FORD MOTOR CO. TORSION BAR

Ford "F" Models (Two-Wheel Drive Only)

DESCRIPTION

Torsion bar type power steering unit consists of a worm and one-piece rack-piston, which is meshed to gear teeth on sector shaft. Hydraulic control valve, valve actuator, input shaft, and torsion bar assembly are mounted to end of worm shaft and operated by twisting action of torsion bar. One-piece rack-piston, worm and sector shaft are mounted in one housing, while valve spool is mounted in an attached housing. This allows internal passage of fluid between valve and cylinder, thus eliminating need for all external lines and hoses, except pressure and return hoses between pump and gearbox assembly.

LUBRICATION

Check fluid level in pump reservoir every 5000 miles. Steering gear and fluid must be at normal operating temperature. If necessary, add Power Steering Fluid to bring level to proper mark on dipstick.

ADJUSTMENT

OVERCENTER POSITION

Disconnect pitman arm from sector shaft. Disconnect fluid return line at pump reservoir, and cap reservoir return line pipe. Place end of return line in clean container and cycle steering wheel in both directions several times to discharge all fluid from steering gearbox. Remove horn button from steering wheel, and turn steering wheel until positioned 45° from left steering stop. Using an INCH-lb. torque wrench on steering wheel attaching nut, measure force required to turn steering shaft ⅛ turn from 45° position. Turn steering wheel back to center position, and measure force required to move steering shaft back and forth across center position. Loosen lock nut and turn adjusting screw until reading across center position is 11-12 INCH lbs. greater than reading across 45° position. Tighten lock nut while holding adjusting screw in place.

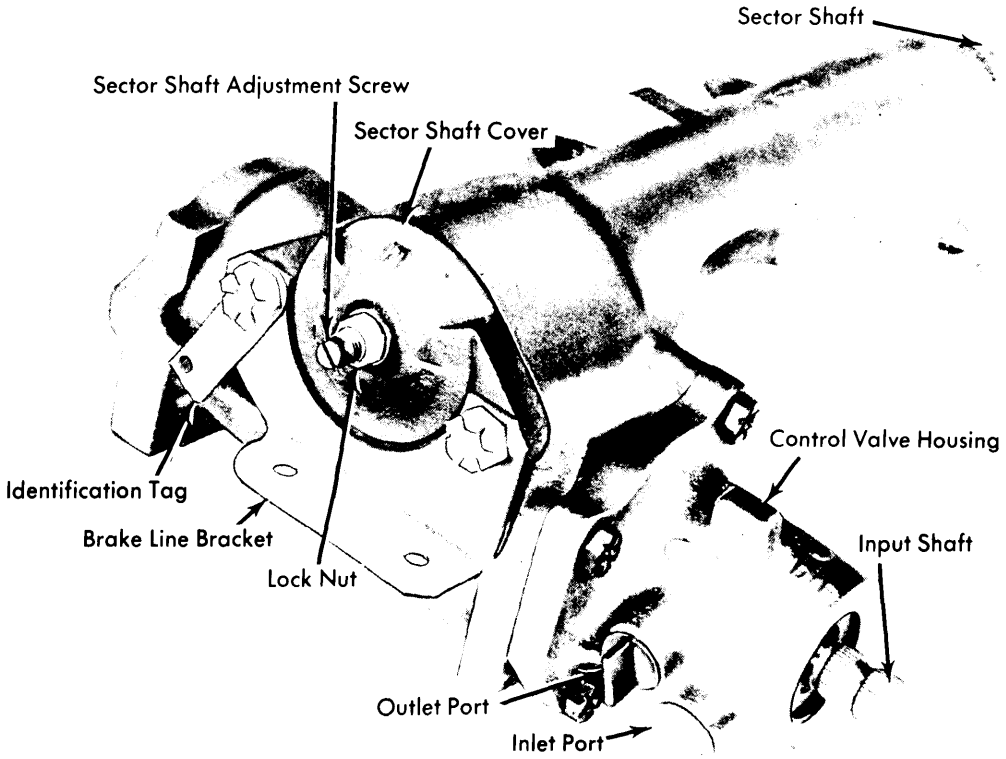
TESTING

PUMP PRESSURE

See procedure given in Thompson Slipper Type power steering pump article in this Section.

VALVE SPOOL CENTERING

Install a suitable 0-2000 psi pressure gauge and valve assembly between power steering pump and high pressure line. Open gauge valve completely, and remove horn button from steering wheel. Attach an INCH-lb. torque wrench to steering wheel attaching nut. With power steering fluid at normal operating temperature and correct level, steering wheel in centered position, and engine at normal operating temperature, set engine idle to 1000 RPM. Using torque wrench, rotate steering shaft to either side of center to obtain gauge reading of 250 psi in each direction. Torque reading should be same in both directions when 250 psi is reached. If difference between readings exceeds 4 INCH lbs., steering gear must be removed and the shaft and control assembly replaced. *NOTE — When performing test off vehicle, use same procedure except take torque and pressure readings at right and left stops rather than either side of center.*



FORD TORSION BAR STEERING GEAR ASSEMBLY

FORD MOTOR CO. TORSION BAR (Cont.)

REMOVAL & INSTALLATION

STEERING GEAR

Removal & Installation – Disconnect hydraulic lines at power steering gear, and cap lines. Plug ports in steering gear to prevent entry of foreign matter. Remove bolts securing flex coupling to steering gear input shaft and to steering column. Raise vehicle, and remove pitman arm-to-sector shaft lock nut. Using suitable tool, remove pitman arm from sector shaft, being sure not to damage seals. If vehicle is equipped with standard transmission, remove clutch fork return spring to provide clearance for steering gearbox removal. Support gearbox, and remove gearbox attaching bolts. Work gear free of flex coupling, and remove gearbox assembly from vehicle. Remove flex coupling from input shaft (if necessary). To install, reverse removal procedure and bleed system. See *procedure given in Thompson Slipper Type power steering pump article in this Section.*

OVERHAUL

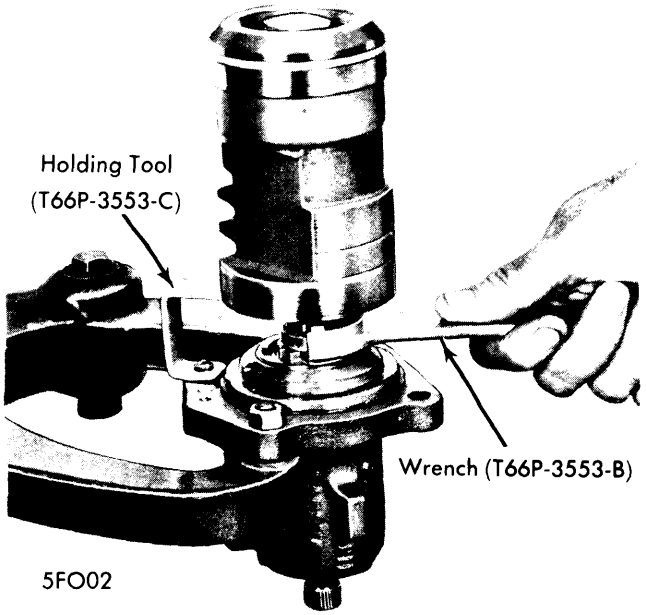
NOTE – If complete gearbox assembly is not to be overhauled, remove unit to be overhauled and proceed to disassembly and reassembly of that unit.

STEERING GEAR

Disassembly – 1) Drain steering gear completely, and mount it in a soft-jawed vise. Remove lock nut and washer from adjusting screw. Turn input shaft to either stop, then turn shaft back 1¾ turns to center gear. Remove sector shaft cover attaching screws. Tap lower end of sector shaft with a soft-faced hammer to loosen shaft in bore, then lift shaft and cover assembly from housing. Discard cover "O" ring.

2) Turn sector shaft cover counterclockwise to remove it from adjusting screw. Remove valve housing attaching bolts. Lift valve housing from steering gear housing while holding piston to prevent it from rotating off worm shaft. Remove valve housing and control valve gasket and discard. Stand valve body and piston assembly on end with piston end downward. Rotate input shaft counterclockwise out of piston, allowing ball bearings to drop into piston. Place a cloth over piston, invert, and remove ball bearings.

3) Remove ball guide clamp attaching screws, then remove clamp and guides. Install valve body in suitable holding fixture, loosen Allen head race nut screw, and remove worm bearing race nut. Carefully slide input shaft, worm, and valve assembly out of valve housing. *CAUTION – Due to close clearance, cocking of spool may cause it to jam in housing.*



REMOVING WORM BEARING RACE NUT

Reassembly – 1) Mount valve housing in a suitable holding fixture with flanged end upward. Apply a light coat of lubricant to Teflon rings on valve sleeve, then carefully install worm and valve in housing. Install race nut in housing and tighten securely. Install Allen head race nut set screw through housing and tighten.

2) Place piston on bench with ball guide holes facing up. Insert worm shaft so that first groove in shaft is aligned with hole nearest to center of piston. Position ball guide in piston. Place ball bearings into ball guide, while turning worm in clockwise direction. If all balls have not been fed into guide upon reaching right stop, rotate input shaft back and forth while installing remaining balls. After balls have been installed, DO NOT rotate input shaft or piston more than 3½ turns off right stop. This will prevent balls from falling out of circuit.

INSTALLING PISTON ON WORM SHAFT

FORD MOTOR CO. TORSION BAR (Cont.)

3) Secure guides in ball nut with guide clamp. Apply vaseline to Teflon seal on piston, and place a new gasket on valve housing. Slide piston and valve into gear housing, using care not to damage Teflon seal. Align lube passage in valve housing with passage in gear housing. Loosely install housing attaching bolts, rotate ball nut until teeth are in same plane as sector shaft teeth, then tighten valve housing attaching bolts.

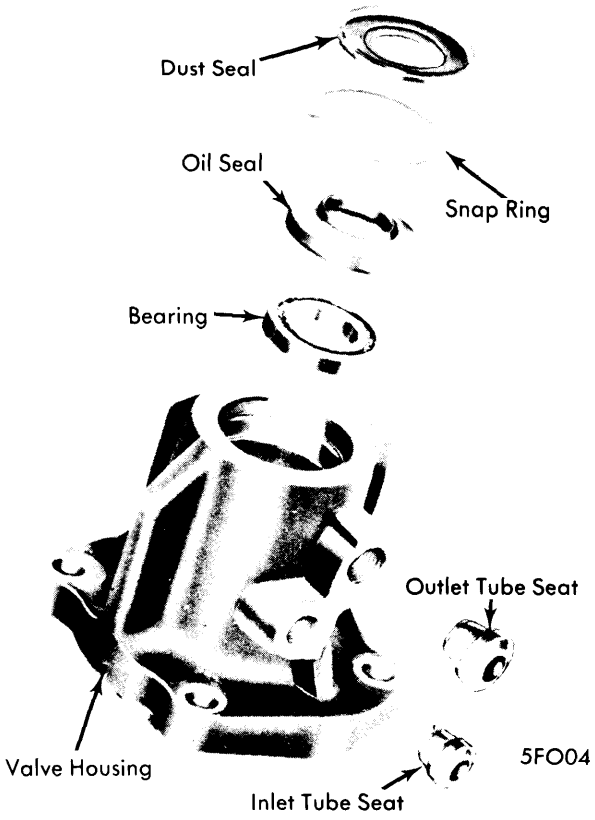
4) Position sector shaft cover "O" ring in steering gear housing. Turn input shaft as required to center piston. Apply vaseline to sector shaft journal, position sector shaft and cover assembly in gear housing, and install and tighten cover attaching bolts. Adjust steering overcenter position. See *Overcenter Position Adjustment.*

STEERING GEAR HOUSING

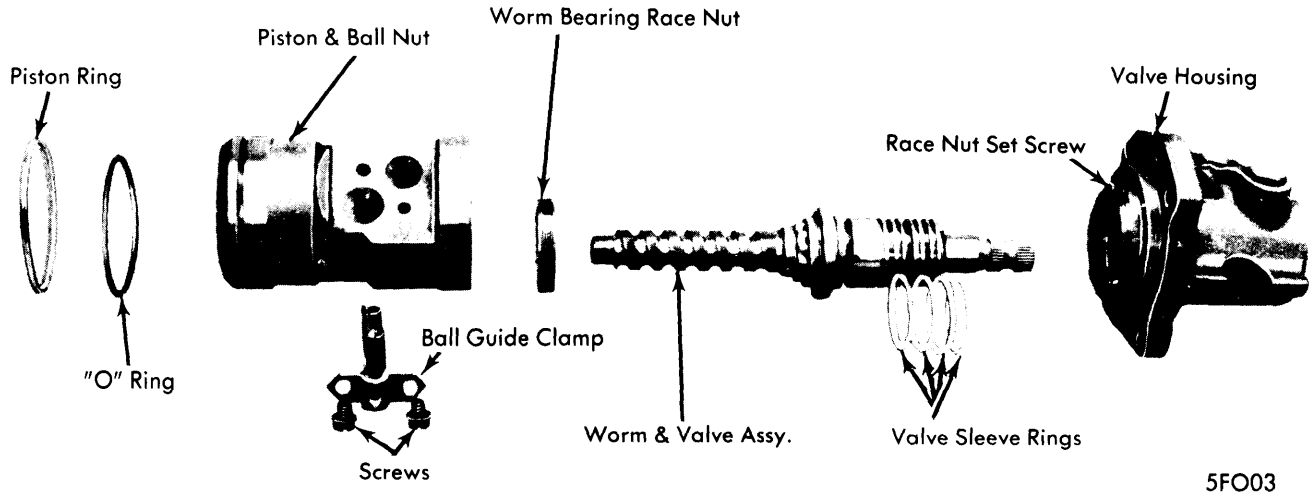
Disassembly & Reassembly – Remove snap ring and spacer washer from lower end of housing. Using a suitable puller, remove lower seal, spacer washer, and upper seal from housing. Lubricate seals and sector shaft bore with power steering fluid, and position sector shaft seal in housing with lip of seal facing inward. Press seal into place. Place a .090" spacer washer on top of seal, and press outer seal into place with lip facing inward. Place .090" spacer washer on top of outer seal, and install snap ring in groove.

CONTROL VALVE HOUSING

Disassembly & Reassembly – Remove dust seal and snap ring, and discard seal. Invert housing, and drive out bearing and seal, using care not to damage valve bore. Using an E-Z out, remove inlet and outlet tube seats (if necessary). Position new seats in ports, and install hydraulic line nuts to press seats into position. Coat bearing and seal surface of housing with vaseline, then press bearing into position in housing. Dip new oil seal in power steering fluid and place seal in housing with metal side out. Drive seal into housing until outer edge of seal does not quite clear snap ring groove. Position snap ring in housing, and drive on ring until ring seats in groove. This will properly seat seal. Place dust seal in housing with dished side facing out.



CONTROL VALVE HOUSING



CONTROL VALVE ASSEMBLY

FORD MOTOR CO. TORSION BAR (Cont.)

WORM & VALVE SLEEVE

Disassembly & Reassembly – Remove rings from sleeve with a small knife. Mount worm end of worm and valve sleeve assembly in a soft-jawed vise and install a suitable mandrel tool (T75L-3517-A1) over the sleeve. Install rings one at a time with the aid of a suitable driver tool (T75L-3517-A3). After installing rings, apply a light coat of oil to sleeve and rings. Slowly install a suitable sizing tool (T75L-3517-A4) over sleeve and onto rings. *Make sure rings are not bent as tube is installed.* Remove tube and check condition of rings. Make sure rings turn freely in grooves.

PISTON & BALL NUT

Disassembly & Reassembly – Remove Teflon ring and "O" ring from piston and ball nut assembly. Dip new "O" ring in power steering fluid and install it on piston and ball nut. Install new Teflon ring on piston and ball nut, using care not to stretch ring more than necessary.

TIGHTENING SPECIFICATIONS

Application	Inch Lbs.
Ball Return Guide Clamp Screw	42-70
Allen Head Race Nut Setscrew	20-25

Application	Ft. Lbs.
Sector Shaft Cover Bolts	55-70
Sector Shaft Adjusting Screw Lock Nut	35-45
Valve Housing-to-Gear Housing Bolts	35-45
Piston End Cap	70-110
Race Retaining Nut	①

① – Tool used with torque wrench will affect observed reading of torque wrench. To obtain required torque wrench reading, multiply length of torque wrench by desired torque (60 ft. lbs.), and divide this product by sum of torque wrench length plus length of tool (5.5").