FORD MOTOR CO. INTEGRAL POWER STEERING

Ford LTD
Lincoln Mark VI
Lincoln Town Car
Mercury Marquis

DESCRIPTION

The Ford integral power steering gear is a torsion bar type with rotary valve, input shaft, torsion bar, worm shaft, one piece rack piston, sector shaft and housing. The rotary valve is mounted on the input shaft and controls fluid pressure to each side of rack piston. The input shaft connects to torsion bar and torsion bar engages worm shaft. Worm shaft moves rack piston through recirculating worm balls with the aid of hydraulic pressure. Rack piston is in mesh with sector shaft which is connected to steering linkage.

LUBRICATION, TROUBLE SHOOTING & TESTING

See Power Steering General Servicing in this section.

ADJUSTMENT

SECTOR SHAFT OVER-CENTER ADJUSTMENT

1) This adjustment may be performed with gear in vehicle. Disconnect pitman arm from sector shaft. Disconnect fluid return line at reservoir, cap reservoir return line fitting. Place return line in container and cycle steering wheel to discharge fluid from gear. Remove horn button and turn steering wheel to within 45° of left stop. Using an INCH lb. torque wrench on steering wheel nut, measure rotational drag required to turn gear about ⅛ of a turn from the 45° position, and record reading.

2) Turn steering wheel to straight ahead position and measure over-center drag torque in both directions. Reading should be 14-18 INCH lbs. greater than torque measured at 45° from stop. If adjustment is required, loosen adjuster screw lock nut and turn screw to adjust sector mesh load. Tighten adjuster screw lock nut and recheck rotational drag torque. Reconnect return line and add fluid as necessary. Install pitman arm and tighten nut as required. Install horn button pad on steering wheel.

REMOVAL & INSTALLATION

STEERING GEAR

Removal – **1)** Remove stone shield. Disconnect pressure and return lines from gear. Plug lines and ports to prevent entry of dirt. Remove flex coupling bolts. Raise vehicle and remove sector shaft nut.

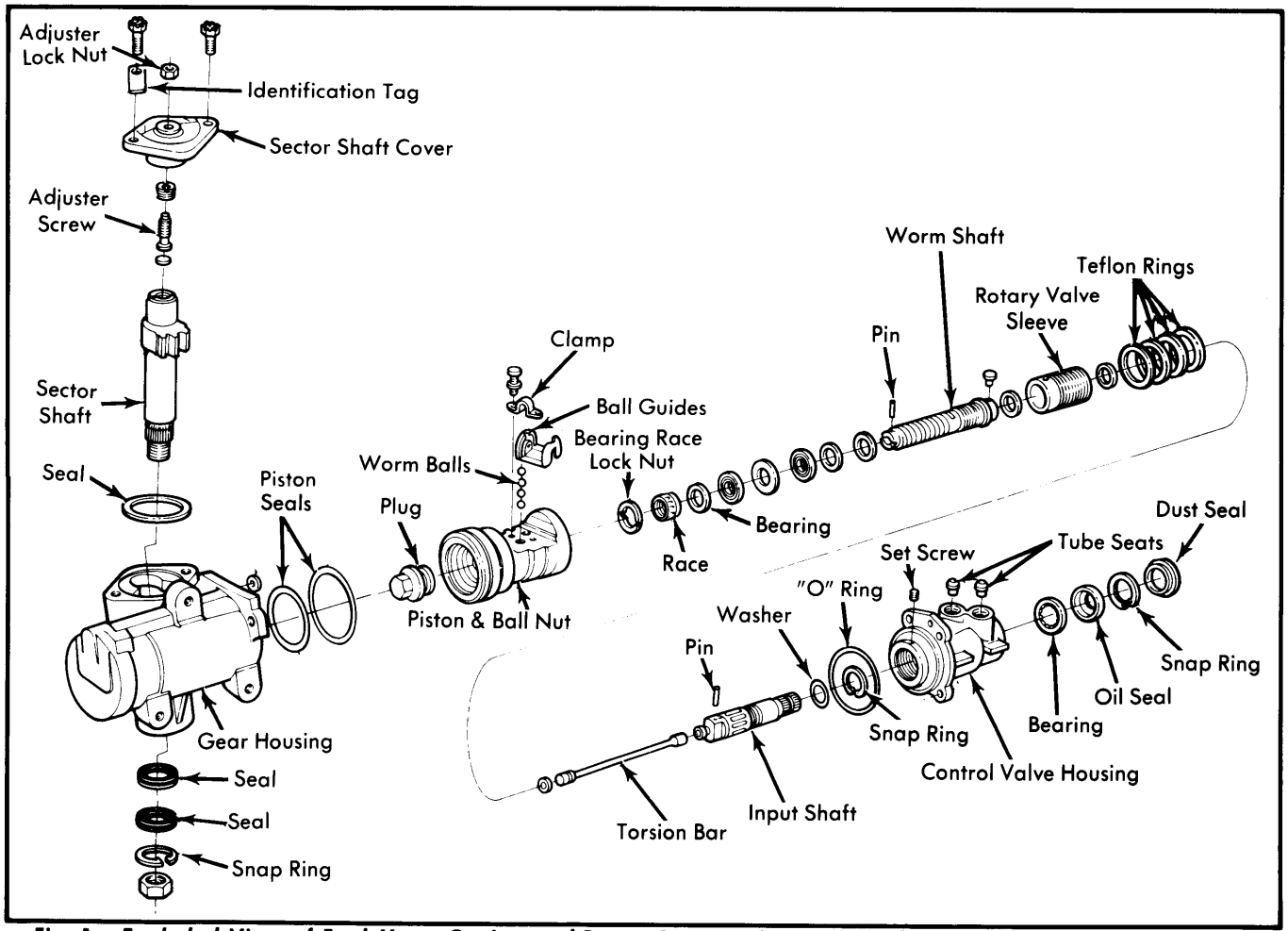

Fig. 1 Exploded View of Ford Motor Co. Integral Power Steering Gear. Input Shaft is Connected to Worm Shaft Through a Torsion Bar. The Torsion Bar is Designed to Flex Under Heavy Steering Load. Flexing Causes the Alignment of the Input Shaft and the Rotary Valve Sleeve to Change. This Change Actuates the Power Assist.

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2) Scribe an alignment mark on pitman arm and steering gear shaft for reassembly reference. Use a suitable puller to remove pitman arm, being careful not to damage seals. Support gear and remove attaching bolts. Remove clamp bolt holding gear to flex coupling, and work gear free from coupling. Remove gear from vehicle.

Installation – To install, reverse removal procedure and tighten all bolts and nuts.

OVERHAUL

STEERING GEAR DISASSEMBLY

1) Drain steering gear and mount in a suitable holding fixture. Remove lock nut and washer from adjusting screw. Turn input shaft to either stop, turn back 1 5/8 turns to center gear.

2) Remove sector shaft cover screws and identification tag. Tap lower end of sector shaft with a soft hammer, lift cover and shaft from housing as an assembly. Discard "O" ring.

3) Turn sector shaft cover counterclockwise to remove cover from adjuster screw. Remove valve housing attaching bolts. Lift valve housing from steering gear housing while holding piston to prevent it from rotating off worm shaft.

4) Remove valve housing-to-gear housing "O" rings and discard. Hold piston so ball guide faces up and remove ball guide clamp screws and clamp.

5) Place finger over opening in ball guide and turn piston so ball guide faces over clean container and let guide tubes drop into container. Rotate input shaft from stop to stop until all balls fall into container.

6) Remove valve assembly from piston and ensure that all balls have been removed. Install valve assembly in holding fixture. Loosen Allen head race nut screw from valve housing and remove worm bearing race nut.

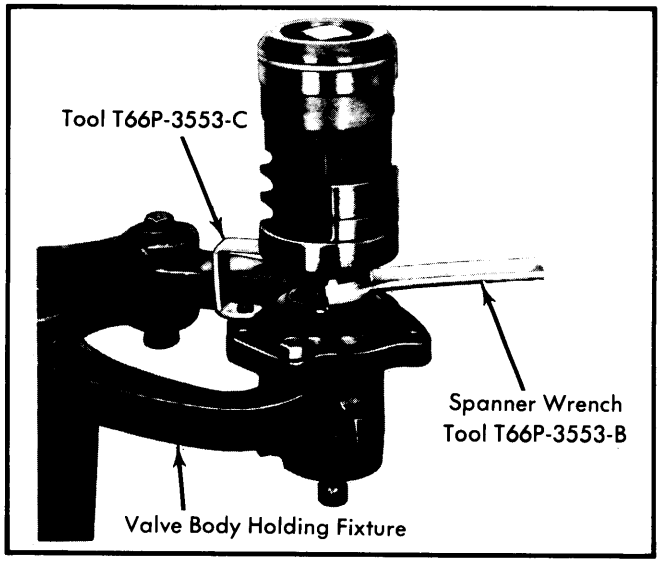

Fig. 2 Removing Worm Bearing Race Nut

7) Carefully slide input shaft, worm and valve assembly out of valve housing.

CAUTION – *Due to close clearance, slightest cocking of the spool may cause it to jam in housing and damage the sleeve.*

HOUSING DUST SEALS

Disassembly & Reassembly – Remove snap ring, lower dust seal and upper pressure seal from housing. Lubricate seals and sector shaft bore. Place dust seal on tool (T77L-3576-A) so that raised lip of seal fits into seat of tool, then slide pressure seal on tool with flat of seal against flat of dust seal. Carefully insert seals into sector shaft bore with tool until they are seated. Install snap ring.

VALVE HOUSING

Disassembly – Remove dust seal and snap ring, discard seal. Invert housing, tap out bearing and seal with suitable tool. Discard seal. Use care when inserting and removing tool so as not to damage valve bore. Remove inlet and outlet tube seats with screw extractor if they are damaged.

Reassembly – **1)** Coat new tube seats with petroleum jelly and install with suitable tool (T74P-3504-M). Coat bearing and seal surface of housing with petroleum jelly and position bearing in housing. Press bearing into position. Be sure bearing rotates freely.

2) Dip new oil seal in gear lube and place in housing, metal side out. Drive seal into housing until outer edge does not quite clear snap ring groove. Place snap ring in housing, and drive in until it seats in groove. With rubber side out, drive dust seal in position behind undercut in input shaft.

WORM & VALVE SLEEVE

NOTE – *Remove valve sleeve Teflon rings only if scratched or worn, and service kit is available. Tool kit T75L-3517-A is required to install and size Teflon rings.*

Disassembly – Remove valve sleeve rings by inserting a knife blade under rings and cutting them off. Avoid scratching valve sleeve. Mount worm end of pinion and valve sleeve assembly in soft-jawed vise.

Reassembly – **1)** Install suitable mandrel tool over sleeve and slide new valve ring over tool. Slide pusher tool over mandrel and rapidly push down on pusher tool, forcing ring down ramp and into fourth groove of sleeve. Repeat this procedure 3 more times, adding a spacer tool under mandrel each time.

2) After installing 4 valve sleeve rings, apply gear lubricant to sleeve and rings. Install 1 spacer over input shaft as a pilot for installing sizing tube. Slowly install sizing tube over sleeve valve end of worm shaft onto valve sleeve rings.

3) Ensure rings are not being bent over as tube is slid over them. Remove sizing tube and check condition of rings. Rings must turn freely in grooves.

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PISTON & BALL NUT

Disassembly & Reassembly – Remove Teflon ring and "O" ring from piston and ball nut. Dip new "O" ring in gear lubricant and install it on piston and ball nut. Install new Teflon ring on piston and ball nut.

CAUTION – *Do not stretch Teflon ring more than necessary.*

STEERING GEAR REASSEMBLY

1) Mount valve housing in suitable holding fixture, flanged end up. Lubricate valve sleeve rings and install worm and valve in housing. Install race nut and tighten as required.

2) Install Allen head race nut set screw through valve housing and tighten. Place piston on bench, ball guide holes facing up. Insert worm shaft so first groove is in alignment with hole nearest to center of piston.

3) While turning worm shaft clockwise, as viewed from input end of shaft, place 27-29 balls, depending on piston design, in ball guide. If all balls have not been fed into guide upon reaching right stop, rotate input shaft back and forth while installing remaining balls.

NOTE – *After all balls have been installed, DO NOT rotate input shaft more than 3 turns from right stop or balls will fall out of circuit.*

4) Secure guides in ball nut with clamp. Apply petroleum jelly to seal on piston. Place new "O" ring on valve housing. Slide piston and valve into gear housing. Align oil passage in valve housing with passage in gear housing.

5) Position new "O" ring in gear housing oil passage. Install identification tag and attaching bolts, but do not tighten.

6) Rotate ball nut so teeth are in same plane as sector teeth. Tighten valve housing bolts. Install sector shaft cover "O" ring in gear housing. Turn input shaft to center piston.

7) Apply petroleum jelly to sector shaft journal. Position sector shaft and cover assembly in gear housing. Install cover bolts and tighten. Perform sector shaft over-center adjustment as previously described.

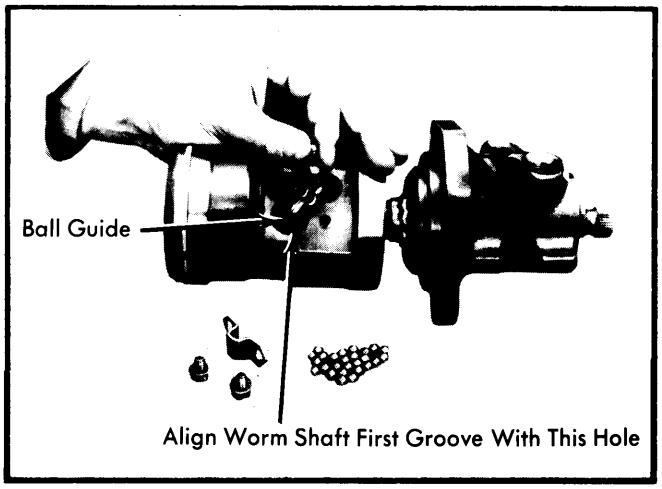

Fig. 3 Installing Piston & Worm Shaft Ball Bearings

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N·m)
Pitman Arm Retaining Nut	200-250 (271-339)
Steering Gear Mounting Bolts	50-65 (68-88)
Flexible Coupling Bolt	20-30 (27-41)
Sector Shaft Cover Bolts	55-70 (75-95)
Sector Shaft Adjusting Screw Lock Nut	35-45 (47-61)
Valve Housing Bolts	35-50 (47-68)
Piston End Cap	70-110 (95-149)
Worm Bearing Race Nut	①72 (98)
Ball Return Guide Clamp Bolts	42-70 INCH Lbs. (4.8-7.9)

① – To obtain proper torque reading when using adapter tool (T66P-3553-B), multiply desired torque reading (72 ft. lbs.) by torque wrench length and divide result by total of torque wrench length and adapter tool length (5.5"). Example: With a 13" torque wrench and 5.5" adapter tool, actual torque reading would be 50 ft. lbs.