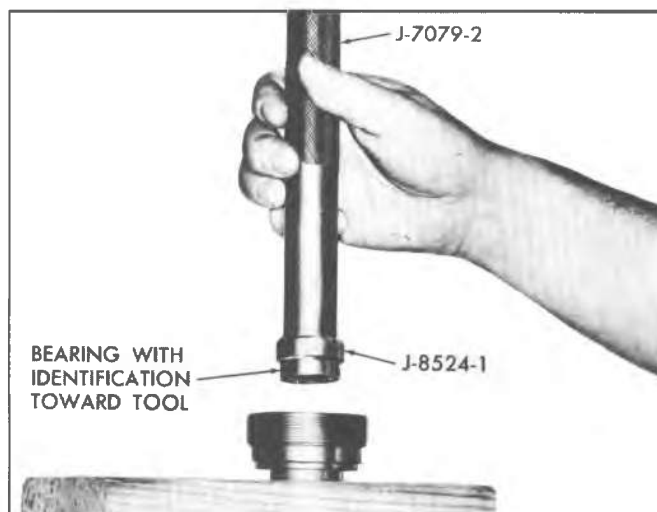


Fig. 3B-42--Installing Bearing

Valve and Stub Shaft Assembly

Disassembly

1. Remove and discard the "O" ring in the shaft cap end of the valve assembly.

2. To remove the lower shaft assembly from the valve body, proceed as follows:

a. While holding the assembly (stub shaft down), lightly tap the stub shaft against the bench until the shaft cap is free from the valve body (fig. 3B-45).

b. Pull the shaft assembly out of the spool valve until the shaft cap clears the valve body approximately 1/4".

CAUTION: Do not pull the shaft assembly out too far or the spool valve may become cocked in the valve body.

c. Carefully disengage the shaft pin from the valve spool and remove the shaft assembly (fig. 3B-45).



Fig. 3B-44--Installing Retainer

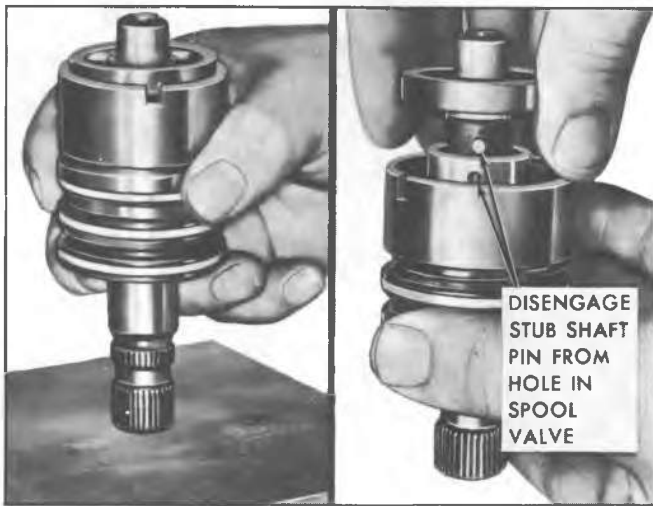


Fig. 3B-45--Removing Stub Shaft Assembly

3. Push the spool valve out of the flush end of the valve body until the dampener "O" ring is exposed, then carefully pull the spool from the valve body, while rotating the valve (fig. 3B-46). If the spool valve becomes cocked, carefully realign the spool valve, then remove.

4. Remove the dampener "O" ring from the spool valve and discard.

5. If the teflon oil rings are to be replaced, cut the 3 teflon oil rings and "O" rings from the valve body and discard.

Cleaning and Inspection

1. Wash all parts in clean solvent and blow out all oil holes with compressed air.

2. If the drive pin in the stub shaft or valve body is cracked, excessively worn or broken, replace the complete valve and shaft assembly.

3. If there is evidence of leakage between the torsion bar and the stub shaft, or scores, nicks, or burrs on the ground surface of the stub shaft that cannot be cleaned up with crocus cloth, the entire valve and shaft assembly must be replaced.

4. Check the outside diameter of the spool valve and the inside diameter of the valve body for nicks, burrs, or bad wear spots. If the irregularities cannot be cleaned up by the use of crocus cloth, the complete valve and shaft assembly will



Fig. 3B-46--Removing Spool Valve

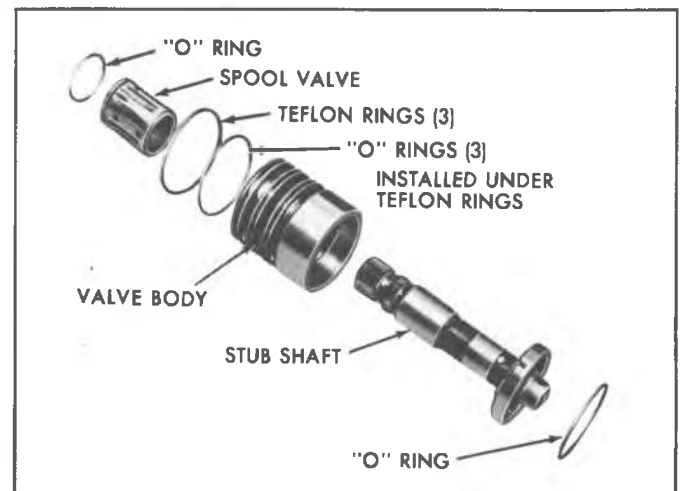


Fig. 3B-47--Valve Body and Shaft Assembly - Exploded

have to be replaced.

5. If the small notch in the skirt of the valve body is excessively worn, the complete valve and shaft assembly will have to be replaced.

6. Lubricate the spool valve with Power Steering Fluid and check the fit of the spool valve in the valve body (with the spool valve dampener "O" ring removed). If the valve does not rotate freely without binding, the complete valve and shaft assembly will have to be replaced.

Assembly (Fig. 3B-47)

1. If valve body "O" rings and teflon rings were removed, install new "O" rings in the oil ring grooves and lubricate with Power Steering Fluid.

2. Lubricate the 3 new teflon oil rings with Power Steering Fluid and install in grooves over "O" rings.

NOTE: The teflon rings may appear to be distorted, but the heat of the oil during operation of the gear will straighten them out.

3. Lubricate the spool valve dampener "O" ring with Power Steering Fluid and install over the spool valve.

4. Lubricate the spool valve and valve body with Power Steering Fluid and slide the spool valve into the valve body. Rotate the spool valve while pushing it into the valve body. Push the spool valve on through the valve body until the shaft pin hole is visible from the opposite end (spool valve flush with shaft cap end of valve body).

5. Lubricate the shaft assembly with Power Steering Fluid and carefully install it into the spool valve until the shaft pin can be placed into the hole in the spool valve.

6. Align the notch in the shaft cap with the pin in the valve body and press the spool valve and shaft assembly into the valve body (fig. 3B-48).

CAUTION: Make sure that the shaft cap notch is mated with the valve body pin before installing valve body into the gear assembly.

7. Lubricate a new "O" ring with Power Steering Fluid and install it in the shaft cap end of the valve body assembly.

Pitman Shaft and Side Cover

Disassembly

Remove the locknut and unscrew the side cover from the adjusting screw. Do not attempt to disassemble pitman shaft. Discard locknut.

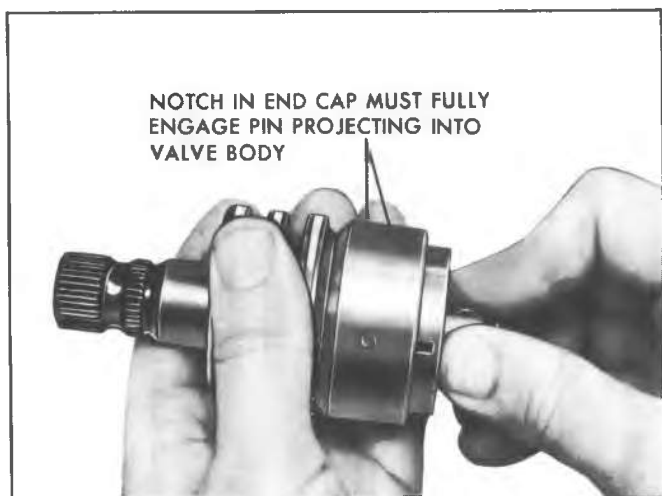


Fig. 3B-48--Installing Stub Shaft Assembly

Cleaning and Inspection

1. Wash all parts in clean solvent and dry parts with compressed air.

2. Check pitman shaft bearing surface in the side cover for scoring. If badly worn or scored, replace the side cover.

3. Check the sealing and bearing surfaces of the pitman shaft for roughness, nicks, etc. If minor irregularities in surface cannot be cleaned by use of crocus cloth, replace the pitman shaft.

4. Replace pitman shaft assembly if teeth are damaged or if the bearing surfaces are pitted or scored.

5. Check pitman shaft lash adjusting screw. It must be free to turn with no perceptible end play. If adjusting screw is loose replace the pitman shaft assembly.

Assembly

Thread the side cover onto the pitman shaft adjusting screw until it bottoms and then turn in one-half turn. Install a new adjusting screw locknut, but do not tighten.

Rack-Piston

Disassembly

1. Remove tool J-7539 from the rack-piston.

2. Remove the ball return guide clamp, ball guide and balls.

3. If necessary to replace the teflon oil seal and "O" ring, remove at this time.

Cleaning and Inspection

1. Wash all parts in clean solvent and dry with compressed air.

2. Inspect the worm and rack-piston grooves and all the balls for scoring. If either the worm or rack-piston needs replacing, both must be replaced as a matched assembly.

3. Inspect ball return guide halves, making sure that the ends where the balls enter and leave the guides are not damaged.

4. Inspect lower thrust bearing and washers for scores or excessive wear. Check bearing washers to make sure they are not flat but conical in shape to provide proper bearing preload adjustment when reinstalled in the steering gear. If any of these conditions are found, replace the thrust bearing and washers.

5. Inspect rack-piston teeth for scoring or excessive wear. Inspect the external ground surfaces for wear, scoring



Fig. 3B-49--Installing Ring on Rack-Piston

or burrs.

Assembly

1. If the teflon oil seal and "O" ring were removed, lubricate a new "O" ring and seal with Power Steering Fluid and install in groove on rack-piston. The teflon ring may be slightly loose after assembly, but will tighten up when subjected to the hot oil in the system (fig. 3B-49).

2. Slide the worm all the way into the rack-piston. It is not necessary to have the thrust bearing assembly on the worm at this time.

3. Turn the worm until the worm groove is aligned with the lower ball return guide hole (fig. 3B-50).

4. Lubricate the balls with Power Steering Fluid, then feed 17 balls into the rack-piston, while slowly rotating the worm counter-clockwise.

5. Alternately install 7 balls into the return guide and retain with chassis lubricant at each end of guide. Install the return guide assembly onto the rack-piston. Install the return guide clamp and tighten the 2 clamp screws to 10 ft. lbs.

6. Insert Bearing Retainer Tool J-7539 into the rack-

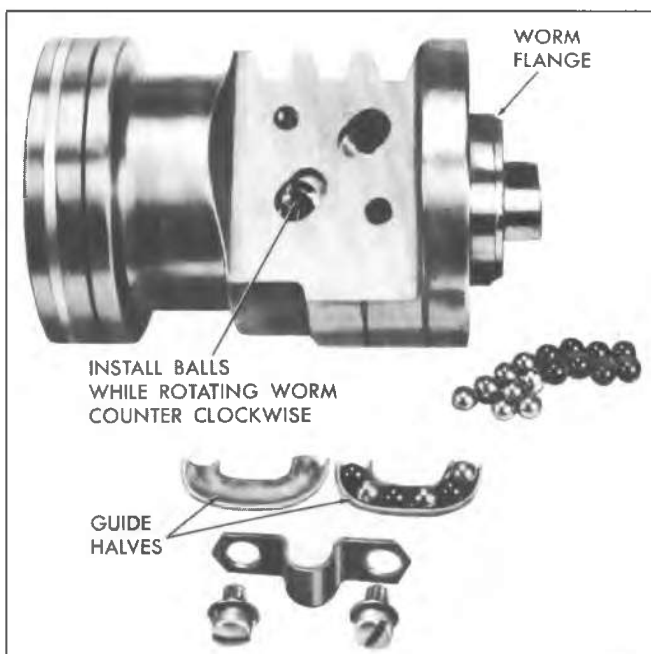


Fig. 3B-50--Installing Balls in Rack-Piston

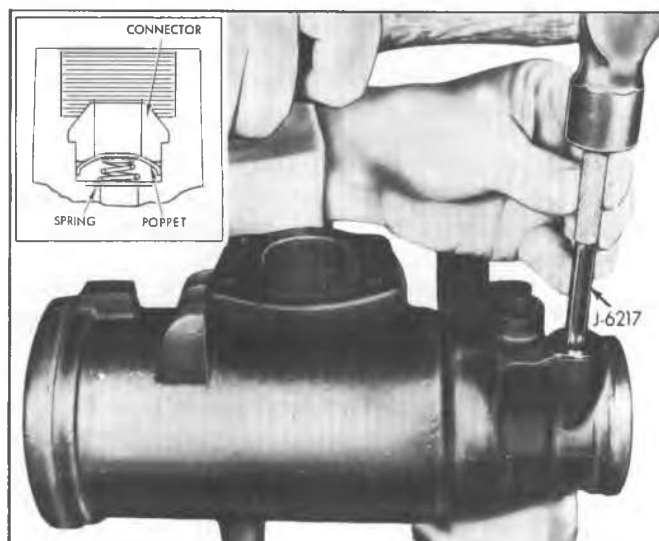


Fig 3B-51--Installing New Connector in Housing

piston, then while holding tool tightly against end of worm, thread worm out of the rack-piston.

Hose Connector Inverted Flares

If the brass inverted flare connectors show need of replacement, proceed as follows:

1. Tap threads into the center hole of the connector with a 5/16-18 tap.

CAUTION: Do not tap the threads too deep in the pressure hose connector seat as the tap will bottom the poppet valve against the housing and damage it. It is necessary to tap only two or three threads deep.

2. Thread a 5/16-18 bolt, with a nut and flat washer attached, into the tapped hole so that the washer rides against the face of the port boss and the nut rides against the washer.

3. Hold the bolt from rotating while turning the nut off the bolt. This will force the washer against the bolt boss and will back out the bolt, drawing the connector from the housing. Discard the connector.

4. Clean the housing thoroughly to remove any tapping chips.

5. Drive the new connector against the housing seat using Tool J-6217, being careful not to damage either the connector or housing seat (fig. 3B-51).

Pitman Shaft Needle Bearing and Seals

Removal

1. If pitman shaft seals **ONLY** are to be replaced, remove the seal retaining ring with Internal Pliers J-4245 and remove outer steel washer. Pry out the outer seal. Remove the inner steel washer, then pry out the inner seal (fig. 3B-52). Discard seals.

CAUTION: When prying out seals, be extremely careful not to score the housing bore.

2. If pitman shaft needle bearing replacement is necessary, remove with Tool J-6278. Since this bearing is shouldered, it must be pressed out the pitman shaft end of the housing.

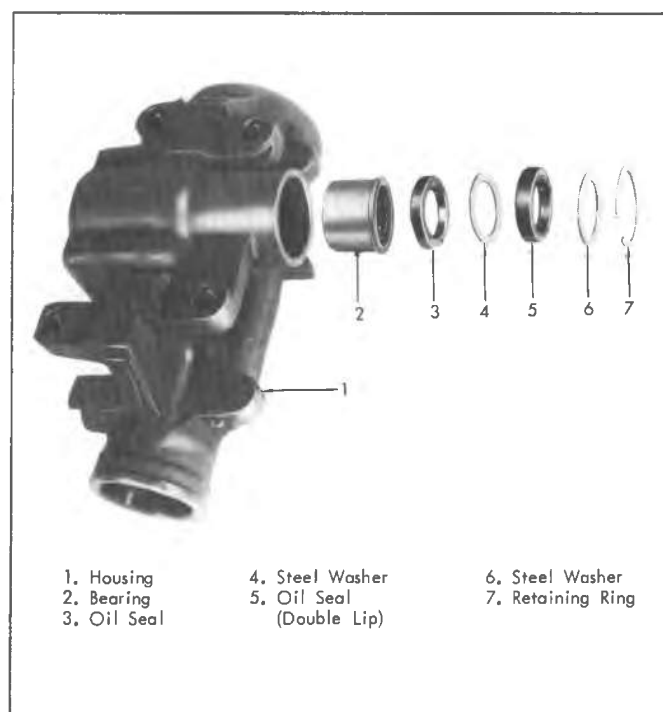


Fig. 3B-52--Pitman Shaft Bearing and Seals

Installation

1. If the pitman shaft needle bearing was removed, place bearing Installer Tool J-22407 onto Handle J-8092. Place needle bearing (shouldered end first) on to Tool J-22407. Press bearing into gear housing until Tool bottoms on housing. The bearing is now correctly positioned (fig. 3B-53).

CAUTION: Do not drive the bearing further into the housing after removing Tool J-22407, since damage to the bearing would result.

2. Lubricate the lips of the oil seals with Power Steering Fluid.

3. Install the pitman shaft oil seals as follows:

- a. Place Adapter J-6278-2 over Tool J-6278, then install the outer seal (double lip), inner steel washer, and inner seal with the lips of the seals facing away from the adapter.

- b. Drive the seals into the housing until the top of

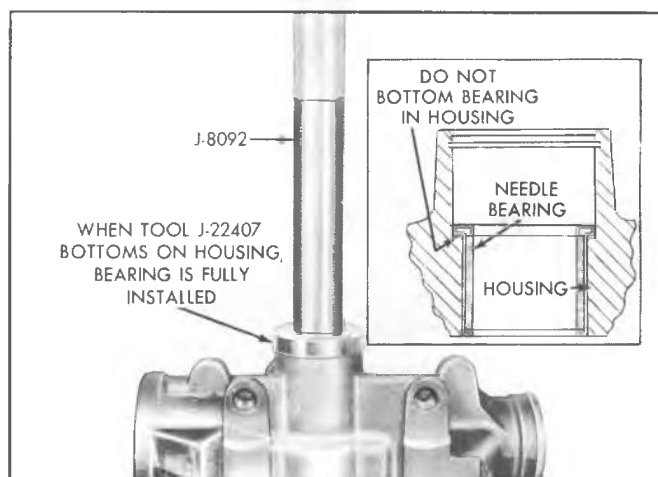


Fig. 3B-53--Installing Pitman Shaft Bearing

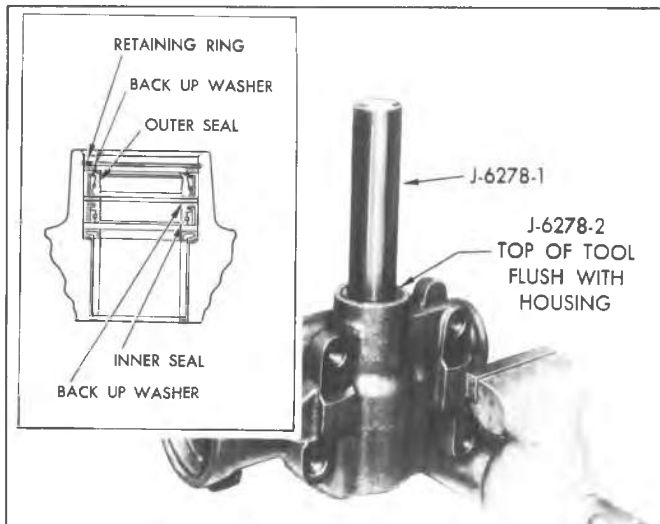


Fig. 3B-54--Installing Pitman Shaft Seals (On Bench)

Adapter J-6278-2 is flush with the housing (fig. 3B-54).

c. Remove the tool and adapter, then install the outer steel washer and seal retaining ring. The retaining ring will not seat in the groove at this time.

d. Reinsert Tool J-6278 with Adapter J-6278-2 and continue driving the seals until the retaining ring seats in its groove (Refer to Inset, Figure 3B-54), then remove the tool and adapter.

Removal and Installation of Pitman Shaft Seals with Steering Gear in Vehicle (fig. 3B-55)

If upon inspection of the gear, it is found that oil leakage exists at the pitman shaft seals, the seals may often be replaced without removing the gear assembly from the vehicle as follows:

1. Remove pitman nut and disconnect pitman arm from pitman shaft using Puller J-6632.

CAUTION: Do not hammer on the end of Puller Tool J-6632.

2. Thoroughly clean end of pitman shaft and gear housing, then tape splines on end of pitman shaft to insure that seals will not be cut by splines during assembly.

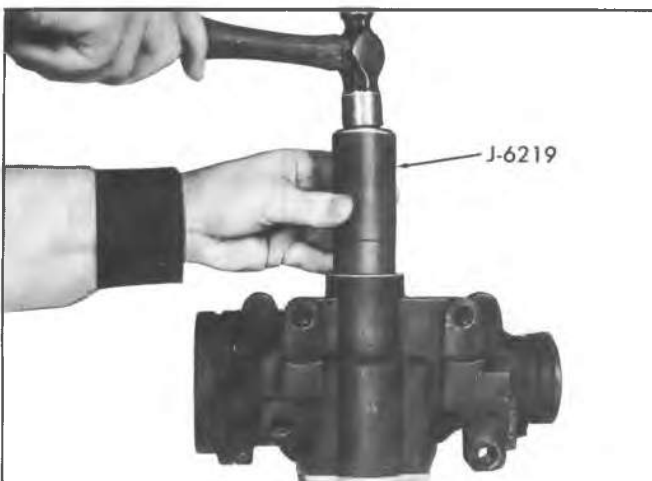


Fig. 3B-55--Installing Pitman Shaft Seals

NOTE: Only one layer of tape should be used; an excessive amount of tape will not allow the seals to pass over it, due to the close tolerance between the seals and the pitman shaft.

3. Remove pitman shaft seal retaining ring with Snap Ring Pliers J-4245.

4. Start engine and turn steering wheel fully to the left so that oil pressure in the housing can force out pitman shaft seals. Turn off engine.

NOTE: Use suitable container to catch oil forced out of gear. This method of removing the pitman shaft seals is recommended, as it eliminates the possibility of scoring the housing while attempting to pry seals out. If pressure of oil does not remove seals, turn off engine, remove the steering gear and remove the seals as outlined previously in this section.

5. Clean the end of housing thoroughly so that dirt will not enter housing with the installation of the new seals.

6. Lubricate the seals thoroughly with Power Steering Fluid to install seals with Installer J-6219. Install the inner single lip seal first, then a back-up washer. Drive seal in far enough to provide clearance for the outer seal, back-up washer and retaining ring. Make sure that the inner seal does not bottom on the counterbore. Install the outer double lip seal and the second back-up washer in only far enough to provide clearance for the retaining ring. Install retaining ring.

7. Fill pump reservoir to proper level. Start engine and allow engine to idle for at least three minutes without turning steering wheel. Turn wheel to left and check for leaks.

8. Remove tape and reconnect pitman arm.

CAUTION: The pitman arm to steering gear nut is an important attaching part in that it could affect the performance of vital components and systems, and/or could result in major repair expense. It must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.

GEAR ASSEMBLY

1. Lubricate the worm, lower thrust bearing and the two thrust washers with Power Steering Fluid, then install one thrust washer, the bearing, and the other thrust washer over the end of the worm (fig. 3B-56).

2. Lubricate the valve body teflon rings and a new stub shaft cap "O" ring with Power Steering Fluid. Install the stub shaft cap "O" ring in the valve body so it is seated against the stub shaft cap. Align the NARROW NOTCH in the valve body with the pin in the worm, then install the valve and stub shaft assembly in the gear housing (fig. 3B-57). Apply pressure to the VALVE BODY when installing. If pressure is applied to the stub shaft during installation, the stub shaft may be forced out of the valve body (fig. 3B-58).

NOTE: The valve body is properly seated when the oil return hole in the housing is entirely uncovered (fig. 3B-59).

3. Lubricate a new adjuster plug "O" ring with Power Steering Fluid and install in groove on adjuster plug. Place Seal Protector J-6222 over the stub shaft, then install the adjuster plug assembly in the housing until it seats against the valve body (fig. 3B-60). Remove Seal Protector.

4. Adjust the thrust bearing preload as follows:

a. Drain power steering fluid from gear by rotating the

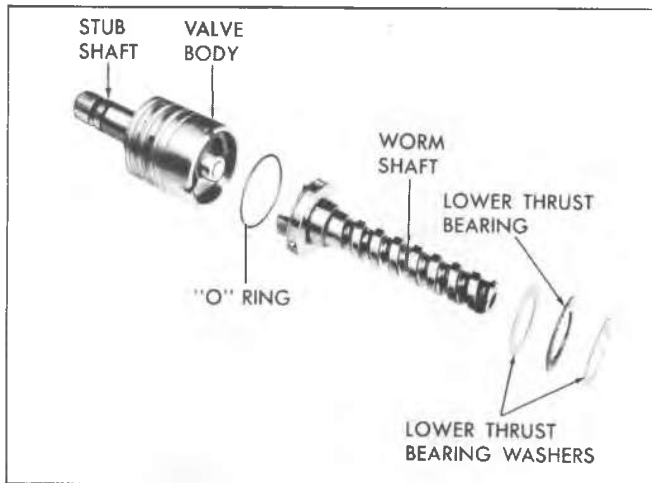


Fig. 3B-56--Worm and Valve Body--Exploded View



Fig. 3B-58--Installing Valve Body

stub shaft full travel in both directions several times.

b. Loosen and remove adjuster plug locknut (fig. 3B-61 and 3B-62).

c. Using spanner wrench J-7624, turn the adjuster plug in (clockwise) until the plug and thrust bearings are firmly bottomed, approximately 20 ft. lbs. (Fig. 3B-63).

d. Mark the housing even with one of the holes in the face of the adjuster plug (Fig. 3B-64).

e. Measure back (CCW direction) 1/2 inch (12.5mm) and place a second mark on the housing (fig. 3B-65).

f. Turn adjuster plug counterclockwise until the hole in the face of the adjuster plug, which was even with the first mark, is in line with second mark (fig. 3B-66).

g. Tighten lock nut securely. Hold (or have held) adjuster, plug to maintain alignment of hole with mark (fig. 3B-67).

5. Install the rack-piston as follows:

a. Lubricate the rack-piston teflon seal with Power Steering Fluid.

b. Position Seal Compressor J-8947 (Passenger Cars) J-7576 (Trucks) against the shoulder in the housing.

c. With Ball Retainer J-7539 in place in the rack-piston,

push the rack-piston (with teeth toward pitman shaft opening), into the housing until Tool J-7539 contacts the center of worm (fig. 3B-68).

d. Turn the stub shaft clockwise with a 3/4" twelve point deep socket or box end wrench to thread the rack-piston onto the worm while holding Tool J-7539 against the end of the worm.

e. When the rack-piston is completely threaded on the worm, remove Ball Retainer J-7539 and Seal Compressor J-8947 (Cars) or J-7576 (Trucks).

6. Install the pitman shaft and side cover as follows:

a. Install a new "O" ring in the pitman shaft side cover and retain with chassis lubricant.

b. Turn the stub shaft until the rack-piston teeth are centered in the pitman shaft opening, then install the pitman shaft and side cover so that the center tooth of the pitman shaft engages the center groove of the rack-piston.

c. Install the side cover bolts and lock washers and tighten to 30 ft. lbs.

7. Install the rack-piston plug in the rack-piston and torque to 75 ft. lbs.



Fig. 3B-57--Valve to Worm Alignment



Fig. 3B-59--Valve Body Position in Housing

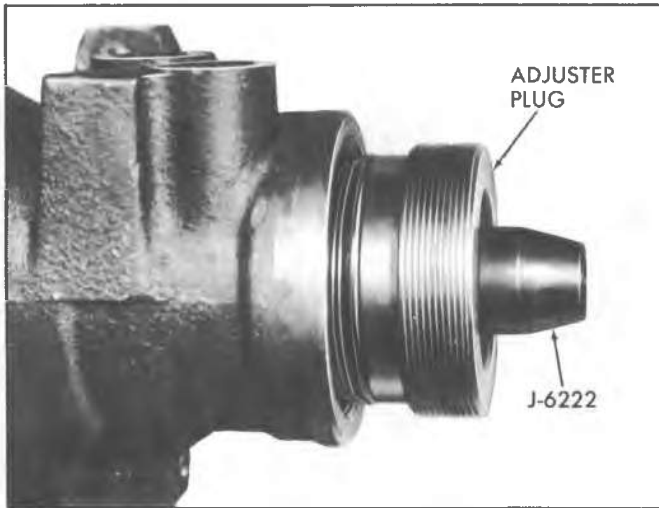


Fig. 3B-60--Installing Adjuster Plug

8. Install a new housing end cover "O" ring and lubricate it with Power Steering Fluid. Install the end cover and retaining ring.

9. Adjust the over-center preload (Fig. 3B-69) as follows:

a. Make sure the over-center adjusting screw is backed all the way out and then turned back in one-half turn.

b. Install an inch-lb. torque wrench with a 3/4", 12-point socket on the stub shaft splines.

c. Rotate the stub shaft from one stop to the other. Count the number of turns and locate the center of travel, then check the combined seal drag and thrust bearing preload by rotating the torque wrench through the center of travel. Note



Fig. 3B-61--Loosening Lock Nut

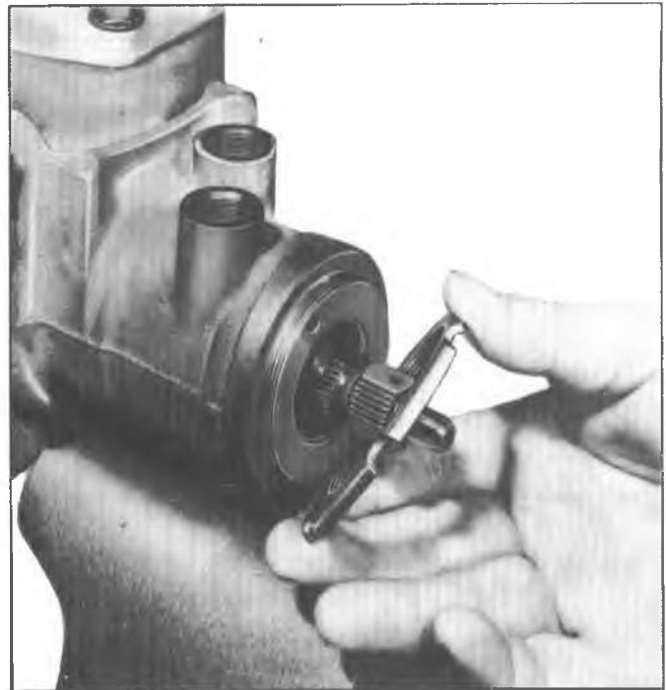


Fig. 3B-62--Removing Lock Nut

the highest reading.

d. Tighten the pitman shaft over-center adjusting screw until the torque wrench reads 4-8 in. lbs. higher than the reading noted in Step c. The total reading should not exceed 14 in. lb. for a used (400 mi. or more) gear.

e. While holding the adjusting screw, tighten the lock-nut to 35 ft. lbs. using using Adapter J-5860 (fig. 3B-70) and recheck the adjustment.

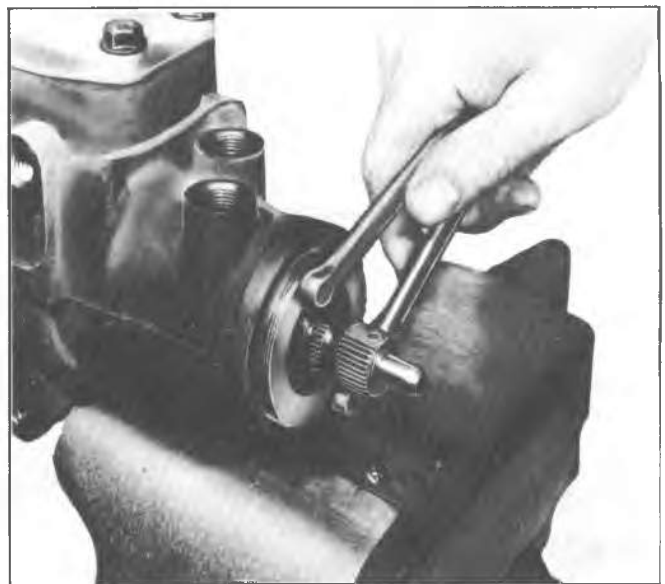


Fig. 3B-63--Bottoming Adjuster Plug



Fig. 3B-64--Marking Housing



Fig. 3B-66--Align Hole With Second Mark



Fig. 3B-65--Measure Back and Remark Housing



Fig. 3B-67--Tighten Lock Nut

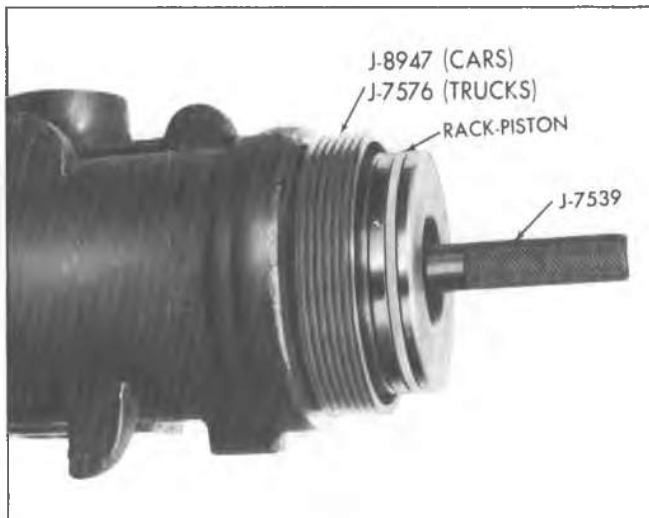


Fig. 3B-68--Installing Rack Piston

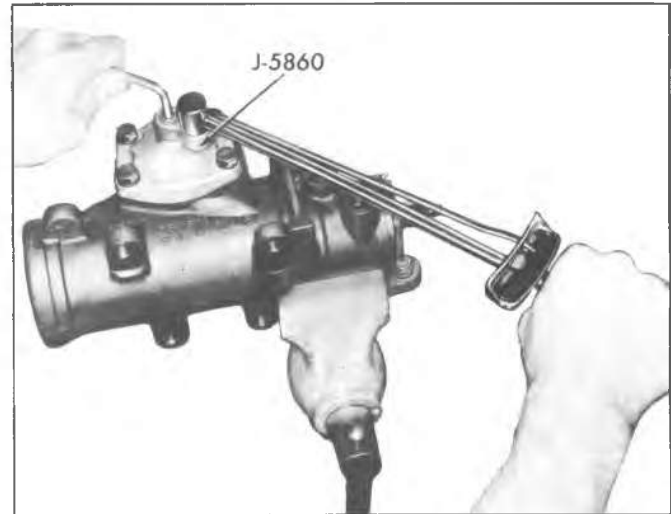


Fig. 3B-70--Torquing Over-Center Locknut

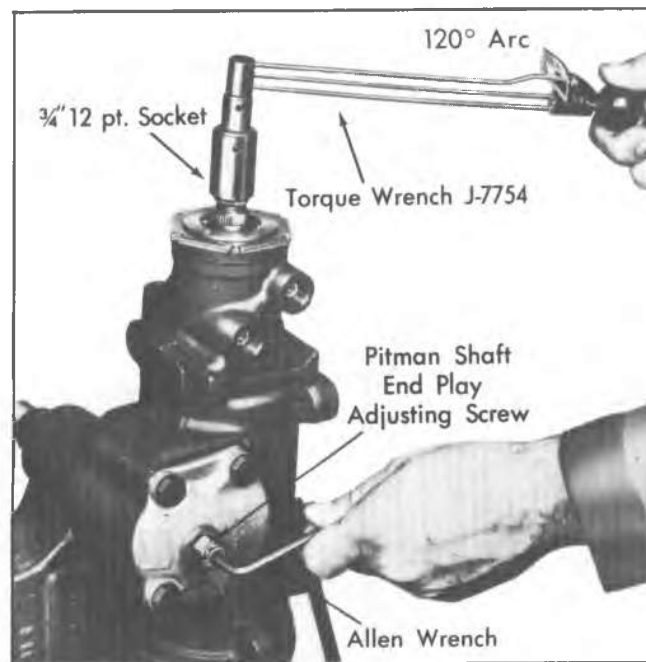


Fig. 3B-69--Adjusting Over Center Preload

CONTROL VALVE--CORVETTE

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OVERHAUL OPERATIONS

Disassembly

1. Place the valve in a vise as shown and remove dust cover (fig. 3B-71).
2. Remove adjusting nut (fig. 3B-72).
3. Remove valve to adapter bolts and remove valve housing and spool from adapter.
4. Remove spool from the housing (fig. 3B-73).
5. Remove spring, reaction spool, washer reaction spring, spring retainer, and seal (fig. 3B-74). "O" ring may now be removed from the reaction spool.
6. Remove the annulus spacer valve shaft washer and plug to sleeve key (See Figure 3B-75).
7. Remove clamp by removing nut, bolt and spacer or, if crimped type clamp is used, straighten clamp end and pull clamp and seal off end of stud (fig. 3B-76).
8. Carefully, so as not to nick the top surface, turn adjuster plug out of sleeve (fig. 3B-77).
9. Remove the adapter from the vise and invert, permitting the spring and one of the two ball seats to fall free.
10. Remove the ball stud and the other ball seat and the sleeve will fall free.

Inspection

1. Wash all metal parts in nontoxic solvent and blow dry with compressed air.
2. Inspect all parts for scratches, burrs, distortion, evidence of wear and replace all worn or damaged parts, including mating parts when necessary.
3. Replace all seals, gaskets, covers with approved service parts.

Repairs

NOTE: The Corvette valve incorporates a 40 lb. centering spring. The Corvette valve incorporating this spring is identified by an "C" stamped on the dust cover.

In case a connector seat becomes damaged, proceed as follows:

To remove connector seat, tap threads in center hole using a 5/16-18 tap. Thread a bolt with nut and flat washer attached into tapped hole so that the washer rides against the face of the port boss and the nut rides against the washer.

Hold the bolt from rotating while turning the nut off the bolt. This will force the washer against the port boss face and will back out the bolt thus drawing the connector seat from the top cover housing (fig. 3B-78). Discard the connector seat. Clean the housing out thoroughly to remove any tapping chips.

Drive new connector seat against housing seat, using Tool J-6217, being careful not to damage either the connector seat or the housing seat (fig. 3B-79).

Assembly (Fig. 3B-81)

1. Replace the sleeve and ball seat in the adapter, then the ball stud, and finally the other ball seat and the spring, small coil down.
2. Clamp the adapter in vise, put the shaft through the seat in the adjuster plug and screw adjuster plug in sleeve (fig. 3B-80).
3. Turn the plug in until it is tight, then back it off until the slot lines up with notches in the sleeve.
4. Install new seal and clamp over stud so lips on seal mate with clamp. (A nut and bolt attachment type clamp replaces the crimped type for service fig. 3B-76).
5. Center the ball stud, seal and clamp at opening in adapter housing, then install spacer, bolt and nut.
6. Insert the key, making sure that the small tangs on the ends of the key fit into the notches in the sleeve (fig. 3B-82).
7. Install the valve shaft washer, annulus spacer, and the reaction seal (lip up), spring retainer, reaction spring and spool, washer and adjustment spring. (Install "O" ring seal on reaction spool before installing spool on shaft.) Install the washer with the chamfer "up".
8. Install the seal on the valve spool (lip down), then install spool in housing being careful not to jam spool in housing.
9. Install housing and spool onto adapter. The side ports should be on the same side as the ball stud. Bolt the housing to the adapter.
10. Depress the valve spool and turn the locknut onto the shaft about four turns with a clean wrench or socket.



Fig. 3B-71--Dust Cap Removal



Fig. 3B-72--Removing Adjusting Nut



Fig. 3B-73--Removing Spool from Housing

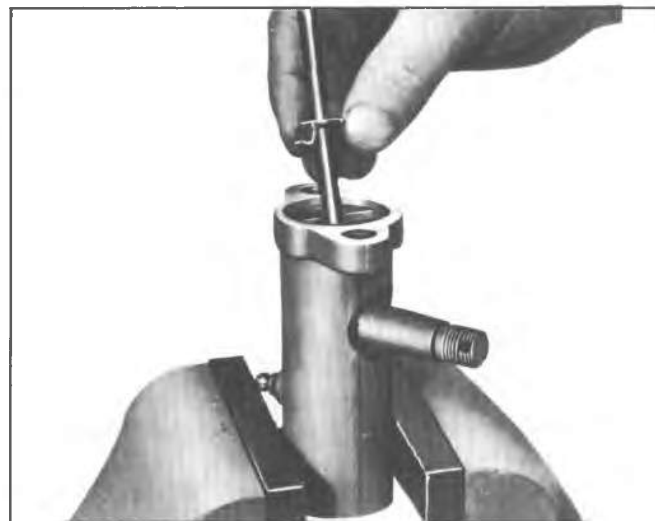


Fig. 3B-75--Removing Plug-to-Sleeve Key

NOTE: Always use a new nut.

Valve Balancing (Fig. 3B-83)

The control valve must be adjusted, after being disassembled, as outlined in the following procedure. The same procedure may be followed to correct a complaint of harder steering effort required in one direction than the other. See Figure 3B-83.

1. Install valve in vehicle. Connect all hoses and fill the pump reservoir with oil. Do not connect the piston rod to the frame bracket. If the vehicle is already in operation, it will be necessary to detach the piston rod from the frame bracket.

2. With the car on a hoist, start the engine. One of the following two conditions will exist.

a. If the piston rod remains retracted, turn the adjusting nut clockwise until the rod begins to move out. Then turn the nut counter-clockwise until the rod just begins to move in. Now turn the nut clockwise to exactly one-half the rotation needed to change the direction of the piston rod movement.

b. If the rod extends upon starting the pump, move the nut counter-clockwise until the rod begins to move in. Now position the nut exactly one-half the rotation needed to change the direction of the piston rod movement.

CAUTION: Do not turn the nut back and forth more than is absolutely necessary to balance the valve.

3. With the valve balanced it should be possible to move the rod in and out manually.

4. Turn off the engine and connect the cylinder rod to the frame bracket.

5. Restart the engine. If the front wheels (still on the hoist) do not turn in either direction from center, the valve has been properly balanced. Correct the valve adjustment if necessary.

6. When the valve is properly adjusted, grease end of valve and install dust cap.



Fig. 3B-74--Removing Valve Parts from Shaft

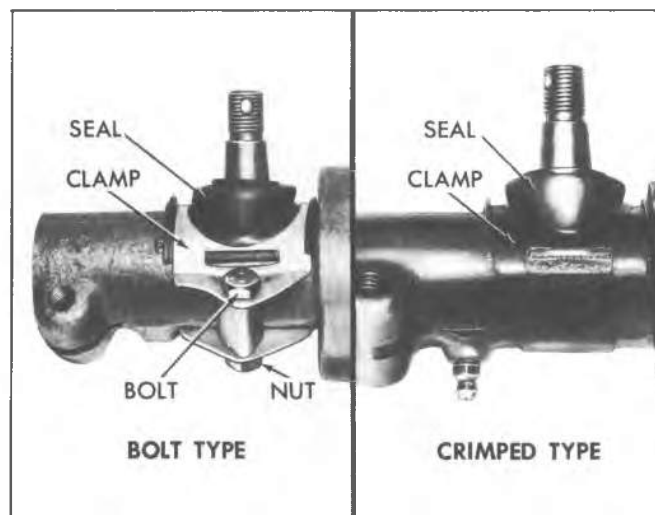


Fig. 3B-76--Seal with Clamp Attachment

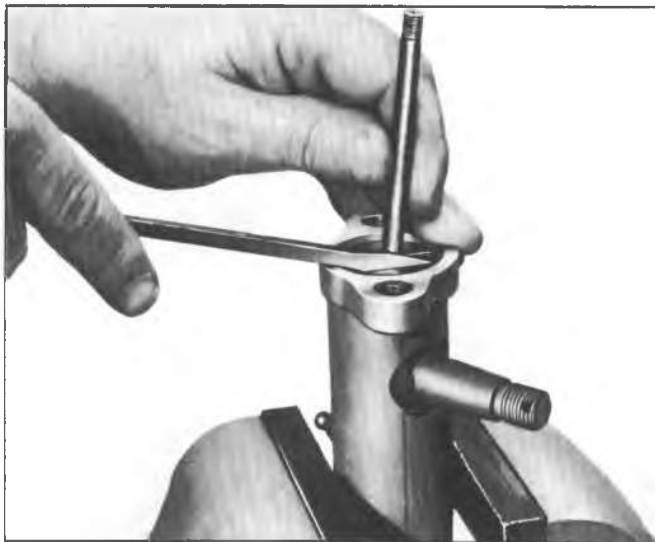


Fig. 3B-77--Turning Adjuster Plug out of Sleeve

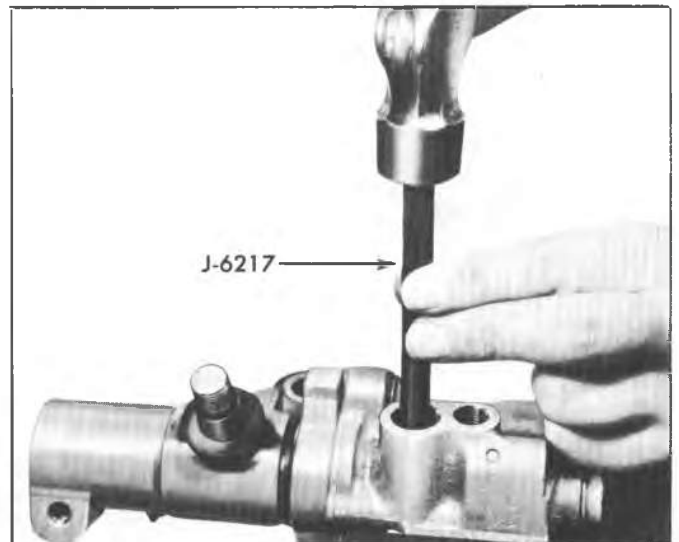


Fig. 3B-79--Installing Connector Seat

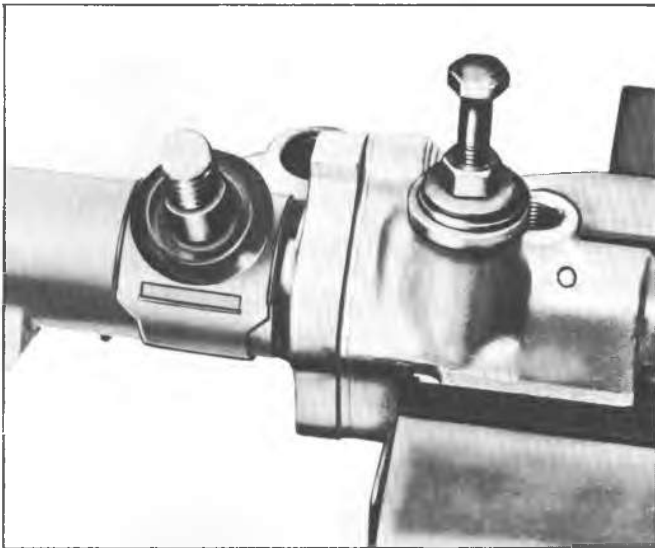


Fig. 3B-78--Removing Connector Seat



Fig. 3B-80--Replacing Adjuster Plug and Shaft

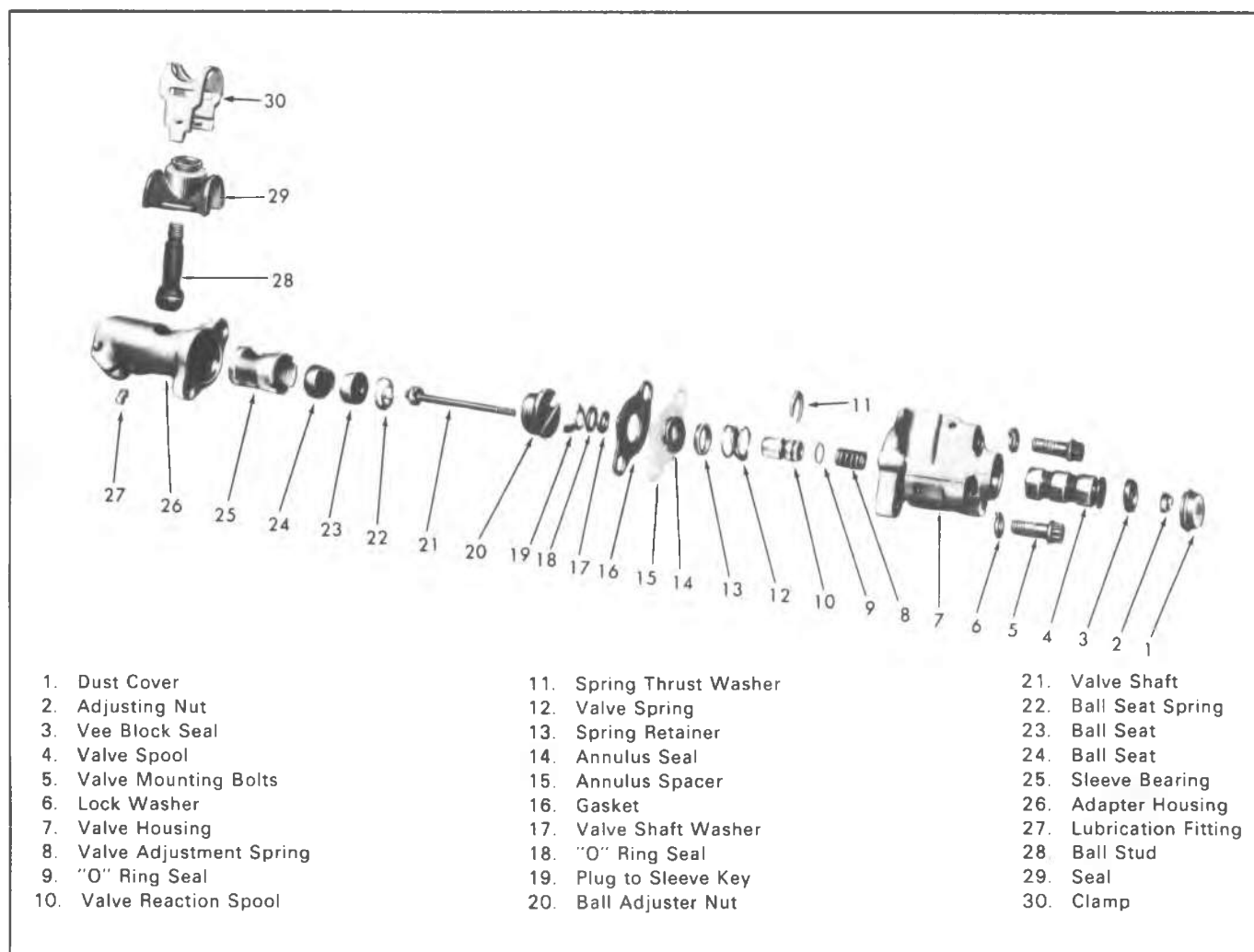


Fig. 3B-81--Power Steering Control Valve and Adapter--Exploded



Fig. 3B-82--Proper Key Installation

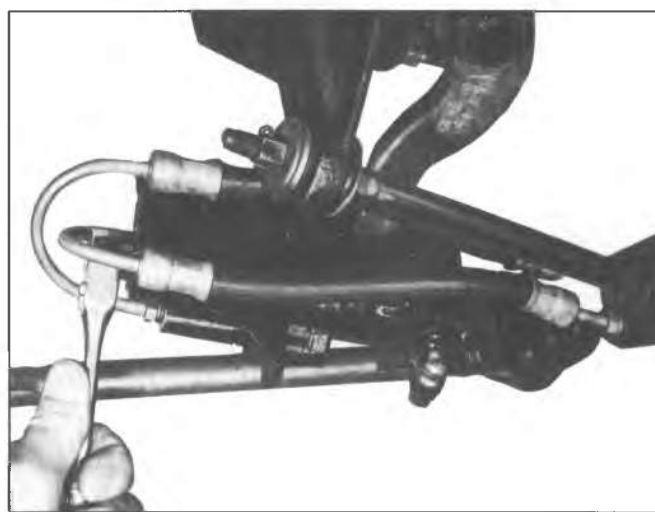


Fig. 3B-83--Balancing Valve

POWER CYLINDER-CORVETTE OVERHAUL OPERATIONS

Disassembly (Fig. 3B-84)

1. To remove the piston rod seal, remove the snap ring; then pull out on rod, being careful not to spray oil.
2. Remove the piston rod scraper and scraper element, back up washer and piston rod seal from the rod.
3. At the ball stud end of the cylinder, remove the ball stud seal.
4. Remove the snap ring retaining the end plug and lube fitting.
5. Push on the end of the ball stud and remove the end plug, spring, spring seat and ball stud.
6. Remove the "O" ring seal from the top lip of the power cylinder ball stud opening.
7. If the ball seat is to be replaced, it must be pressed

out using Tool J-8937.

Assembly

1. Reassemble the piston rod seal components by reversing the disassembly procedure. Apply power steering fluid on the inner surfaces of the seal and scraper before assembly.
2. Reverse the disassembly procedure when reassembling the ball stud.
3. In each case be sure that the snap ring is securely seated in the ring groove.

NOTE: Be sure to use new seals and "O" rings when re-assembling cylinder.

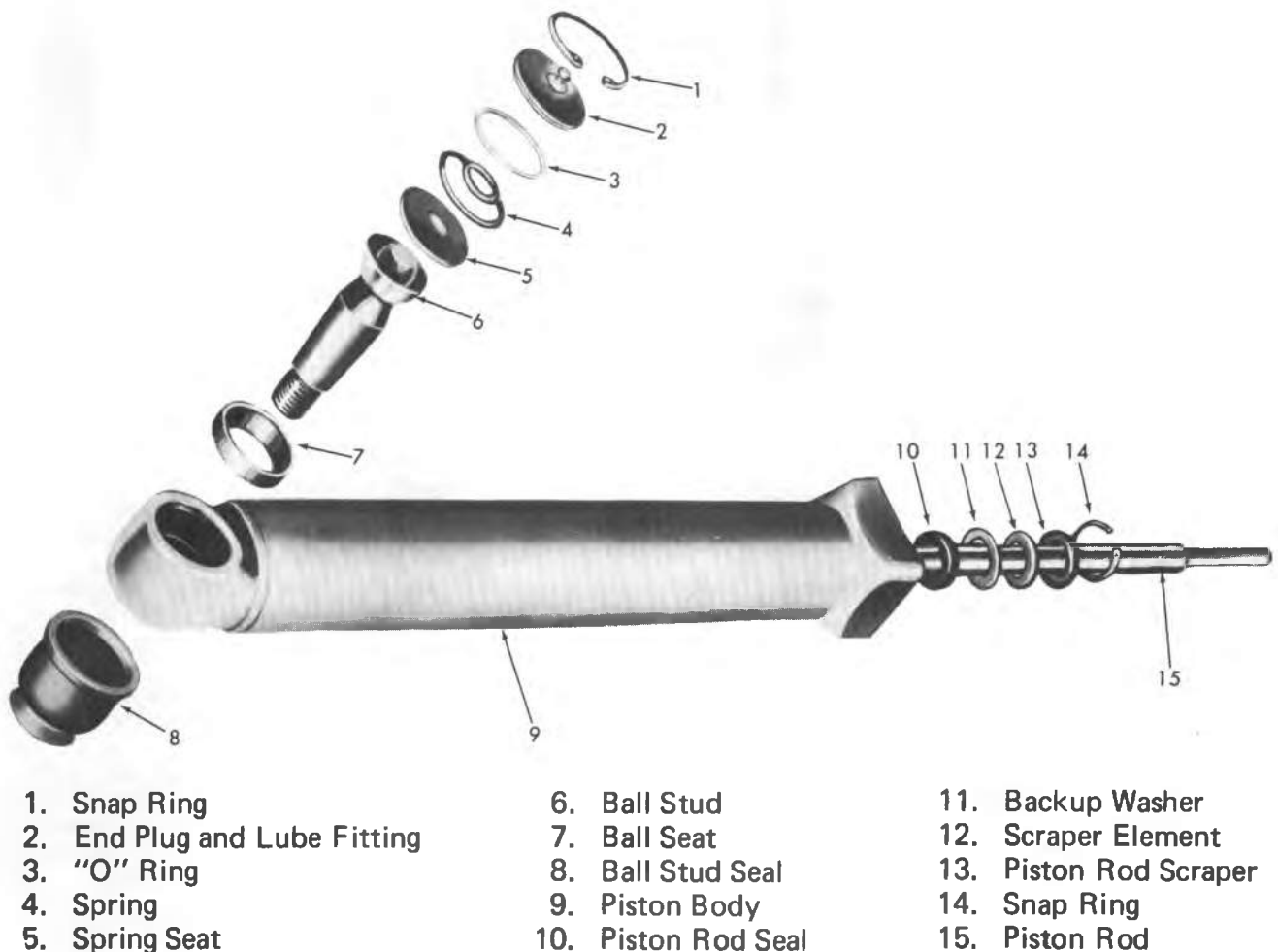


Fig. 3B-84--Power Steering Power Cylinder Exploded

SPECIAL TOOLS

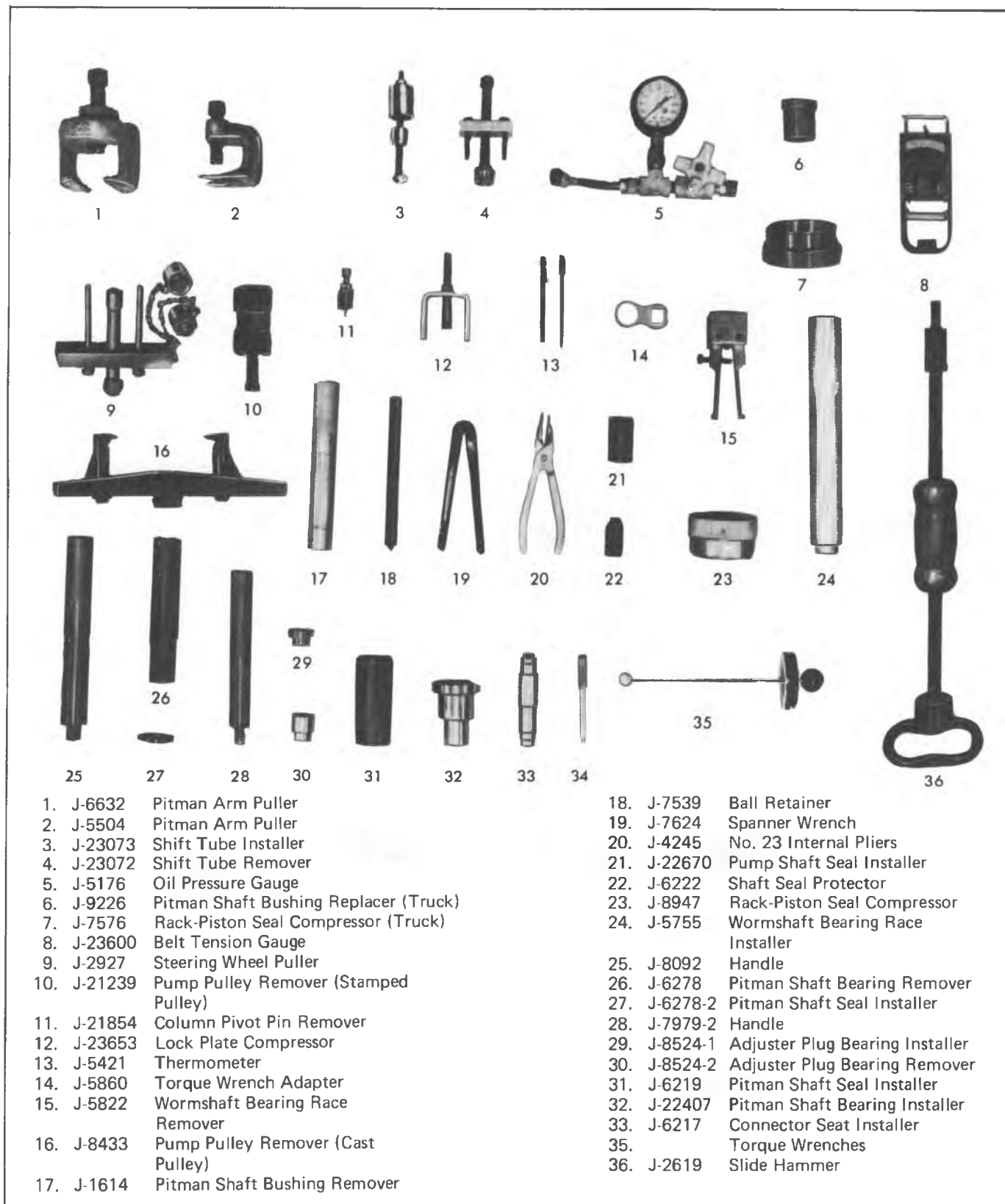


Fig. 3B-85--Manual and Power Steering Special Tools