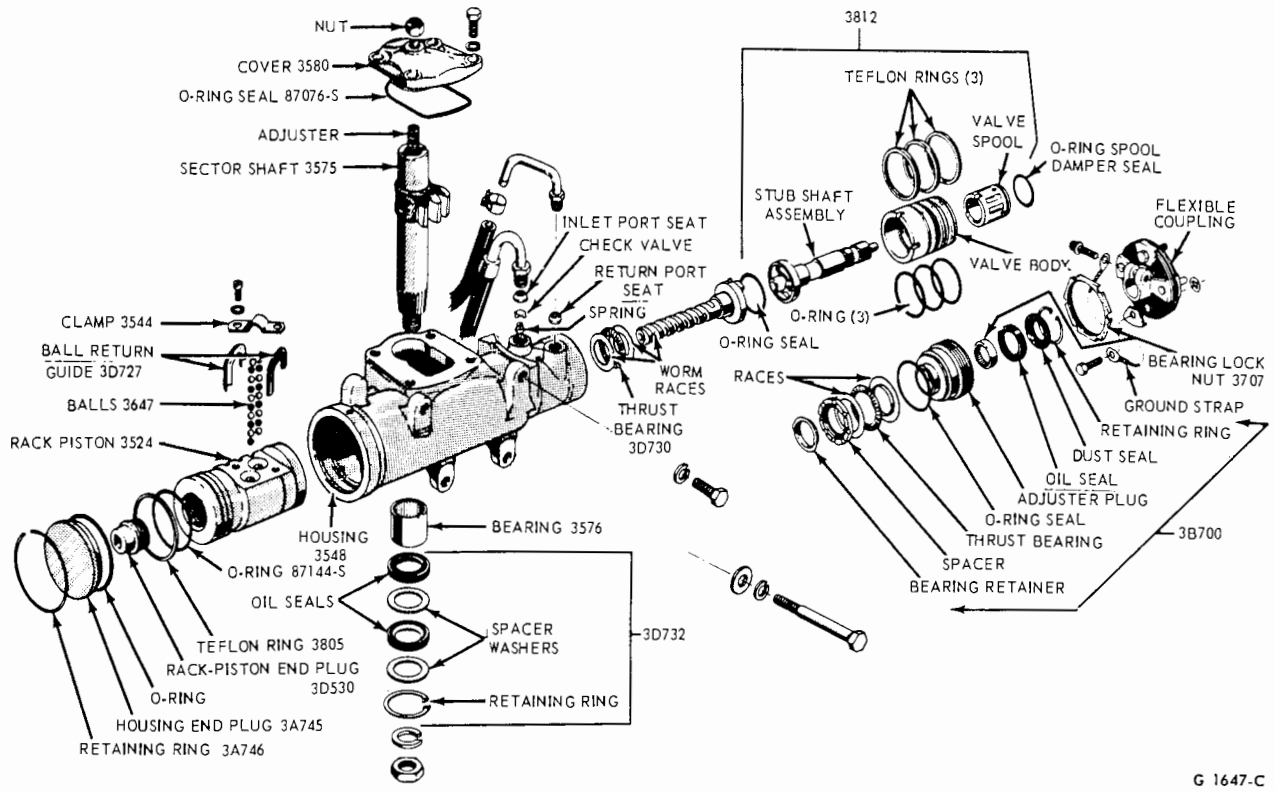


FIG. 5 Steering Gear Disassembled

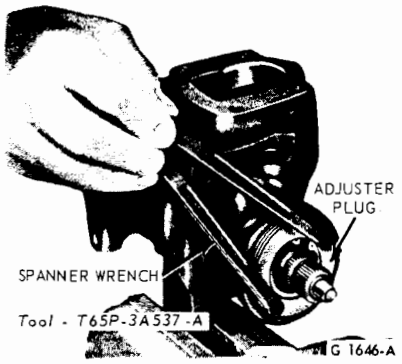


FIG. 6 Removing Adjuster Plug

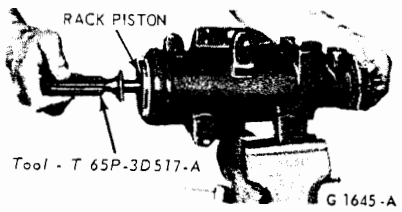


FIG. 7 Removing Rack Piston

5. Lubricate a **new** adjuster plug O-ring with petrolatum and install it in the adjuster plug groove.
6. Install the adjuster plug over the end of the stub shaft and tighten it just enough to be sure all parts are properly seated. Remove Tool T65P-3A537-B.

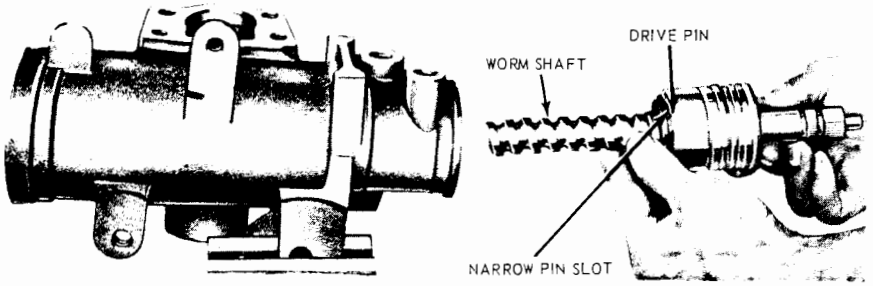


FIG. 8 Installing Valve and Worm Shaft in Housing

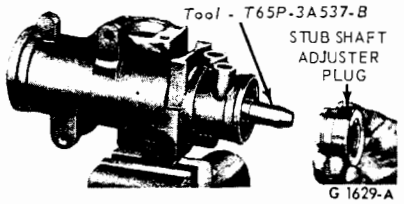


FIG. 9 Installing Adjuster Plug

7. Install the adjuster plug locknut loosely on the plug.
8. Tighten the adjuster plug with wrench T65P-3A537-A while rotating the input shaft. As soon as additional drag is noted, loosen the adjuster plug one-eighth turn. Measure input shaft drag with an in-lb torque wrench.
9. Tighten the adjusting plug (Fig. 10)

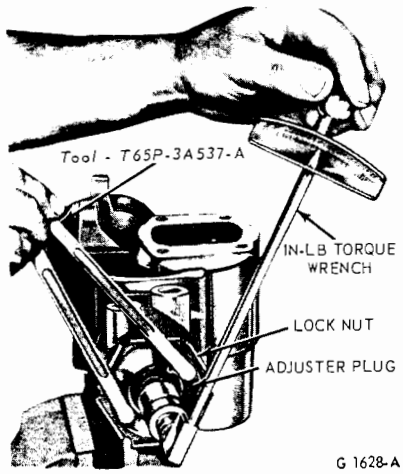


FIG. 10 Adjusting Thrust Preload

until preload is 1 to 3 in-lb greater than the drag measured in Step 8. Tighten the adjuster plug lock nut and recheck thrust bearing preload. Total preload must not exceed 8 in-lbs.

10. Install Tool T65P-3805-A in the steering gear housing. Position the rack-piston as shown in Fig. 11. Be sure Tool T65P-3D517-A contacts the worm shaft. Push the rack-piston inward until it contacts the worm shaft, while keeping pressure applied to Tool T65P-3D517-A. Turn the stub shaft clockwise until the middle rack groove in the rack-piston is aligned with the center of the sector shaft roller bearing. Remove the tool from the housing.

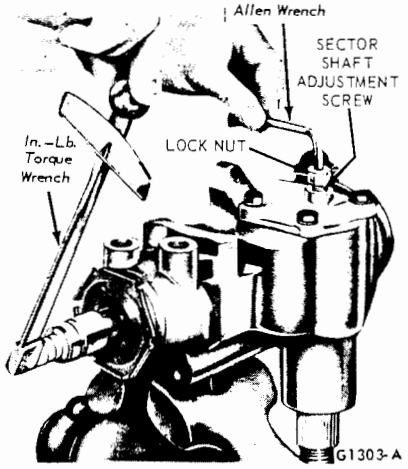


FIG. 11 Adjusting Sector Shaft Mesh Load

11. Lubricate a **new** O-ring with C1AZ-19582-A and install it in the sector shaft cover.
12. Thread the sector shaft cover onto the adjusting screw until it bottoms, then back it off one and one-half turns.
13. Install the sector shaft so the center gear tooth meshes with the center groove in the rack-piston. Be sure the cover O-ring is in place before pushing the cover down on the housing.
14. Install the cover screws and lock washers and torque to 30 to 35 ft-lb.
15. Install a **new** adjuster lock nut halfway on the adjuster screw.
16. Install the end plug in the rack-piston. Torque the plug to 50 to 100 ft-lb.
17. Lubricate a **new** housing end plug O-ring and install it in the housing.
18. Place the end plug in the gear housing and seat it against the O-ring seal. It may be necessary to tap the end plug lightly with a soft-faced mallet to seat it properly.
19. Snap the retainer ring in place with the fingers. Tap lightly on the ring to be sure it is securely bottomed in the housing.
20. Turn the input shaft all the way to the left or right, then turn it back approximately one and three-quarter turns to center the worm.
21. Place an in-lb torque wrench on the input shaft as shown in Fig. 11.
22. With the gear on center and the sector shaft adjusting screw loose, measure the total drag. With the gear on center, adjust the sector shaft thrust screw so preload is 4 to 8 in-lb greater than total preload and drag. Take readings through an arc not exceeding 20 degrees. Tighten the lock nut.
23. After obtaining proper mesh load, torque the sector shaft adjusting screw lock nut to 30 to 35 ft-lb.

STEERING GEAR HOUSING

Disassembly and Assembly

1. Remove the snap ring (Fig. 12) that secures the sector shaft seals in the lower end of the housing. Remove the lower spacer washer.
2. Remove the lower seal (double lip), spacer washer, and upper seal (single lip) using Tools T58L-101-A and T59L-100-B (Fig. 13).
3. Check the housing bearing for wear and damage and remove if necessary. Working from the lower end of the housing (Fig. 14) press the bearing out of the housing. Discard the bearing.
4. Working from the upper end of the housing, press in a new bearing until the upper end is 0.030 inch below the housing bore. When installing the bearing, be sure to press only on the identification (stamped) end.
5. Lubricate new sector shaft seals (Fig. 15) in D2AZ-19582-A hydraulic fluid. Install the single lip seal first, then a back-up washer. Using Tool T65P-3D642-A (Fig. 16), drive the seal and washer in only far enough to provide clearance for the other seal and back-up washer and the retaining ring. Do not let the seal bottom on the end of the counterbore. Install the double lip seal and back-up washer. Using Tool T65P-3D642-A drive the seal and washer in only far enough to provide clearance for the retaining

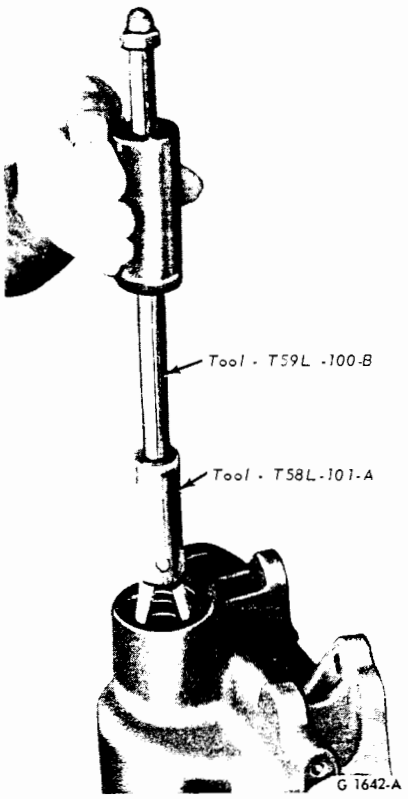


FIG. 13 Removing Sector Shaft Seals

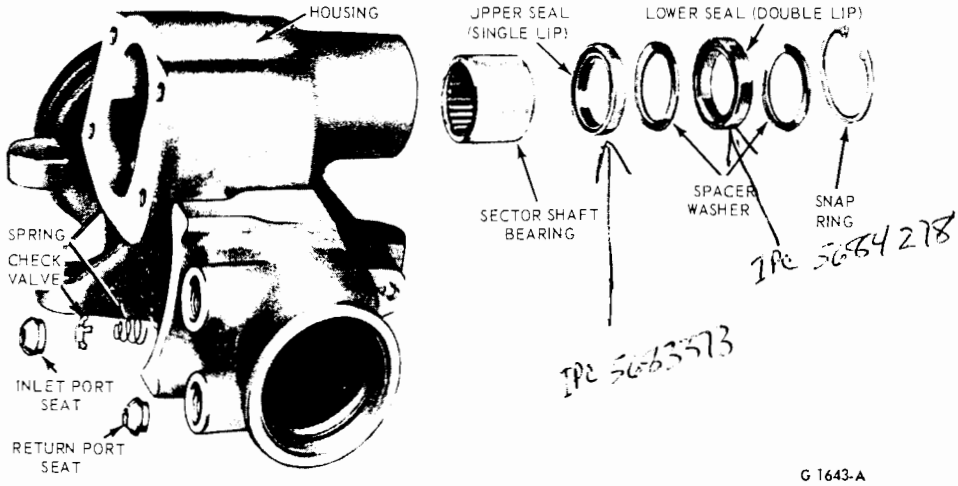


FIG. 12 Steering Gear Housing Disassembled

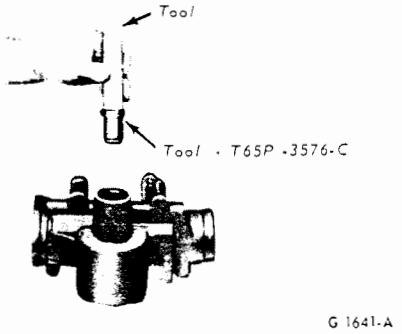


FIG. 14 Removing Sector Shaft Bearings

ring. Install the sector shaft seal retaining ring with snap ring pliers, making certain that the ring seats properly.

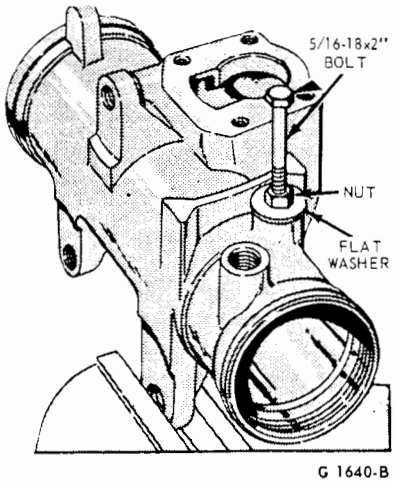


FIG. 17 Removing Port Seal

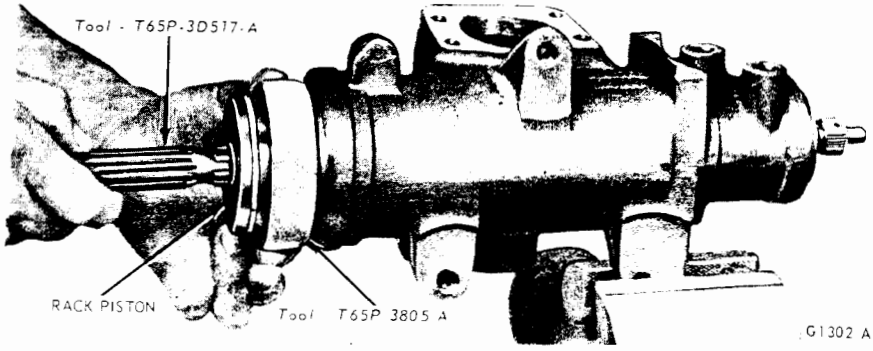


FIG. 15 Installing Rack-Piston

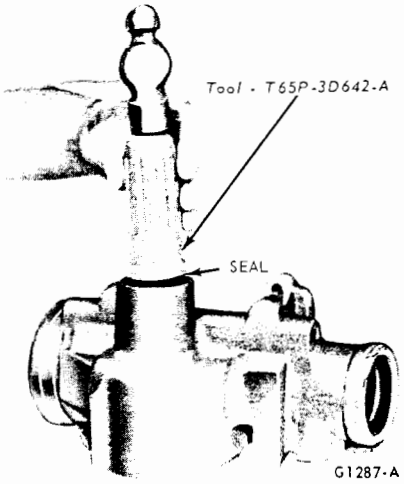


FIG. 16 Installing Sector Shaft Seal

6. To remove a damaged port seat, use a 5/16-18 inch U.S. thread (coarse) tap and turn it two turns into the seat. Coat the end of the tap with petrolatum to prevent chips from entering the passage while tapping the seat.
7. Thread a bolt and nut with a flat washer into the tapped hole (Fig. 17).
8. Hold the bolt in place and tighten the nut to extract the seat. Discard the seat.
9. Remove the check valve and spring from the inlet port.
10. Position the spring, check valve and a **new** seat in the inlet port.
11. Using Tool T65P-3D642-A, drive the seat into place.

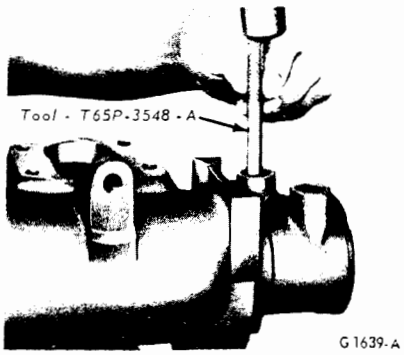


FIG. 18 Installing Inlet Port Seat

12. Remove and install the outlet port seat in the same manner.
13. A stop ring is located in the piston bore to limit piston travel. Do not attempt to remove this ring. If the stop ring is damaged, the entire housing assembly must be replaced.

ADJUSTER PLUG

Disassembly and Assembly

1. Lift the adjuster plug off the stub shaft (Fig. 5).
2. Pry the thrust bearing retainer off the adjuster plug as shown in Fig. 19. Be careful not to score the needle bearing bore. Discard the retainer.

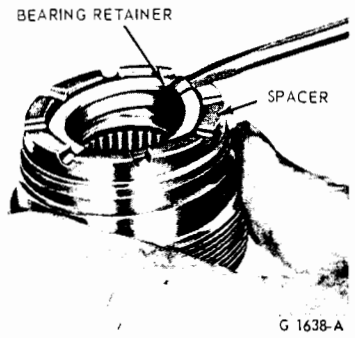


FIG. 19 Removing Thrust Bearing Retainer

3. Lift the spacer, thrust bearing, races and O-ring, off the plug (Fig. 20). Discard the O-ring.
4. If the roller bearing must be replaced, remove the dust seal retaining ring. Working from the spacer end of the adjuster plug, remove the roller bearing, oil seal and dust seal as shown in Fig. 21.

   Do not remove the roller bearing if it is not damaged. Pry the dust seal and oil seal off the adjuster plug with a screwdriver.
5. Place a **new** roller bearing on Tool T65P-3D525-A, with the bearing manufacturer's identification facing toward the tool.
6. Insert the bearing and tool in the bore. Drive the bearing into the plug until it is flush with the bottom surface of the stub shaft seal bore.
7. Lubricate a **new** oil seal with D2AZ-19582-A. Install the seal with Tool T65P-3D526-A pressing it into the plug far enough to provide clearance for the dust seal and the snap ring (Fig. 22).
8. Lubricate a **new** dust seal with D2AZ-19580-A and install it with its smooth rubber surface facing outward.
9. Secure the dust seal with the ring, making sure that the ring is properly seated.
10. Lubricate a **new** O-ring seal with Vaseline and install it on the adjuster plug.
11. Assemble the thrust bearing, outer race, thrust bearing, inner race, and

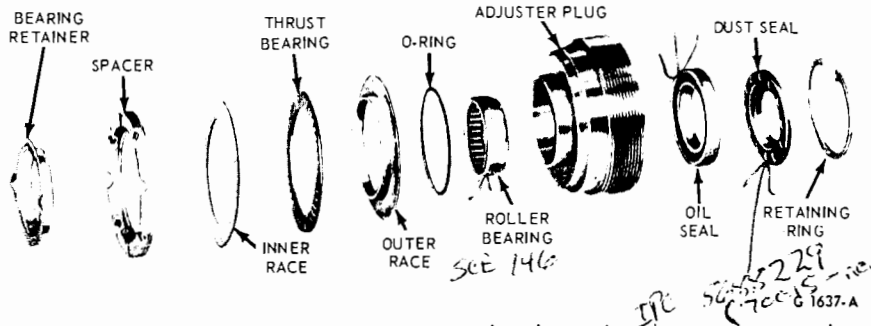


FIG. 20 Adjuster Plug Disassembled

the thrust bearing spacer on the adjuster plug (Fig. 20).

12. Install a new bearing retainer on the adjuster by carefully tapping on the flat surface of the retainer (Fig. 23).

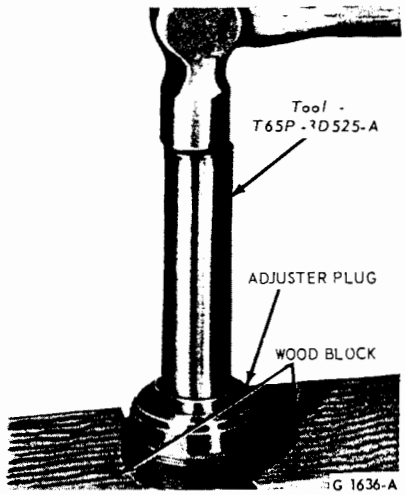


FIG. 21 Removing or Installing Roller Bearing from Adjuster Plug

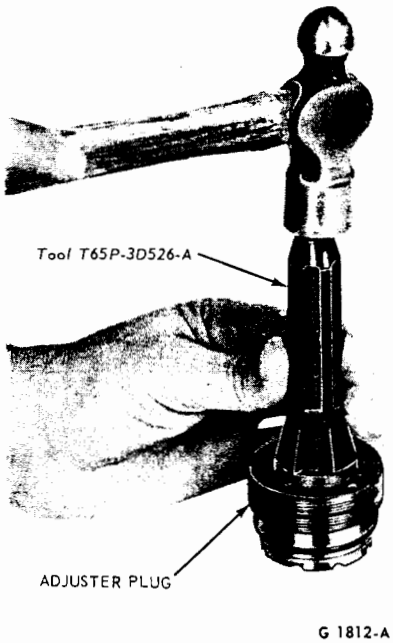


FIG. 22 Installing Oil Seal in Adjuster Plug

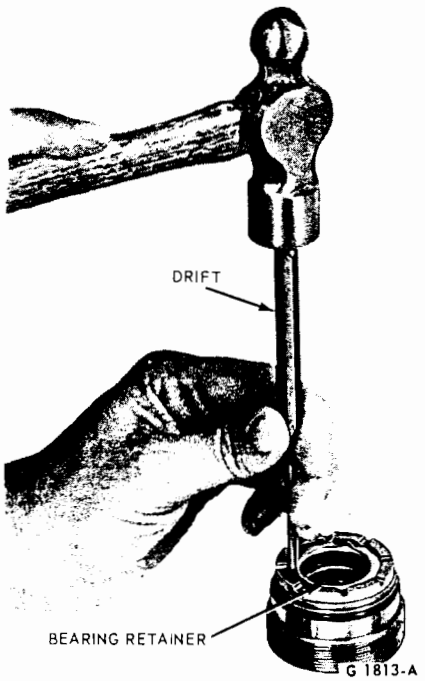


FIG. 23 Installing Thrust Bearing Retainer

STUB SHAFT AND ROTARY VALVE ASSEMBLY

Disassembly

Do not disassemble the valve (Fig. 24) unless the components have become contaminated or the dampener O-ring must be replaced.

1. Invert the valve and tap on the work bench (torsion bar end) until the torsion bar cap separates from the valve body (Fig. 25). Discard the cap-to-body O-ring.
2. Grasp the stub shaft and push it down through the valve body until the drive pin hole is visible.
3. Tilt the stub shaft so the drive pin disengages from the spool. Remove the stub shaft from the valve body and spool assembly.
4. Slide the spool out the top of the valve body. **Do not attempt to remove the spool through the bottom as it may jam or be damaged.**

Assembly

Only the O-ring and Teflon seals can be replaced.

1. Dip the dampener O-ring in power steering fluid and install the O-ring on the spool. Insert the spool into the valve body using a turning motion.
2. Push the spool into the valve body until it bottoms. Depress the dampener O-ring with fingertips to prevent it from being cut. When the spool is correctly installed, the spool drive pin hole will be directly opposite the deep valve body notch. This will correctly position the cap notch to the body pin.
3. Insert the stub shaft into the spool with the stub shaft drive pin aligned with the mating spool hole.
4. Insert the drive pin into the spool hole and pull the assembly into the valve body keeping the cap slot and body pin aligned. When the cap seats correctly in the valve body, the top surface of the cap will be at least 3/32 inch below the deep body notch.
5. Replace the cap-to-body O-ring.

RACK PISTON

Disassembly and Assembly

1. Cut the Teflon ring and O-ring from the piston.
2. Place the assembly on a clean lint-free cloth and remove the screws that attach the ball return guide clamp to the rack-piston. Remove the clamp (Fig. 26).
3. Remove the ball return guides from the rack-piston.
4. Remove Tool T65P-3D517-A from the piston and remove the remaining balls.
5. Thoroughly clean all parts.
6. Lubricate a new O-ring and Teflon ring and install the O-ring on the piston being careful not to twist it. Slide the Teflon ring into place being careful not to stretch it any more than necessary.
7. Slide the worm (Fig. 27) all the way into the rack-piston. Insert 16 balls, alternating dark balls with polished balls, into the guide hole nearest the Teflon ring, while slowly rotating the worm counterclockwise to feed the balls through circuit.

Apply petrolatum liberally to one of the ball return guides and install the remaining balls in the guide. The constant ratio gear requires a total of 22 balls, while the variable ratio gear requires 24 balls. Place the other half of the guide in position and insert both guides into holes in the

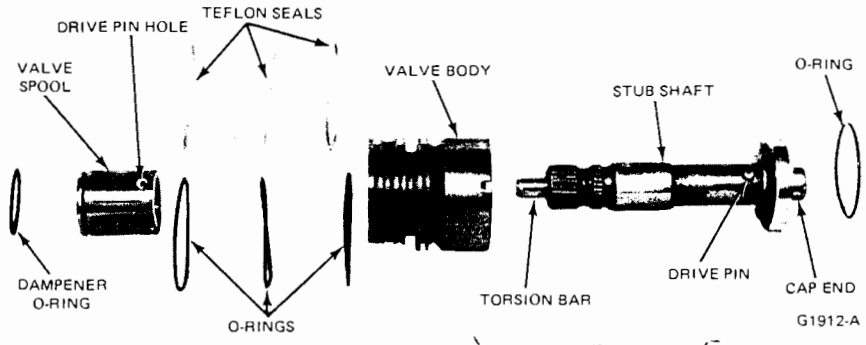


FIG. 24 Rotary Valve Disassembled

Pin - .185 x .685

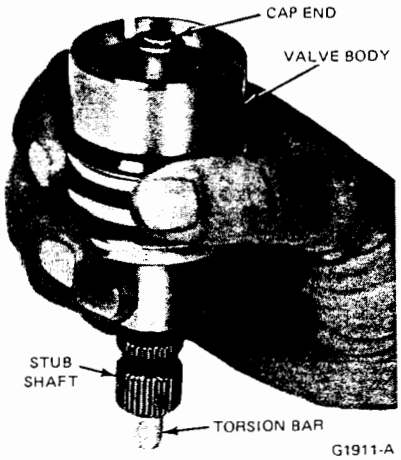


FIG. 25 Removing Spool from Rotary Valve

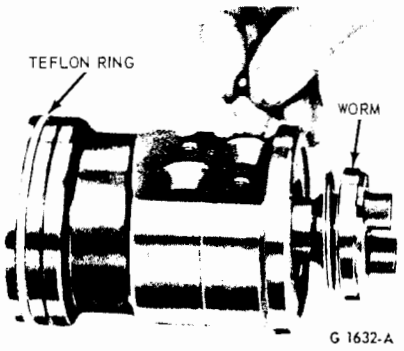


FIG. 27 Assembling Rack Piston

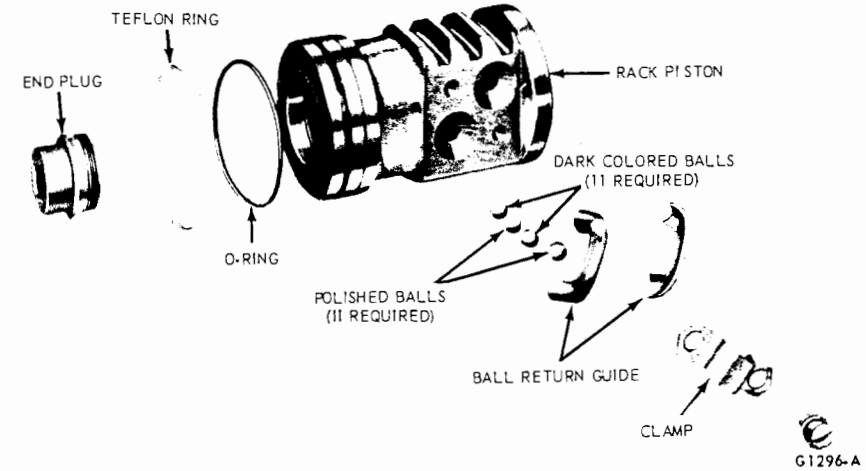


FIG. 26 Rack Piston Disassembled

rack-piston. Be sure that the dark ball in the guide is installed next to the polished ball in the rack-piston. Install the ball return guide clamp, screws and lock washers. Torque the screws to specification.

8. The worm groove is ground with a high point in the center. When the rack-piston passes over this high point there should be a preload of 1 to 4 in-lb. Clamp the rack-piston in a soft-jawed vise with the worm shaft pointing up. To avoid distortion, do not make the vise too tight.
9. Place the valve assembly on the worm, engaging the worm drive pins. Rotate the worm until it extends 1-1/4 inches from the rack-piston to the thrust bearing face. This is the center position.
10. Place an in-lb torque wrench with a 3/4 inch deep wall 12-point socket on the stub shaft, and rotate the wrench through a 60 degree arc in both directions several times. Take a torque reading. The highest average reading obtained while the worm is rotating should be between 1 and 4 in-lb.
11. If the reading is too high or too low install a new set of balls. Service replacement balls are available in the sizes shown in Fig. 28.

Code Size	Diameter Mean	Size Range of Ball (Inch)
6	0.28117	0.28112-0.28122
7	0.28125	0.28120-0.28130
8	0.28133	0.28128-0.28138
9	0.28141	0.28136-0.28146
10	0.28149	0.28144-0.28154
11	0.28157	0.28152-0.28162

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FIG. 28 Worm Ball Sizes

12. Note the ball size stamped on the rack piston and install the next larger size to increase preload. If no number is stamped on the rack-piston, the original ball code size is No. 7.

    An increase of one ball size will increase the preload approximately one in-lb. Final preload on replacement balls should be 2 to 3 in-lb.

    Remove the valve assembly from the worm and the rack piston from the vise.
13. Insert Tool T65P-3D517-A into the plug end of the rack and piston until it contacts the worm shaft (Fig. 29). Apply pressure on the tool while rotating the worm shaft out of the piston and rack. Leave the tool in place until the piston is installed in the housing.

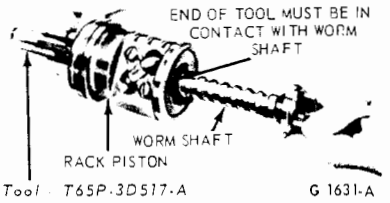


FIG. 29 Installing Tool in Rack Piston

SPECIFICATIONS

SAGINAW INTEGRAL POWER STEERING GEAR TORQUE LIMITS (FT-LB)

Description	Torque Limit	Description	Torque Limit
Sector Shaft Cover Bolts	30-35	Preload Adjusting Lock Nut	50-110
Mesh Load Adjusting Screw Lock Nut	30-35	Piston End Cap	50-100
Ball Return Guide Clamp Screw	3-6	Hose Clamps to Cooler	10-18 (In-Lb)

SAGINAW INTEGRAL POWER STEERING GEAR SPECIFICATIONS

Type	Recirculating Ball
Ratio	24:1
Turns of Steering Wheel (Lock to Lock – Linkage Disconnected)	5 4/5
Fluid Specification	D2AZ-19582-A
Fluid Capacity (Included in Reservoir Fill)	1.6 Pt. (Approx.)
Total Mesh Load Over Mechanical Center	20 In-Lb Max.
Worm Bearing Preload	10 In-Lb Max.
Total Mesh Load Over Worm Bearing Preload	6-10 In-Lb
Worm to Piston Preload	Select Recirculating Ball Size to Provide .5-4.5 In-Lb Preload

SAGINAW INTEGRAL POWER STEERING GEAR SPECIAL SERVICE TOOLS

Tool No.	Description	Tool No.	Description
T59L-100-B	Impact Slide Hammer	T65P-3D525-A	Adjuster Plug Bearing Remover and Installer
T58L-101-A	Puller Attachment	T65P-3D526-A	Adjuster Plug Seal Installer
T65P-3548-A	Oil Line Connector Seat Installer	T65P-3A537-A	Bearing Preload Spanner Wrench
T65P-3576-C	Sector Needle Bearing Remover and Installer Adapter	T65P-3A537-B	Adjuster Plug Seal Protector
T65P-3805-A	Piston Rack Ring Compressor	T65P-3D642-A	Sector Shaft Seal Installer
T65P-3D516-A	Rack Piston Arbor		

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