

Group 19
STEERING GEAR
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MANUAL STEERING DATA AND SPECIFICATIONS

Type	Worm and Three Tooth Roller
Ratio	20.4 to 1
Gear Shaft Bearings	2 Needle Roller Bearings
Worm Shaft Bearings	Tapered Roller
High Point	Notch on Steering Column Tube Straight Up

TIGHTENING REFERENCE

	Foot-Pounds
Steering Gear to Frame Bolt	50
Steering Gear Pitman Arm Nut	125
Steering Wheel Nut	40
Steering Knuckle Tie Rod Clamp Bolt	15
Steering Knuckle Tie Rod End Ball Nut	40
Intermediate Steering Arm Pit Nut	50
Steering Idler Arm Bolt Nut	60

SPECIAL TOOLS

Tool Number	Tool Name
C-3350.....	Remover and Installer—Seal
C-3394.....	Remover—Tie Rod End
C-3428.....	Steering Wheel Puller
C-3646.....	Pitman Arm Puller
C-3786.....	Gear Shaft Bearing Remover and Installer Arbor

CONSTANT CONTROL FULL TIME POWER STEERING DATA AND SPECIFICATIONS

Ratio	16 to 1
Fluid Capacity of Hydraulic System	2 Qts.
Type of Fluid	Use only Part Number 2084329 Power Steering Fluid
Maximum Pump Pressure (All Models)	950 to 1050 psi
Maximum Fluid Flow at 3000 rpm	2¼ Gallons

TIGHTENING REFERENCE

	Foot-Pounds
Reservoir to Pump Body Bolts	10 - 15
Steering Wheel Nut	40
Steering Arm Nut	120
Steering Gear Housing to Frame Bolt	50
Steering Valve End Plug	25
Steering Valve Body Attaching Bolts	15
Steering Column Support Nut	110 to 200
Steering Gear Shaft Cover Nut	110 to 200
Steering Gear Shaft Adjusting Screw Lock Nut	50
Pressure Control Valve Body Screws	10
Pump Inlet Fitting	30

SPECIAL TOOLS

Tool Number	Tool Name
SP-3052.....	Adapter Steering Gear Shaft Seal Installing
SP-3062.....	Remover Adapter Cross Shaft Bearing
C-3128.....	Pliers—Snap Ring
C-3211.....	Hose—High Pressure
C-3229.....	Pliers—Snap Ring
C-3309B.....	Gauge—Pressure Check
C-3318.....	Hose—Low Pressure
C-3332.....	Remover—Cross Shaft Bearing
C-3333.....	Driver—Cross Shaft Bearing
C-3350.....	Remover and Installer—Seal
C-3388.....	Hose—Coupling
C-3394.....	Remover—Tie Rod End
C-3428.....	Puller—Steering Wheel
C-3633.....	Nut Wrench—Cross Shaft Retainer
C-3634.....	Adjusting Wrench—Gear Support Nut
C-3638.....	Seal Remover—Gear Worm Shaft
C-3646.....	Puller—Steering Arm
C-3650.....	Seal Driver—Gear Worm Shaft
C-3676.....	Worm Piston Ring—Remover and Installer
C-760.....	Pliers—Snap Ring
MTU-36.....	Ounce Pull Scale

POWER STEERING PUMP DATA AND SPECIFICATIONS

Type	Constant Displacement
Maximum Pump Pressure	950 to 1050 psi
Maximum Fluid Flow	2 $\frac{1}{4}$ gallons
Type of Fluid	MoPar No. 2084329 Power Steering Fluid

TIGHTENING REFERENCE

	Foot-Pounds
Reservoir to Pump Body Bolt	10 - 15
Pump Inlet Fitting	30
Pump to Pump Bracket Bolts	30

SPECIAL TOOLS

Tool Number	Tool Name
C-3229.....	Pliers—Snap Ring
C-3309B.....	Gauge—Pressure Check
C-3388.....	Hose—Coupling
C-3615.....	Puller—Steering Pump Pulley
C-3640.....	Seal Driver—Pump Shaft
C-3642.....	Seal Puller—Pump
C-3643.....	Supporting Stand (Pump Shaft)
C-3655.....	Remover—Pump Flow Control Valve Bore Plug

MANUAL STEERING SERVICE DIAGNOSIS

1. **EXCESSIVE PLAY OR LOOSENESS IN THE STEERING WHEEL**
 - a. Steering gear shaft adjusted too loose or badly worn.
 - b. Steering linkage loose or worn.
 - c. Front wheel bearings improperly adjusted.
 - d. Steering arm loose on steering gear shaft. Inspect for damage to gear shaft and steering arm.
 - e. Steering gear housing attaching bolts loose.
 - f. Steering arms loose at steering knuckles.
 - g. Worn ball joints.
2. **HARD STEERING**
 - a. Low or uneven tire pressure.
 - b. Insufficient lubricant in the steering gear housing or in steering linkage.
 - c. Steering gear shaft adjusted too tight.
 - d. Front wheels out of line.
 - e. Steering column misaligned.
3. **PULL TO ONE SIDE (Tendency of the car to veer in one direction only)**
 - a. Incorrect tire pressure.
 - b. Wheel bearings improperly adjusted.
 - c. Dragging brakes.
 - d. Improper caster and camber.
 - e. Incorrect toe-in.
 - f. Grease, dirt, oil or brake fluid on brake linings.
 - g. Front and rear wheels out of alignment.
 - h. Broken or sagging rear springs.
 - i. Bent suspension parts.
4. **WHEEL TRAMP (Excessive Vertical Motion of Wheels)**
 - a. Incorrect tire pressure.
 - b. Improper balance of wheels, tires and brake drums.
 - c. Loose tie rod ends or steering connections.
 - d. Worn or inoperative shock absorbers.

Group 19

STEERING GEAR

(PUMPS, STEERING GEAR ARM, IDLER ARM)

MANUAL STEERING

SERVICE PROCEDURES

5. STEERING WHEEL (Removal)

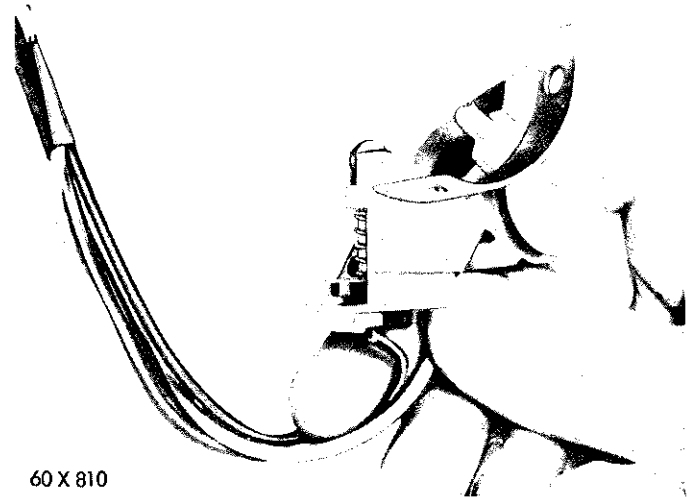
- (1) Disconnect the battery ground cable.
- (2) Remove steering wheel ornament by pressing down on center ornament and turning the ornament 1/4 turn to remove.
- (3) Disconnect the horn wire and remove three screws, bushings, horn blowing ring, rubber insulator and horn terminal plate.
- (4) Loosen the steering wheel nut three turns. Use puller, Tool C-3428, to loosen the steering wheel.
- (5) Remove the tool, steering wheel nut and steering wheel.

6. MANUAL STEERING GEAR UNIT

a. Removal

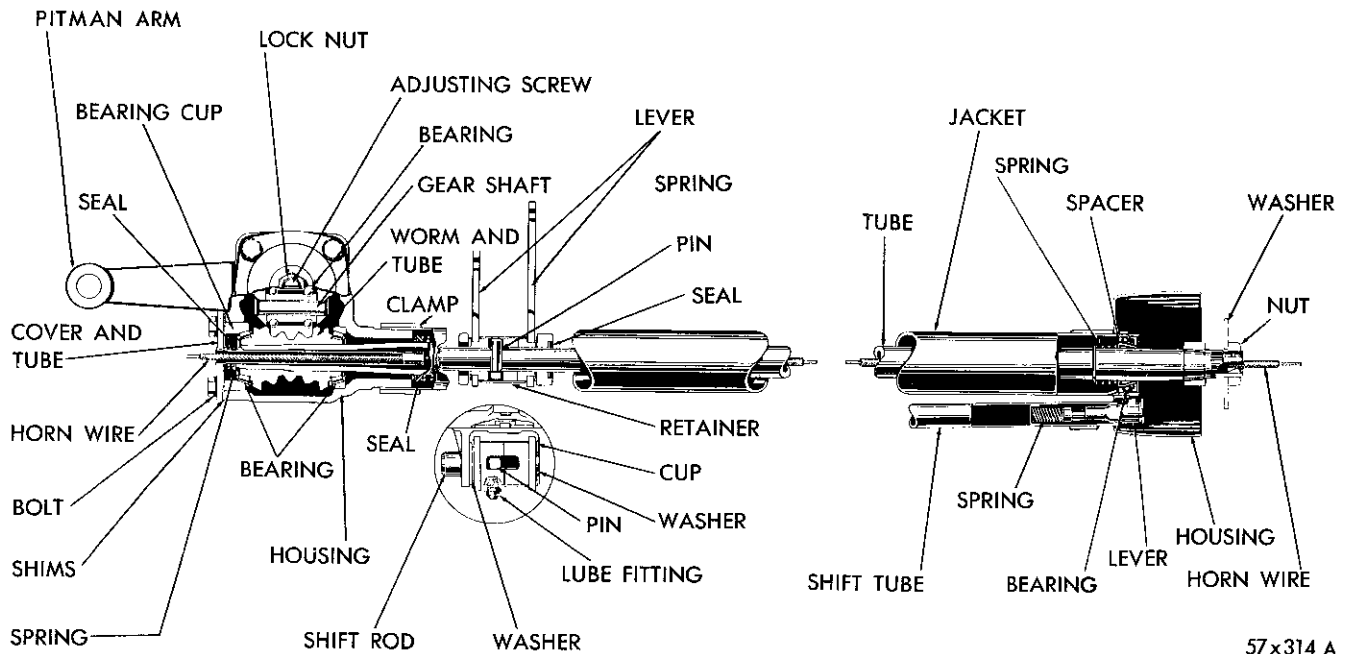
- (1) Disconnect the battery ground cable.
- (2) Remove the steering wheel as outlined in Paragraph 5.

- (3) Disconnect the directional signal wires and the horn wire at connectors.
- (4) Remove the turn signal switch (Fig. 1) (held to jacket tube by two screws).



60 X 810

Fig. 1—Removing or Installing Turn Signal Switch



57x314 A

Fig. 2—Steering Gear (Sectional View)

- (5) Remove two screws attaching steering jacket tube clamp at instrument panel and remove clamp.
- (6) Raise the carpet to expose the floor panel. Move rubber grommet up on jacket column.
- (7) Remove the screws attaching the rubber dust boot at the dash panel.
- (8) Loosen the jacket tube clamp at the steering gear housing.
- (9) Remove the steering arm nut and washer at the steering gear shaft.
- (10) Slide the Tool C-3646 up on the steering arm and place the shoe of the puller behind the steering arm. Tightening the tool center screw against the gear shaft will pull the steering arm from the gear shaft.
- (11) Disconnect the hydraulic brake line at the master cylinder and brake tee and remove the line.
- (12) Slide the steering gear jacket tube rearward and remove it as an assembly through the driver's compartment.
- (13) Remove the tapered retainer and spring from the column tube (Fig. 2).
- (14) Remove the steering gear housing to the frame bolts and slide the gear toward the rear of the car and at the same time raise the lower end of the gear up.

(15) Remove the steering gear out through the hood opening.

b. Disassembly (Fig. 3)

(1) Remove the gear shaft oil seal from the steering housing with Puller Tool C-3350. If the shaft is corroded or dirty, clean the portion between the oil seal and the serrations to avoid binding in the bearings.

NOTE: Position Tool C-3786 gear shaft bearing remover and installer arbor over the gear shaft threads and while withdrawing the gear shaft, follow with the arbor. This arbor will keep the bearing rollers from dropping out of their cages.

(2) Refer to Figure 3 and remove the gear shaft adjusting screw lock nut, cover gasket and steering gear shaft assembly.

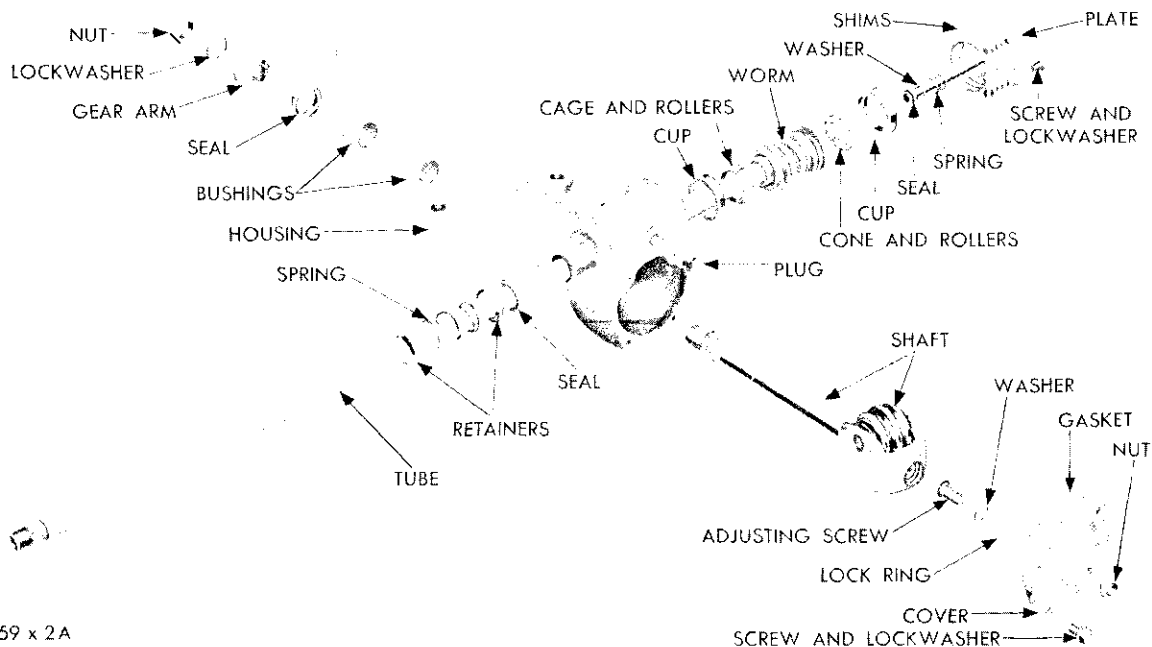
(3) Remove the cover and tube shims, spring, seal and washer from the bottom of the housing.

(4) Remove the steering tube and worm assembly, bearing cups and bearings, cork, cork retainer and spring.

(5) If it is necessary to remove the housing bearings, drive the bushings from the steering gear housing with the gear shaft bearing remover and installer arbor, Tool C-3786.

c. Reassembly

Clean all parts in a suitable solvent. Check all parts for wear.



59 x 2A

Fig. 3—Steering Gear (Disassembled View)

NOTE: Assemble parts without lubrication. Lubrication should be done after adjustments are completed. Needle bearings are grease-packed from factory.

If either of the worm thrust roller bearings are damaged, replace both bearings. Use new oil seals.

If gear shaft bearings have been removed, install the gear shaft outer bearing into the housing with Tool C-3786 (Fig. 4). Drive the outer (lower) bearing to within 1/16 inch or end of counterbore. Drive the inner (upper) bearing (Fig. 5) flush with the bore face with Tool C-3786.

(1) Insert the worm and the tube into the housing with bearings and cups.

(2) Install shims and lower housing cover, making sure bearings are seated.

NOTE: When tightening the cover, turn the worm tube to be sure no bind exists.

(3) Final tightening of the cover screws should cause end play to disappear with torque of $\frac{3}{8}$ to $\frac{3}{4}$ pound required to rotate the tube, when measured with a pull scale applied at the rim of the steering wheel. Add or remove shims in the event a bind or excessive end play occurs. Shims are available in .003, .006 and .011 inch.

(4) Install the gear shaft.

(5) Before installing the cover, turn adjusting screw all the way out.

(6) Place steering wheel on tube and rotate steering wheel in one direction to the end of its travel. Rotate the wheel in the other direction to the end of its travel, counting the turns. Rotate the wheel back $\frac{1}{2}$ of the full number of turns. This is the exact center of travel (high point).

(7) Turn the adjusting screw (clockwise) until all

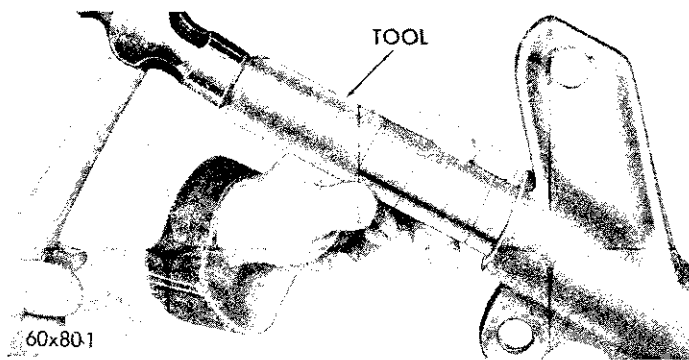


Fig. 4—Installing Gear Shaft Housing Outer Bearing

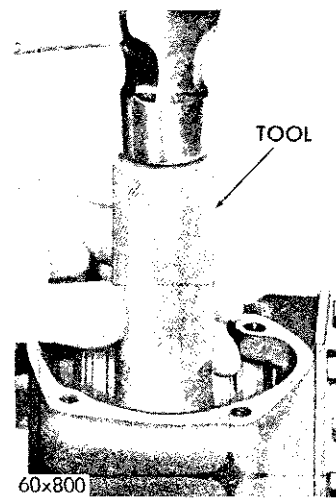


Fig. 5—Installing Gear Shaft Housing Inner Bearing

end play in the gear shaft is gone. Rotate the wheel to one end of its travel and apply a spring scale. With pull applied at rim of the steering wheel, tension should measure from 1 to 2 pounds. The greatest tension should be felt as the wheel is rotated past the center position (high point). Adjust the torque load by turning the adjusting screw in or out as required.

(8) Install the lock nut and tighten while holding the adjusting screw.

(9) Fill the gear housing with SAE 90 gear lubricant and check for leaks.

d. Installation

(1) Enter the steering gear assembly into the engine compartment and through the opening in the floor panel. Install the housing attaching bolts with the "D" bar between the frame and the forward mounting pad of the housing (flat of "D" against frame, Fig. 6).

(2) Install the flat washers, spherical washers and nuts, but do not tighten. Concave side of spherical

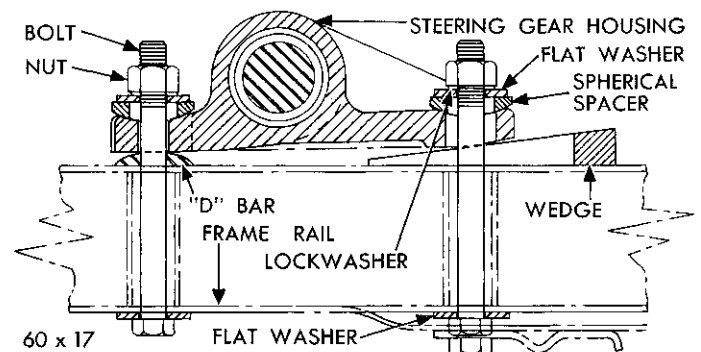


Fig. 6—Steering Gear (Mounting on Frame)

washers must be against the steering gear housing.

(3) Install the bearing spring and tapered retainer on the column tube.

(4) Slide the jacket tube assembly down against the shoulder on housing. Raise the tube $\frac{1}{8}$ inch and tighten the bolts to 15 foot-pounds torque.

(5) Install the jacket tube bracket clamp at the instrument panel. Tighten screw to 50 inch-pounds torque.

(6) Connect the directional signal wires and the horn wire at the connectors.

(7) Install the turn signal switch (Fig. 1) and make sure the column jacket does not restrict the switch movement (on all Chrysler models only).

(8) Install the steering wheel and the steering wheel nut. Tighten the nut to 40 foot-pounds torque.

(9) Measure the distance between the steering column jacket tube and the steering wheel, if less than $\frac{1}{8}$ inch, loosen the clamp bolts and adjust the column jacket to obtain the proper clearance. Tighten clamp bolts to 15 foot-pounds torque.

(10) Install the stationary plate, bushings, horn ring and attaching screws. Connect the horn wire at the stationary plate and install the steering wheel ornament.

(11) Tighten the jacket tube to the instrument panel clamp screws and install the jacket tube dust shield.

(12) Tighten front upper and lower gear housing to frame attaching bolts to 20 foot-pounds torque.

(13) Install a wedge over the rear bolt (Fig. 6) between the housing and the frame so that the tapered surfaces match, tapping it lightly in place and tighten the three attaching bolts to 50 foot-pounds torque. Tightening should be done by alternately tightening.

(14) Install steering gear arm, washer and nut. Tighten to 125 foot-pounds torque.

(15) Reinstall the brake line between the master cylinder and brake tee. Bleed brakes as necessary.

7. GEAR SHAFT OIL SEAL REPLACEMENT

(Unit in Vehicle)

a. Removal (Fig. 7)

(1) Remove the steering gear arm nut.

(2) Remove the steering gear arm with Puller, Tool C-3646.

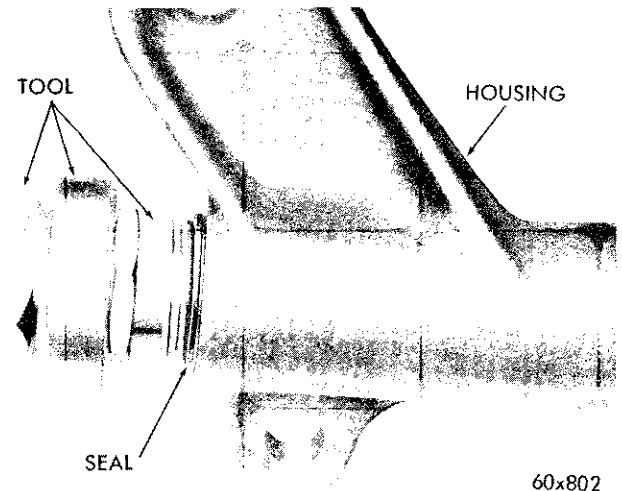


Fig. 7—Removing Gear Shaft Oil Seal

(3) Remove the gear shaft oil seal with Tool C-3350 gear shaft oil seal removing and installing tool set as follows:

(4) Slide the threaded portion of the adapter SP-3056 over the end of the gear shaft and install the threaded nut section of the tool on the gear shaft.

(5) Maintain pressure on the adapter SP-3056 with the nut of tool, while turning the adapter SP-3056, forcing it into the seal until it engages the metal lip of the seal.

(6) Slide the retainer of Tool C-3350 over the adapter, engage the grooves in the adapter and the tool nut with the two half-rings of the tool set and slide the retainer down to hold the half-rings in position.

(7) Turning the puller nut counter-clockwise will pull the oil seal from the housing.

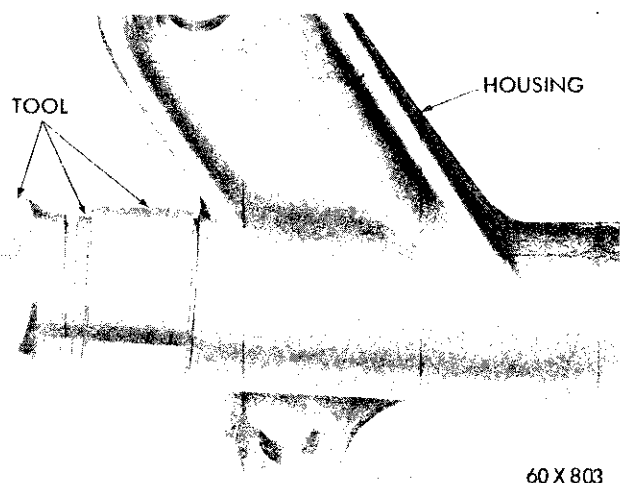


Fig. 8—Installing Gear Shaft Oil Seal

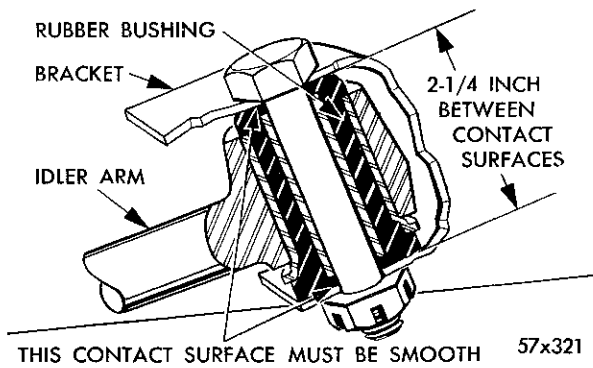


Fig. 9—Idler Arm (Sectional View)

b. Installation (Fig. 8)

- (1) Place the seal on the seal protector sleeve, Tool SP-1601 and install the sleeve over the splines on the gear shaft (lip of seal toward housing).
- (2) Place the adapter, Tool SP-1934, over the protector sleeve and against the seal.
- (3) Thread the tool nut on the threaded end of the gear shaft and turn the tool nut until the shoulder of the adapter tool contacts the housing.
- (4) Install the steering gear arm and nut. Tighten the nuts to 125 foot-pounds torque.

8. STEERING GEAR ALIGNMENT

- (1) Tighten the body mounting bolts at the front frame outrigger and the front frame rear cross-member.
 - (2) Loosen the steering gear at the frame and the dash support bracket to allow the steering gear to move in relation to the frame.
- NOTE:** Make sure the pivot ("D") bar at the front end of the steering gear housing is between the housing and the frame with the flat side of the bar against the frame and the concave side of the spherical washers must be against the housing (Fig. 6).
- (3) Tighten the two front mounting bolt nuts finger tight and just start the rear mounting bolt nut on the threads.
 - (4) Tighten the jacket tube clamp at the gear housing to 15 foot-pounds torque.
 - (5) Position the steering column jacket tube in the instrument panel jacket support and tighten the screw to 50 inch-pounds torque.
 - (6) Install the wedge between the steering gear housing and frame at the rear mounting bolt, so that the tapered surface of the wedge matches with the taper of housing.

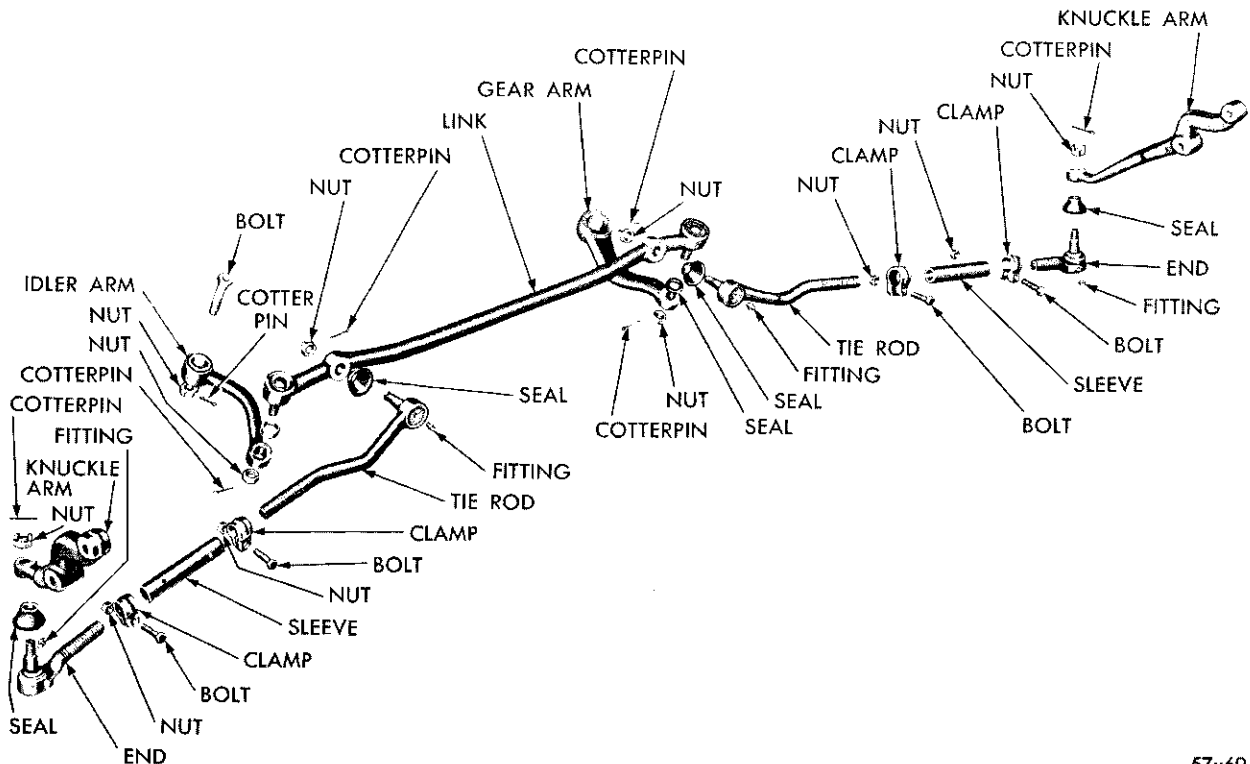


Fig. 10—Steering Gear Linkage

(7) Tighten the steering gear housing to frame bolts to 50 foot-pounds torque.

NOTE: Tightening should be done by alternately tightening the rear and front mounting bolts gradually so that gear alignment is not disturbed.

**Adjustments of the Roller Tooth and Worm
(In Vehicle)**

- (1) Disconnect the steering gear arm at the link.
- (2) Rotate the steering wheel to mid-position and then check for backlash by attempting to move the steering gear arm back and forth.

(3) If backlash exists, loosen the gear shaft adjustment screw lock nut and tighten the adjusting screw enough to eliminate free play. Be sure the roller shaft and the worm do not bind. Recheck backlash.

(4) Tighten the adjusting screw lock nut while holding the adjusting screw from turning.

(5) Install the steering gear arm.

9. REMOVAL AND REPLACEMENT OF THE IDLER ARM (Fig. 9)

- (1) Place the front wheels in the straight-ahead position.
- (2) Remove the cotter pin and nut and separate the link and the arm.
- (3) Remove the cotter pin, nut and the mounting bolt and slide the idler arm out of the bracket. The

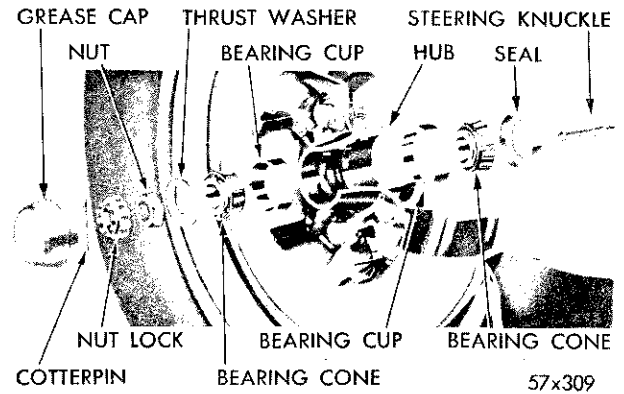


Fig. 12—Front Wheel Bearing Adjustment

idler arm and bushing are serviced only in an assembly.

(4) Measure the width of the idler bracket. The distance between the bushing contact surfaces should be 2¼ inches (Fig. 10).

(5) Install the idler arm (protect bushing ends from being damaged from the sharp edges of the mounting bolt holes by using a shim stock over the holes).

(6) Coat the mounting bolt with lubriplate and slide the bolt through the bracket and bushing; install the nut.

(7) With the wheels in the straight-ahead position, tighten the nut to 85 foot-pounds torque; install the cotter pin.

10. STEERING KNUCKLE TIE RODS

a. Removal

NOTE: The tie rod end and bolt is serviced only as an assembly.

- (1) Loosen the nut on the rod end and remove the tie rod end with Tool C-3394.
- (2) Insert the leg of the tool between the steering linkage knuckle arm and the tie rod end.
- (3) Turn the puller screw against the tie rod end nut, forcing the tie rod end from the knuckle arm.
- (4) Remove the tie rod from center link by placing leg of puller between center link and tie rod end.
- (5) Remove the tie rod end assembly from the tie rod by loosening the clamps and unscrewing the rod end assembly.

b. Installation

(1) When installing the tie rod ends to the rod tube, be sure to thread the ends evenly on tube body

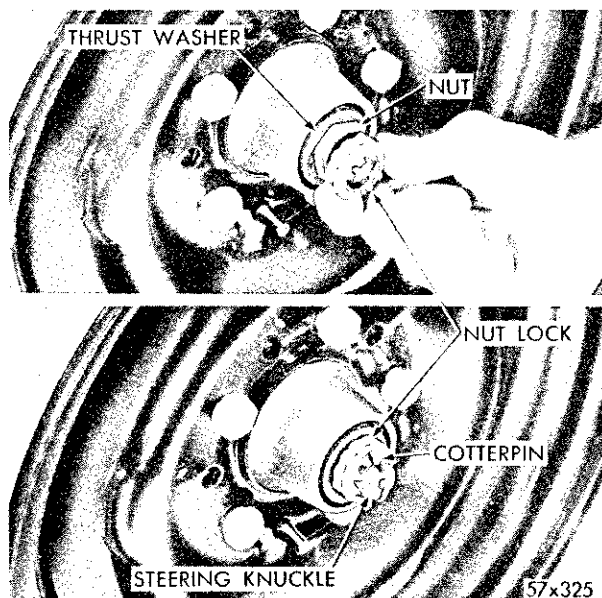


Fig. 11—Positioning Bearing Nut Lock

to the nominal length to obtain proper positioning of the steering wheel.

NOTE: The clamping bolts must be beneath the tie rods to prevent interference on turns. Measure and adjust the toe-in when the new tie rods are installed.

11. FRONT WHEEL BEARINGS (Fig. 11)

a. Adjusting

NOTE: It is important to remove any burrs or nicks on the spindle thread to insure accurate torque reading.

(1) Tighten the wheel bearing adjusting nut to 180 inch-pounds while rotating the wheel.

(2) Position the nut lock on the nut with one pair of slots in line with the cotter pin hole.

(3) Back off the adjusting nut 1½ slots. (The cotter pin hole will be covered.)

(4) Remove the lock and re-position it so the cotter pin can be inserted. **Do not move the adjusting nut.**

(5) Install the cotter pin.

b. Removing Front Wheel Bearing Races

(1) Remove the drum and remove the inner oil seal and bearing (Fig. 12). Invert the drum, then using a suitable drift, drive the outer bearing race from the drum. (Driving slots are machined in the drum for this operation).

(2) Again invert the drum and drive out the inner bearing race.

(3) Clean the drum and bearings, using a suitable solvent, then blow dry with compressed air. **(Do not spin bearings with air pressure.)** Check the bearings for pits or brinelling. Install new bearings as required.

c. Installation of Front Wheel Bearing Races

When installing new bearing races, be sure to start the race evenly in the drum. Drive down into position alternately, using (if possible) the old race. Be sure the race is seated evenly.

Pack the inner bearing with short fibre grease, then install in the drum. Install new grease seal. Slide the drum over spindle and into the drum. Install a thrust washer and nut, then adjust the bearing as described in Paragraph 11 (a).

CONSTANT CONTROL FULL TIME POWER STEERING SERVICE DIAGNOSIS

12. HARD STEERING

- a. Tires not properly inflated.
- b. Low oil level (usually accompanied by pump noise).
- c. Loose pump belt.
- d. Oil on pump belts.
- e. Steering linkage needs lubrication.
- f. Power steering pump output low. See Paragraph 20 — "Pressure Test."
- g. Steering gear malfunction.
 1. Gear shaft adjustment to tight. (See Paragraph 21.)

2. Pressure control valve stuck in closed position.
3. Defective or damaged valve lever.
4. External oil leakage at the following points:
 - a. Lower sector shaft oil seal.
 - b. Sector shaft adjusting screw seal.
 - c. Sector shaft cover "O" ring seal.
 - d. Valve housing-to-gear housing "O" ring.
5. Excessive internal leakage.

13. POOR RECOVERY FROM TURNS

- a. Tires not properly inflated.
 - b. Steering linkage binding.
-

- c. Improper wheel alignment.
- d. Damaged or faulty steering tube bearing.
- e. Steering wheel column jacket and steering unit not properly aligned.
- f. Steering gear malfunctions.
 1. Improper gear shaft mesh adjustment. (See Paragraph 21.)
 2. Pressure control valve piston stuck in open position.
 3. Column support spanner nut loose.
 4. Faulty or damaged valve lever.
 5. Improper worm thrust bearing adjustment.
 6. Burrs or nicks in reaction ring grooves in cylinder head or column support.
 7. Faulty or damaged cylinder head worm seal ring.
 8. Dirt or chips in steering gear unit.
 9. Rough or catchy worm in the piston assembly.
 10. Faulty worm piston ring.

14. SELF-STEERING OR LEADS TO EITHER SIDE

- a. Tires not properly inflated.
- b. Improper wheel alignment.
- c. Steering wheel off center when the car is traveling straight ahead.
- d. Valve body out of adjustment:

Steering to the left — Move the steering valve housing down on the steering housing.

Steering to the right — Move the steering housing up on the steering housing.

- e. Valve lever damaged.
- f. Column support spanner nut loose.

15. TEMPORARY INCREASES IN EFFORT WHEN TURNING STEERING WHEEL TO RIGHT OR LEFT

- a. Oil level low.
- b. Loose pump belt.
- c. Oil on pump belts.
- d. Binding steering linkage.
- e. Engine idle too slow.
- f. Faulty power steering pump.
- g. Air in system. (Work the steering wheel from right to left until the air is expelled.)

- h. Gear malfunctions.
 1. External leakage.
 2. Improper gear shaft adjustment. (See Paragraph 21.)
 3. Excessive internal leakage.

16. EXCESSIVE STEERING WHEEL FREE-PLAY

- a. Improper gear shaft adjustment. (See Paragraph 21.)
- b. Column support spanner nut loose.
- c. Improper worm thrust bearing adjustment.
- d. Coupling loose on the worm shaft.

17. LACK OF ASSISTANCE (One Direction)

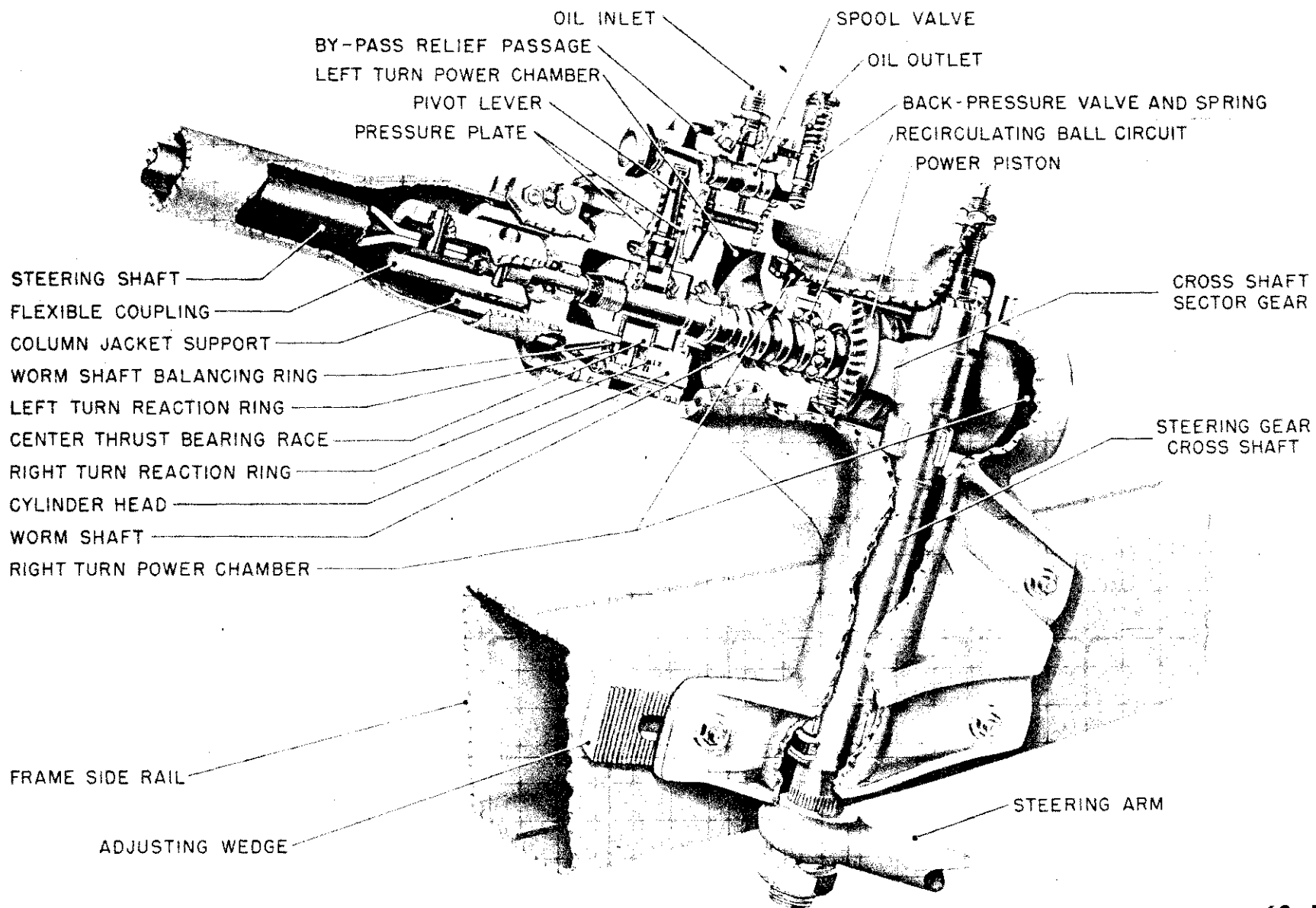
- a. Oil leaking past worm shaft oil seal ring or throttle "O" ring.
- b. Broken or worn ring on worm piston.
- c. Piston end plug loose.
- d. Reaction seal missing.

(Both Directions)

- a. Pump belt slipping.
- b. Pump output low.
- c. Broken or worn ring on worm piston.
- d. Piston end plug loose.
- e. Reaction seal missing.
- f. Internal leakage in the valve body.

18. NOISES

- a. Buzzing noise in neutral, stops when the steering wheel is turned.
 1. Noisy pump.
 2. Damaged hydraulic lines.
 3. Pressure control valve sticking.
 4. Air in system.
- b. Chuckling noise.
 1. Improper gear shaft adjustment. (See Paragraph 21.)
 2. Improper worm thrust bearing adjustment.
 3. Excessive radial clearance in the column jacket support bearing.
 4. Coupling loose on the worm shaft.
- c. Metallic clatter or tapping noise.
 1. Back pressure valve cushion missing or broken.



60 x 11

Fig. 13—Power Steering Complete (Cross Section)

POWER STEERING

19. DESCRIPTION AND OPERATION

a. Description

The power steering gear (Figs. 13 and 14) consists of a gear housing containing a gear shaft with sector gear, a power piston with gear teeth milled into the side of the piston is in constant mesh with the gear shaft sector and a worm shaft connects the steering wheel to the power piston. The worm shaft is geared to the piston through a recirculating ball contact.

b. Operation

In this explanation of operation (as viewed in the following illustrations) the left end of the steering gear means the lower end and the right end means the upper end of the steering gear. Direction of oil flow will also be described as flowing to left or right as shown in the following illustrations.

When the car is in the straight-ahead direction, the steering valve is in the neutral (center) position and oil flow through both of the grooves in the steering valve body is equal, since in the neutral position (Fig. 15), the two lands of the steering valve are centered in the grooves of the valve body. The left oil passage directs its oil where it contacts the right (upper) end of the power piston and across into the right reaction chamber. Part of this oil is forced around the grooves of the worm shaft, inside the piston and around the recirculating balls, to the hollow area between the left (lower) end of the worm shaft and the left (lower) end of the power piston. Pressure on the end of the worm shaft is balanced by the pressure against the area of the worm shaft balancing ring.

At the same time, oil from the right groove in the steering valve is directed to the left, through a gallery, parallel to the worm shaft. This oil flows to the

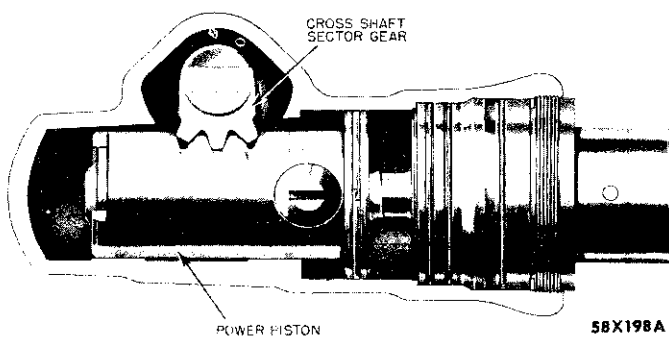


Fig. 14—Steering Gear Housing (Sectional View)

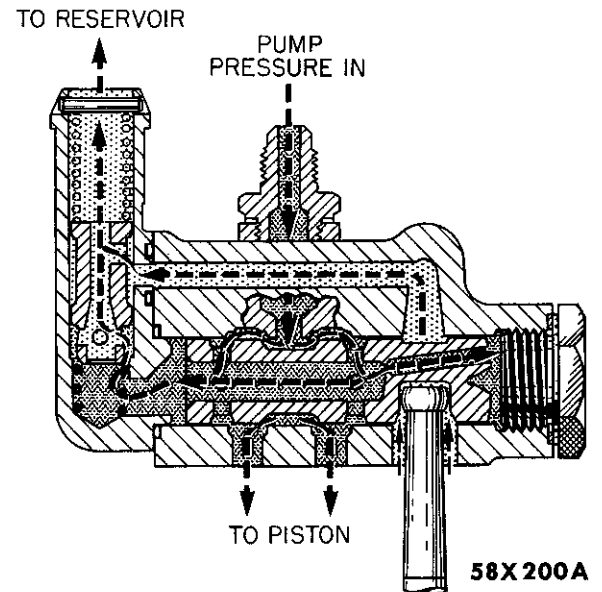


Fig. 15—Steering Gear Valve (Neutral Position)

area below the power piston flange. Part of this oil is then directed through the cylinder head into the left reaction chamber.

Forces exerted on the piston through oil pressure on its faces are completely balanced by the two reaction rings shown in cross section in Figure 16. The reaction ring shown to the left of the center bearing race is fed oil from the right turn power chamber oil gallery through a drilled hole.

When the driver makes a left turn, power is immediately provided by the unit to effect the turn. As the wormshaft rotates inside the power piston, the piston is prevented from instantly “climbing down” the wormshaft by the resisting forces which the steering linkage and wheels transmit to the steering gear cross shaft. Instead, the worm shaft is “drawn out” of the piston a very small amount (a few thousandths of an inch). The center thrust bearing race, which in effect is clamped axially to the wormshaft, moves the same distance. The race thus tips the pivot lever and moves the steering valve to the left (down).

The oil flow diagram for a left turn is shown in Figure 17. Here it can be seen that as the left edges of the two lands on the valve approach the groove edges of the valve body, two things happen: Flow to the right groove in the valve body is reduced and the flow of oil to the left groove is increased because the opening is larger. Oil then flows from the power

steering pump through the enlarged orifice and through the oil gallery to the left turn power chamber of the piston (Fig. 18). Since the supply of oil to the left (lower side) (right turn chamber) of the piston has been cut off by movement of the steering valve, a force of unbalance on the piston exists and it is pushed to the left. Its linear movement is translated into rotation of the cross shaft sector gear (Figs. 13 and 14) and subsequently through the steering linkage to the front wheels.

In the reaction area of the steering unit another action takes place simultaneously as the wheel is turned to the left. The restraining force of the reaction spring must be overcome before the center race can move to the right. The force of the reaction

spring provides positive returnability to the unit. At the instant when power assistance is no longer desired by the driver, the reaction spring and the operating oil pressure move the center thrust bearing race and the steering spool valve back to their neutral (center) positions. Equal oil pressures then are directed to both sides of the power piston and power assist ceases immediately. The natural effect of the front wheel caster and the steering axis inclination then returns the wheels to their straight-ahead position.

When a right turn is made, all of the earlier described actions necessary to make a left turn in the steering unit are repeated, except that all of the motions are reversed. Consequently, in a right turn,

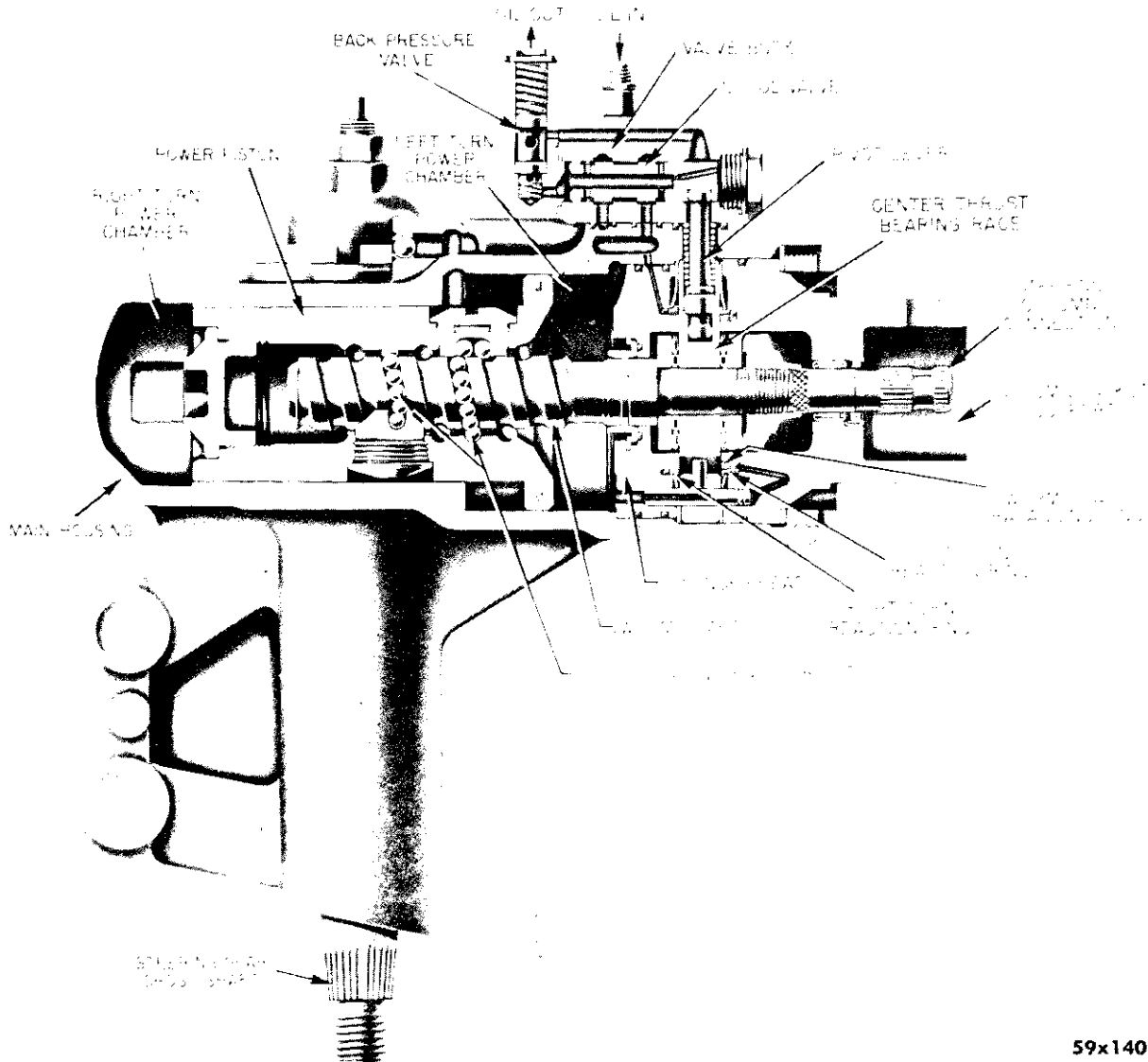


Fig.16—Steering Gear (Sectional View)

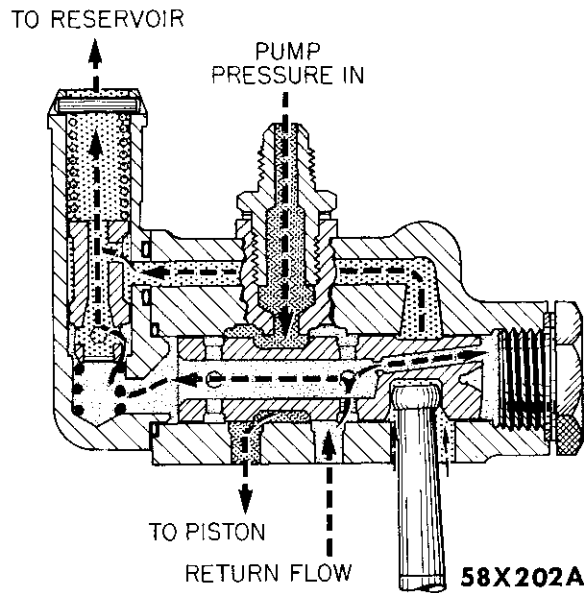


Fig. 17—Steering Gear Valve (Left Turn Position)

the lower side of the power piston and the right turn reaction ring are pressurized (Fig. 18).

The force of this reaction spring also contributes to increased on-center “feel.” The “feel” is further provided by the operating oil pressure which tends to

return the center thrust bearing race to its neutral position. The driver feels this force on the reaction rings (shown in Figures 17 and 18) as a force proportional to operating oil pressure. It causes the driver to exert a steering effort proportional to the total force required to turn the front wheels of the car. The force he actually exerts is only a small percentage of the total force that would be required to steer the car with a manual gear. If oil pressure is interrupted in the steering gear, it would operate with increased effort and there would be more steering wheel free play. However, complete steering control is retained by the driver if a “lack of power assist” condition should ever arise.

20. PRESSURE TEST (STEERING GEAR AND PUMP)

(1) Start the engine, turn the steering wheel all the way to the left and back all the way to the right several times to expel air from the system, then shut off the engine.

(2) Remove the filler cap and visually check the oil level in the reservoirs.

Engine Cold—Oil level should be at the bottom of the filler neck.

Engine Hot—Oil level should be one-half way up in the filler neck.

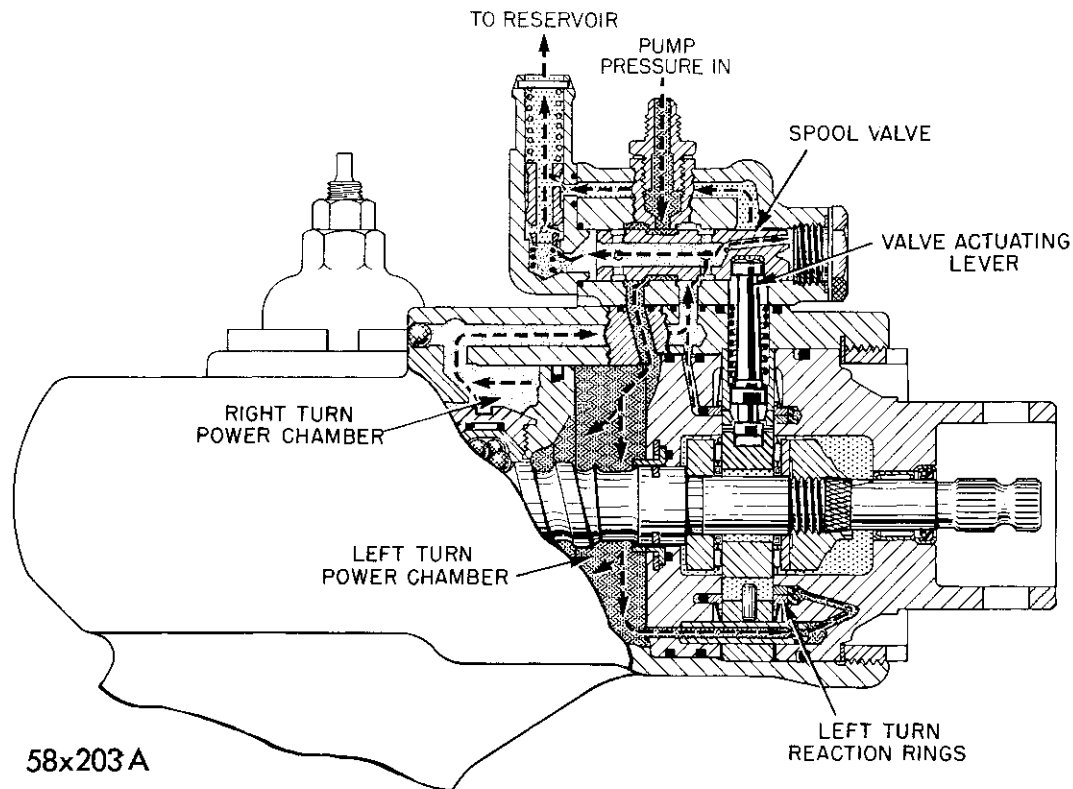


Fig. 18—Oil Flow (Left Turn Position)

If necessary, add only Mopar No. 2084329 Power Steering Fluid to bring up to the required level. Do not overfill.

(3) Check the pump belt tension.

(4) Disconnect the pump to the steering gear pressure hose at the power steering pump. Connect the test hose Tool C-3388 with the proper adapters between the power steering pump and the pressure gauge Tool C-3309B with the shut-off valve between the pressure gauge and the pressure hose that you disconnected from the pump (Fig. 19). **Make sure all connections are tight and that the shut-off valve is fully opened.**

(5) Start the engine and operate at idle speed (500 rpm).

(6) With the engine operating at idle (500 rpm) and oil temperature between 150 degrees F. and 170 degrees F. (checked with thermometer in the reservoir) the pressure gauge should show a pressure of 55 to 80 psi. If the pressure is higher, check the hoses and connections for kinks and obstructions, check the pump or flow control valve for faulty operation.

(7) Increase the engine speed to 1000 rpm, then slowly close the gauge shut-off valve. The pump pressure should be 950 to 1150 psi with the gauge shut-off valve fully closed.

CAUTION

Do not close the valve for more than a few seconds, as this would abnormally increase the oil temperature and cause undue oil pump wear.

a. If the pressure increases to more than 1050

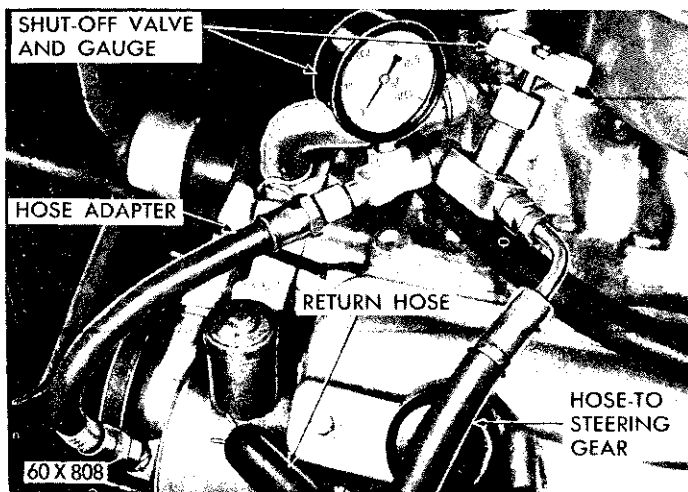


Fig. 19—Pressure Testing Pump and Steering Gear

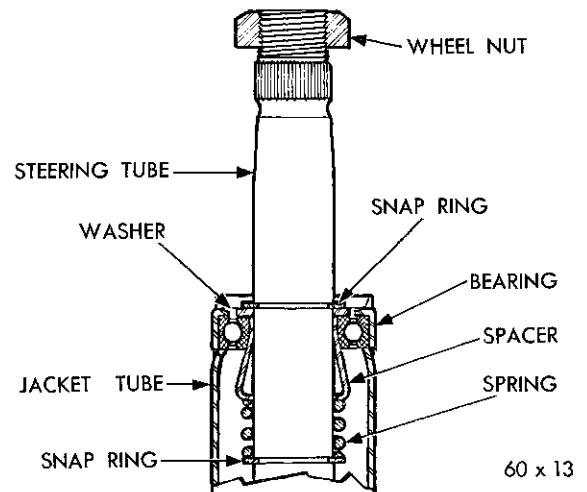


Fig. 20—Jacket Tube Installation (PC-1, 2, 3 and PY-1)

psi, the relief valve is faulty or the pump is equipped with the wrong relief valve.

b. If the pressure is less than 950 psi, the pump is faulty.

c. If the pressure is within the specified range of 950 to 1050 psi, the pump is operating properly and the trouble is in the steering gear.

d. Open the gauge shut-off valve and operate the steering unit through another cycle, this time holding unit at extreme travel in each direction while watching the oil pressure gauge. The gauge reading should be equal in each direction. If not, it indicates excessive internal leakage in the unit. **Do not hold the wormshaft at either extreme position for more than a few seconds.**

21. GEAR SHAFT ADJUSTMENT

(1) With the gear shaft on center, loosen gear shaft adjusting screw lock nut 1/2 turn and tighten the adjusting screw until backlash just disappears. Tighten screw 1 1/4 turns from this position and while holding the adjusting screw in this position, tighten the lock nut.

NOTE: This is a temporary adjustment to insure that the piston rack and sector teeth are in full alignment.

(2) Operate unit manually for a minimum of 180 degrees from the center in each direction, measured at worm shaft.

(3) Start the engine and run at idle speed. With hydraulic power to the steering gear unit and with the gear shaft on center plus or minus 2 degrees, readjust the gear shaft backlash. This will require loosening the adjusting screw until the backlash is

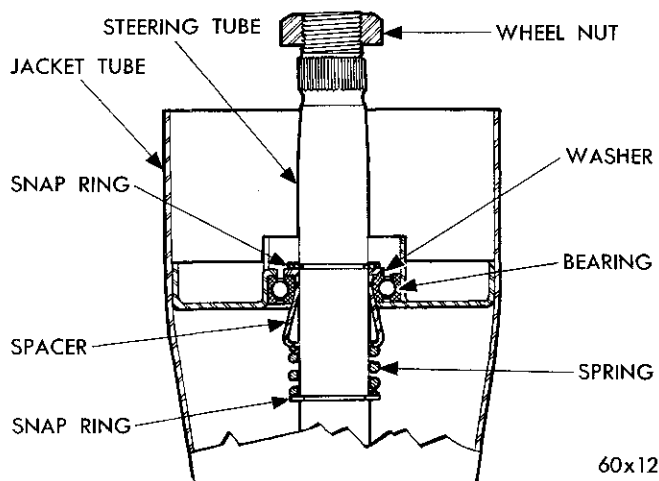


Fig. 21—Jacket Tube Installation (PS-1 and PS-3)

evident. Retighten the adjusting screw until the backlash just disappears. Continue to tighten $\frac{3}{8}$ to $\frac{1}{2}$ turn from this position and tighten the lock nut 50 foot-pounds torque to maintain this setting.

22. REMOVING POWER STEERING GEAR UNIT

- (1) Disconnect the battery ground cable.
- (2) Remove the steering wheel ornament by pressing down on center ornament and turning the ornament $\frac{1}{4}$ turn to remove.
- (3) Disconnect the horn wire and remove three screws, bushings, horn blowing ring, rubber insulator and horn terminal plate.
- (4) Disconnect the directional signal wires and the horn wire at connectors.
- (5) Loosen the steering wheel nut three turns. Use puller, Tool C-3428, to loosen steering wheel.
- (6) Remove the tool, steering wheel nut and steering wheel.
- (7) Remove the directional switch cancelling mechanism (Fig. 1, Manual Steering).
- (8) Remove the retainer snap ring (Figs. 20 and 21) from the groove in the steering tube at the top of the bearing using pliers Tool C-3229.
- (9) Remove the jacket tube shield to allow access to the column tube clamp and remove the screws attaching the steering jacket tube clamp at the instrument panel and remove the clamp.
- (10) Raise the carpet to expose the floor panel. Move the rubber grommet up on the jacket column.
- (11) Remove the screws attaching the rubber dust boot at firewall. (On Imperial cars, remove the floor inspection panel.)

(12) Loosen the jacket tube clamp at the steering gear housing.

(13) Remove the cotter key and nut at the drag link and disconnect the link from the steering arm.

(14) Remove the steering arm nut and washer at the steering gear shaft.

(15) Slide Tool C-3646 up on the steering arm and place the shoe of the puller behind the steering arm (Fig. 22). Tightening the tool center screw against the gear shaft, will pull the steering arm from the gear shaft.

CAUTION

Do not remove the steering arm by prying with a lever or striking with a hammer as serious steering gear internal damage will result.

(16) Disconnect the hydraulic brake line at the master cylinder and the brake tee and remove the line (not necessary on Imperial cars).

(17) Disconnect the pressure and return hoses at the steering gear. Fasten the ends of the hoses above the oil level in reservoir. Cap the ends of the hoses. Cap the fittings on the steering gear.

(18) Slide the jacket tube up and off the steering gear through the driver's compartment. Remove the jacket tube upper spring and retainer. Remove the rubber insulator boot and horn ground strap (copper).

(19) Remove the steering tube coupling pin, two plastic inserts, horn ground strap (copper) (Fig. 23), rubber insulator and upper steering tube.

(20) Remove the gear housing to frame bolts, washers and alignment wedge. Slide the steering gear towards the rear of the car and at the same

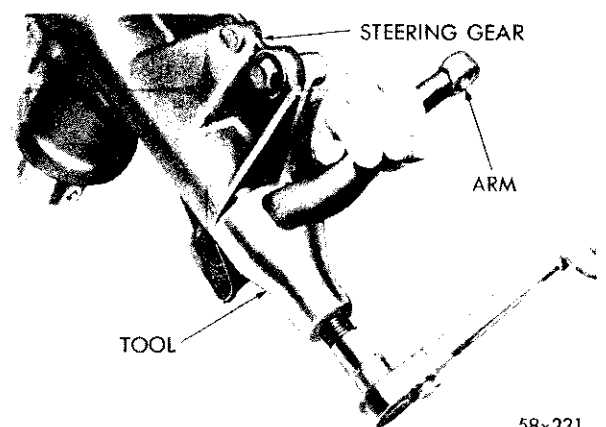


Fig. 22—Removing Steering Gear Arm

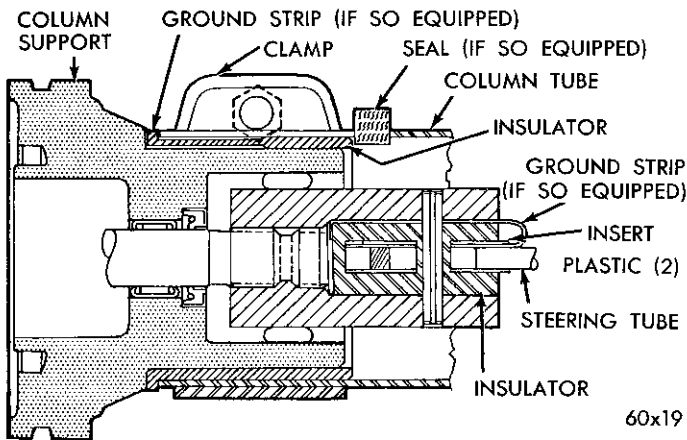


Fig. 23—Jacket Tube and Column Tube (Cross Section)

time, raise the lower end of the gear to remove the gear at the engine compartment. (Remove the gear through the driver's compartment on Imperial cars.)

(21) On cars equipped with Ram Manifold, remove the fender inspection opening panel. Raise the lower end of the gear housing and rotate the assembly in a clockwise motion towards the cowl panel until the gear shaft splines clear the frame rail, then tilt the housing toward the engine and remove the steering gear assembly (gear shaft end first) through inspection hole at fender side panel.

23. DISASSEMBLY OF STEERING GEAR (Fig. 13)

NOTE: Prior to disassembly, clean the gear assembly thoroughly in a suitable solvent and install the unit in the holding fixture C-3323 (Fig. 24).

When disassembling, each part should be placed in a suitable solvent, washed, then dried by dry

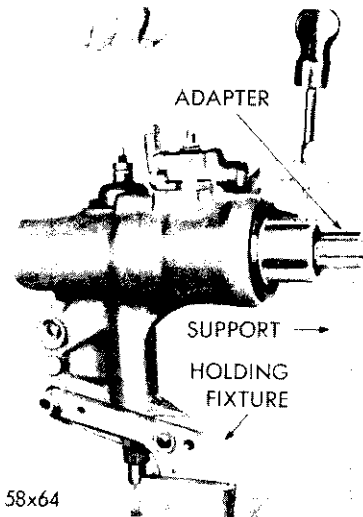


Fig. 24—Removing Coupling Pin

compressed air. Careful handling of the parts must be exercised to avoid the occurrence of nicks and burrs. Crocus cloth may be used to remove small nicks or burrs provided it is used carefully. When used on the steering gear valve, use extreme care not to round off the sharp edge portions of the two lands located between the valve drilled holes. The sharp edge portion of these two lands is vitally important to this type of valve.

Remove and discard all "O" seal rings and seals. Use new ones lubricated with petrolatum when re-assembling.

(1) Drain the steering gear through the pressure and return connections by turning the steering tube coupling from one extreme of travel to the other.

(2) Align the coupling pin with the holes in steering column jacket support and remove the coupling pin (Fig. 24).

CAUTION

Support the coupling when driving the pin in or out to avoid damaging the worm shaft and bearings.

(3) Remove the valve body housing attaching screws and remove the valve body and the three "O" rings (Fig. 25).

(4) Remove the valve lever and spring. Pry under the spherical head with a screwdriver. Use care not to collapse the slotted end of the valve lever as this will destroy the bearing tolerances of the spherical head.

(5) Loosen the gear shaft adjusting screw lock-nut to facilitate removal and remove the gear shaft cover nut with Tool C-3633 (Fig. 26).

CAUTION

Oil will be expelled when the gear shaft and cover are withdrawn from the housing.

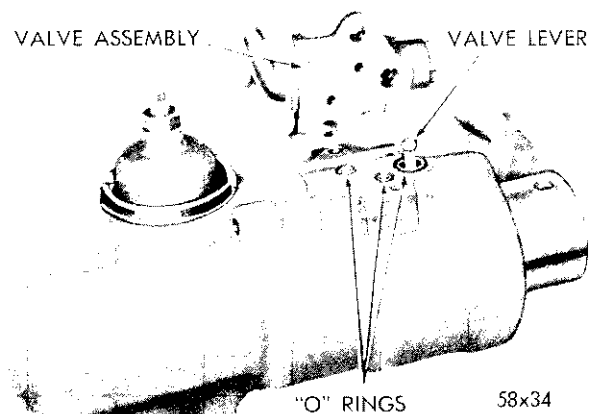


Fig. 25—Removing or Installing Valve Body Assembly

(6) Rotate the worm shaft to the full right turn position, then return the worm shaft to the center of travel. This will place the piston in the center position (Fig. 14). Withdraw the gear shaft until the sector teeth clear the housing. Rotate the shaft 180 degrees and allow the ends of the teeth to rest on the housing.

(7) Turn the worm shaft to full right turn position to compress the power train parts and then remove the coupling.

(8) Remove the steering jacket support nut with Tool C-3634 (Fig. 27).

(9) Firmly install a suitable drift through the hole in the jacket support to engage the groove in the worm shaft, thereby locking these two parts together (Fig. 28).

(10) While holding the drift, pry on the piston teeth with a screwdriver using the gear shaft as a fulcrum and remove the complete power train.

NOTE: By this procedure, the worm will be all the way into the piston and the power train parts will be resting against the piston flange. It is imperative that the cylinder head, center race and spacer assembly and the jacket support be maintained in close contact with each other. This will prohibit the teflon sealing ring on the worm shaft from becoming disengaged from its mating sleeve retained in the cylinder head. It will also eliminate the possibility of the reaction rings becoming disengaged from their grooves in both the cylinder head and column jacket support.

(11) Remove the gear shaft assembly from the housing and remove the steering gear housing from the vise.

24. DISASSEMBLY OF POWER TRAIN

(1) Place the power train in a vise equipped with

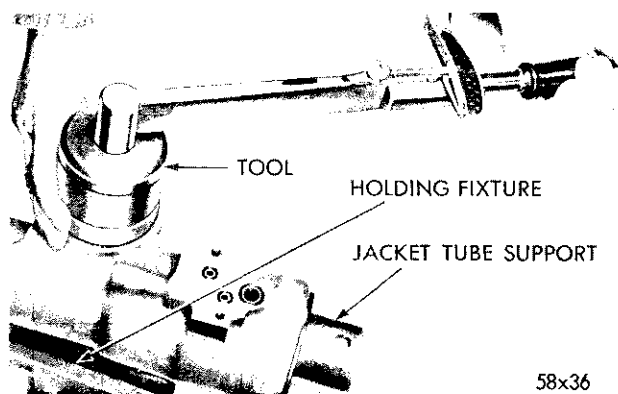


Fig. 26—Removing or Installing Gear Shaft Cover Nut

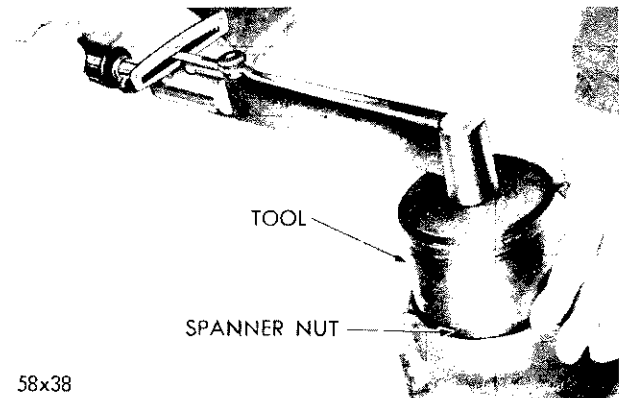


Fig. 27—Removing Steering Column Support Nut

soft jaws to avoid damaging the piston assembly.

CAUTION

Do not turn the worm shaft more than one-half turn during disassembly.

(2) Remove the column jacket support tang washer and jacket support.

(3) Remove the reaction spring, reaction ring and spacer, ferrule "O" ring and the center bearing spacer.

(4) Hold the worm shaft from turning, then turn the nut with sufficient force to release the staked portions from the knurled section and remove the nut.

NOTE: Wire brush the knurled section to remove chips, then blow out the nut and worm shaft to remove any metal particles.

(5) Remove the upper thrust bearing race (thin) and upper thrust bearing.

(6) Remove the center bearing race.

(7) Remove the lower thrust bearing and lower thrust bearing race (thick).

(8) Remove the lower reaction ring and reaction spring.

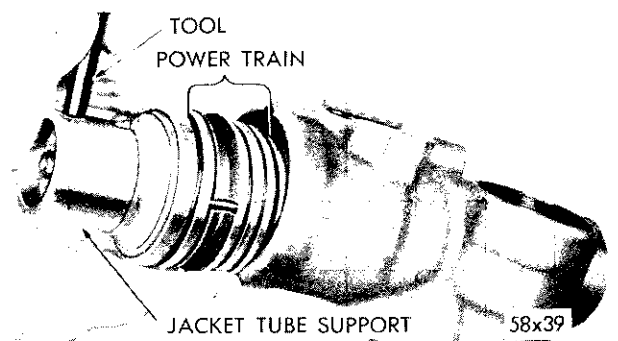


Fig. 28—Removing or Installing Power Train

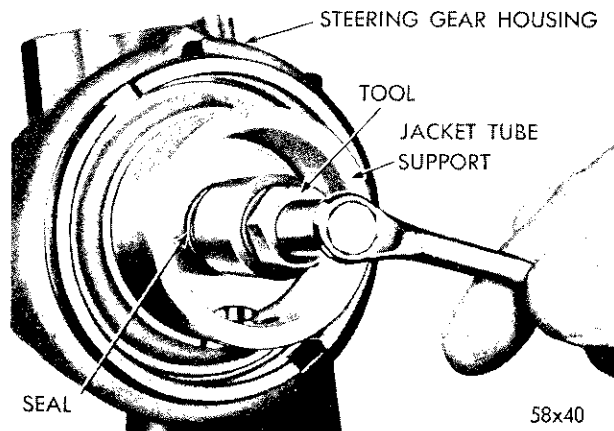


Fig. 29—Removing Worm Shaft Upper Seal

(9) Remove the cylinder head assembly.

NOTE: The worm and piston assembly is furnished as a complete assembly only.

25. COLUMN JACKET SUPPORT

a. Disassembly

(1) Remove the worm shaft upper seal with puller Tool C-3638 (Fig. 29).

NOTE: The column jacket support and worm shaft upper bearing are serviced as an assembly.

(2) Remove the large “O” ring from the groove in the jacket support.

(3) Remove the reaction seal from the groove in the face of the jacket support with air pressure directed into the ferrule chamber (Fig. 30).

(4) Inspect all grooves for burrs. Make sure the passage from the ferrule chamber to the upper reaction chamber is unobstructed.

b. Assembly

(1) Install the worm shaft upper oil seal using

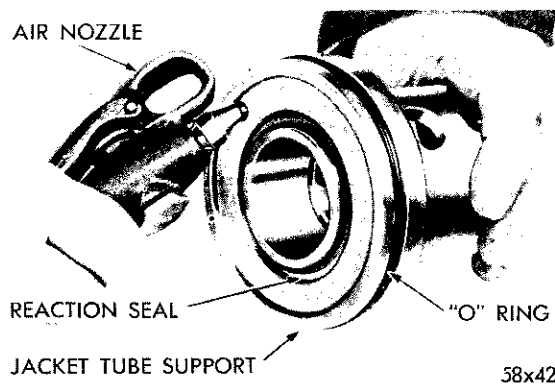


Fig. 30—Removing Reaction Seal from Jacket Support

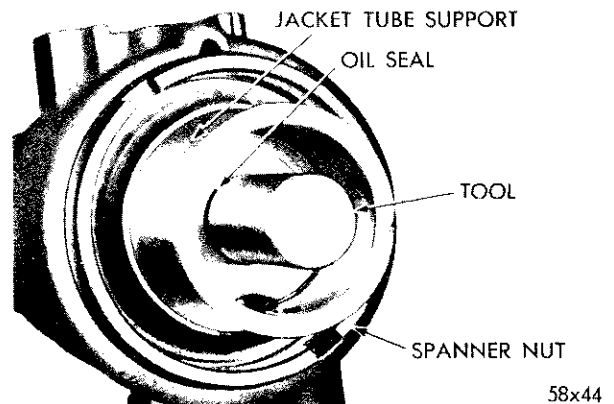


Fig. 31—Installing Worm Shaft Upper Seal

Tool C-3650 (Fig. 31) (with the lip of the seal toward bearing).

(2) Lubricate and install the reaction seal in the groove in the face of the column jacket support with the flat side of the seal out (Fig. 32).

26. CYLINDER HEAD

a. Disassembly

(1) Remove the two “O” rings in the two outer grooves in the cylinder head.

(2) Remove the lower reaction “O” ring in the groove in the face of the cylinder head. Apply air pressure into the oil hole located in the groove between the two “O” ring grooves (Fig. 33).

(3) Inspect the worm shaft seal in the cylinder head counterbore for possible damage; replace the cylinder head seal if necessary (Fig. 34).

b. Assembly

(1) Check the oil passage in the ferrule for obstruction and cylinder head lands for burrs, then

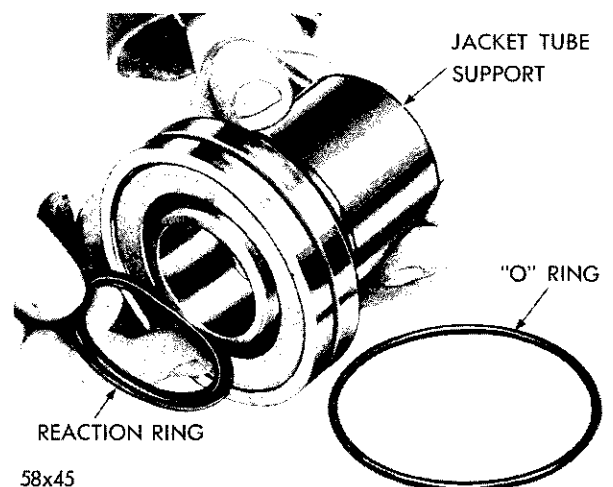


Fig. 32—Installing Reaction Seal into Jacket Support

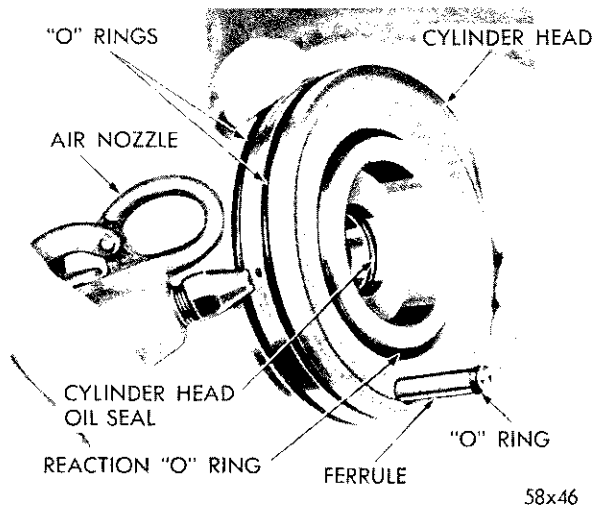


Fig. 33—Removing Reaction Ring Seal from Cylinder Head

lubricate the two large "O" rings and install in the grooves on the cylinder head.

(2) Install the cylinder head oil seal, back-up ring and retainer (if removed). Make sure the retainer is seated in the groove.

(3) Install the lower reaction seal in the cylinder head groove.

NOTE: The small "O" ring for the ferrule groove should be installed after the worm shaft bearing preload has been established; otherwise, the small "O" ring will be damaged by the reaction springs and center bearing spacer.

27. STEERING VALVE ASSEMBLY (Fig. 35)

a. Disassembly

(1) Remove the two screws attaching the pres-

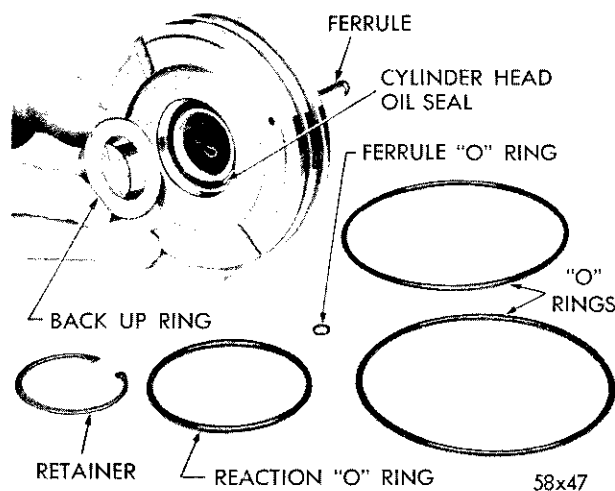


Fig. 34—Removing Cylinder Head Seal

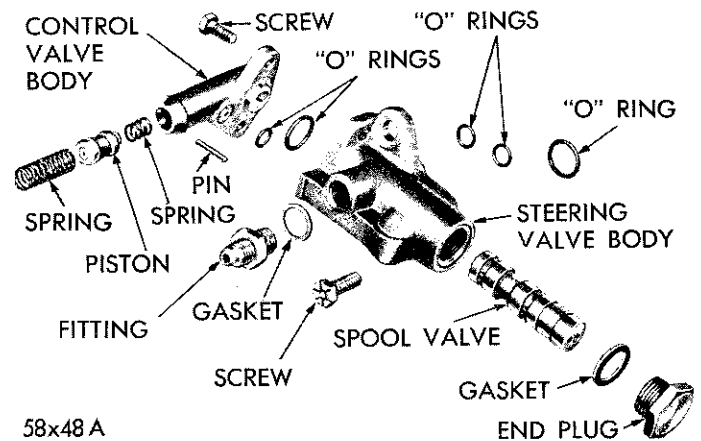


Fig. 35—Control Valve (Disassembled)

sure control valve body to the steering valve body and remove the back pressure control valve assembly.

(2) Compress the pressure control valve spring and remove retainer pin, spring, pressure control valve piston and back pressure valve cushion spring.

(3) Carefully shake out the steering valve piston. Check the valve for nicks, burrs and scores.

NOTE: If the steering valve or valve housing is damaged, replace the valve and housing assembly.

Do not remove the valve end plug unless inspection indicates a leak at the seal.

Small burrs and nicks may be removed with crocus cloth, if extreme care is used not to round off the sharp edge portion of the valve. The sharp edge portion is vitally important to the operation of this valve.

Clean the valve bodies and valve pistons thoroughly in clean solvent. Blow out all passages and blow parts dry with dry compressed air. Lubricate pistons and bores with MoPar No. 2084329 Power Steering Fluid.

b. Assembly

(1) Install the steering spool valve into valve housing so that the valve lever hole is aligned with the lever opening in the valve body. Valve must be perfectly free in the valve body without sticking or binding.

(2) Install a new seal and end plug (if removed). Tighten the plug to 25 foot-pounds torque.

(3) Install the back pressure valve cushion spring in the back pressure valve body. Lubricate the back pressure valve piston and insert the hose end of the

piston into the body bore. Check for smooth operation. Be sure lower spring is not cocked.

(4) Install the pressure control valve spring on top of the valve piston. Compress the spring and install the retaining pin.

(5) Install the two "O" rings and assemble the back pressure valve assembly to the control valve body. Tighten the two attaching screws to 10 foot-pounds torque.

(6) If the pressure inlet fitting has been removed, replace the copper gasket and retighten the fitting to 30 foot-pounds torque.

28. GEAR SHAFT

a. Disassembly

(1) Remove the gear shaft adjusting screw lock nut and remove the small "O" ring from the top of the cover and large "O" ring from the base of the cover (Fig. 36).

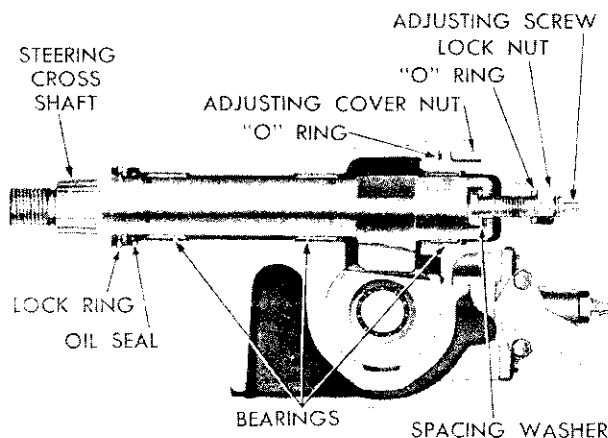
NOTE: The needle bearing in the cover consists of 51 needles originally retained in the cover by a heavy grease to facilitate assembly. This grease, however, will have become dissolved in the hot hydraulic fluid with the unit in operation.

CAUTION

If for some reason, the cover assembly must be removed from the gear shaft, the 51 needles will fall out of the cover. If any needles (51) become lost, it will be necessary to replace the cover and bearing as an assembly. Use wheel bearing grease to retain the needle rollers in the cover when reassembling.

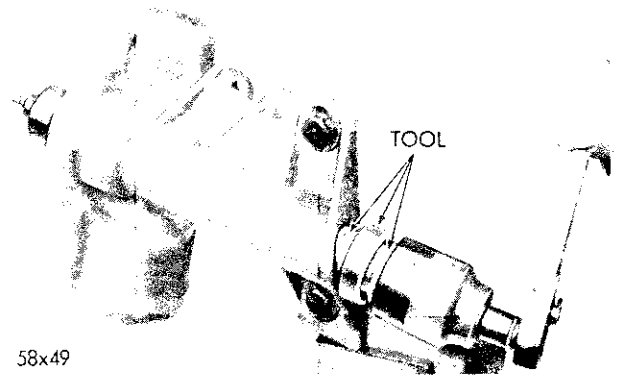
b. Assembly

(1) Lubricate a new small "O" ring and install it



58x283

Fig. 36—Steering Gear Housing (Sectional View)



58x49

Fig. 37—Removing Gear Shaft Oil Seal

over the adjusting screw into position at the top of the gear shaft cover.

(2) Lubricate an "O" ring and gear shaft cover with petrolatum and install the "O" ring in the cover groove.

(3) Install the adjusting screw lock nut, but do not tighten.

29. STEERING GEAR HOUSING

a. Disassembly

(1) Attach the steering gear housing on the holding fixture Tool C-3323 and place the holding fixture in a vise.

(2) Remove the oil seal snap ring with pliers Tool C-3229 and remove the seal back-up washer.

NOTE: The gear shaft oil seal should be removed with the gear shaft installed in the housing.

(3) Remove the gear shaft oil seal with adapter SP-3056 and Tool C-3350 (Fig. 37) as follows:

a. Slide the threaded position of adapter SP-3056 over the end of the gear shaft.

b. Install the nut section of Tool C-3350 on the shaft.

c. Maintain pressure on adapter SP-3056 with the nut of Tool C-3350 while turning the adapter into the seal until it has bottomed in the seal.

d. Install the two half-rings and retainer over both portions of the tool.

e. Turn nut counter-clockwise; as the hexagon nut is removed from the shaft, the seal will be pulled from the housing.

(4) If necessary to remove the housing bearings, use puller Tool C-3332 with adapter SP-3062 (Fig. 38) as follows:

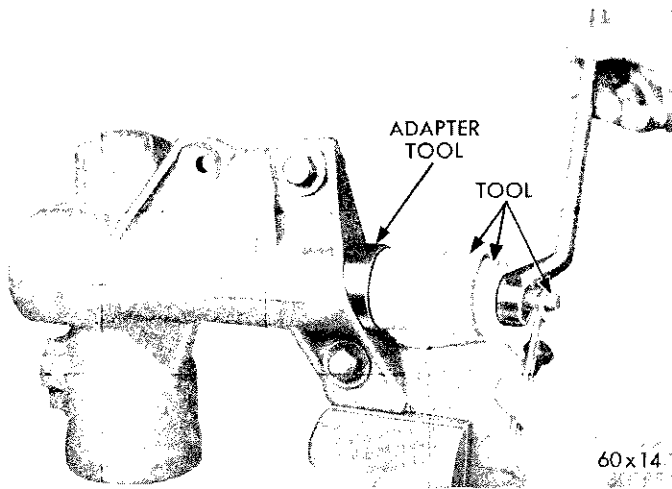


Fig. 38—Removing Housing Lower Bushing

a. Engage jaws behind the bearing, hold the center screw while turning the puller nut to pull the lower (outer) needle bearing out of the housing.

b. Use puller, Tool C-3332, to remove the upper (inner) needle bearing.

b. Assembly

(1) Install the gear shaft bearings into the housing with driver, Tool C-3333 (lettered end of the bearings against the driver tool). Drive the bearings to $\frac{1}{8}$ inch below edge of the counterbore.

(2) Install the gear shaft oil seal into the housing (lip of seal toward needle bearing) with adapter SP-3052 and Tool C-3350 as follows:

a. Place the adapter against the seal and thread the tool nut on the threaded end of the gear shaft (Fig. 39).

b. Turn the tool nut on the gear shaft until the shoulder of the adapter tool contacts the housing.

c. Remove the tools and install the oil seal back-up washer and snap ring.

CAUTION

Make sure the snap ring is properly seated in the groove in the housing (Fig. 36).

30. ASSEMBLY OF POWER TRAIN (Figs. 1 and 40.)

If the power piston ring was removed at disassembly, check the condition of the rubber sealing ring and install a new cast iron ring with Tool C-3676, Piston Ring Remover and Installer, as follows:

a. Position Tool C-3676 in the vise (Fig. 41).

b. Slide a new piston ring into place in the piston groove.

c. Place the piston and ring assembly in Tool C-3676 with the lower part of the piston and the ring resting on the land of tool.

d. Press down on the piston to bottom the piston ring in the piston groove, forcing the open ends of the ring out for ease of locking the ring. The ring should be positioned with ring hooks in line with the ball guide plug.

(1) Place the piston assembly in a vertical position (worm shaft up) in a vise equipped with soft jaws.

(2) Slide the cylinder head assembly (ferrule up) on the worm shaft, check the worm shaft seal ring making sure the gap is closed to avoid damaging the ring as the cylinder head moves against the piston flange.

(3) Lubricate with No. 2084329 Power Steering Fluid and install the following parts in order:

a. Lower thrust bearing race (thick).

b. Lower thrust bearing.

c. Lower reaction spring (with small hole over the ferrule).

d. Lower reaction ring (flange up so the ring protrudes through the reaction spring and contacts the reaction "O" ring in the cylinder head).

e. Center bearing race.

f. Upper thrust bearing.

g. Upper thrust bearing race (thin).

h. Start the worm shaft thrust bearing nut (do not tighten).

(4) Turn the worm shaft counter-clockwise one-half turn. Hold the worm shaft in this position while

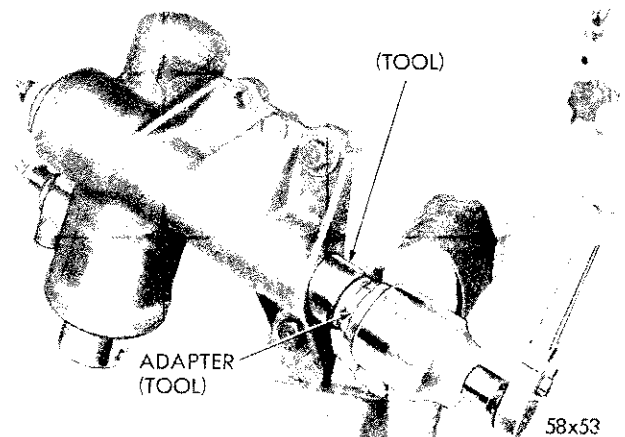
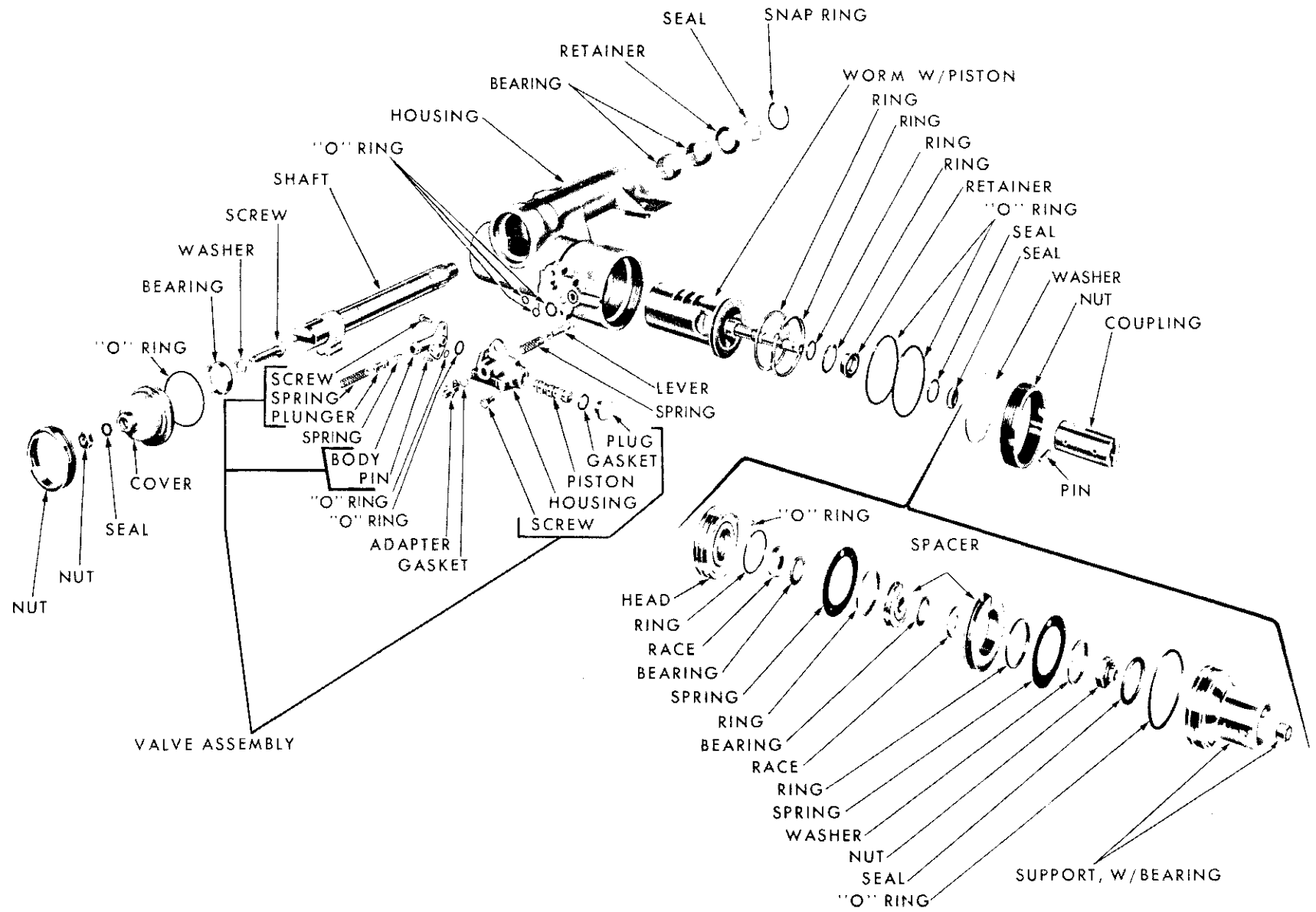


Fig. 39—Installing Gear Shaft Oil Seal



60x18

Fig. 40—Steering Gear (Exploded View)

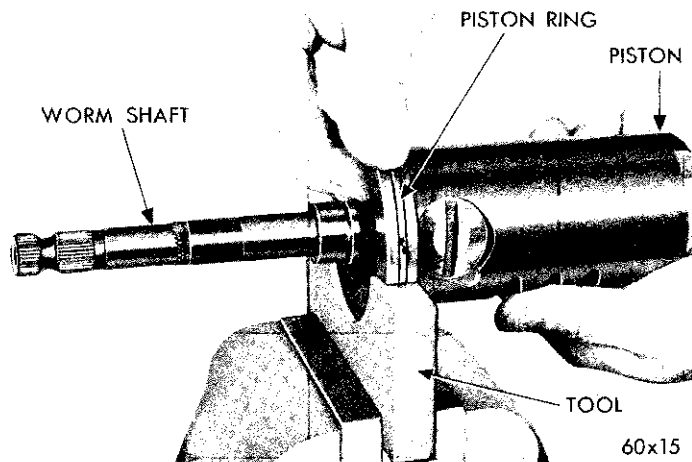


Fig. 41—Removing or Installing Piston Ring

tightening unit to 50 foot-pounds torque to pre-stretch the worm shaft threads.

CAUTION

If the worm shaft is turned more than one-half turn, the cylinder head sleeve will clear the oil seal ring on the worm shaft. Always position the worm shaft oil seal ring before bottoming the cylinder head against the piston top flange to avoid damaging the oil seal ring.

(5) Loosen the adjusting nut. Place several rounds of cord around the center bearing race (Fig. 42). Make a loop in one end of the cord and hook the loop of a distributor breaker arm spring scale Tool MTU-36 in the cord loop. Pulling the cord will cause the bearing race to rotate. Retighten the worm bearing adjusting nut while pulling on the cord with the scale. If the adjusting nut is tightened

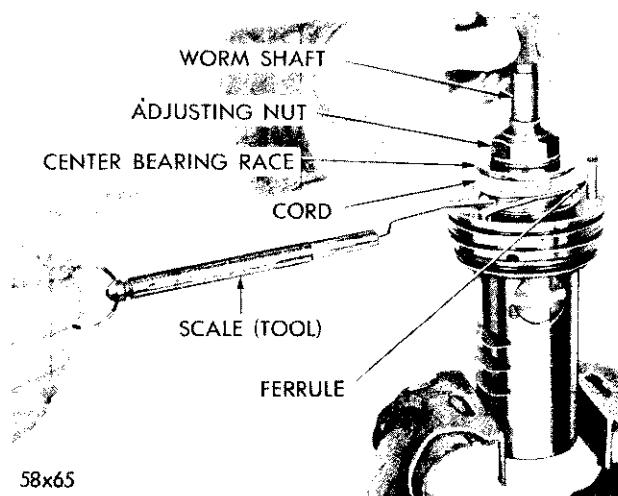


Fig. 42—Checking Center Bearing Race Preload

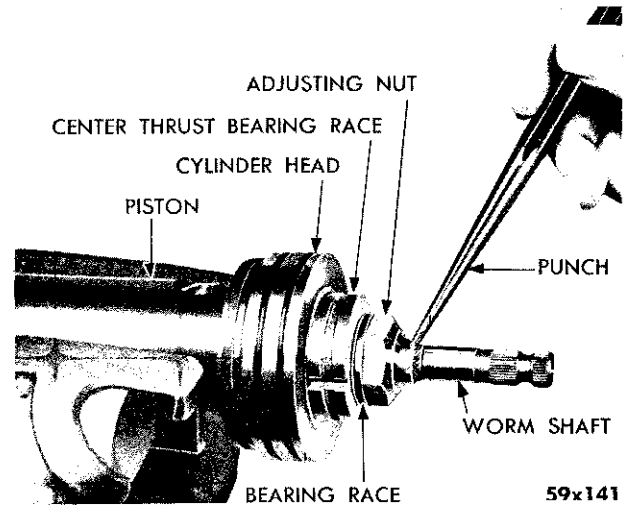


Fig. 43—Staking Worm Shaft Bearing Adjusting Nut

properly, reading on the scale should be 8 to 16 ounces (12 ounces preferred) while the bearing race is turning.

CAUTION

Place a support under the adjusting nut during the staking operation to avoid brinelling the piston and worm bearings.

(6) Stake the upper part of the worm shaft adjusting nut into the knurled area of the shaft as follows:

- a. Hold a 1/4 inch flat end punch on the center line of the worm shaft and perpendicular to the worm shaft and at a slight angle to the nut flange (Fig. 43).
- b. Strike the punch a sharp blow with a hammer and recheck the pre-load.

NOTE: If the adjusting nut moved during the staking operation, it can be corrected by striking the nut a glancing blow in the direction required to regain proper pre-load.

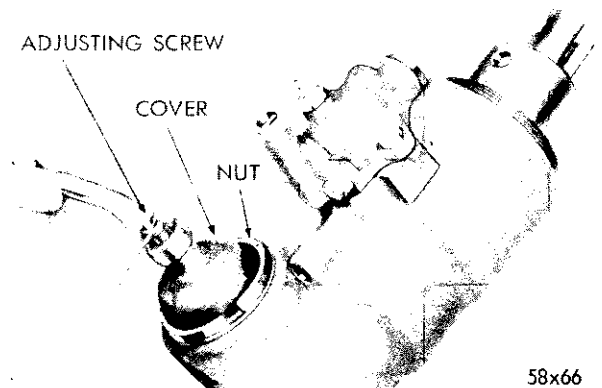


Fig. 44—Steering Gear Shaft Adjustment

c. After proper pre-load, stake the nut at three more locations 90 degrees apart around the upper part of the nut.

d. To test the total staking, torque the nut to 20 foot-pounds torque in either direction. If the nut does not move, the staking operation is satisfactory.

IMPORTANT

Recheck pre-load adjustment, the torque of 8-16 inch ounces must remain after the adjusting nut is securely locked.

(7) Install the center bearing spacer assembly over the center bearing race and engage the dowel pin of the spacer in the slot of the race and the slot of the spacer entered over the cylinder head ferrule.

NOTE: This will align the valve lever hole in the center bearing race with the valve lever hole in the center bearing spacer assembly.

(8) Install the upper reaction ring on the center bearing spacer with the flange down against the spacer.

(9) Install the upper reaction pressure spring over the reaction ring with the cylinder head ferrule through the hole in the spring.

(10) Install the reaction ring (without flange) inside the upper reaction ring.

(11) Lubricate the ferrule "O" ring with petrolatum and install it in the groove on the cylinder ferrule.

(12) Install the jacket support over the worm shaft, carefully engaging the cylinder head ferrule and the "O" ring and making sure the reaction rings enter the circular groove in the jacket support.

CAUTION

Form a .0015 inch feeler gauge into a coil and insert with the jacket support to protect the lip of the seal when installing over the worm shaft serrations.

(13) Align the parts on the power train so that the valve lever hole in the center bearing spacer assembly is 90 degrees counter-clockwise from the piston rack teeth and lock all the parts to the worm shaft by entering a drill rod or suitable drift through the jacket support holes and the groove in the worm shaft.

31. REASSEMBLY OF THE STEERING GEAR

(1) With the steering gear housing in holding fixture Tool C-3323 in approximate car position; lubricate the bore of the housing with petrolatum

and carefully install the power train assembly (Fig. 28) with the center bearing spacer valve lever hole in "UP" position to line up with the control valve lever clearance hole in the steering gear housing.

NOTE: Place a feeler stock, .0015 inch, to cover the aligning notch in the steering gear housing to protect the "O" ring seals when installing the gear train.

CAUTION

Make sure the cylinder head is bottomed on the housing shoulder (Fig. 13). Do not remove the power train locking pin (Fig. 28) until all parts are positioned in the steering gear housing.

(2) Align the valve lever hole in the center bearing spacer exactly with the clearance hole in the housing, using a suitable drift as an aligning tool. **Tool should not be removed until the spanner nut is securely tightened.**

(3) Install the column support spanner nut and tighten nut 110 to 200 foot-pounds torque with Tool C-3634 (Fig. 26).

(4) Set the piston at the center of travel and install gear shaft and cover assembly so that the sector teeth index with the piston rack teeth. Make sure the "O" ring is properly positioned in the face of the cover (Fig. 36).

(5) Install the cover spanner nut and tighten nut 110 to 200 foot-pounds torque with Tool C-3633 (Fig. 26).

(6) Install the valve lever (double bearing end first) into the center bearing spacer through the hole in the steering housing so that the slots in the valve lever are parallel to the worm shaft in order to engage the anti-rotation pin in the center bearing race (Fig. 13).

NOTE: Turn the worm until the piston bottoms in both directions and observe the action of the lever. It must return easily to its center position when the worm torque is relieved.

(7) Install the valve body on the housing making sure that the valve lever enters the hole in the piston (Fig. 16). Be sure the "O" ring seals are in place. Tighten the valve mounting screws to 30 inch-pounds torque.

32. FINAL TEST, ADJUSTMENTS AND SPECIFICATIONS

(1) Remove the oil reservoir cover and fill the reservoir to the bottom of the filler neck opening.

(2) Connect the test hoses, Tool C-3211 and Tool C-3318, with the proper adapters to the hydraulic pump on the car with pressure gauge Tool C-3309B installed between the pump and the steering gear to register pressures.

(3) Start the engine and operate at idle to bring the steering gear to normal operating temperature.

(4) Expel all air from the unit by turning the worm shaft several times to the right and then to the left.

(5) Refill the reservoir before proceeding with the following test and adjustments on bench:

a. Tighten the steering valve body attaching screws to 7 foot-pounds torque.

b. With the gear shaft on center, tighten the gear shaft adjusting screw until backlash just disappears. Tighten $1\frac{1}{4}$ turn from this position and while holding the adjusting screw in this position, tighten the lock nut (Fig. 44).

NOTE: This will bring the piston rack and the sector teeth in full alignment.

c. Turn off the hydraulic power to the unit. Operate the unit manually for a minimum of 180 degrees from center in each direction, measured at the worm shaft.

d. With hydraulic power applied to the unit and with the gear shaft on center plus or minus 2 degrees, readjust the gear shaft backlash. This will require loosening the adjusting screw until backlash is evident. Retighten the adjusting screw until backlash just disappears. Continue to tighten $\frac{3}{8}$ to $\frac{1}{2}$ turn from this position and tighten the lock nut to 50 foot-pounds torque to maintain this setting.

e. Starting from a point at least one full turn of

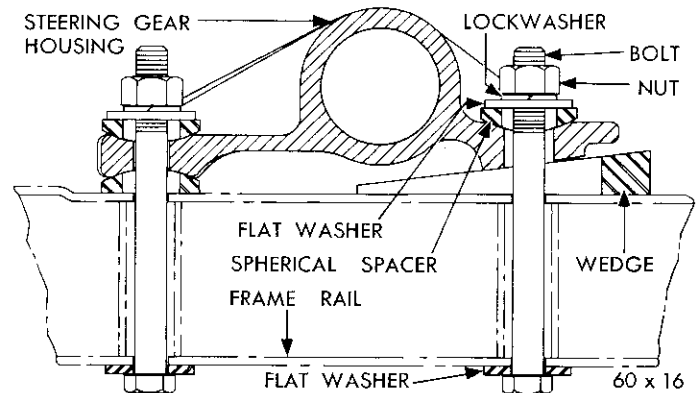


Fig. 46—Steering Gear Mounting

the worm shaft either side of center, the torque at the gear shaft required to turn the unit through center at 2 rpm in each direction shall not exceed 25 foot-pounds or vary more than 5 foot-pounds from left to right. Perform this operation carefully to prevent a lockup in the steering gear.

f. Adjust the torque evenly by moving the steering valve assembly by tapping gently on the back pressure valve body attaching screws to move the valve body up on the steering housing and tap on the end plug to move the valve body down the housing.

NOTE: If the torque is greater to the right, move the control valve body "Down." If the torque is greater to the left, move the valve body "Up." After positioning the valve to obtain equal torque, tighten the valve body attaching screws to 15 foot-pounds torque to maintain this setting.

g. With the unit at or near full turn in either direction, attempt to return the unit to the center by applying a torque wrench at the steering gear cross shaft. Hold the worm shaft until the cross shaft torque builds up to 50 foot-pounds torque. Release the worm shaft and maintain a constant steady pull on the cross shaft (turning cross shaft slowly). If the cross shaft torque does not drop to 25 foot-pounds torque maximum as the piston passes through the center, check for too much interior drag; binding valve lever, binding valve spool, or cross shaft adjustment is too tight.

(6) With the unit under power, but without any load, the torque required to rotate the worm shaft through an included angle of 180 degrees (90 degrees either side of center) shall be 6 to 9 inch-pounds. Disconnect test equipment and mounting fixture and install the unit in the car.

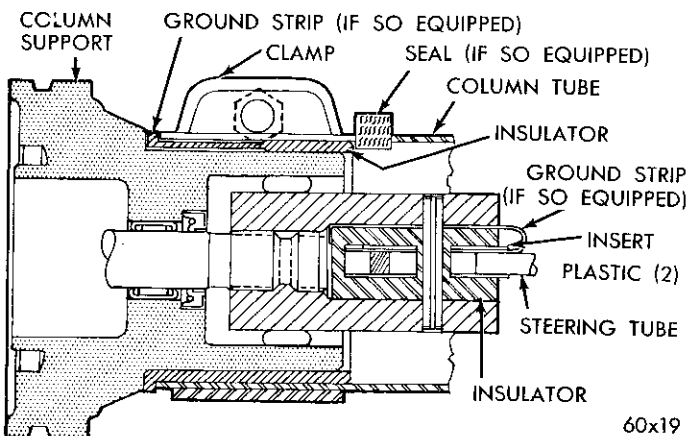


Fig. 45—Jacket Tube Installation

33. INSTALLATION (Steering Gear)

(1) Install the steering tube rubber insulator,

plastic insert, upper steering tube and coupling pin and horn ground strap.

(2) Enter the steering gear assembly into the engine compartment and through the opening in the floor panel. Install the housing attaching bolts, flat washers, swivel washers and nuts, but do not tighten. The swivel washer permits alignment of the housing to the dash.

(3) Inspect the jacket bearing snap ring in the steering tube lower groove. Install a new ring if the old ring will not fully seat in the groove. Install the spacer washer, spring and tapered spacer on top of the snap ring.

(4) Assemble the horn ground strap (copper) to the jacket tube support rubber insulator boot and install this assembly into the lower end of the jacket tube (Fig. 45).

(5) Lubricate (powder lubricant) the end of the steering gear column jacket support and insulator boot to facilitate installation and slide the jacket tube and insulator boot assembly down against the shoulder on the jacket tube support. Tighten the clamp bolts securely.

NOTE: There must be at least 1/16 inch clearance between the bottom face of the jacket tube clamp and the column support spanner nut to avoid metal to metal contact.

(6) Install the jacket tube support bracket clamp at the instrument panel. Tighten clamp bolts to 15 foot-pounds torque.

(7) Connect the directional signal wires and horn wire at the connectors.

(8) Pry the steering column tube up with a wedge shaped tool or screwdriver far enough to install the truarc ring in the column tube upper groove next to the bearing. Make sure the lock ring seats in the groove.

IMPORTANT

This lock ring places the upper column tube in proper relation with the worm shaft coupling pin.

(9) Install the steering wheel and the steering wheel nut. Tighten the nut to 40 foot-pounds torque.

(10) Install the turn signal cancelling mechanism on jacket tube (Fig. 1, Paragraph 6). Make sure column jacket does not restrict lever movement (Chrysler models only).

(11) Install the stationary plate, bushings, horn ring and attaching screws. Connect the horn wire at the stationary plate and install the steering wheel ornament.

(12) Tighten the jacket tube to the instrument panel clamp screws. Tighten screws to 50 inch-pounds torque.

(13) Tighten the front upper and the lower gear housing to the frame attaching bolts to 20 foot-pounds torque.

(14) Install a wedge over the rear bolt (Fig. 46) between the housing and the frame so that the tapered surfaces match, wedge lightly into place and tighten the three attaching bolts to 50 foot-pounds torque.

(15) Install the steering gear arm, washer and nut. Tighten to 120 foot-pounds torque.

(16) Install the steering center link, nut and cotter pin.

(17) Connect the pressure and the return hoses.

(18) Install the hydraulic brake line at the master cylinder and brake tee. Bleed the brakes as necessary.

(19) Refill the reservoir. Expel all the air from the system by turning the steering wheel several times to the right and left.

POWER STEERING PUMP (SLIPPER TYPE) SERVICE DIAGNOSIS

34. HARD STEERING

- a. Loose or worn pump belt.
- b. Oil on pump belt.
- c. Power steering pump output low. See Paragraph "Pressure Check."

35. TEMPORARY INCREASE IN EFFORT WHEN TURNING STEERING WHEEL

- a. Low oil level in pump reservoir.
- b. Loose or worn pump belt.
- c. Oil on pump bolts.
- d. Defective power steering pump.

36. LEAKS

- a. Pressure and return hose connections and fittings.
- b. Reservoir-to-pump body "O" ring or mounting screws.
- c. Drive shaft oil seal.

37. NOISE

- a. Improper oil level.
- b. Reservoir air vent plugged.
- c. Air in system.
- d. Dirt in pump.

- e. Pump bushings, shaft, slippers, rotor worn or damaged.

38. LOW OIL PUMP PRESSURE

- a. Pump drive belt or pulley loose.
- b. Low oil level in reservoir.
- c. Pressure relief valve spring weak, or valve stuck in open position.
- d. Flow control valve stuck or a broken flow control valve spring.
- e. Worn pump rotor, slippers or broken and distorted springs.

SLIPPER TYPE POWER STEERING PUMP

39. DESCRIPTION AND OPERATION

The slipper type power steering pump is a belt-driven constant displacement pump.

In operation (Fig. 47) the spring-loaded slippers in the pump rotor are in contact with the eccentric, inside diameter of the housing. As the rotor revolves, the slippers force the oil from the inlet side of the pump to the flow control valve. Orifices in the valve permit a flow of approximately two gallons per minute through the valve before the valve moves to the right to allow the excess to flow back to the inlet side of the pump. Maximum pressure in the system is limited by the pressure relief valve. The valve opens into the reservoir when the pressure exceeds the maximum pressure specified.

40. REMOVAL

NOTE: Before removing the pump, make a pressure test as outlined in Paragraph 20.

(1) Loosen the pump attaching bracket and remove the drive belt.

(2) Place the container under the pump and disconnect both hoses at the pump. Cap the ends of the hoses and keep the ends of the hoses high.

(3) Remove the bolts attaching pump support brackets to the engine and remove the pump, pulley and pump brackets as an assembly.

41. DISASSEMBLY

NOTE: Disassembly of the pump is not recommended as the internal parts of the pump are not serviced separately. The only parts that are serviced are the pump assembly, filler cap, reservoir, "O" ring and gasket, pump shaft oil seal, flow control plug, snap ring and relief valve.

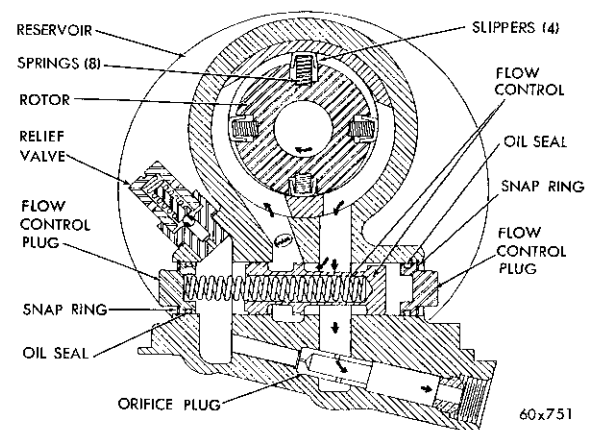


Fig. 47—Slipper Type Power Steering Pump

(1) Clean the exterior of the pump before disassembly.

(2) Remove the filler cap and drain the reservoir.

(3) Remove the brackets, reservoir screws, gasket and "O" ring.

(4) Using spacer washers between the front bracket and the pump, reinstall the front bracket for use as a holding fixture. Clamp the bracket in a vise (Fig. 48).

(5) Remove pulley with Tool C-3615 as follows:

a. Engage one half-collar under the flange of the pulley hub.

b. Position the screw shaft and nut with the flange section inside the half-collar.

c. Engage other half-collar under pulley hub and over the flange of the screw shaft nut and install the retainer sleeve over both half-collars.

d. Hold the nut from turning and turn the screw inward to remove the pulley (Fig. 48).

(6) Remove the relief valve assembly and the gasket (Fig. 49). **The relief valve is serviced only as an assembly.**

(7) Remove the flow control valve plug snap ring with pliers, Tool C-3229.

(8) Remove the flow control valve plug with Tool C-3655 (Fig. 50) by threading the tap securely into the plug. Place spacer and nut over the tap. Hold the tap and tighten the nut to remove the plug.

CAUTION

The valve is spring loaded.

(9) Remove the oil seal by threading Tool C-3642

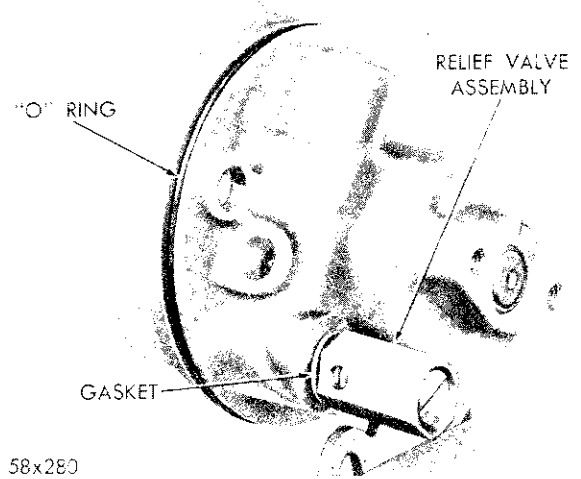


Fig. 49—Removing Relief Valve

far enough to engage the metal portion of the seal (Fig. 51). Turning the puller center screw while holding tool body will force the seal assembly from the pump.

42. CLEANING AND INSPECTION

Clean all parts in mineral spirits or other suitable solvent, discard the body to reservoir "O" ring. The pump shaft should turn freely and should be smooth at the seal contact area. The flow control valve bore and the valve should be smooth, free of scores or scratches. The valve must operate freely in the bore.

NOTE: Small scratches can be removed with crocus cloth. DO NOT round off the square edges on the valve as they are vitally important to this type of valve. The housing bore should not be honed. If the bore is scratched or worn, the pump should be replaced.

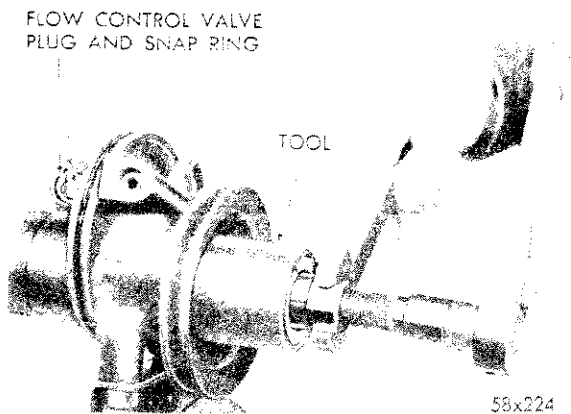


Fig. 48—Removing Pump Pulley

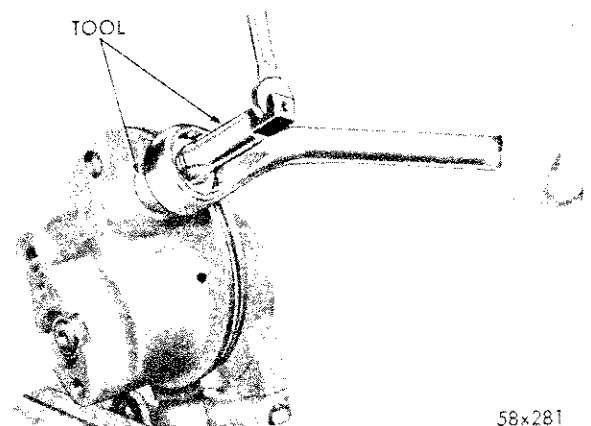


Fig. 50—Removing Flow Control Valve Plug

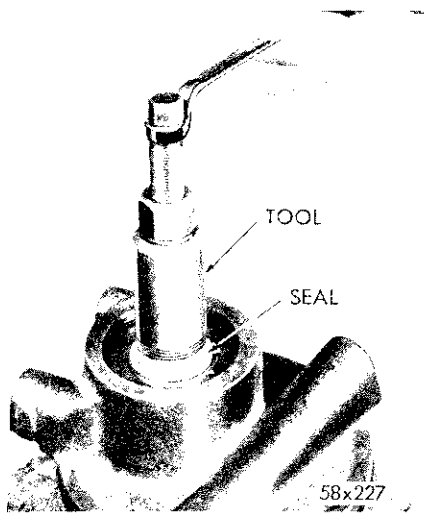


Fig. 51—Removing Pump Oil Seal (Typical)

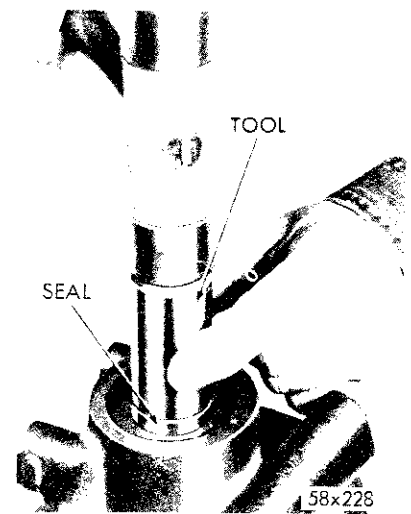


Fig. 53—Installing Pump Oil Seal (Typical)

43. ASSEMBLY

(1) Install the flow control valve spring and valve.

(2) Drive a new plug into base with Tool C-3233 only far enough to place the snap ring in the bore (Fig. 52) then drive snap ring and plug with Tool C-3233 until snap ring seats in its groove in the housing bore.

(3) Install the new oil seal with the lip of the seal toward the pump. Use Tool C-3640 to drive the seal flush with insert (Fig. 53).

(4) Install the pressure relief valve and gasket assembly.

(5) Remove the front bracket. Support the pump body on the holding fixture, Tool C-3643, with the tool dowel pins in the pump bolt holes so that the

pressure will be absorbed by the lower end of the pump shaft (Fig. 54).

CAUTION

The pump must be supported in a manner in which all pressing force will be applied to the shaft only; otherwise, the pump body and rotor will be damaged.

(6) Install the pulley with a heavy duty arbor press. Press on the pulley hub only until the hub is flush with the end of the pump shaft.

(7) Lubriplate the large "O" ring and the reservoir cap screw gasket and install both on the pump body.

(8) Install the reservoir and pump brackets. Tighten the screws to 10 foot-pounds torque.

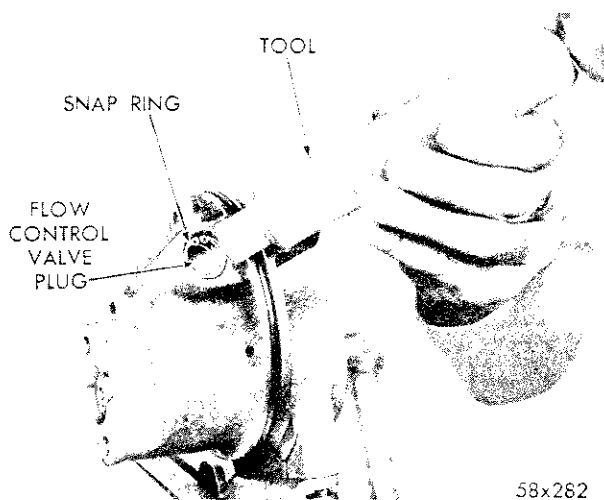


Fig. 52—Installing Flow Control Valve Plug

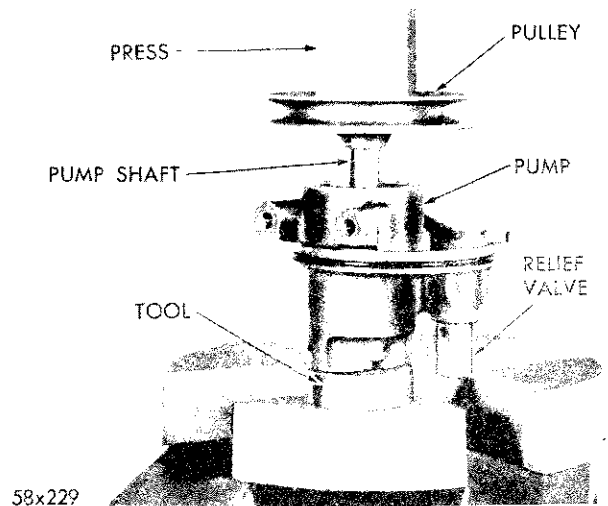


Fig. 54—Installing Pump Puller (Typical)

44. INSTALLATION

(1) Position the pump on the engine and install the attaching bolts.

(2) Install the drive belt, adjust (see "Accessory Belt Drives") and tighten bolts to 30 foot-pounds torque.

(3) Connect the pressure and return hoses.

(4) Fill the pump reservoir with No. 2084329 Power Steering Fluid.

(5) Start the engine, turn the steering wheel all the way to the left and back all the way to the right several times to expel the air from the system, then turn off ignition switch to stop engine and recheck fluid in reservoir.
