Section X

STEERING

CONTENTS

MANUAL

COAXIAL POWER STEERING

DATA AND SPECIFICATIONS

MODELS	C-75-1	C-75-2	C-76	IM-1, 2 & 4
Steering Type				
Manual	Worm and Three Tooth Roller	None	None	None
Power	Rack and Gear Sector, Recirculating Ball Nut			
Ratio				
Manual	20.4	....	....	None
Power	16.3	16.3	16.3	16.3
Turning Radius (Curb to Curb)	45.4	45.4	....	49.5
Number Wheel Turns				
Manual	5.6	....	....	....
Power	3.5	3.5	3.5	3.5
Tread—Front	61.0	61.0	61.2	61.9
Rear	59.7	59.7	60.0	62.4
Wheel Base	126.0	126.0	126.0	129.0

DATA AND SPECIFICATIONS (Cont'd)

MODELS	C-75-1	C-75-2	C-76	IM-1, 2 & 4
Camber				
Left	+ ¼ degree ± ¼ degree			
Right	0 degree + ¼ degree			
	Preferred Left + ⅜ degree, Right 0 degree			
	Left ¼ degree to ½ degree algebraically greater than right			
*Caster				
Manual	— ¾ degree ± ¾ degree with Manual Steering			
Power	+ ¾ degree ± ¾ degree with Power Steering			
Toe-In (Outside Thread Inches)	3/32 to 5/32 in. (⅛ in. Preferred)			
Tow-Out on Turns	21 degrees 45 minutes ± 1 degree (inner wheel when outer wheel is 20 degrees)			
Steering Axis Inclination at Camber (Degree)	5 to 7 degrees at 0 degree			
Steering Knuckle Type	Ball and Socket			
Front Wheel Bearing Type	Tapered Roller Bearing			
Inner Bearing Size	1.25	1.25	1.25	1.375
Outer Bearing Size	.75	.75	.75	.844
Spindle Thread Size	¾—16 (NF)			
Steering Linkage Type	Symmetric Idler Arm (Equal Length Tie Rods)			

*Caster should be equalized as near as possible on Left and Right wheel.

COAXIAL POWER STEERING

MODELS	C-75, C-76, IM-1, 2 & 4
Fluid Capacity of Hydraulic System	2 qts.
Fluid Capacity of Worm Housing	14 Fluid ounces
Gear Housing	12 Fluid ounces
Type of Fluid	Automatic Transmission Fluid (Type A)
Pump Reservoir Capacity Including Hoses	28 Fluid ounces
Maximum Pump Pressure	750 to 900 psi.
Maximum Fluid Flow at 3,000 R.P.M.	2.25 gal.
Maximum Pump Rotor Clearances	.012

COAXIAL POWER STEERING (Cont'd)

MODELS	C-75, C-76, IM-1, 2 & 4
Flow Control Valve Spring	
Free Length	4.0 inches
Working Length	1.5 inches
Force at Working Length	12.5± 1.25 lbs.
Pressure Relief Valve Spring	
Free Length	.825 inch
Working Length	35/64 inch
Force at Working Length	12.5 to 14 lbs.

SPECIAL TOOLS

MANUAL STEERING

Tool Number	Tool Name
C-3402	Pitman Arm Puller
C-3428	Steering Wheel Puller

COAXIAL POWER STEERING

Tool Number	Tool Name
C-3128	Pliers—Snap Ring
C-3211	Hose—High Pressure
C-3229	Pliers—Gear Shaft Adjusting Screw Snap Ring
C-3309B	Gauge—Pressure Check
C-3318	Hose—Low Pressure
C-3319	Holding Nut—Worm Shaft Bearing
C-3320A	Nut Wrench—Worm Shaft

COAXIAL POWER STEERING (Cont'd)

C-3321	Holding Spanner—Worm Connector
C-3323	Fixture—Holding
C-3326	Nut Spanner—Worm Connector
C-3328	Nut Spanner—Upper Piston Rod
C-3329	Control Valve Spacer Seal-Installing Thimble
C-3331A	Driver and Pilot—Piston Rod Seal Installing
C-3332	Remover—Gear Shaft Bearing
C-3333	Driver—Gearshaft Bearing
C-3350	Remover and Installer—Gear Shaft Seal
C-3392	Wedge—Coupling Removing
C-3554	Protector—Lower Piston Rod Seal
C-3401	Thimble—Gear Shaft Adjusting Screw "O" Ring Installing
C-3402	Pitman Arm Puller
C-3428	Puller—Steering Wheel
C-3445	Rod—Control Valve Centering
C-3555	Flange—Oil Leak Testing

TIGHTENING REFERENCE

MANUAL STEERING

	Foot-Pounds
Steering Gear to Frame Bolt	50
Steering Gear Pitman Arm Nut	120
Steering Wheel Nut	40
Steering Knuckle Arm Bolt	50

MANUAL STEERING

	Foot-Pounds
Steering Linkage Ball Stud Nut	40
Idler Arm Bolt Bushing Nut	60
Tie Rod Clamp Bolt and Nut	150 In.-Pounds

COAXIAL POWER STEERING GEAR

	Thread Size	Foot-Pounds
Hose Fitting Nut	7/16 x 20	*3/8 to 5/8 Turn or 15
Hose Fitting Nut	5/8 x 18	*1/4 to 1/2 Turn or 30
Pump to Gear Housing	1/2 x 20	20
Reservoir to Pump Bolt	1/4 x 20	10
Steering Gear to Frame Bolt	7/16 x 20	50
Steering Gear Pitman Arm to Shaft Nut	.....	120
Steering Linkage Ball Stud Nut	.....	40
Steering Wheel to Steering Shaft Nut	.....	40
Tie Rod Clamp Bolt and Nut	.....	150 In.-Pounds
Pump Flow Control and Relief Valve Adapter (Retaining)	.....	50
Upper Piston Rod Nut	.....	30
Gear Shaft Cover Screws	.....	25
Worm Housing to Gear Housing Screws	.....	25
Gear Shaft Adjusting Screw Lock Nut	.....	30

*The number of turns specified in tightening tube fittings and hose fittings is after initial finger tightening.

RESERVOIR

	Thread Size	Foot-Pounds
Reservoir Cover Bolt	¼ x 20	10
Flow Spring Retainer Fitting	.....	20
Bearing Cap to Body	.....	25

PUMP

	Thread Size	Foot-Pounds
Pump Assembly Bolt	5/16 x 18	15
Hose Connector Outlet	⅝ x 18	30
Flow Divider Valve Plug	⅞ x 14	20

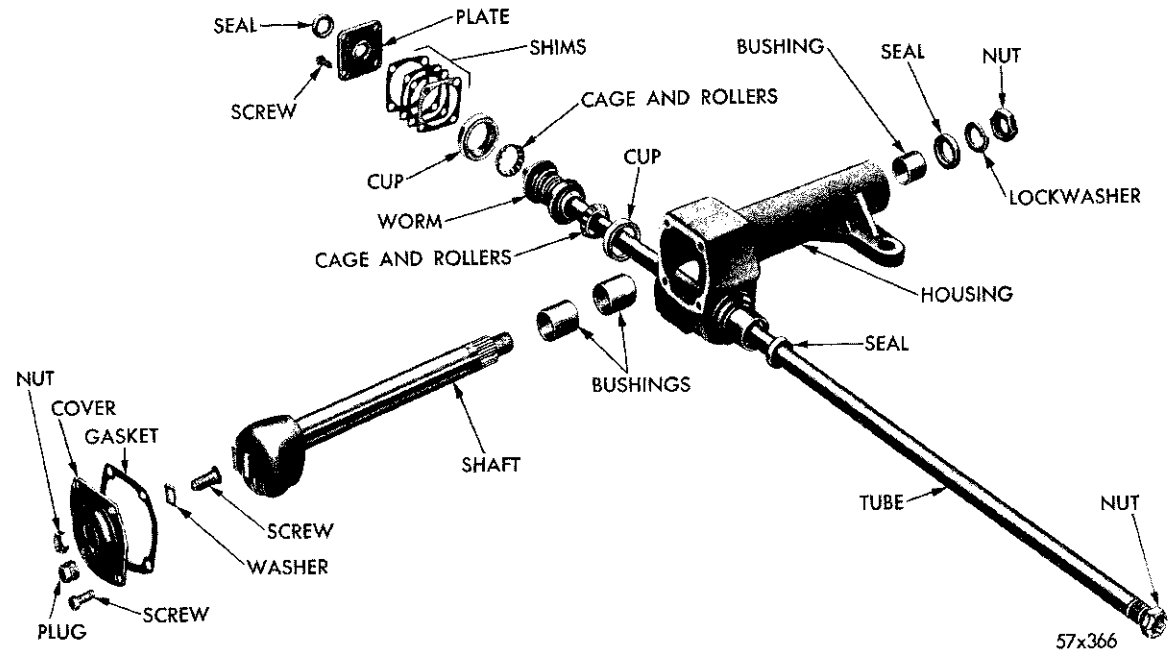


Fig. 1—Steering Gear Assembly (Disassembled View)

Section X
STEERING
MANUAL

A modified three-tooth roller and worm steering gear assembly (Fig. 1) is used in the Chrysler 1957 cars, equipped with manual transmissions. The steering gear is mounted inboard of the frame and can be serviced without removal from car.

The worm is integral with the steering tube and is supported at each end by tapered roller bearings. The worm bearing preload is adjusted by means of shims placed between housing and housing end cover. The steering gear shaft rotates in two bronze bushings pressed into the steering gear housing. The three-tooth roller on shaft is meshed with worm. When the steering wheel is turned, the worm rotates the steering gear shaft and roller, moving the steering gear arm, which is splined to end of shaft and held in place with a nut.

Backlash between steering gear shaft roller tooth and worm is controlled by an adjusting screw that is threaded through shaft and roller cover. The base end of adjusting screw is engaged in a slot in end of the steering gear shaft. Correct backlash can be obtained by turning adjusting screw in or out, as required.

The steering wheel and arm are splined to the steering tube and steering gear shaft, respectively. Both steering wheel and steering gear arm have master serrations to insure correct installation.

The high point is the point of least clearance between the worm and roller and is at midpoint of worm and roller travel.

NOTE: Proper steering gear adjustments influence the performance of the steering gear assembly. Care should be taken to accomplish proper shaft and worm high point setting since this adjustment limits the turning circle on each side of center.

1. REMOVAL OF STEERING WHEEL ASSEMBLY

Disconnect battery. Turn ornament counterclockwise and remove (Fig. 2). Disconnect wire from terminal, remove three screws, three bushings and remove horn ring (Fig. 3). Remove horn blowing contact ring switch from steering wheel hub. Loosen steering wheel nut three full turns and attach steering wheel puller Tool C-3428 and remove nut and steering wheel.

2. ASSEMBLY OF STEERING WHEEL ASSEMBLY

Attach steering wheel to hub and tighten nut.

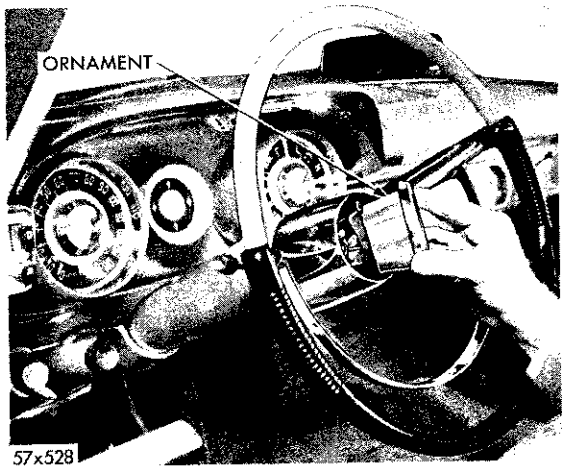


Fig. 2—Removing or Installing Steering Wheel Ornament

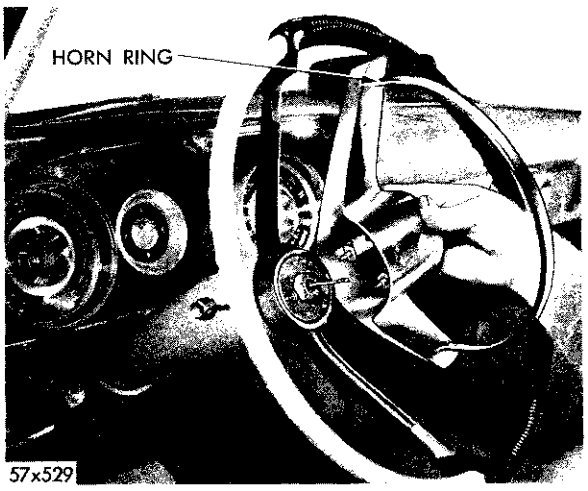


Fig. 3—Removing or Installing Steering Wheel Horn Ring

Install contact ring switch, connect wire to terminal. Install horn ring and tighten three screws. Turn ornament clockwise in hub. Reinstall battery cable.

3. REMOVAL OF MANUAL STEERING GEAR ASSEMBLY (Figs. 1, 2 and 3)

a. Removal (From Vehicle)

NOTE: It is not necessary to remove the steering column and mast assembly from car to service gear lower worm bearings and cross shaft assembly.

Disconnect the battery ground cable. Remove the steering wheel and disconnect the horn and turn signal wires at the instrument panel. Remove jacket tube clamp at the steering gear housing. Remove the steering jacket support clamp at the instrument panel. Remove the dust shield at the firewall. Remove the floor opening panel. Remove the steering gear arm with Tool C-3402. Remove the steering gear housing to frame bolts. Slide the steering gear jacket tube and remove control units rearward, through the drivers compartment as an assembly. Remove the brake pedal pad and remove gear from engine compartment side of firewall.

b. Disassembly Steering Gear Assembly (Fig. 1)

Remove gear shaft adjusting screw lock nut, shaft cover, and gasket, and steering gear shaft and roller tooth assembly. Remove gear shaft oil seal from housing. Remove cover and shims from bottom of housing. Remove steering tube and worm assembly, bearing cups and cages. Remove oil seal from steering gear lower cover.

c. Reassemble Steering Gear Assembly (Fig. 1)

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

NOTE: Assemble parts without lubrication. Lubrication should be done after adjustments are completed.

If either of the worm thrust roller bearings are damaged, replace both bearings. Use new oil seals. The steering gear housing and bushing assembly is serviced only as an assembly.

Insert worm and tube into housing with bearings and cups. Install shims and lower housing cover, making sure bearings are seated. When tightening cover, turn worm tube to be sure no bind exists. Final tightening of cover screws cause end play to disappear with torque of 3/8 to 3/4 pound required to rotate the tube, when measured with the pull applied at rim of steering wheel. Add or remove shims in event a bind or excessive end play occurs. Shims are available in .003, .006, .011 and .025 inch.

Install gear shaft. Before installing cover, turn adjusting screw all the way out. Place steering wheel on tube and rotate steering wheel in one direction to the end of its travel. Rotate wheel in other direction to the end of its travel, counting the turns. Rotate wheel back 1/2 full number of turns. This is center of travel (high point). Turn adjusting screw (clockwise) until all end play in roller shaft is gone. Rotate wheel to one end of its travel and apply a spring scale or torque wrench. With pull applied at rim of 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 bearing load by turning adjusting screw in or out. Install lock plate nut and steering gear arm. Fill gear housing with SAE 90 Gear Lubricant and check for leaks.

d. Installation (In Vehicle)

Install the steering column dust shield on column. Install the steering gear assembly from the engine side of fire wall. Install mounting bolts and attach nuts, tighten to 15 foot-pounds torque. Install the jacket tube clamp at the gear housing. Slide the steering gear jacket tube, and remove control assembly through the floor panel opening. Install the jacket support to dash bracket, align and tighten screws 50 inch-pounds torque. Tighten the steering gear housing to frame bolts 50 foot-pounds torque. Install the steering gear arm nut and washer and tighten 120 foot-pounds torque. Connect horn and turn signal wires at instrument panel. Install floor opening panel and dust shield. Install steering wheel, horn ring and ornament. Connect battery.

4. STEERING GEAR ALIGNMENT

A slight bind of the steering gear may be caused by shifting of body due to loosened bolts. Tighten body bolts. Loosen the steering gear at frame, and dash bracket to allow the

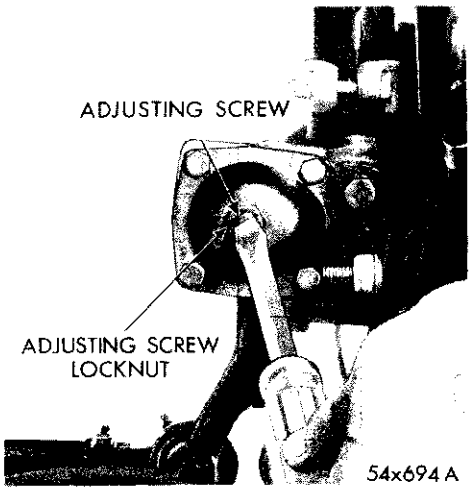


Fig. 4—Steering Gear Adjustments

steering gear to move in relation to the frame. Tighten mounting bolts 50 foot-pounds torque.

Position the center of steering column in center of the instrument panel. If this cannot be done by moving the frame bracket, add metal washer shims between frame and frame bracket to eliminate all bind.

5. ADJUSTMENT (In Car) (Fig. 4)

a. Adjusting Steering Tube Worm Bearings

Remove steering gear arm, drain the housing and disconnect horn wire at connector. Remove grease retainer cover at bottom of steering gear housing and remove necessary shims to eliminate excessive end play. Add shims of necessary thickness, to eliminate a binding condition. If any tightness exists, too many shims have been removed or the steering assembly is out of alignment. See "Steering Gear Alignment," Paragraph 3.

b. Adjustments of Roller Tooth and Worm (In Car)

Disconnect steering gear arm at link. Rotate steering wheel to mid-position and check for backlash by attempting to move steering gear arm back and forth. If backlash exists, remove roller shaft adjustment screw locknut and tighten adjusting screw enough to eliminate free play. Be sure the roller shaft and worm do not bind. Check backlash again. Install adjusting screw locknut and steering gear arm.

6. SERVICING THE IDLER ARM (Fig. 5)

The idler arm and bushing is serviced as an

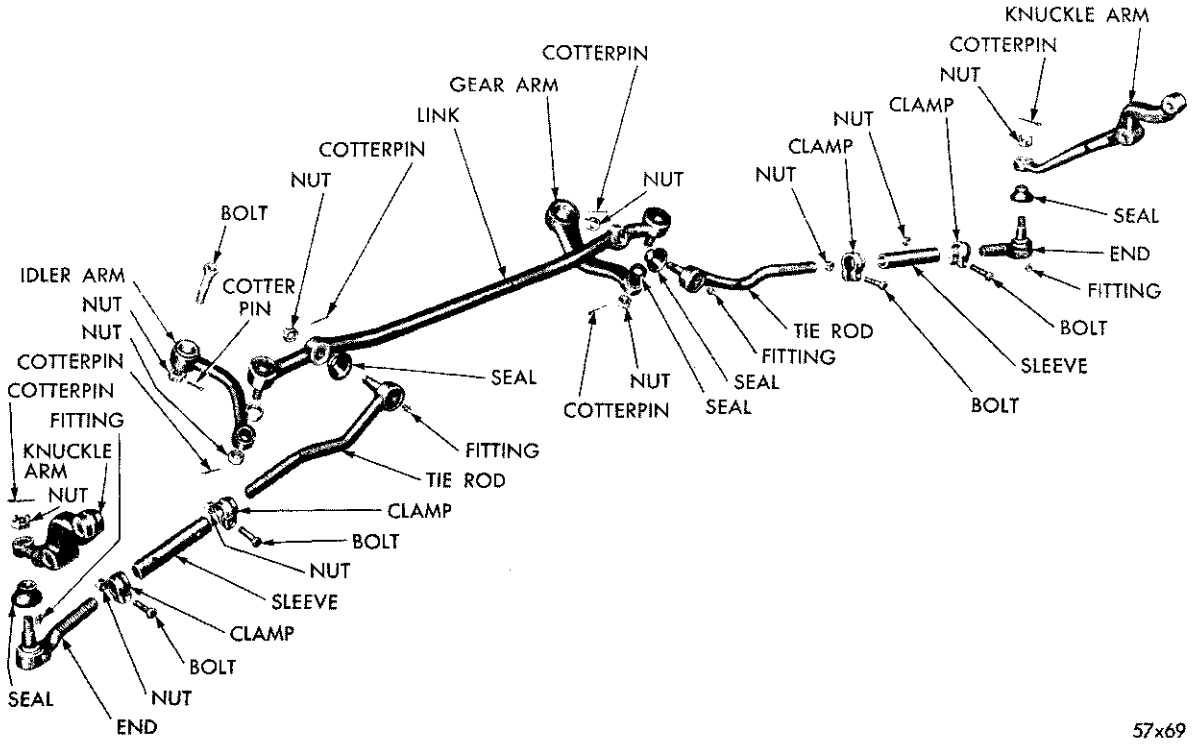


Fig. 5—Steering Gear Linkage

assembly. With wheels in straight-ahead position check opening of idler arm bracket (should be 2¼ inches). Install idler arm assembly. Apply lubriplate to support bolt. Tighten nut to 60 foot-pounds torque and install cotter pin.

7. STEERING KNUCKLE TIE RODS (Fig. 5)

a. Removal

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

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

b. Installation

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

When installing tie rod ends to the rod tube, be sure to thread the ends evenly on tube body to nominal length to obtain proper positioning of steering wheel.

8. ADJUSTMENT OF FRONT WHEEL BEARINGS

(Refer to Front Wheel Suspension, Section I)

Tighten the wheel bearing adjusting nut with an inch-pound torque wrench 90 inch-pounds while rotating the wheel. Position the nut lock, over the adjusting nut so the spindle cotter pin hole is in line with one set of the slots in the nut lock. Without removing the nut lock, back off the nut until the next set of slots are lined up with the spindle cotter pin hole. Insert and bend the cotter pin to secure the nut lock.

NOTE: This procedure should result in from .000 inch (no preload) to .003 inch bearing free play measured axially. It is important to remove any burrs or nicks on the spindle thread to insure accurate readings.

COAXIAL POWER STEERING

The new 1957 Chrysler Coaxial Power Steering Unit (Fig. 6) incorporates two basic gear mechanisms, a worm and worm connector, and rack and sector gear.

The hydraulic system of power steering gear consists of a double-acting piston, a valve (which fits inside the piston), and hydraulic reaction chamber (which gives driver "feel" of road). Axial positioning of valve directs high pressure oil to one side or the other of double-acting piston.

Other components of hydraulic system are the oil pump with pressure relief and flow control valve filter and oil reservoir.

9. PRECAUTIONS DURING DISASSEMBLY AND ASSEMBLY

Cleanliness through the entire disassembly and assembly cannot be over-emphasized. Unit should be thoroughly cleaned in a suitable solvent when removed from vehicle. When disassembling, each part should be placed in solvent, washed, and dried by compressed air. Crocus cloth may be used to remove small nicks or burrs provided it is used carefully. When used on valve spool, use extreme care not to round off sharp edge portion. The sharp edge portion is vitally important to this type of valve, it helps to prevent dirt and foreign matter from getting between the valve and bore, thus reducing the possibilities of sticking.

Remove and discard all "O" seal rings, and seals, using new ones lubricated with Lubriplate when reassembling.

10. REMOVAL OF STEERING WHEEL AND POWER STEERING GEAR COLUMN JACKET (MODELS C-75, C-76)

Disconnect battery. Turn horn blowing ring ornament counter-clockwise. Remove ornament from steering wheel. Disconnect wire from terminal. Remove three screws and three bushings and remove horn ring.

Remove horn blowing contact ring switch

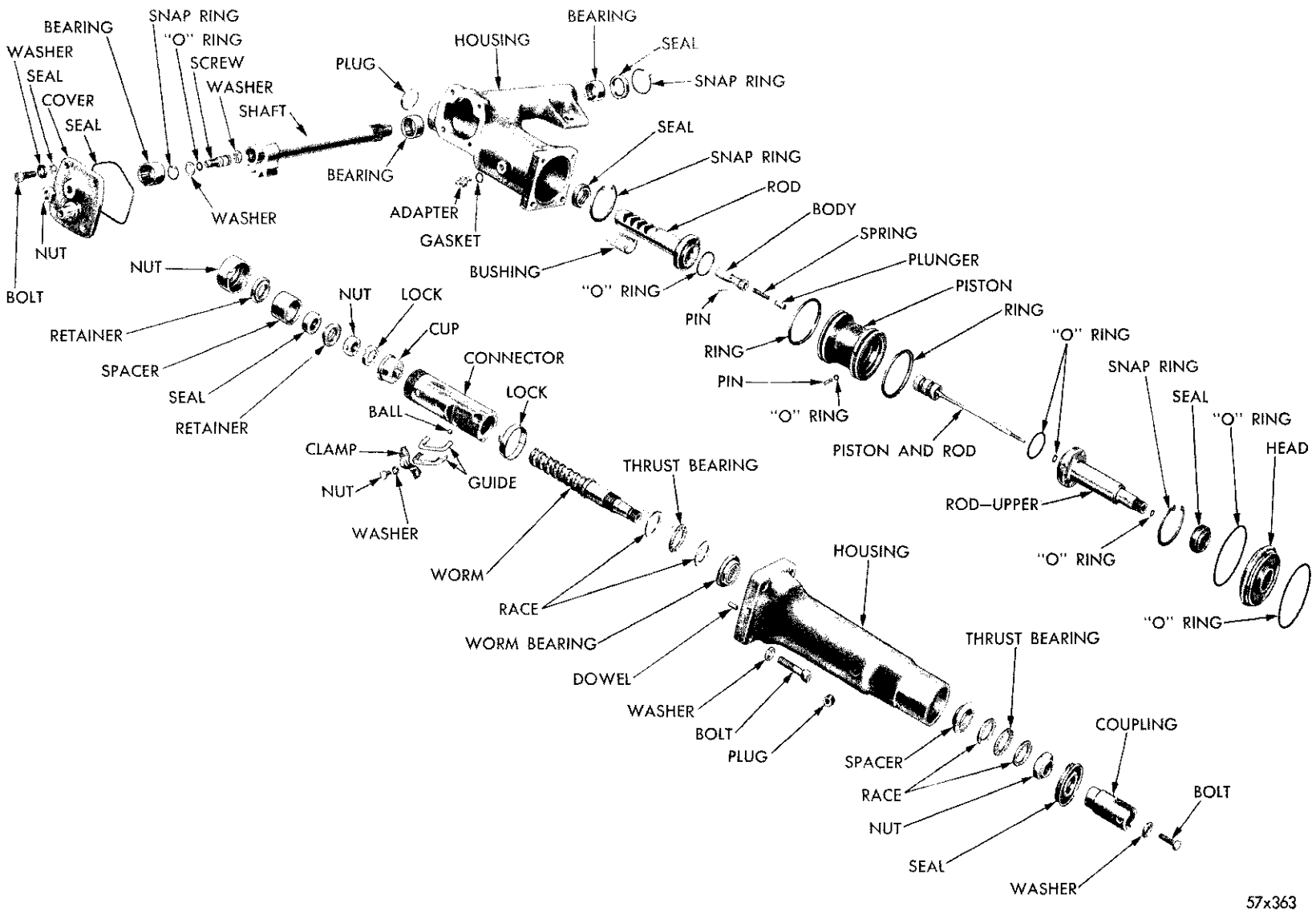


Fig. 6—Coaxial Power Steering Unit (Exploded View)

from steering wheel hub. Loosen steering wheel nut 3 full turns and attach puller Tool C-3428. Remove steering wheel from serrations, and remove tool, nut, steering wheel. Remove screw and washer from under side of heat shield. Remove shield.

Remove two screws and bracket clamp securing steering column jacket at instrument panel. Disconnect direction indicator wires and horn wire at connectors below instrument panel. Loosen two screws and nuts at steering gear housing jacket at lower clamp. Remove column jacket, by carefully turning assembly clockwise and pulling upward.

11. INSTALLATION OF STEERING WHEEL AND POWER STEERING GEAR COLUMN JACKET (MODELS C-75, C-76)

Install column jacket over steering column tube and position jacket over the power steering gear housing. Be sure rubber sleeve is in position before installing steering post bracket clamp on instrument panel. Do not tighten clamp bolts at this time. Connect direction indicator wires and horn wire at connectors, and install junction block into retaining clip below instrument panel. With front wheels in straight-ahead position, install steering wheel and steering wheel nut. Tighten nut 40 foot-pounds torque.

NOTE: Check to make certain that cancelling dogs on steering wheel actuate the directional switch. Move column jacket up or down to obtain proper steering wheel to column jacket clearances and for proper operation of directional switch.

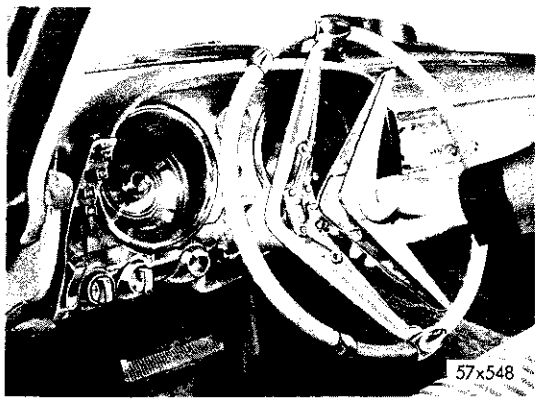


Fig. 7—Removing or Installing Steering Wheel Horn Ring

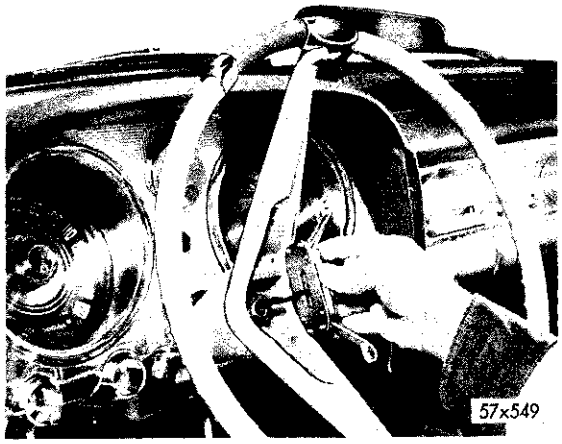


Fig. 8—Removing or Installing Ground Plate

With steering wheel positioned, tighten clamp bolts at power steering housing and screws at instrument panel bracket clamp. Install heat shields. Install horn blowing contact ring switch on steering wheel hub. Install horn ring. Connect horn wire and install ornament. Connect battery.

12. REMOVAL OF STEERING WHEEL AND POWER STEERING GEAR COLUMN JACKET (MODELS IM 1, 2 and 4)

Remove two screws and washers from underside of steering wheel spokes. Remove horn ring and cushion assembly (Fig. 7). Disconnect horn wire. Remove four screws and bushings and remove horn blowing ring retainer and horn switch. Remove four screws and washers and remove ground plate (Fig. 8) from steering wheel. Loosen steering wheel nut three full

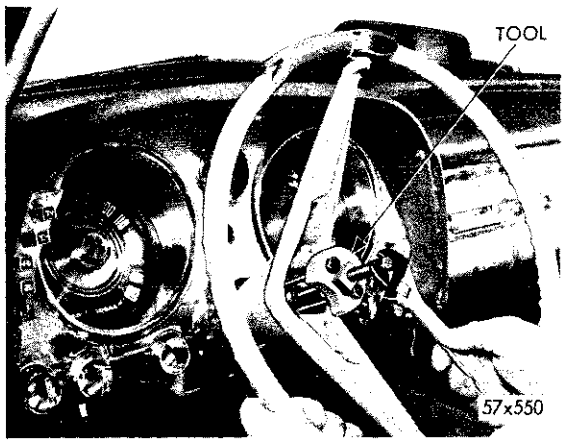


Fig. 9—Removing or Installing Steering Wheel Using Tool C-3428

turns and attach puller Tool C-3428 and remove steering wheel (Fig. 9) from serrations. Remove tool, nut, steering wheel.

Remove four screws and remove cover plate. Remove two screws and turn signal switch. Remove two screws and bracket (Fig. 10). Remove one screw to remove shield. Loosen two clamp screws at lower clamp and loosen three gear housing to frame attaching bolts, pull upward and remove column jacket.

13. INSTALLATION OF STEERING WHEEL AND POWER STEERING COLUMN JACKET (MODELS IM 1, 2 and 4)

Install column jacket over steering column tube and position jacket over power steering housing and tighten two clamp screws at lower clamp. Tighten three gear housing to frame attaching bolts. Install shield. Install two screws and bracket. Install turn signal switch (Fig. 11). Install 4 screws and cover plate.

With front wheels in straight ahead position, install steering wheel and nut. Tighten nut 40 foot-pounds torque. Install ground plate, horn switch, horn blowing ring retainer. Connect hornwire, and install horn ring and cushion assembly.

14. REMOVAL OF POWER STEERING UNIT

Remove steering wheel and power steering column jacket. Refer to Paragraphs 10 and 12. Remove pin and disconnect steering tube from coupling. Remove floor mat retaining plate—(Heat Shield Support).

Remove rubber dust pad (Seal), and floor

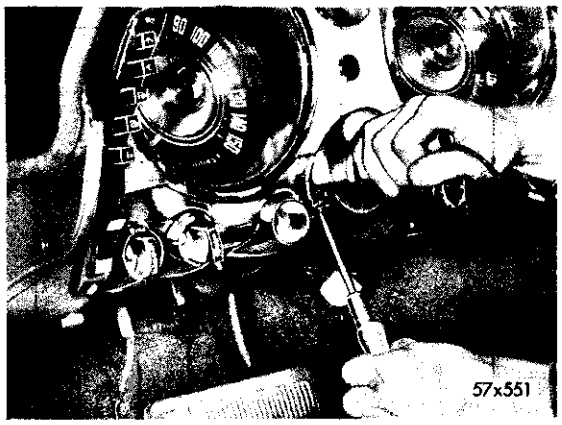


Fig. 10—Removing Turn Signal Switch and Bracket

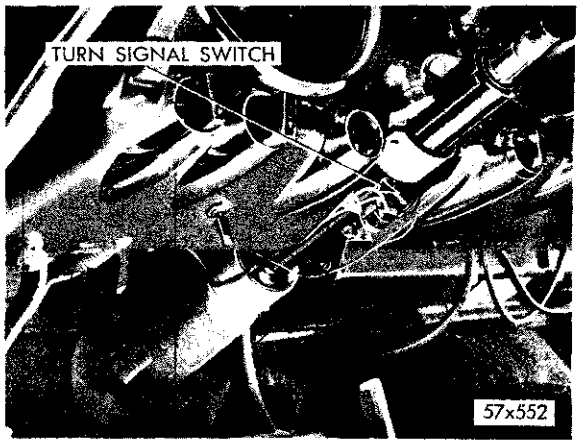


Fig. 11—Installing Turn Signal Switch

panel. (Opening Cover). Disengage drag link from steering gear arm and pull steering gear arm with Tool C-3402.

Loosen three gear housing to frame attaching bolts. Disconnect pressure and return hoses. Cap fittings at steering gear and fasten disconnected ends of hoses above oil level in reservoir to prevent further oil loss. Cap ends to prevent any foreign matter from entering. Disconnect stop lite switch wires from brake master cylinder. Disconnect brake booster reservoir from fender side shield and move aside. Remove gear housing to frame attaching bolts and alignment wedge. Remove gear assembly by sliding unit forward and out of engine compartment, as shown in Figure 12.

15. INSTALLATION OF POWER STEERING UNIT

Enter steering gear assembly through engine compartment and up into position through opening in floor panel. Align the gear housing and frame mounting holes. Install the gear housing to frame mounting bolts and spherical washers (two washers on each front bolt and one on wedge bolt). Tighten nuts finger tight. Position rubber dust shield at the firewall. Slide the jacket tube over the upper housing. Install the jacket tube and tighten the jacket to housing clamp. Install the steering wheel, horn ring, ornament and connect horn and direction signal wires.

NOTE: If distance between steering column jacket and steering wheel is less than 1/8 inch, adjust column jacket.

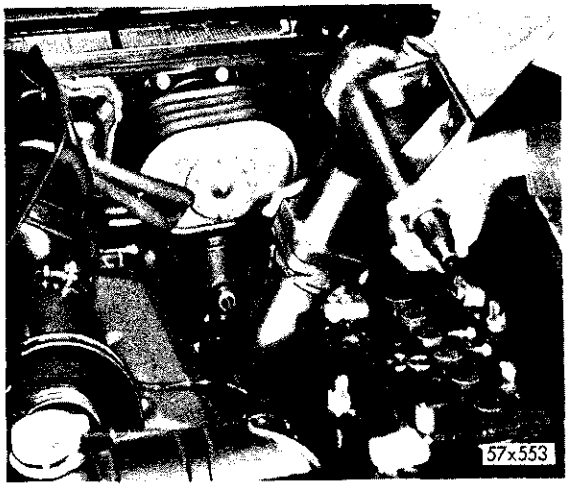


Fig. 12—Removing or Installing Power Steering Gear Assembly

Install and tighten the jacket to dash panel support bracket. Install the heat shield. Tighten the front upper and lower gear housing to frame bolts 20 foot-pounds torque. Install wedge at rear bolt, tapping it lightly in place. Tighten the mounting bolts 50 foot-pounds torque. Install the steering gear arm and tighten nut 120 foot-pounds torque. Connect the pressure and return hoses. Refill the reservoir and gear housing. Connect battery.

16. REMOVAL OF WORM HOUSING FROM GEAR HOUSING (Fig. 6)

Drain lower portion of steering gear through the pressure and return connections, by turning steering tube coupling from one extreme of travel to the other. Drain the upper housing. Bolt holding fixture, Tool C-3323 to power steering unit and mount fixture in vise, as shown in Figure 13. Remove bolt and washer that attaches coupling to worm shaft. Slide

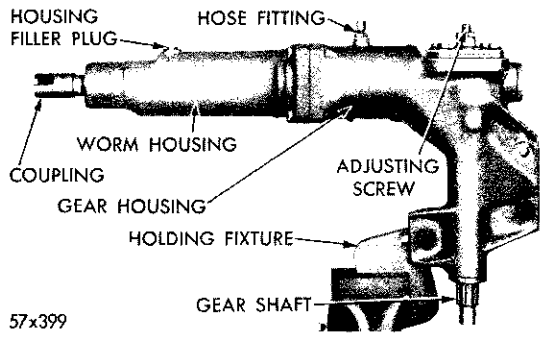


Fig. 13—Steering Unit Mounted in Holding Fixture

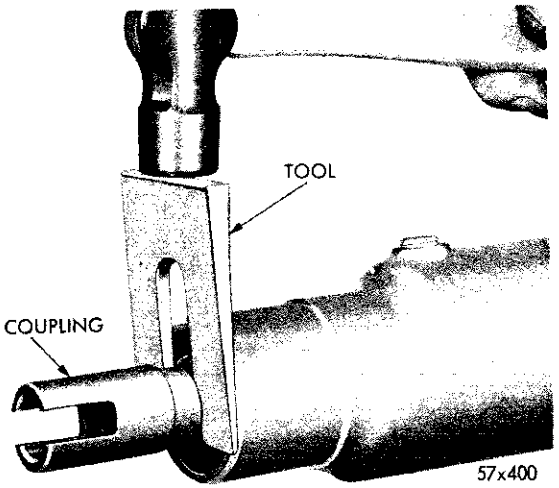


Fig. 14—Removing Coupling

Tool C-3392 down between housing and coupling, rap sharply with hammer, forcing coupling off end of the shaft, as shown in Figure 14.

Insert a screw driver under lip of worm housing oil seal, gently pry seal out away from housing and slide off end of worm shaft. Using a thin blade screw driver, pry locking collar portion of bearing adjusting nut out of keyway in worm shaft. Slide Tool C-3320A over worm shaft and down over nut. Position Tool C-3319 over shaft end and engage serrations, as shown in Figure 15. Holding worm shaft stationary, loosen bearing adjusting nut, as shown in Figure 16. Remove tools, and remove adjusting nut. Discard adjusting nut, using a new nut at reassembly.

CAUTION

Use extreme care so as not to damage threads of shaft or torque reading will be affected at adjustment. Be sure new nut threads on shaft freely. To make a thread chaser nut of the new one, use 3 cornered file and relieve threads (beyond bottom) in 1/32 inch deep in 4 equal-

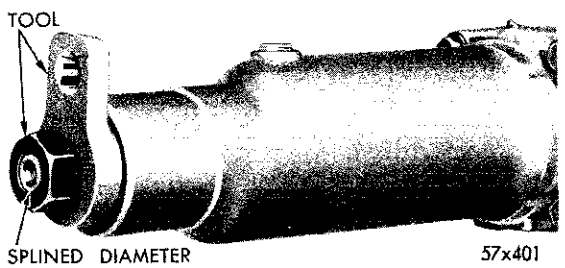


Fig. 15—Tools for Removing or Installing Adjusting Nut

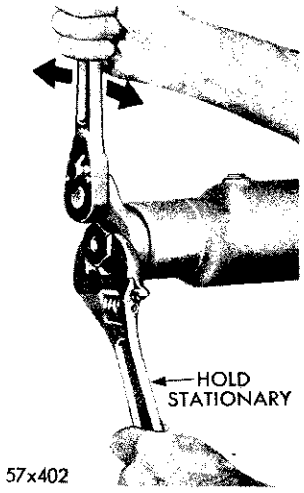


Fig. 16—Removing or Installing Adjusting Nut

ly spaced positions. Then thread nut on shaft to clear threads. Remove and clean nut several times during operation.

Slide the outer bearing race, thrust bearing inner race and spacer out of housing, as shown in Figure 17. Remove bolts and washers that attach worm housing to gear housing. Slide worm housing up and away from gear housing, exposing the worm connector, as shown in Figure 18. Lightly tap worm housing to overcome the interference fit of "O" seal rings, between worm housing and housing head. Remove "O" seal rings from head and discard.

Remove the bearing races, thrust bearing and spacer (with needle bearings) from the worm housing. **The spacer and needle bearing assembly are serviced as an assembly only.** The bearing races should be smooth, without pits or scratches, and the wear pattern should be uniform around the race. The rollers of bearings should be smooth, highly polished and free to turn in their retainers. The needle bearing rollers in lower spacer should also be free to

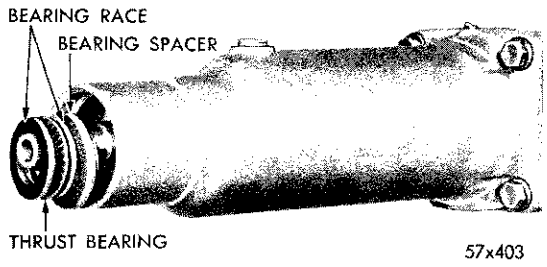


Fig. 17—Removing or Installing Bearing Race, Bearing and Spacer

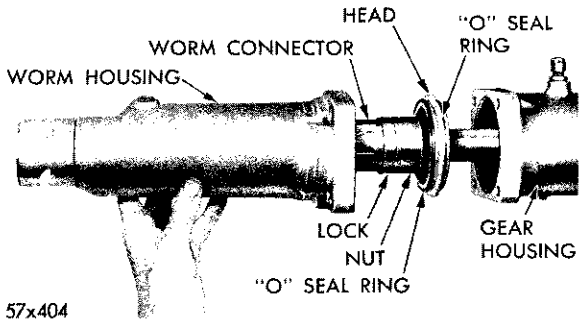


Fig. 18—Removing or Installing Worm Housing

roll in cage. The spacers should fit flat against shoulders in worm housing and machined surfaces at each end of housing must be smooth, without nicks or burrs. Replace all parts that show signs of wear.

17. REMOVING WORM CONNECTOR AND VALVE CONTROL (Fig. 19)

Pry worm connector nut lock from openings in connector, slide lock up on connector far enough to clear unit. Slide Tool C-3321 over rails of connector, as shown in Figure 20. Ro-

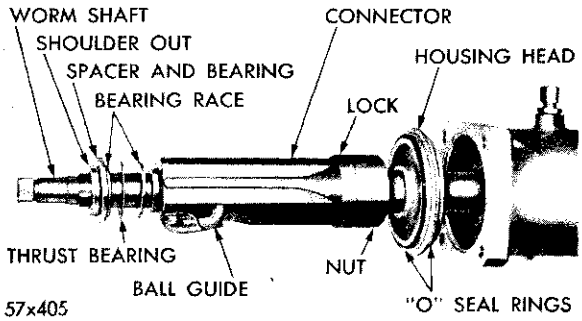


Fig. 19—Worm Connector Assembly

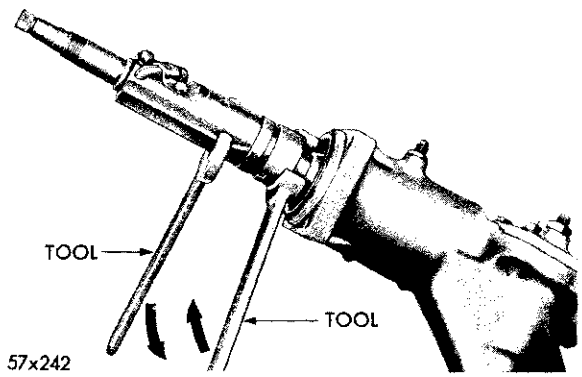


Fig. 20—Worm Connector Nut Removing or Installing Tools C-3321 and C-3326

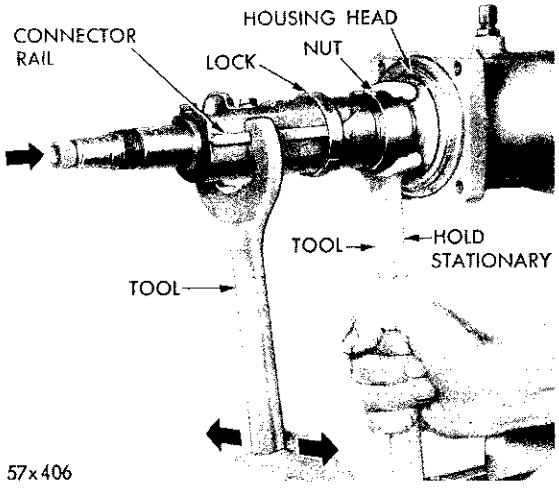


Fig. 21—Removing or Installing Worm Connector Nut

tate steering gear shaft and raise connector far enough to install Tool C-3326. Move connector down to hold tool against housing head to keep tool from slipping out of nut. Remove worm connector nut, as shown in Figure 21. Slide worm connector assembly from upper piston rod. Remove the valve adjusting cup from inside of worm connector.

Pry retaining portion of piston rod nut lock from the indents in the nut. Remove the lock. **(Use care when removing lock so as not to damage the control spacer).** Install Tool C-3328 in indents in nut, remove nut, as shown in Figure 22. Slide spacer, seal assembly and nut from valve rod, as shown in Figure 23. Slide housing head off end of valve rod.

The piston rod nut must be smooth on both ends. The nylon insert nut must be tight in the valve adjusting cup. The flange inside connector nut should be smooth and housing head

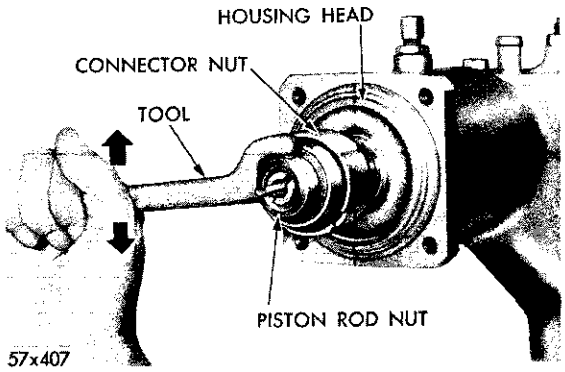


Fig. 22—Removing or Installing Piston Rod Nut

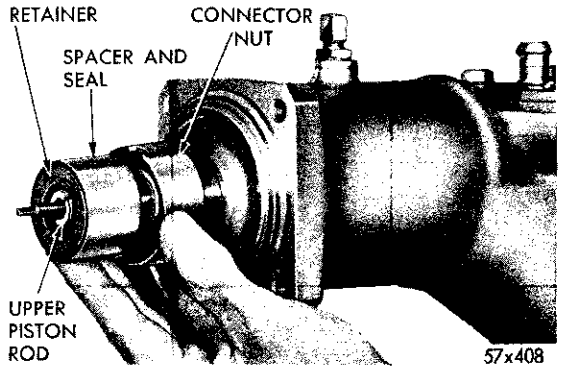


Fig. 23—Removing Spacer, Seal and Nut

should be free from nicks or burrs. The inner bore of valve control spacer should show little or no wear from the retainers, and edges should be smooth; free from nicks or burrs. If nicks or burrs are present, remove with crocus cloth spread over a flat surface.

The valve control spacer is serviced in two different lengths, with a .001 inch differential. The spacer must be exactly the same length as space between piston rod nut and shoulder of piston rod. With nut tightened, spacer should roll freely in groove, barely holding its own weight.

18. DISASSEMBLING THE WORM CONNECTOR

NOTE: When disassembling the worm connector, care should be taken so as not to bottom the worm shaft in either direction. Bottoming the worm shaft may damage the ball guides, which will cause either a tight or rough operating worm.

Remove bolts and lock washers that attach ball

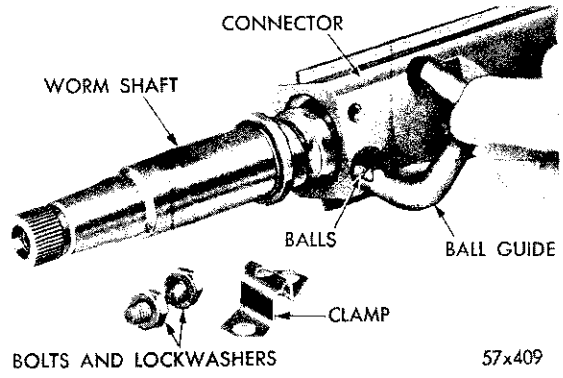


Fig. 24—Removing or Installing the Ball Guide

guide clamp to connector. Remove clamp, carefully remove guide (with balls), as shown in Figure 24 (if so equipped). **Do not lose any of the balls. The worm balls are a select fit and if one or more is damaged, it is recommended that complete new set of 40 balls be installed.** With worm connector held upside down, carefully remove remaining balls by turning worm in and out. **Be sure and count the balls which were removed from connector, so that the same number will be installed at reassembly.**

Slide worm out of connector, remove the nut lock by sliding off connector. The guide rails on connector should be free of nicks or burrs and slide freely on guides in housing. The ball track on the worm should be smooth, without pitting or roughness. The balls should show no signs of brinelling, pitting or flaking. Check the fit of adjusting cup and spacer in connector; if loose, install new spacer; adjusting cup, or both.

19. DISASSEMBLY OF GEAR HOUSING

Remove lock nut from gearshaft adjusting screw. Remove gearshaft oil seal snap ring, using pliers. Slide threaded portion of Tool C-3350 over end of gear shaft and down against seal. Install nut on threaded portion of shaft. Turn complete tool until the tool has entered seal. Install half collars and retainer to lock tool together. Back off on nut and pull seal out of housing, as shown in Figure 25. Remove tool. Remove bolts and washers that attach gearshaft adjusting cover to housing. (Two bolts have sealing washers. The bolt holes are tapped through to inside of housing). Discard sealing washers.

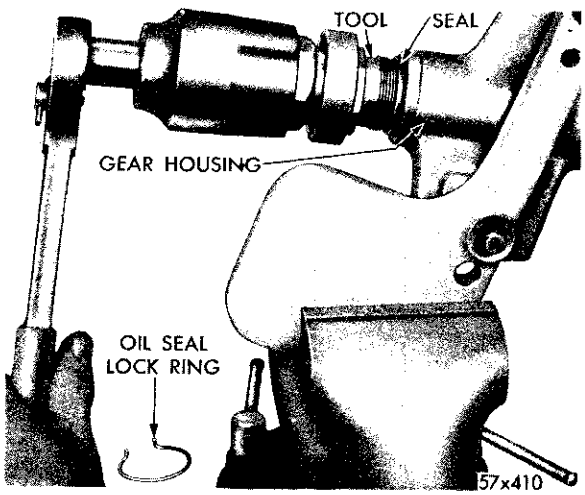


Fig. 25—Removing the Gearshaft Oil Seal

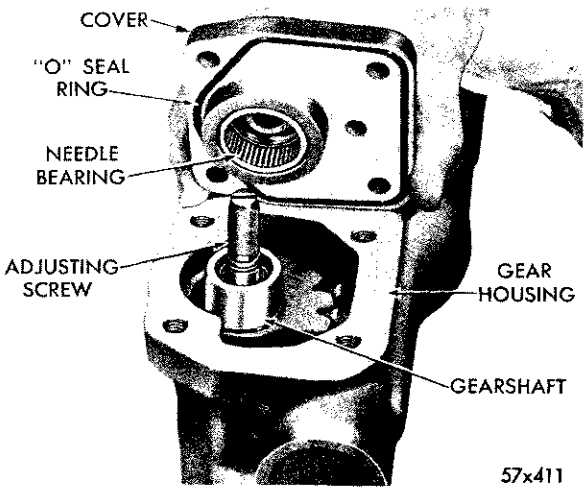


Fig. 26—Gearshaft Cover Removed

To remove the gearshaft cover, turn the adjusting screw into cover, using a screw driver until flush. Spin cover off adjusting screw and remove from housing, as shown in Figure 26. Remove and discard the cover "O" seal ring. Align gear on gearshaft to clear opening in housing, and using a fibre hammer, rap lightly on end of gearshaft. Slide gear and shaft out of housing, as shown in Figure 27.

Using pliers Tool C-3229, remove adjusting screw retaining snap ring, as shown in Figure 28. Slide adjusting screw, "O" seal ring and retaining washer from end of gearshaft. Re-

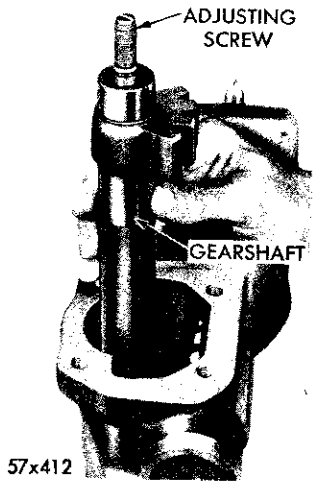


Fig. 27—Removing the Gearshaft

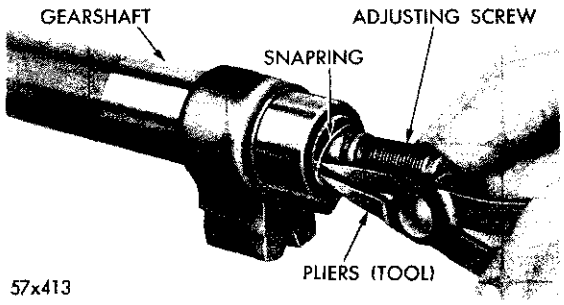


Fig. 28—Removing or Installing Adjusting Screw Snap Ring

move thrust washer from seat in end of shaft. Discard "O" seal ring. The gear shaft should be free of pits, scores or signs of excessive wear in seal and bearing contact areas. The gear teeth should be smooth and show a good contact pattern. The needle bearings in cover should be smooth and rotate freely in the race.

20. DISASSEMBLY OF PISTON AND RODS

Place a suitable container under gear housing to catch the trapped oil, remove piston assembly and rods from housing and disassemble as follows: Grasp upper piston rod firmly, twist slightly and pull piston and lower rod straight out of housing, as shown in Figure 29. **Do not permit lower piston rod to touch piston bore to prevent gouging.** Remove snap ring that holds lower rod in piston, using snap ring pliers, Tool C-3106, as shown in Figure 30. Carefully work the lower rod out of piston, to expose piston valve, as shown in Figure 31. Remove and discard the rod "O" seal ring.

Slide piston valve out of piston, as shown in Figure 32. **Use care so as not to bend the valve rod during or after removal.** Support piston assembly (in order to protect seal ring land) using a soft wood block, drive piston

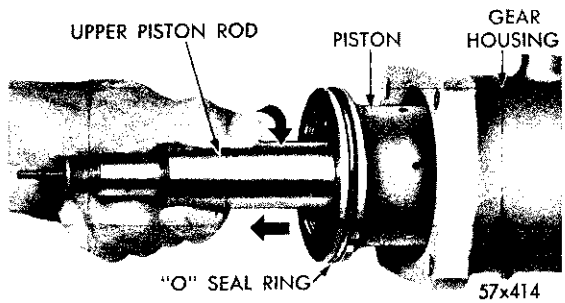


Fig. 29—Removing the Piston and Rod Assembly

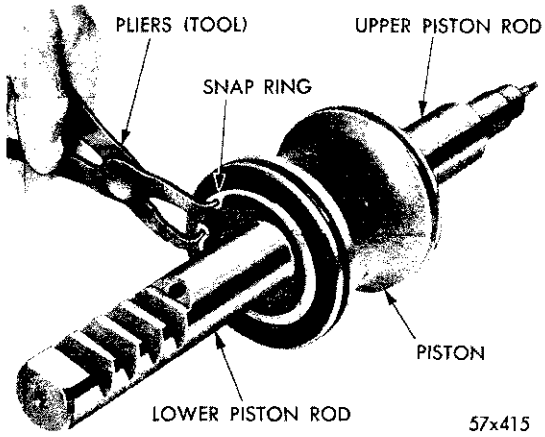


Fig. 30—Removing Lower Piston Rod Snap Ring

pin into upper rod using a ¼ inch round drift, as shown in Figure 33. Using snap ring pliers Tool C-3106, remove upper piston rod retaining snap ring. Carefully work upper piston rod out of piston, as shown in Figure 34. Insert wire (or paper clip) down through piston pin, bend inserted end over through oil passage hole in rod. Pull piston pin out of piston

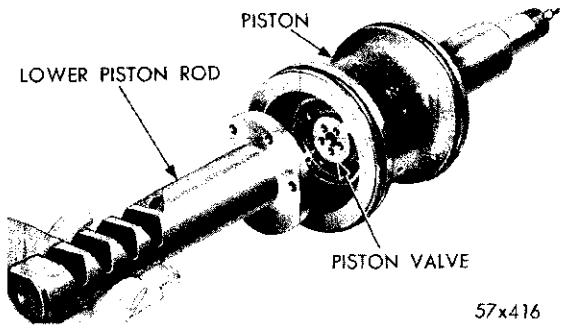


Fig. 31—Removing or Installing Lower Piston Rod

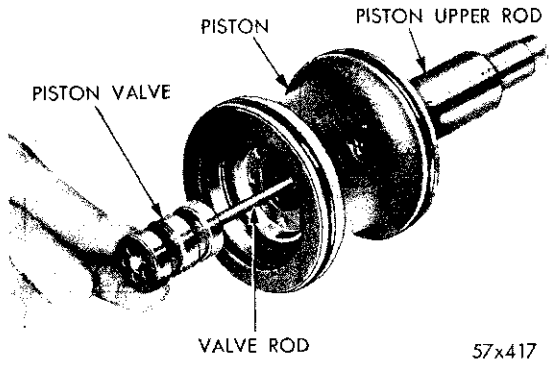


Fig. 32—Removing the Piston Valve

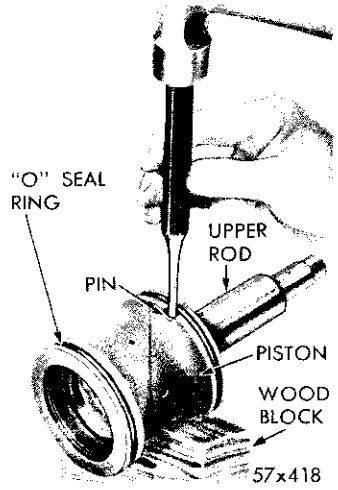


Fig. 33—Driving Pin into Upper Piston Rod

rod, as shown in Figure 35. Discard "O" seal ring.

Remove large "O" seal ring from base of upper rod, using a paper clip, remove valve rod "O" seal rings from each end of upper rod, as shown in Figure 36. Remove and discard "O" seal rings (piston rings) from each end of piston. Using a $\frac{7}{16}$"-14 (standard thread) bolt, remove the restrictor valve from lower piston rod. Thread bolt into valve, finger tight.

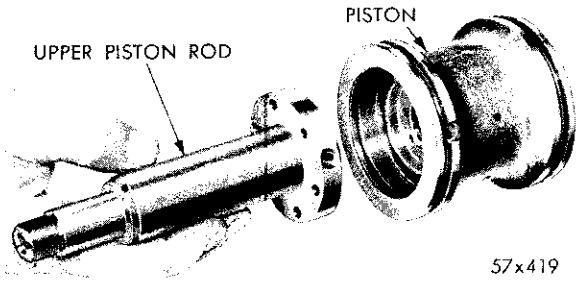


Fig. 34—Removing the Upper Piston Rod

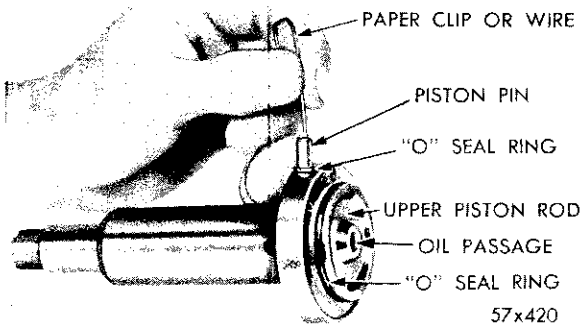


Fig. 35—Removing Piston Pin from Upper Rod

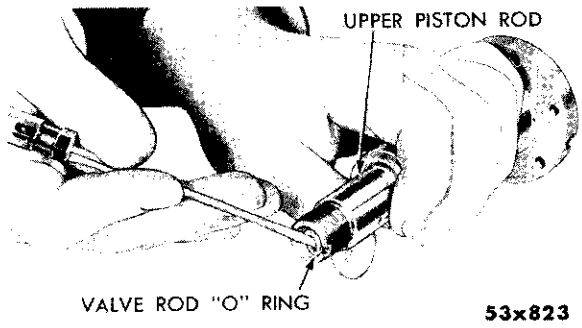


Fig 36—Removing Valve Rod "O" Seal Rings

Clamp head of bolt in a vise, rap on end of rod, using a fibre hammer. Slide valve out of rod, as shown in Figure 37. To disassemble valve, insert a stiff wire (paper clip) into pin hole and push out retaining pin. Remove plunger and spring.

The restrictor valve plunger should slide freely in valve body and show no signs of sticking. The lower piston rod should be free of burrs or scratches. The upper rod should be unmarked in the seal contact area. The valve port rings inside piston should have a bright, highly polished surface with sharp edges. The valve rod should slide freely through the "O" seal rings. Check valve rod, insert valve in

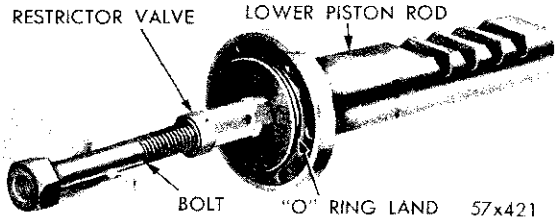


Fig. 37—Removing or Installing the Restrictor Valve

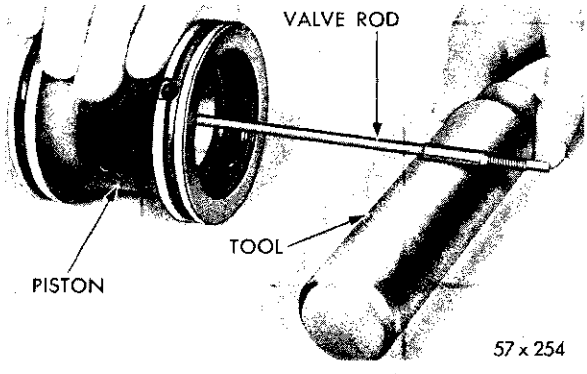


Fig. 38—Checking the Valve Rod for Trueness (Tool C-3333)

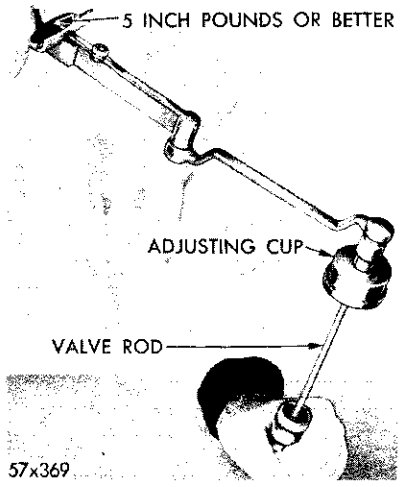


Fig. 39—Testing Torque of Adjusting Cup on Valve Rod

piston until centered. Lay piston on flat surface, place Tool C-3333 under valve rod, as shown in Figure 38. Rotate piston slowly. If rod is bent, the distance from the tool will vary. The rod must be tight in valve. If loose, install new assembly. The adjusting cup should grip threads of valve rod tightly. To check, install cup on end of rod, install Tool C-3380, as shown in Figure 39. The minimum reading should not be less than 5 inch-pounds torque. The piston "O" ring grooves should be free from nicks or burrs, with no sharp edges around piston pin hole.

21. DISASSEMBLING THE GEAR HOUSING

Using a suitable blunt drift, drive out welsh plug in the bottom of gear housing from the

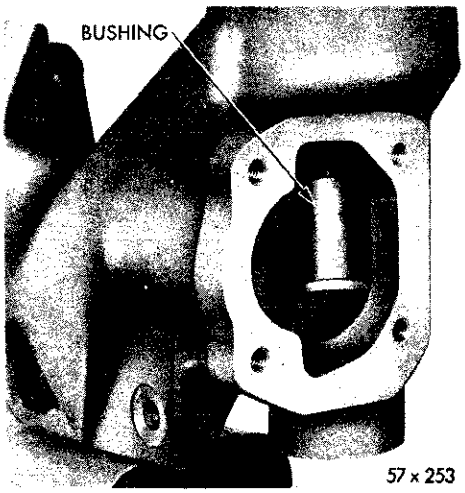


Fig. 40—Lower Piston Rod Thrust Pad

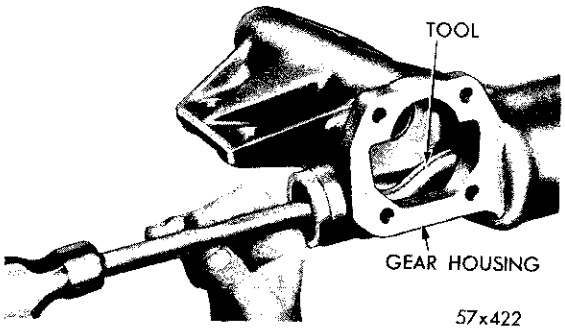


Fig. 41—Removing Lower Piston Rod Oil Seal

cylinder side. **Do not remove plug by punching hole and flipping out. This method will damage aluminum housing.** Using a thin blade screw driver, pry out lower piston rod thrust pad from gear housing Fig. 40. Remove lower piston rod oil seal from housing, using Tool C-3450. To remove seal, insert disc end of tool through opening in end of housing, locating disc between seal and housing shoulder. Using offset (curved) section as a fulcrum, force disc between seal and shoulder, until retainer screw almost contacts seal, (viewed from opposite end). Drive seal out of housing, using a hammer, as shown in Figure 41. Inspect steering gear shaft needle bearings in gear housing, for broken or rough needles. **Do not remove bearings unless inspection reveals it is necessary to do so.** If necessary to remove needle bearings, install Tool C-3332, as shown in Figures 42 and 43 and pull upper and lower needle bearings out of housing.

Inspect bearing surface of lower piston rod

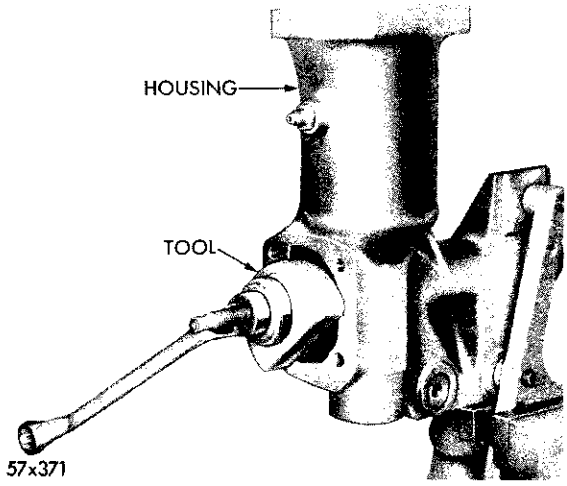


Fig. 42—Removing Upper Needle Bearing

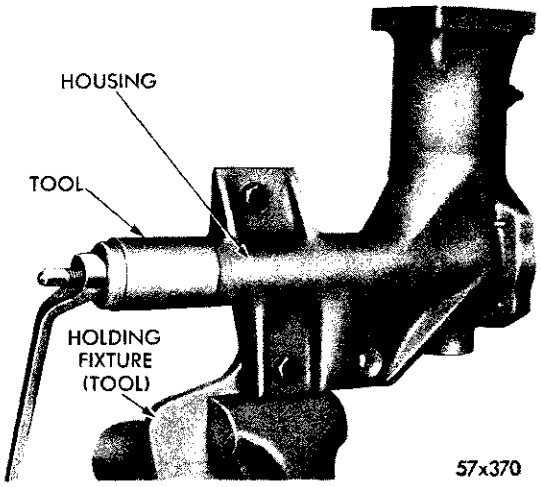


Fig. 43—Removing Lower Needle Bearing

thrust pad if scratched, install new thrust pad. Check piston cylinder walls for scoring, nicks or scratches. All machined surfaces of housing should be smooth and free from nicks or burrs. The steering gear unit has now been disassembled as far as necessary for cleaning, inspection and the replacement of worn or damaged parts.

Clean all parts in a suitable solvent and blow dry with compressed air. Be sure and use new "O" seal rings and seals at reassembly. Coat seals and "O" seal rings with lubriplate at installation.

22. ASSEMBLING THE GEAR HOUSING (Fig. 6)

Remove garter spring from new piston rod

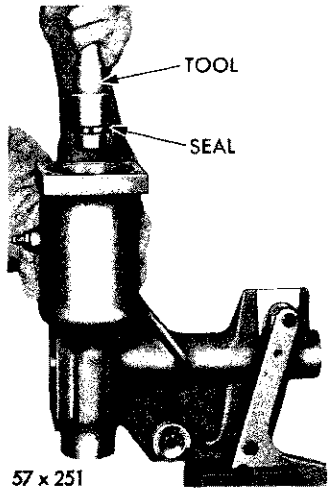


Fig. 44—Installing Lower Piston Rod Seal

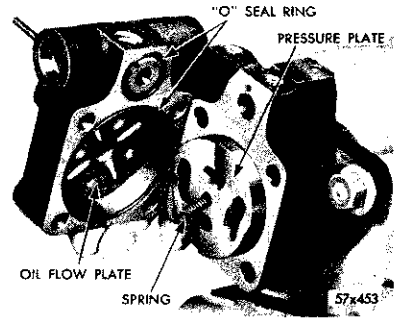


Fig. 45—Installing Gearshaft Lower Needle Bearing

seal, install seal on driver Tool C-3331. (Lip of seal toward driver). Slide pilot SP-1927 through seal and into driver until bottomed. Insert assembly into housing (keeping tool centered in bore), as shown in Figure 44. Drive seal into position, remove tool. **Carefully** work garter spring into seal with the aid of two long shank screw drivers. (If Tool C-3331-A is used, it will not be necessary to remove garter spring).

Slide gearshaft lower needle bearing (if removed) over pilot of Tool C-3333, (lettered end against driver) and insert into housing. Drive needle bearing into housing, as shown in Figure 45. The outer end of bearing should be $1\frac{1}{16}$ inches from end of housing when properly seated. Slide the gearshaft upper needle bearing (if removed) over pilot of Tool C-3333, (lettered end against driver) then insert into housing. Drive needle bearing into housing, as shown in Figure 46. The outer end of bearing should be flush with end of bore when properly seated.

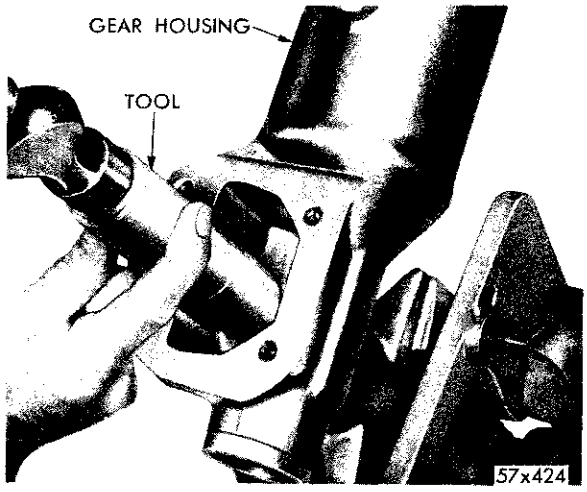


Fig. 46—Installing Gearshaft Upper Needle Bearing

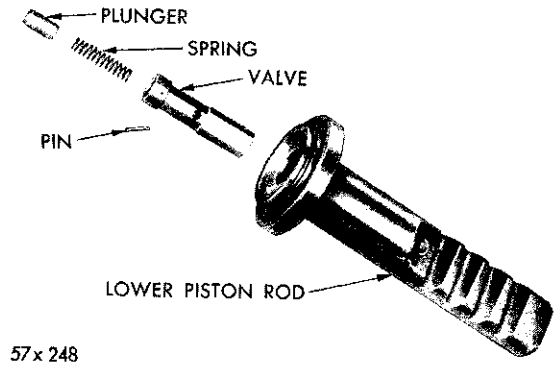


Fig. 47—Restrictor Valve (Disassembled View)

Place lower piston rod thrust pad in position, (Fig. 40) align shoulder with recess in housing and press into position.

23. ASSEMBLING THE PISTON AND RODS

Slide restrictor valve spring and plunger into valve body, as shown in Figure 47. Secure with pin, install assembly into lower piston rod bore. Press until flush with end of bore. Check plunger for free operation in valve. Check grooves to be sure they are free of dirt and chips. Install two new valve rod "O" seal rings in each end of upper piston rod, as shown in Figure 48 and 49. (Be sure the "O" rings are seated evenly in the grooves). Coat a new "O" seal ring with lubriplate, slide into position in groove on end of upper piston rod. Carefully slide the rod into piston aligning piston pin holes.

Align new "O" seal ring over piston pin, insert into opening in piston. Be sure pin is perfectly straight, then carefully tap into piston, using a ¼ inch drift. The pin should be flush in piston. Using pliers Tool C-3106, install retaining snap ring (bevelled side out). **Be sure that ends of snap ring do not obstruct an oil passage, as shown in Figure 50. Any obstruction at this point will affect steering performance.** It may be necessary to tap the snap ring, using a brass drift, to be certain it is fully expanded in groove. Slide valve and rod into piston and upper rod, working carefully past "O" seal rings previously installed, as shown in Figure 51. **Be careful not to bend the rod.** Slide new "O" seal ring into position in groove on bottom of lower piston rod. Carefully slide rod into piston and down into position. Using pliers Tool C-3106, install retaining snap ring (bevelled side out). **Be sure ends of snap ring do not obstruct an oil passage, (Fig. 50). An obstruction at this point will affect steering performance.**

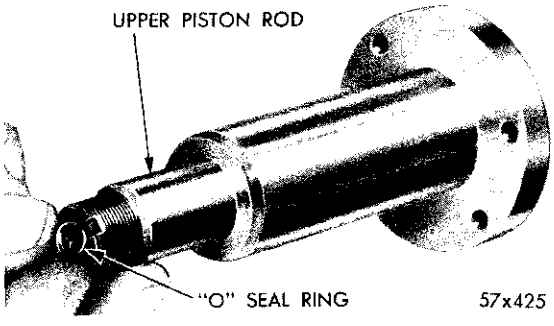


Fig. 48—Installing Upper Valve Rod "O" Seal Ring

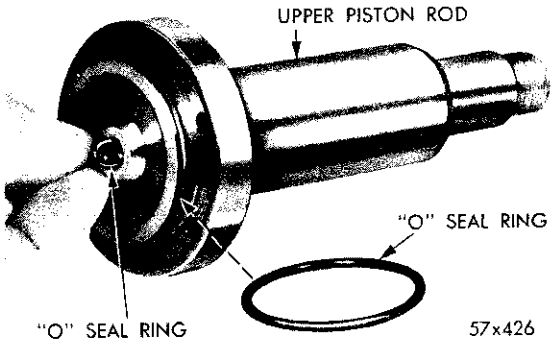


Fig. 49—Installing Valve Rod Lower "O" Seal Ring

Install new "O" seal rings on each end of piston, locate Tool C-3344 on gear housing (around cylinder bore). Coat Tool C-3554 with lubriplate, place over teeth of lower piston rod. Slide piston and rod assembly into

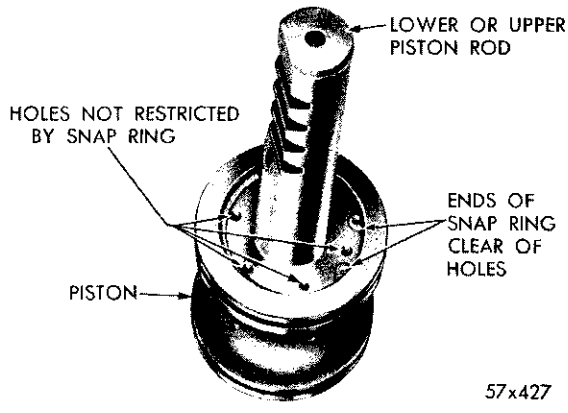


Fig. 50—Snap Ring Correctly Installed

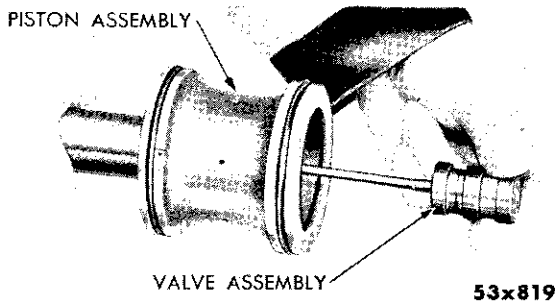


Fig. 51—Installing Valve in Piston

cylinder bore, as shown in Figure 52. Guide seal protector Tool C-3554 out of lower housing (through cover opening), as piston is being pushed into cylinder. As piston is being installed, align teeth on lower rod for meshing with teeth on gearshaft. Remove tools.

24. INSTALLING GEAR SHAFT

Slide gearshaft adjusting screw thrust washer into position in end of shaft, install adjusting screw and retaining washer (Fig. 53). Install snap ring. Install Tool C-3401 over end of adjusting screw and slide down until seated. Slide

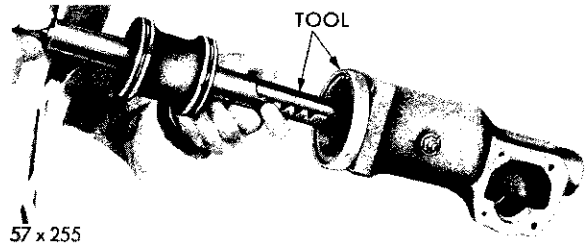


Fig. 52—Installing Piston in Gear Housing

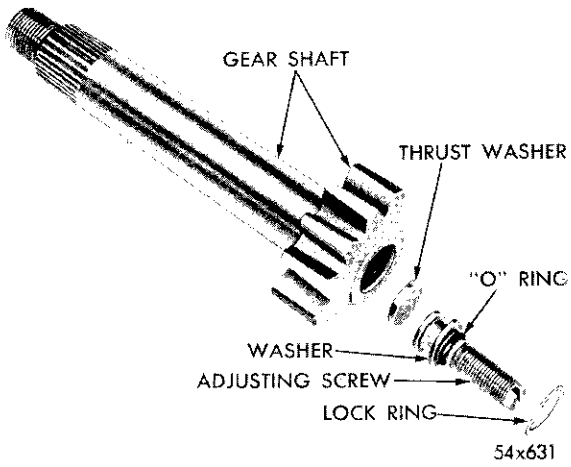


Fig. 53—Adjusting Worm Housing

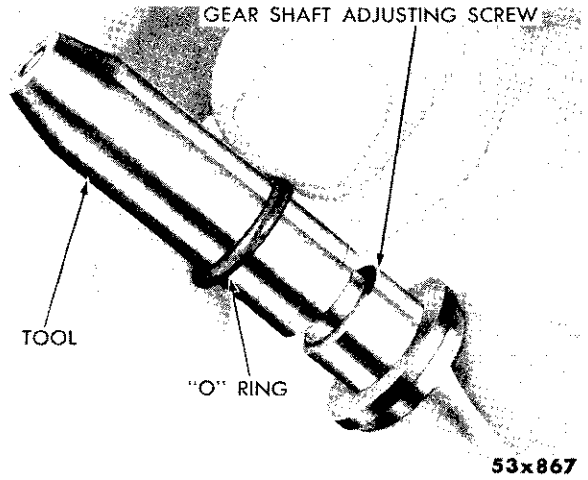


Fig. 54—Installing Gearshaft Adjusting Screw "O" Seal Ring

new "O" seal ring over tool and into groove of adjusting screw, as shown in Figure 54. (This operation may be done before installing screw).

Install sector gear to mesh with rack, as shown in Figure 55. Seat shaft to mesh teeth. Check gear timing, using steering gear arm to rotate gearshaft. Full piston travel must be approximately 2 inches. **Failure to follow the timing instructions will result in a broken gear housing.** Check operation of gears by rotating gear shaft. Place new gear shaft oil seal (suitably coated with lubriplate) lip side down, on a piece of clean paper. Carefully slide tapered end of sleeve (part of Tool C-3350) in seal and slide seal back approximately ¼ inch on sleeve. Slide sleeve and seal over shaft (lip of seal toward housing) until seal contacts

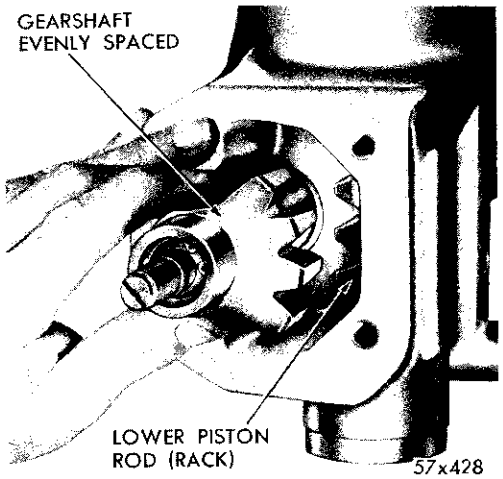


Fig. 55—Gear Tooth Alignment

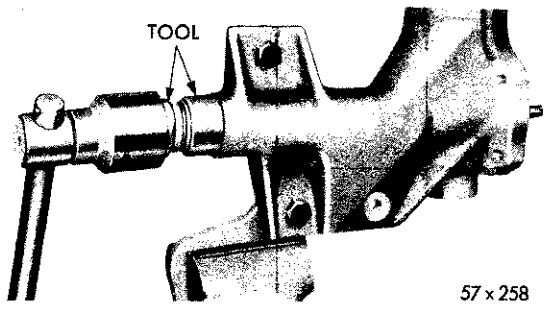


Fig. 56—Installing Gearshaft Oil Seal (Tool C-3350)

bore of housing. Slide adapter over sleeve, followed by coupling nut. Install seal in housing by turning nut on shaft threads until shoulder of adapter contacts housing, as shown in Figure 56. Remove nut and adapter.

Wrap new piece of friction tape around sleeve to provide a firm grip. Slide sleeve off gearshaft using a twisting motion, as shown in Figure 57. **Do not use any tool to remove sleeve.** Install oil seal retaining snap ring. Install a new "O" seal ring in groove on adjusting cover, place cover on adjusting screws and spin down as far as possible. Align cover with bolt holes. Using a screw driver, move adjusting screw out of cover until cover is seated on housing. (**Do not force**). Install bolts and washers (with seals), in inside holes and tighten to 30 foot-pounds torque. Install adjusting screw locknut but do not tighten at this time. Place a new welsh plug in position at bottom of housing and drive into position.

25. INSTALLING THE VALVE CONTROL SPACER

Remove garter spring from a new upper piston

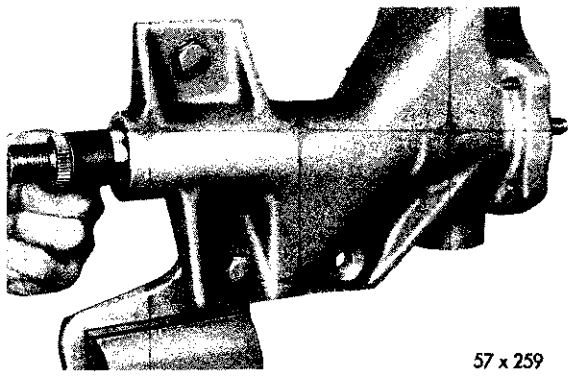


Fig. 57—Removing Oil Seal Protector Sleeve

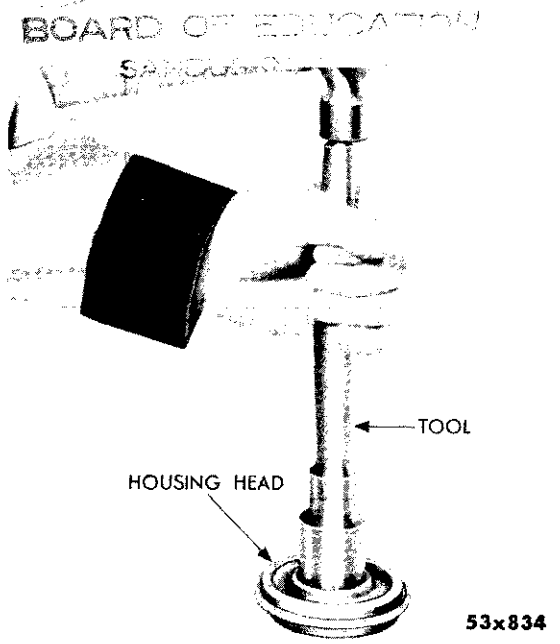


Fig. 58—Installing Upper Piston Rod Seal

rod seal, position seal on driver Tool C-3331 with lip of seal toward driver. Install seal aligning pilot in end of driver. (If Tool C-3331-A is used it will not be necessary to remove garter spring). Place housing head on a flat surface (single flange side up) and seal into head until seated, as shown in Figure 58. Remove tool and reinstall garter spring.

Position a new "O" seal ring over shoulder on housing head, carefully slide head over piston rod and down against housing. Be sure "O"

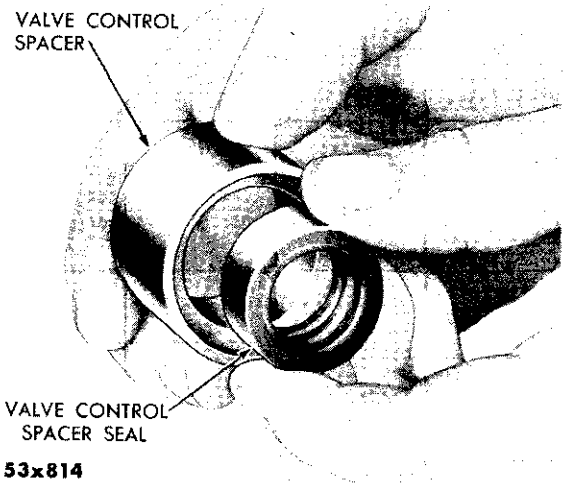


Fig. 59—Removing or Installing Seal in Valve Control Spacer

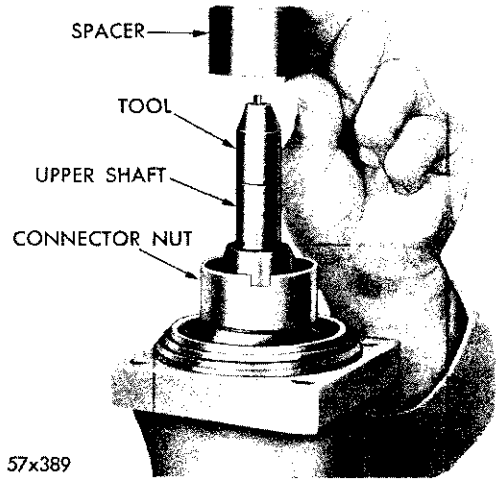


Fig. 60—Installing Valve Control Spacer

seal ring is seated. Slide the connector nut over piston rod with threaded end out. Slide a new control spacer seal into spacer and install retainers, as shown in Figure 59. Place seal protector Tool C-3329 over threads on upper rod. Slide spacer assembly over tool and down against shoulder of upper rod, as shown in Figure 60. Remove seal protector tool.

Install upper piston rod nut and tighten with sharp rap of hammer on Tool C-3328. Install new lock cap over nut and index with slots in rod. Using a suitable punch, drive outer diameter into recess in nut, as shown in Figure 61.

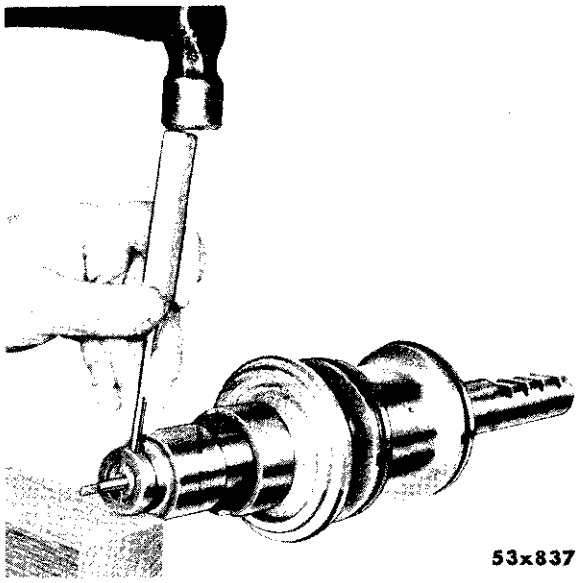


Fig. 61—Locking Upper Piston Rod Nut Lock

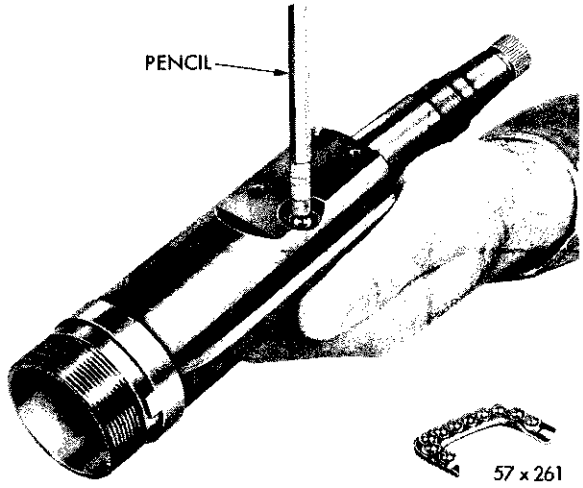


Fig. 62—Installing Balls in Worm Connector

26. ASSEMBLING AND INSTALLING THE WORM CONNECTOR

Slide worm into connector and visually align upper portion of passages with ball guide holes. Insert 30 balls (no more), into lower hole by pushing them gently, using rubber end of pencil, and at same time, oscillating worm, as shown in Figure 62. When 30 balls have been inserted, they should be visible in the hole. Place remaining (10) balls in either half of ball guide. Grease balls to help hold them in place, then place the other half over balls.

Insert guide and ball assembly into holes in connector (Fig. 62). Install clamp, lock washers and bolts. Tighten bolts to 12 foot-pounds torque. Check operation of worm, making sure it is free to turn the maximum travel of worm shaft. The worm should rotate freely by its own weight in either direction. **Do not allow worm to bottom.** Install valve adjusting cup on end of valve rod. Slide worm connector nut lock over threaded end of connector with tang side facing threads.

Slide worm connector over control spacer and screw nut on to connector by hand. Hold worm connector with Tool C-3321, then using Tool C-3326, tighten nut securely. (Fig. 21). Engage tank of lock with recess in nut, stake lock in hole in connector, remove tools.

27. TESTING FOR LEAKS

Align housing head to gear housing, install Tool C-3555 over head. Install bolts and tighten

securely. Install hose fittings, adapters and test hoses from pump to unit, as shown in Figure 63. Fill pump reservoir with Transmission Fluid Type "A" and have additional fluid available. Install Tool C-3445 through the worm shaft (forked end first) and engage valve rod.

Remove coil wire and turn engine over, using starting motor. (This will prevent damaging the steering unit should valve be positioned to give excessively fast self steering).

As steering gear fills, it will self steer and reservoir will need additional fluid. **Be ready to turn the valve to stop self steering before piston reaches limit of travel.** Turn valve to right if piston moves up, and to left as piston moves down. Fill reservoir. Allow unit to warm to full operating temperature then check for leaks. (This was a temporary valve adjustment. The final adjustment should be made after unit is completely assembled).

28. INSTALLING WORM HOUSING

Slide new "O" seal ring on smallest land of housing head. Slide a bearing race over worm shaft followed by a thrust bearing and a race. Slide spacer and needle bearing assembly into housing past the rail guides. Press shoulder of bearing spacer into housing, using a suitable tool. Turn connector until ball guide is directly down and rails are aligned. Slide worm housing over connector with vent on top side. **Use care so as not to force "O" seal ring off housing head.** Hold housing in alignment with connector rails, then seat against gear housing. (Worm housing must meet gear housing with **hand pressure only**). Install attaching bolts and washers. Tighten 30 foot-pounds torque.

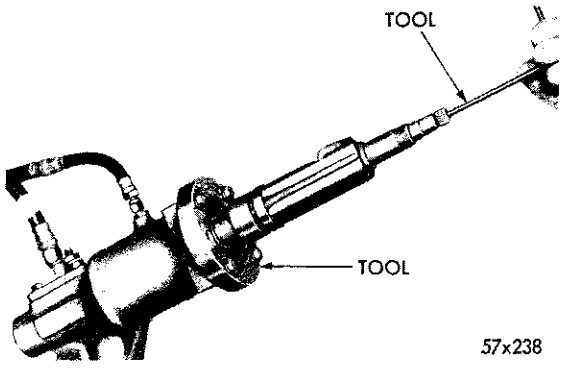


Fig. 63—Testing Steering Gear for Leaks

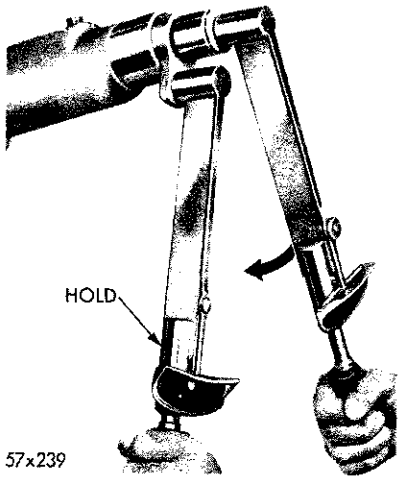


Fig. 64—Adjusting Worm Housing Bearings (Outer)

Slide bearing spacer over worm shaft (shoulder towards worm) and seat in housing. Slide bearing race, radial bearing and race over worm shaft and down against spacer (Fig. 17). Install **new** adjusting nut with locking flange up. Pour 14 oz. of Transmission Fluid Type "A" into upper housing, install filler plug. Make worm bearing adjustment, piston valve adjustment and the gear adjustments as described in the Steering Gear Adjustment Paragraph 22.

29. ADJUSTING THE POWER STEERING

The three adjustments, all of which can be made without removing the assembly from car, should be made as follows: Worm Bearing Adjustment, Piston Valve Adjustment, and Gear Lash Adjustment. Since a considerable amount of work is involved in making either the worm **bearing adjustment or piston valve adjustment** in car. It is suggested, you make definitely sure that they are causing the difficulty. If all other possibilities have been checked, make the adjustment without removing the assembly from the car, as follows:

Remove steering wheel using puller C-612, steering column jacket and tube. Remove tube coupling bolt and washer from center of the coupling. Using Tool C-3392, remove coupling from worm shaft and the worm housing oil seal. Remove steering connecting rod (drag link) from steering gear arm. Back off gear lash adjusting screw until the lash is maximum.

30. WORM SHAFT BEARING ADJUSTMENT

Slide Tool C-3320-A on the adjusting nut, and Tool C-3319 on splines of worm shaft with sufficient space between tools to lift Tool C-3320-A off the adjusting nut. Turn steering gear to full left turn and hold in this position with a foot-pound torque wrench, as shown in Figure 64.

Attach torque wrench Tool C-3380 to Tool C-3320-A in an inline position. Lift wrench off nut and re-position with torque wrench down or slightly to your left. While holding five-pounds (left) tension with the large wrench, loosen nut with small wrench and adjust to exactly five inch-pounds, as shown in Figure 65. Remove tools with extreme caution so as not to move adjusting nut. Crimp ring section of adjusting nut into keyway in worm shaft, with care so as not to move adjusting nut. Install worm housing seal.

31. PISTON VALVE ADJUSTMENT

Start engine and run at medium idle speed. Allow steering gear to reach maximum normal operating temperature. Attach a small tap handle (or equivalent) to the flat on end of Tool C-3445, insert tool through worm shaft over end of piston valve rod. With foot-pound torque wrench on steering arm nut, read tension while turning the steering gear to full right and full left at moderate rate. Wrench movement should be smooth. Turn piston valve in direction necessary to produce the same torque reading in both directions. Torque reading must be equal and under 40 foot-pounds.

If torque reading is equal at less than 25 foot-pounds, a much more accurate adjustment can then be made with the 300 inch-pound torque wrench, using same procedure. Remove tools.

32. GEAR LASH ADJUSTMENT

With engine running and steering gear at normal operating temperature, turn steering gear to straight ahead position. Using a very light finger-tip touch at end of steering gear arm, turn gear shaft adjusting screw clockwise until all gear lash has been eliminated. Turn adjusting screw ¾ turn tighter (clockwise) and tighten lock nut. Stop engine. Install worm housing oil seal, lip of seal down.

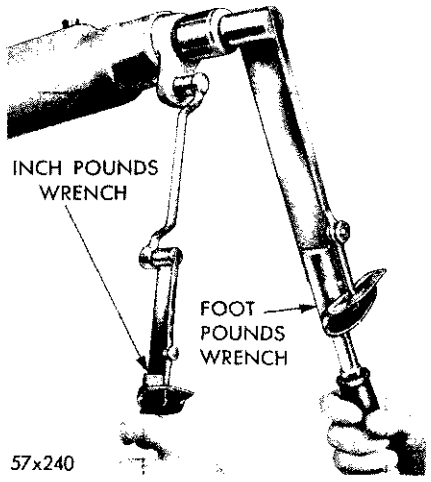


Fig. 65—Final-Worm Housing Bearing Adjustment

With gear still in straight-ahead position, install coupling on worm shaft with slot in up-and-down position. Install drag link on steering gear arm. Install steering tube, steering wheel, etc.

33. RESERVOIR AND WORM HOUSING

Since there is no hydraulic connection between worm and gear housing, the Power Steering has two separate fluid levels. The reservoir fluid level should be checked regularly every 1,000 miles or 30 days. Make sure top of reservoir is absolutely clean. Remove cover or filler cap and check oil level. **An oil level mark is stamped on the inside of the reservoir or on dipstick of style using the filler cap. Replenish as necessary with Transmission Fluid Type "A". When temperatures are consistently below —10 degrees F., it is permissible to drain the hydraulic system and refill with SAE 5W-20 (Multi Visc) Engine Oil.**

CAUTION

It is not necessary to change oil in worm housing due to temperature. When temperatures are consistently above —10 degrees F., drain the 5W-20 lubricant, and refill with Transmission Fluid Type "A". The total capacity of the Hydraulic System is approximately 2 quarts. (This does not include worm housing).

The Worm Housing oil level does not require periodic check (unless leakage occurs). Should the steering gear assembly be removed for any reason, however, it should be checked

at that time. The oil should be level with the filler plug opening when the gear assembly is in an installed position. Replenish as necessary with Transmission Fluid Type "A".

34. DRAINING HYDRAULIC SYSTEM

Should it become necessary to drain hydraulic system, proceed as follows: **Extreme care should be taken to prevent dirt from entering reservoir while cover or filler cap is removed.**

Disconnect the high pressure (small) hose at gear housing and jack up front end of car. Place hose in suitable container. While holding hose in container start engine and allow to idle. Turn steering wheel from one extreme to the other until all fluid is forced from unit. **Do not run engine above idle speed. As soon as fluid starts to show great quantities of air bubbles, stop engine.** Reconnect high pressure hose and refill.

35. REFILLING HYDRAULIC SYSTEM

If oil has been removed from hydraulic system, bleed steering gear as follows: Fill reservoir slightly higher than normal. Start engine and allow to run for a short time to circulate oil through the hoses. With the engine running at idle speed, turn the steering wheel back and forth several times from extreme right to left to bleed any remaining air out of the system. Check oil level in reservoir. Add oil if needed to reach level mark. Total capacity is approximately 2 quarts.

36. FRONT END ALIGNMENT

Front end alignment is very important, not only from the point of excessive tire wear, but care of handling as well. For procedures on checking front end alignment and specifications, refer to Front Wheel Suspension, Section I, in this manual.

37. LUBRICATION

Proper lubrication of steering gear and front suspension is very important on vehicles equipped with Power Steering. Lubrication of tie rods remain the same as specified for manual steering.

38. TIE RODS

Whenever it becomes necessary to install new tie rods and/or tie rod ends, make definitely sure when adjusting toe in, that both tie rod end tubes are turned an equal amount and are of equal length. **Clamp bolts must be positioned horizontally below tube. Make sure tie rod ball studs are positioned so they do not bind on edges of sockets, check by turning the tie rods back and forth after clamp bolts have been tightened.**

COAXIAL POWER STEERING PUMP

A sleeve type Power Steering Pump is used on all Chrysler 1957 Models (Fig. 66). When servicing the Power Steering Pump the following procedures should be followed:

The level of oil in reservoir will vary according to operating temperature of pump. The normal operating temperature is approximately 175° F. At 70° F., the oil level will be approximately 3¼ inches below the top of filler neck.

NOTE: Whenever the pump is drained or removed for servicing the pump must be filled up to the "full" mark indicated on the filler neck of reservoir before and after the engine is started. Use Automatic Transmission Fluid Type "A" oil.

CAUTION

The oil level should never be allowed to fall below the baffle of the reservoir.

39. REMOVAL AND INSTALLATION (Fig. 67)

a. Removal

Remove hose clamp and hose from discharge outlets. Loosen bracket fan belt adjusting screw and remove fan belts. Remove pump.

b. Disassembly

Do not disassemble the hydraulic pump in dirty surroundings or on a dirty work bench. Use clean paper on bench. After the pump has been disassembled, place the parts in a suitable cleaning solvent; clean and protect from dirt

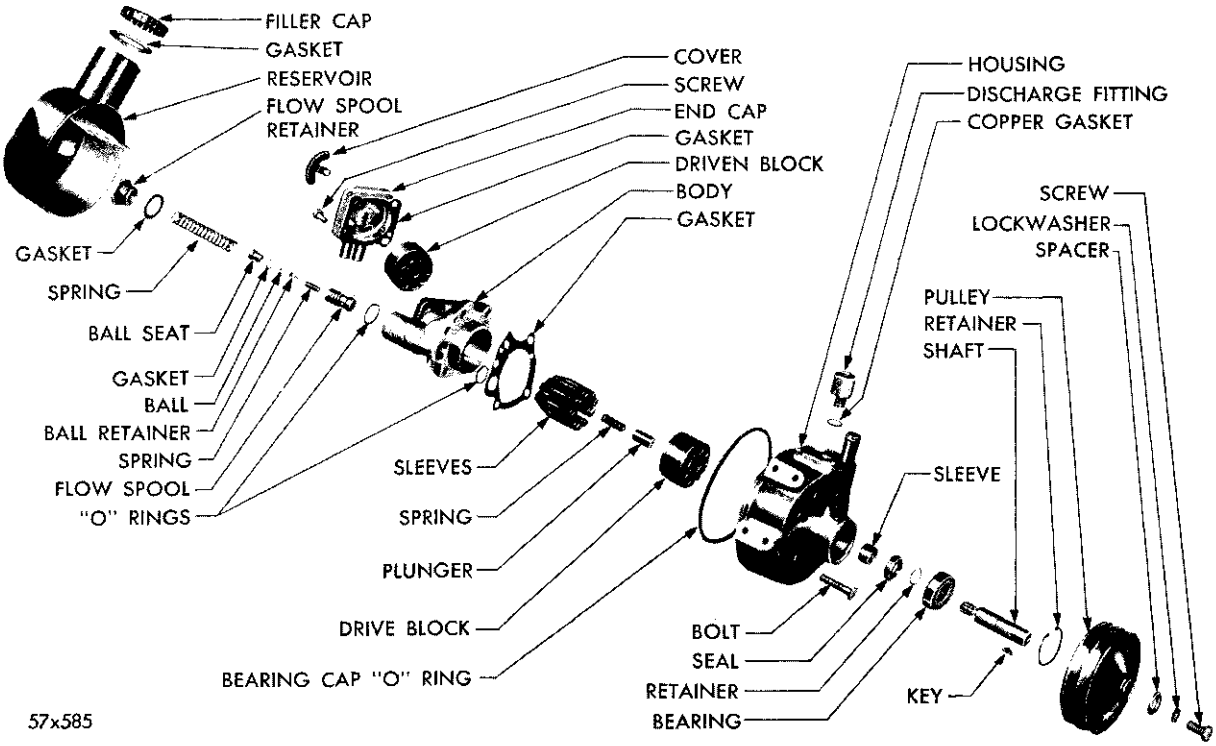


Fig. 66—Power Steering Oil Pump (Disassembled View) (Thompson Pump)

and grit. Drain oil from pump and reservoir. Cap discharge and return line fittings with protective closures to exclude dirt from pump. Thoroughly clean exterior of pump. Mount pump in a vise. Remove cap screw and reservoir. (Fig. 68). Loosen four cap screws at the inlet end cap (Fig. 69). Remove flow valve spring retainer fitting.

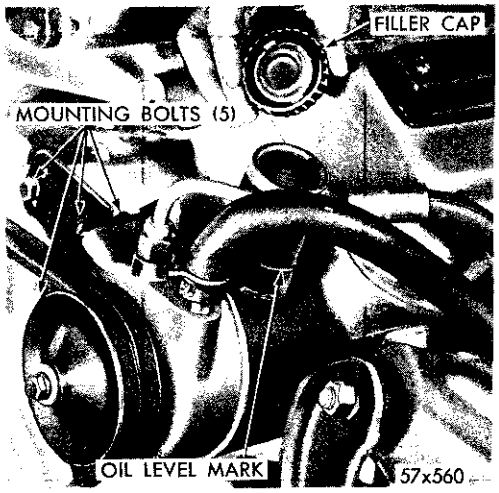


Fig. 67—Sleeve Type Power Steering Pump Installed

CAUTION

Flow and plunger springs are under pressure. Use care when removing cap and retainer to prevent spring and fitting from escaping due to spring force. Remove flow valve and spring. Remove and disassemble both end caps from inlet cap body and pump housing (Figs. 69

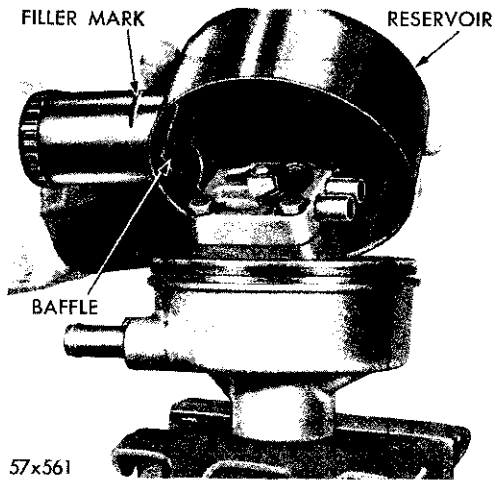


Fig. 68—Removing or Installing Power Steering Pump Reservoir

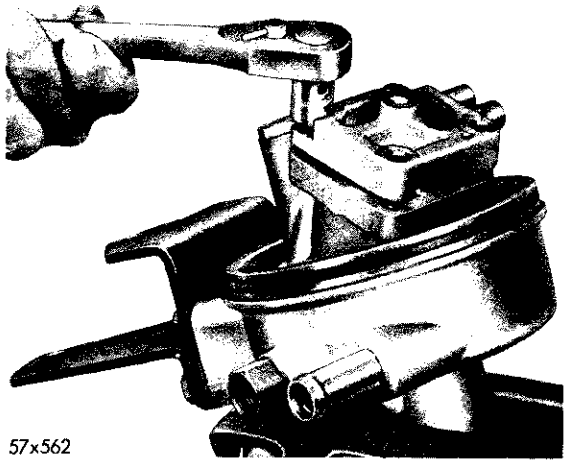


Fig. 69—Removing or Installing Inlet Cap Bolts

and 70). Plunger spring will tend to push the cylinder blocks out of body. Use care when disassembling.

The cylinder blocks will push out of body slightly due to pressure of plunger spring between blocks. Remove cylinder drive blocks and nine sleeves from pump body (Fig. 71), as well as cylinder plunger spring. Remove ball bearing retainer ring from housing, using snap ring pliers Tool C-3106 (Fig. 72). Remove shaft and bearing (Fig. 73).

40. CLEANING AND INSPECTION

Wipe bearing and shaft assembly with clean, lint free cloths. Do not soak in cleaning solvent; the lubricants sealed into the ball bearing may become diluted by the solvent.

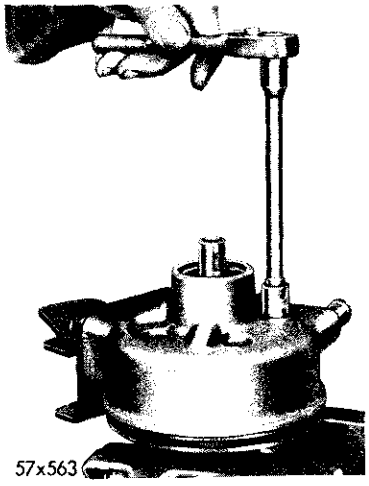


Fig. 70—Removing or Installing Pump Body from Housing

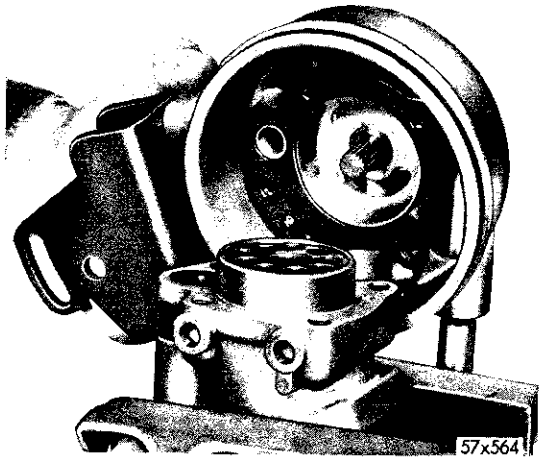


Fig. 71—Removing or Installing Housing from Pump Body

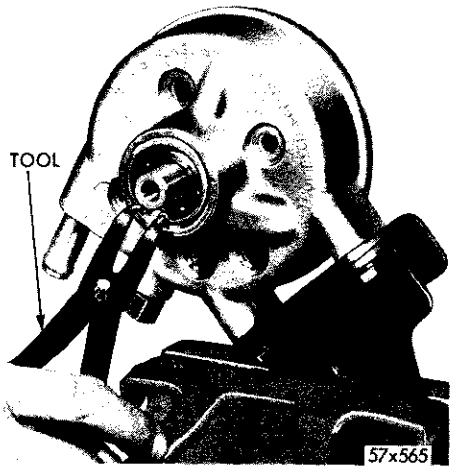


Fig. 72—Removing or Installing Snap Ring Bearing Retainer (Tool C-3106)

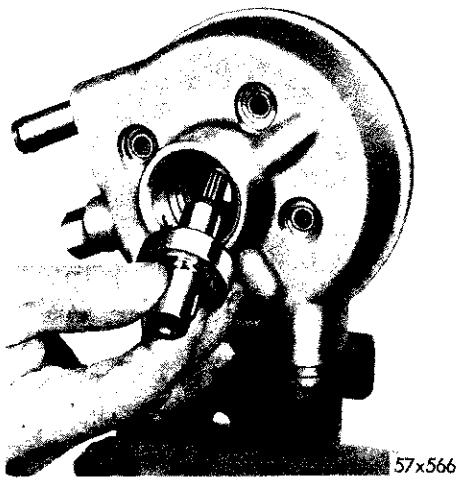


Fig. 73—Removing or Installing Shaft and Bearing

Inspect shaft for wear and check the ball bearing for roughness or noisy operation. If bearing must be replaced, remove shaft key, press bearing from shaft away from splined or serrated end of shaft. Examine retaining ring groove in housing, replace worn or distorted parts. If ball bearing is to be replaced, support bearing on inner bearing race and press shaft through bearing until retaining ring stops against inner race of bearing. The retaining ring must always be located between the bearing and splined or serrated end of pump shaft.

Check fit of sleeves in cylinder block bores. Sleeves must slide freely. Examine mating surfaces of sleeves and bores. Heavy scoring, if present, can impair pumping efficiency; cylinder blocks showing such scoring should be replaced. Hairline marking seen on sleeves are normal. Sleeves bearing such marks need not be replaced.

Examine flow valve spool and valve liner. Slight hair line scratches are permissible. Burrs from heavy gouges or scratches which may cause the flow spool to stick must be removed. This may be done by polishing with a smooth stone.

CAUTION

Do not break the sharp edges of the spool or liner.

Insert flow valve in valve body. (Fig. 74). By means of a pencil or other such rod which will not mar the internal diameter of valve

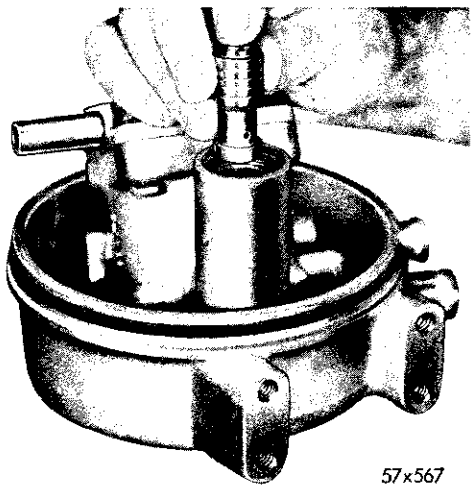


Fig. 74—Checking Flow Valve in Housing

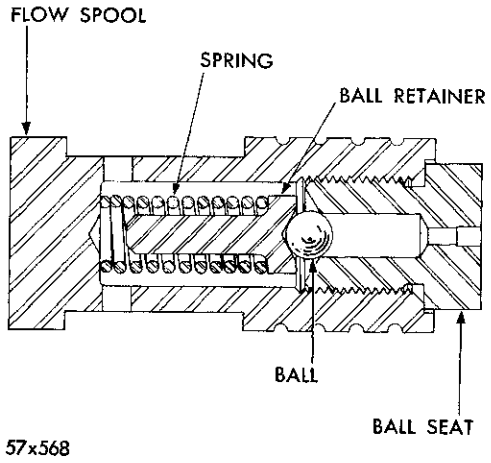


Fig. 75—Flow Spool Valve

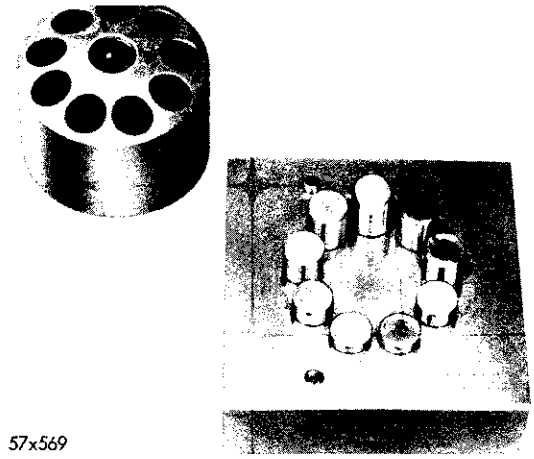
liner, move flow spool back and forth to inspect. On each pass, rotate spool slightly. The spool must slide freely. If spool sticks or drags, remove it from liner. Remove dirt, nicks, and burrs, using above caution and check by repeating above procedure.

Examine shaft seal in bearing cap. If worn or damaged, replace seal.

NOTE: The lips of seal must point toward the casting. Examine running surfaces of bearing cap and inlet end cap. If heavy scratches or gouging are present or if port edges are damaged, the part should be replaced.

Press seal in until the shoulder stops against the bearing cap casting. Care must be used to see that seal is properly aligned. This operation should be performed on an arbor press.

Check the pressure relief valve. The pressure relief valve is located in flow valve spool. (Fig. 75). The valve must not leak at any pressure below 750 psi. and must open completely at 900 psi. Evidence of leakage will be seen at small holes in the side of flow spool. If relief valve leaks, disassemble by removing valve seat for dirt or nicks. Clean all valve parts and reassemble, replacing valve seat if nicked or damaged. Check the pressure again. If the pressure still falls below the minimum requirement, disassemble the valve again and replace the pressure relief spring or place a $\frac{1}{32}$ inch washer between spring and ball retainer. To correct pressures exceeding the maximum requirement, remove valve seat and place a $\frac{1}{32}$



57x569

Fig. 76—Drive Block Assembling Fixture

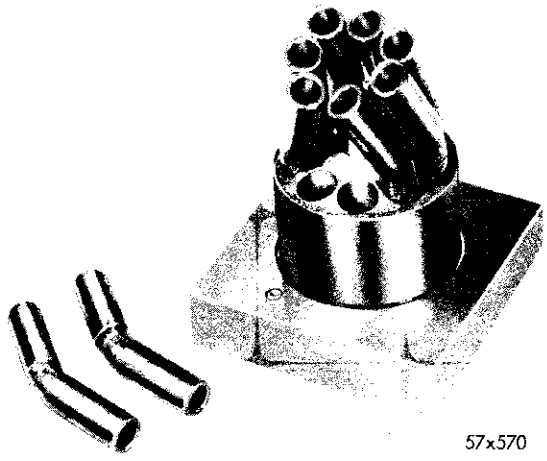
inch washer between valve seat and the flow spool body.

Examine the pump body for signs of unusual wear or damage. Small scratches or burrs can be removed with fine emery paper. If body is scored or damaged, a new pump body should be used.

41. ASSEMBLY OF POWER STEERING PUMP

Clean parts thoroughly and assemble pump in a clean work place.

Press drive shaft and bearing sub-assembly into bearing cap. Check rotation of shaft to make certain shaft turns freely. Use a sleeve which bears on outer race of ball bearing, and press the sub-assembly in place.



57x570

Fig. 77—Assembling Sleeves in Drive Cylinder

57x571

Fig. 78—Installing Drive Block

CAUTION

Make certain that the shaft bearing sub-assembly are properly aligned, otherwise the shaft may push sleeve bearing out of bearing cap or may scratch or mar the inside diameter of sleeve bearing.

Use an assembly fixture, as shown in Figure 76 and place driven cylinder block (without spline or serration) on assembly fixture. Lubricate (SAE 10W) and insert plunger spring, plunger, and seven sleeves in drive block, as shown in Figure 77. Place the pump body, square end down, over the cylinder drive block, and fixture locating pins use a pointed probe to align the sleeves to a uniform spacing and install the two other remaining sleeves. Position the drive splined block with serration over the sleeves. Sighting thru the bores in the drive block for alignment, lower the cylinder block until it engages the two sleeves in the forward position. Again use pointed probe slightly smaller in diameter than the sleeve bores, Figure 78, correct the alignment of sleeves in the 5 and 7 o'clock position at the same time guiding cylinder block downward. Continue this procedure to the 4 and 8 o'clock positions until all of the sleeves are aligned and engaged; the block may then be pushed in all the way.

CAUTION

Do not force the cylinder block forcibly in place; proper alignment of the block and sleeves will allow the block to be pushed easily into

place without excessive pressure. Tighten body to housing.

Remove body and cylinder block assembly from fixture, using care to see that blocks are not forced out of body by plunger spring. Assemble a new end cap gasket on pump body. Install end cap on body, tighten cap screws finger tight.

Insert a new "O" ring in counterbore at the flow valve liner in body. Install a new bearing cap gasket, assemble the bearing cap to the body.

NOTE: It may be necessary to exert hand pressure on the bearing cap to get drive block down into body after bearing cap is seated.

Tighten five cap screws finger tight. Grip end of pump shaft in a vise and rotate pump. The pump should rotate freely without binding. After making sure pump rotates freely tighten cap screws uniformly to 25 foot-pounds torque. Check pump again for rotation. Mount pump in a vise in a vertical position, gripping on the bearing hub. Install the flow valve spool with the 3/16 land down. Place flow valve spring on top of flow spool. Replace "O" ring on flow spring retainer fitting. Compress flow spring with fitting, and screw fitting into place. Tighten to 20 foot-pounds torque.

Install and align a new reservoir "O" ring on bearing cap. Lubricate "O" ring for ease in assembling reservoir. Align reservoir so that the indentation on back will mate with angular boss on suction end cap.

NOTE: Reservoir alignment may be achieved by sighting thru the 9/32 inch hole in the back of the reservoir. Push the reservoir into place applying force around its outside diameter.

Replace the copper gasket between the head of the 1/4 inch hex head cap screw and the back of reservoir. Tighten the 1/4 inch cap screw to 15 foot-pounds torque.

CAUTION

Do not attempt to align or pull the reservoir into place on the angular boss with the 1/4 inch cap screw.

Install shaft key, and pulley. Tighten pulley attaching bolt to 20 foot-pounds torque. Refill pump with Automatic Transmission Fluid Type "A" oil. Tighten fan belt as outlined in "Cooling System, Section V, Specifications.

SERVICE DIAGNOSIS (MANUAL)

42. EXCESSIVE PLAY OR LOOSENESS IN THE STEERING WHEEL

a. Steering gear adjusted too loosely or badly worn.

b. Steering linkage loose or worn.

c. Front Wheel bearings improperly adjusted.

d. Steering gear arm loose on steering gear shaft. Check damage to roller shaft and steering gear arm.

e. Steering gear housing attaching bolts loose.

f. Steering arms loose on anchor bolts.

43. HARD STEERING

a. Low or uneven tire pressure.

b. Insufficient lubricant in the steering gear housing.

c. Steering gear adjusted too tightly.

d. Front wheels out of line.

e. Steering column out of line.

COXIAL POWER STEERING

When a check is made on a report of a oil leak, be sure to keep in mind the difference between oil **leakage** and oil seepage. An oil spot on driveway, or one that drops on outside of gear housing, doesn't necessarily mean there's an oil leak in power steering unit. The only way to tell whether it's seepage or leakage is to find out whether owner has had to add oil to reservoir to maintain proper level.

Seepage can be caused by one or more of following:

a. Overfilling of upper housing. If a unit is filled level with filler plug opening, instead of using proper measured amount of oil, (14 oz.) it may show signs of seepage at vent due to expansion.

b. The normal breathing action of unit will leave a slight film of oil around vent opening.

c. Recently installed units. Oil becomes trapped in vent passage during shipping and drains out when unit is operated at mating surface between upper and lower housing.

If turning force is continued to be exerted on steering wheel after front wheels have reached their limit of travel and engine is accelerated excessively, it is possible to build up pump pressure in excess of 1,000 psi., which causes the power steering unit to flex at point when two housings are bolted together. Constant flexing at this point will cause seepage at the "O" ring. **THIS IS DEFINITELY AN ABNORMAL CONDITION.**

If some doubt exists as to whether or not a unit has internal leakage into the upper housing, proceed as follows:

Insert a pipe cleaner into upper housing vent to absorbe any oil which may be trapped in opening. Start engine and turn steering wheel from one extreme of travel to other, holding it a short time against each wheel stop.

CAUTION

Do not exceed 1,400 engine r.p.m. or hold against stops longer than 15 seconds, as it is possible to damage power units, fan belt and/or oil pump.

If there was no emission of oil from vent during this test, the condition existing was one of seepage or, all of oil has been lost from upper housing due to neoprene plug missing from vent passage inside housing.

44. LEAKAGE

If oil was observed coming from vent during above test, remove chuck assembly from the vehicle and proceed as follows to determine source of leak:

Special Service Tool C-3469 Dummy Flange Bulkhead Retaining has recently been released. This tool is essential in locating upper housing leaks in power steering unit.

Place chuck in holding fixture Tool C-3323. Connect test hoses Tool C-3211 and C-3318 so gear can be operated under pressure. Drain and remove upper housing. Using Tool C-3469, secure housing head. Remove all traces of oil around housing head, upper piston and connector assembly. Start engine and check for source of leaks.

NOTE: To build up pressure in unit when testing, it will be necessary to move control valve off center in each direction with adjusting Tool C-3445.

45. REACTION SEAL

Determined by oil coming from connector assembly. Inspect seal for signs of shrinkage or being damaged and replaced with new seal marked with silver "M". Check new seal prior to installation for snug fit in valve control spacer. Also inspect upper rod for being scratched at seal sealing surface.

46. CONTROL VALVE ROD UPPER "O" RING

Determined by oil coming from connector assembly. Remove "O" ring and inspect "O" ring seat for foreign material, nicks, or burrs. Install new "O" ring making sure it is seated properly in groove and cannot possibly come out of groove when pressure is applied. **Always** install new upper and lower valve rod "O" rings whenever gear is disassembled.

47. UPPER PISTON ROD SEAL

Due to oil leaking around the upper piston rod at housing head. Replace seal, at the same time inspecting seat in housing head for nicks and burrs: also check sealing surface on upper piston rod for scratches. Make sure seal is properly seated in housing head.

48. POROUS HOUSING HEAD

This can be noted by oil seeping through pores in housing head. If this condition exists, replace housing head.

49. LEAKAGE AT MATING SURFACE BETWEEN THE UPPER AND LOWER HOUSINGS

May be caused by looseness of three attaching screws which secure upper and lower housings. These screws should be torqued to 30 foot-pounds. If leakage was not caused by looseness of three attaching screws, or an abnormal operating condition, inspect for improperly seated or damaged "O" rings on housing, especially the one located on pressure side. Inspect the "O" ring seating surfaces on housing head and gear housing for nicks, burrs, and foreign material. Install new "O" rings.

CAUTION

Make sure upper "O" ring is installed properly, on upper or smaller diameter step, or damage to housing will occur when bolts are tightened.

50. LOWER HOUSING PLUG

Caused by improperly installed plug.

51. GEAR SHAFT OIL SEAL

Caused by damaged or improperly seated seal and/or snap ring. Replace seal. Remove steering arm with puller Tool C-3402. Remove old seal and install new seal with Tool C-3350.

52. GEAR SHAFT COVER

Leaks at gear shaft cover can be correct with removal of unit from vehicle.

a. Between gear shaft cover and housing. Due to loose cover attaching screws or damaged "O" ring. Tighten attaching screws to 20 foot-pounds torque. If leak persists, remove cover and replace "O" ring. Inspect mating surfaces of cover and housing for nicks, burrs, etc.

b. Around cover attaching screws. Two of these screws have neoprene seals, the two adjacent to engine do not. Make sure seals are installed properly or replace with new ones if needed.

c. Around threads of gear shaft adjusting screw. Due to damaged "O" ring. Remove cover and replace adjusting screw "O" ring.

Check for porosity of housing Can be corrected by peening the porous area.

53. NOISE IN CHUCK ASSEMBLY

Squealing (high pitched). If squeal is encountered only while applying turning force to steering wheel, it is an indication that pump drive belt adjustment is too loose. Make sure both top and bottom belts are adjusted to proper tension using Tool C-3379.

54. HISSING NOISE (NO LOAD)

Caused by low oil level or improper operation of back pressure valve, in lower position rod. Fill reservoir to proper level and recheck for noise. If noise is not eliminated, make following pressure checks:

Connect pressure gauge Tool C-3309 between the pump and pressure hoses. Open gauge valve and run engine at idle (475-500 r.p.m.). With engine idling, no turn effort being applied to steering wheel, and unit at operating temperature the gauge should show a pressure between 70-100 psi. If pressure is below 70 psi., it is an indication that lower piston rod relief valve is not operating properly. If pressure is considerably above 100 psi., the plunger may be sticking and preventing normal return pressure. If pressure is not within limits, install new back pressure valve assembly, making sure end plug is seated tightly against valve body.

(A) Hissing Noise (Right Turn Only)

This is caused by oil leaking past lower piston rod gear housing seal. Remove seal, with Tool C-3450, inspect lower piston rod and seal seat in gear housing for nicks, burrs, scratches, etc. Install new seal being sure it is properly seated in gear housing. Install seal with Tool C-3331.

(B) Hissing Noise Accompanied by Loss of Oil Through Upper Housing Vent (Left Turn Only)

This is caused by oil leaking past upper piston rod housing head oil seal. Remove seal, inspect upper piston rod and seal seat in housing head for nicks, scratches, burrs, etc. Install new seal being sure it is properly seated in housing head. Use same tools that were used on lower piston rod seal.

55. CREAKING NOISES ON TURNS

Probably due to loose gear to frame mounting bolts. Tighten bolts 60 foot-pounds torque.

56. SNAPPING NOISES

This is usually an intermittent noise which is produced when direction of steering wheel rotation is suddenly reversed. Tighten steering gear to frame mounting bolts. If noise still exists, remove steering chuck from vehicle and proceed as follows:

a. Check coupling screw for tightness.

b. Check lower piston rod bushing dowel pin for being too high.

c. Remove bushing and inspect for any foreign matter which may be under bushing, preventing it from seating properly.

d. Inspect bearing surface of bushing for signs of excessive roughness.

e. Install new bushing if needed, making sure it is seated properly in gear housing and head of dowel pin is slightly below bearing surface of bushing.

f. Check lower piston to assure a tight fit exists at piston. If looseness exists, it could possibly be due to too thin a snap ring or too wide a snap ring groove.

g. Replace necessary parts to assure a tight fit.

57. CHUCKLE NOISE

This noise will be most noticeable when vehicle is being operated on rough or choppy roads and usually is accompanied by wheel wander. This condition can be caused by any one or more of following items, each of which should be checked in following sequence:

a. Steering gear arm nut loose on gear shaft. Tighten 120 foot-pounds torque.

b. Loose front wheel bearing. Adjust bearings.

c. Gear shaft adjusted too loose. Adjust gear shaft.

d. Steering tube coupling screw loose. Tighten screw.

e. Worm bearing preload adjustment too loose. Adjust to proper preload with Tool C-3319 and C-3320 in combination with correct torque wrenches.

f. Excessive worm shaft end play in connector assembly. Replace worm and connector as an assembly (Part No. 1671270).

58. WANDER (STEERING WHEEL FREEPLAY)

This is a condition whereby operator has to constantly turn steering wheel in order to hold vehicle in a straight course. To determine whether or not this condition is caused by power steering unit, proceed as follows:

With front wheels in straight ahead position and resting on floor, start engine. Using a very light feather touch on steering wheel, check for freeplay. This should not exceed 5/8 inch.

CAUTION

Extreme care should be used when checking steering wheel freeplay, as it is rather difficult to check exact point where freeplay begins and ends.

If steering wheel freeplay exceeds 5/8 inch, without moving steering linkage, it is an indication that this difficulty is caused by one of following items in power unit, and should be checked in following sequence:

a. Gear Shaft adjustment too loose. Adjust gear shaft.

b. Steering tube coupling screw loose. Tighten screw.

c. Worm bearing preload adjustment too loose. Adjust to proper preload with Tools C-3319 and C-3320 and in combination with correct torque wrenches.

d. Excessive worm shaft end play in connector assembly. Replace worm and connector as an assembly. (Part No. 1670687).

If steering wheel freeplay does not exceed

⅝ inch, it is an indication that the difficulty is caused by one of following:

a. Steering gear arm nut loose on gear shaft. Tighten 120 foot-pounds torque.

b. Loose front wheel bearings. Adjust.

c. Steering linkage. Check for worn or loose tie rod ends, loose steering knuckle arms, drag links, etc. Tighten or replace necessary parts to eliminate freeplay.

d. Front wheel alignment. Align front wheel.

59. POOR RETURNABILITY (BOTH DIRECTIONS)

This is a condition whereby front wheels will not return to straight ahead position without assistance of operator. A primary cause of this condition is often due to low tire pressure, therefore, prior to checking further, inflate tires to proper pressure and road test. If condition exists, check returnability of power unit as follows to determine if condition is caused by power unit or front wheel alignment.

Disconnect linkage from steering gear arm and start engine. With engine idling, use torque wrench on steering gear arm nut and check torque required to turn gear shaft through center from one extreme to other.

The torque reading should be approximately equal in each direction and should not exceed 40 foot-pounds, + or — 10 pounds. If torque reading does not exceed 40 foot-pounds + or — 10 pounds, it is an indication that difficulty is caused by one of following and not power steering unit:

a. Check all tie rod ends, steering knuckles for binding. If a bind is found to exist in any of these parts, replace as necessary.

b. Front wheel alignment. Align front wheels.

If torque readings exceed 40 foot-pounds, + or — 10 pounds in either direction, it is an indication that the condition is caused by the power steering unit. To determine an exact source, it will be necessary to start engine and recheck amount of torque required to turn gear shaft each time one of following items is checked.

c. Steering wheel to column jacket interference. Adjust to give necessary clearance.

d. Steering column jacket bearing. Remove steering wheel, with puller, Tool C-3428, jacket and shroud assembly and steering tube. Recheck torque, if reading is 40 foot-pounds or below, the difficulty is caused by steering column jacket bearings, replace bearings. If reading was not below 40 foot-pounds, proceed as follows:

e. Gear shaft adjustment too tight. Adjust gear shaft.

f. Worm bearing preload too tight. Place unit in special holding fixture Tool C-3323, connect test hoses and refill reservoir. Remove worm shaft oil seal. Start engine and recheck torque reading. If torque reading remains above 40 foot-pounds, check worm bearing preload for being too tight.

Readjust preload. If reading still remains above 40 foot-pounds, proceed as follows:

g. Worm shaft binding in connector. Remove upper housing and using Tool C-3469, secure housing head. Start engine and recheck torque reading. If reading is 40 foot-pounds or below, difficulty is due to either worm shaft binding in connector or connector guide rails binding on housing. Inspect and replace necessary parts.

60. POOR RETURNABILITY (ONE DIRECTION ONLY)

This is a condition whereby front wheels will not return to straight ahead position without assistance of operator. A primary cause of this condition is often due to low tire pressure, therefore, prior to checking further, inflate tires to proper pressure and road test. If condition still exists, check returnability of power unit as follows to determine if condition is caused by power unit or front wheel alignment:

a. Disconnect linkage from steering gear arm and start engine.

b. With engine idling, use a torque wrench on steering gear arm nut, and check torque required to turn gear shaft through center from one extreme to other. The readings should be approximately equal and not exceed 40 foot-pounds, then difficulty is caused by front wheel alignment and not power unit.

c. Align front wheels. If this does not correct condition, proceed as follows:

d. Center the control valve until equal torque readings are obtained in each direction.

61. UNEQUAL STEERING EFFORT (SEVERE CASES OF SELF STEERING)

A condition whereby operator finds that it takes very little effort to turn steering wheel in one direction, while considerable force is required, in the opposite. In severe cases of unequal steering effort it is possible that vehicle will have a tendency to self steer unless steering wheel is held.

Unequal steering effort is often mistaken for "lack of assist in one direction," and since causes for each are entirely different, make sure difficulty is diagnosed properly before attempting to correct. To establish which condition exists, check turning effort of steering wheel as follows:

a. With engine idling and front wheels resting on floor, turn steering wheel at normal rate of r.p.m. from one extreme to other, noting amount of turning force required. Turn steering wheel in same manner except at much higher rate of r.p.m. and again noting amount of turning force required.

CAUTION

Do not exceed 60 steering wheel r.p.m.'s when making this check.

If turning force did increase considerably with higher rate of steering wheel r.p.m.'s, then refer to "lack of assist" (one direction). If amount of turning force did not increase appreciably with increased steering wheel r.p.m. then it is reasonable to assume that condition is unequal steering effort. Proceed as follows:

b. Disassemble unit as required.

62. CONTROL VALVE ADJUSTMENT

Disconnect linkage and center control valve so that an equal amount of torque is required to turn gearshaft from one extreme to other. If proper adjustment cannot be maintained after it has been set, then refer to "INABILITY TO MAINTAIN CONTROL VALVE ADJUSTMENT", Paragraph 71.

63. UPPER PISTON ROD MOVEMENT IN PISTON

Check fit of snap ring which retains upper piston rod in piston, by attempting to rotate it. If snap ring can be rotated, it will allow upper piston rod to move axially with respect to piston thus displacing control valve in relation to valve body. This can cause self steering in either direction; however, it is usually most noted to be to the left. To correct, replace piston making sure snap ring seats properly.

64. CONNECTOR NUT

Anything which will cause valve rod adjusting disc to be loose in connector, will result in self steering. Check for connector nut not tightened sufficiently to lock valve rod adjusting disc and reaction assembly in connector. To accomplish this, remove worm connector and reaction assemblies from upper piston rod. Reassemble by placing the adjusting disc, adjusting disc retainer and valve control spacer in their respective positions in worm connector. Install worm connector nut and tighten securely. Insert small punch or screw driver through bottom of connector and attempt to rotate adjusting disc. If it cannot be rotated, it is properly locked.

65. CONTROL VALVE LOOSE ON ROD

The control valve rod is connected to control valve by peening. Check for any movement between the two. If movement exists, replace control valve and rod. Do not attempt to tighten by peening.

66. UPPER PISTON ROD NUT LOOSE

Tighten to proper torque.

67. UPPER PISTON ROD

Inspect upper piston rod for being scored at reaction seal retainer bearing surfaces and replace if needed.

68. REACTION ASSEMBLY

If above mentioned items have failed to correct unequal steering effort, replace all reaction parts. Make definitely sure valve control spacer is matched to upper piston rod. The length of valve control spacer must be identical to dis-

tance between the seat of lower valve control spacer retainer and the seated upper piston rod nut.

69. INABILITY TO MAINTAIN CONTROL VALVE ADJUSTMENT

This condition can be caused by one of the following: Reaction spacer being too long, too short, or by burrs, or out of squareness of any reaction area parts which are held inside connector by connector nut, including nut. Anything which causes unseating of reaction retainers when no turning force is applied will make accurate valve adjustment impossible. This can also be caused by one of following:

a. Valve control rod loose in nut valve rod adjusting cap assembly. Replace the valve rod adjusting assembly as required.

CAUTION

The turning torque for valve control rod in threads of valve rod adjusting disc should be 10-12 inch pounds to prevent any looseness at this point. Do not exceed 20 inch-pounds, otherwise damage to valve rod and/or adjusting tool may result.

b. Upper piston rod nut loose. Tighten to proper torque.

c. Control valve loose on rod. The control valve rod is connected to control valve by peening. Check for any movement between the two. If movement exists, replace control valve and rod. Do not attempt to tighten by peening.

d. Upper piston rod loose in piston. Check for movement of upper piston rod in piston. If movement exists, replace piston.

70. LACK OF ASSIST (ONE DIRECTION)

This is a condition whereby operator finds that considerable more effort is required to turn steering wheel in one direction than it does the other. Since lack of assist in one direction is often mistaken for "Unequal Steering Effort" and causes for each are entirely different, make sure difficulty is properly diagnosed before attempting to correct. To determine which condition exists, refer to "Unequal Steering Effort" for method of establishing. Lack of assist in one direction usually is found to be caused by one of following.

a. Piston Ring (Neoprene). Check for damaged neoprene piston ring.

b. Housing Head Oil Seal Upper Piston Rod. A damaged or improperly seated housing head oil seal will cause lack of assist when turning to left, and will also be accompanied by loss of oil out vent in upper housing. Inspect sealing surface on upper piston rod for being scratched. Replace if necessary. Install new housing head oil seal making sure it is properly seated in housing head.

c. Lower Piston Rod Oil Seal. A damaged or improperly seated lower piston rod oil seal will cause lack of assist when turning to right. Inspect sealing surface on lower piston rod for being scratched. Replace if necessary. Install new lower piston rod oil seal making sure it is properly seated in housing.

d. Valve Rod Lower "O" Ring. Inspect for damaged lower valve rod "O" ring in upper piston rod. Inspect groove for any foreign matter. Install new "O" ring making sure it is seated properly in groove.

e. Piston Rod "O" Rings. Inspect for damaged "O" rings on both upper and lower piston rods which may be causing leakage between piston and rods. Install new "O" rings making sure they fit properly in grooves.

71. LACK OF ASSIST (BOTH DIRECTIONS)

This is a condition whereby operator notes that considerable amount of effort is required to turn steering wheel in both directions. To locate cause of condition, check following possibilities in manner in which listed:

a. Tire pressure too low. Inflate to proper pressure.

b. Pump Drive Belt slipping or broken. Adjust belts to proper tension, or replace if needed.

CAUTION

Where two belts are used, make definitely sure both top and bottom belts are adjusted, otherwise condition will remain.

c. Low fluid level. Fill reservoir to proper level.

d. Should lack of assist still be encountered, a pressure check should be made to determine if pump is at fault.

DIAGNOSIS OF PUMP TROUBLE

COXIAL POWER STEERING GEAR (Continued)

72. PUMP NOT PRIMING

a. Weak or broken plunger spring (compressed to a height of $^{61}/_{64}$ inch, the spring should exert a force of 29.7 to 36.3 pounds when compressed).

b. Flow valve stuck in open position. Check for dirt or burrs on flow spool or in valve liner.

73. REDUCED OR NO FLOW

a. Flow valve stuck in open position—check for dirt or burrs on flow spool or in valve liner.

b. Relief valve leaking—check for dirt or nicks on relief valve seat.

c. Weak or broken relief valve spring—when compressed to a height of $^{35}/_{64}$ inch, the spring should exert a force of 12.5 to 14 pounds when compressed.

d. Flow valve spring retainer loose, torque to maximum specifications.

e. Cap screws on either end of pump loose—torque to indicated specifications.

f. Weak or broken flow valve spring—when compressed to a height of 1½ inch, the spring should exert a force of 11.25 to 13.75 pounds when compressed.

74. LOW SHUT-OFF OR RELIEF PRESSURE

a. Weak or broken relief valve spring—replace.

b. Leak in relief valve—check for dirt or nicks on relief valve seat.

c. Flow valve stuck in open position—check for dirt or burrs on flow spool or in flow valve liner.

d. Cap screws on either end of pump loose—torque to indicated specifications.

75. PUMP NOISE

a. Check oil level in reservoir—oil level should be up to mark on filler neck when pump is at 175° F.

b. Air in steering system—check all connections to make certain that they are tight.

c. Discharge and return line hoses—the hoses must not touch any part of the body or frame except where they are attached to the pump or steering column.

d. Loose pulley.

e. Water in oil.

76. HARD OR JERKY STEERING TOWARD END OF FULL LEFT OR RIGHT TURN

a. Loose drive belt—tighten drive belts to specified torque.

77. OIL LEVEL IN THE RESERVOIR

The following precautions should be observed for best performance of the sleeve-type power steering pump.

The oil level in reservoir will vary according to the operating temperature. The normal operating temperature of the pump is approximately 175° F. At this temperature, the oil should be up to the oil level mark on the filler neck. At 70° F. the oil will be approximately 3¼ inches from top of the filler neck.

NOTE: The oil level should never be allowed to fall below the baffle in the reservoir.

Automatic Transmission Fluid Type "A" is used in the steering system; however, S.A.E. 10W may be used to bring the oil level to the proper place if the level is low. If the steering system is drained, it should be filled with transmission fluid. The pump must be full before the engine is started. After starting the engine, add sufficient oil to make-up for the pump consumption to bring oil up to operating level.

78. BELT TENSION

The belt tension may be checked by applying torque wrench to the bolt which holds the pulley in place. Turning in the direction which will tighten the bolt, the torque should be 20 foot-pounds.