

STEERING

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MANUAL STEERING GEAR

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GENERAL INFORMATION

The manual steering gear (Fig. 1) is designed to provide easy steering with minimum friction in the steering gear. A ball nut travels up or down on the wormshaft, riding on recirculating balls acting as a screw thread.

The wormshaft and ball nut assembly is supported in the gear housing by an adjustable ball thrust type upper and lower bearing. The lower bearing cup is

pressed into the gear housing, and the upper bearing cup is pressed into the wormshaft bearing adjuster.

The cross shaft is integral with the sector gear. The sector gear meshes with the rackteeth on the recirculating ball nut. Adjustment at this point is controlled by the cross shaft adjusting screw which extends through the housing cover.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
HARD STEERING	(a) Low or uneven tire pressure.	(a) Inflate tires to recommended pressures.
	(b) Insufficient lubricant in the steering gear housing or in steering linkage.	(b) Lubricate as necessary.
	(c) Steering gear shaft adjusted too tight.	(c) Adjust according to instructions.
	(d) Front wheels out of line.	(d) Align the wheels. See "Front Suspension."
	(e) Steering column misaligned.	(e) See "Steering Column—Manual Transmission."
PULL TO ONE SIDE (Tendency of the Vehicle to veer in one direction only)	(a) Incorrect tire pressure.	(a) Inflate tires to recommended pressures.
	(b) Wheel bearings improperly adjusted.	(b) See "Front Wheel Bearing Adjustment."
	(c) Dragging brakes.	(c) Inspect for weak, or broken brake shoe spring, binding pedal.
	(d) Improper caster and camber.	(d) See "Front Wheel Alignment."
	(e) Incorrect toe-in.	(e) See "Front Wheel Alignment."
	(f) Grease, dirt oil or brake fluid on brake linings.	(f) Inspect, replace and adjust as necessary.
	(g) Front and rear wheels out of alignment.	(g) Align the front wheels. See "Front Suspension."
	(h) Broken or sagging rear springs.	(h) Replace rear springs.
	(i) Bent suspension parts.	(i) Replace parts necessary.
WHEEL TRAMP (Excessive Vertical Motion on Wheels)	(a) Incorrect tire pressure.	(a) Inflate tires to recommended pressures.
	(b) Improper balance of wheels, tires and brake drums.	(b) Balance as necessary. See "Wheels and Tires."
	(c) Loose tie rod ends or steering connections.	(c) Inspect and repair as necessary.

Condition	Possible Cause	Correction
EXCESSIVE PLAY OR LOOSENESS IN THE STEERING WHEEL	(d) Worn or inoperative shock absorbers.	(d) Replace shock absorbers as necessary.
	(a) Steering gear shaft adjusted too loose or badly worn.	(a) Replace worn parts and adjust according to instructions.
	(b) Steering linkage loose or worn.	(b) Replace worn parts. See "Front Wheel Alignment."
	(c) Front wheel bearings improperly adjusted.	(c) Adjust according to instructions.
	(d) Steering arm loose on steering gear shaft.	(d) Inspect for damage to the gear shaft and steering arm, replace parts as necessary.
	(e) Steering gear housing attaching bolts loose.	(e) Tighten attaching bolts to specifications.
	(f) Steering arms loose at steering knuckles.	(f) Tighten according to specifications.
	(g) Worn ball joints.	(g) Replace the ball joints as necessary. See "Front Suspension."
	(h) Worm-shaft bearing adjustment too loose.	(h) Adjust worm bearing pre-load according to instructions.

SERVICE PROCEDURES

Adjustments

Two adjustments are provided in the steering gear (Fig. 2). The worm bearing pre-load adjustment, and the ball nut rack sector gear mesh adjustment.

Before correct adjustment can be made at ball nut rack and sector gear, it must be determined that worm bearing pre-load is properly adjusted.

The worm bearing pre-load adjustment is controlled by the worm thrust bearing adjuster which threads into the housing at the upper end of the wormshaft.

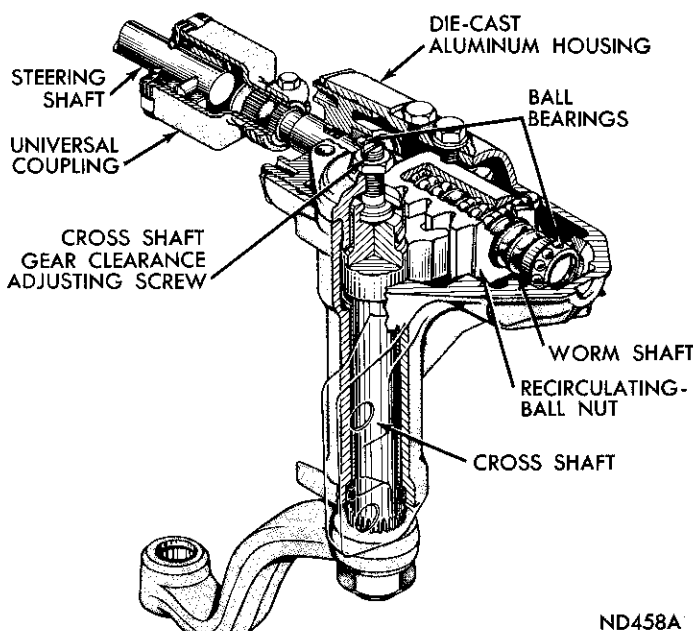
Worm Bearing Pre-Load

(1) Remove steering gear arm retaining nut and lock washer. Remove arm with Tool C-3646 (Fig. 3).

(2) Remove horn button or horn ring.
 (3) Loosen cross shaft adjusting screw lock nut, and back out adjusting screw approximately two turns. This will relieve any friction load which may be present at closely meshed ball nut rack and sector gear teeth.

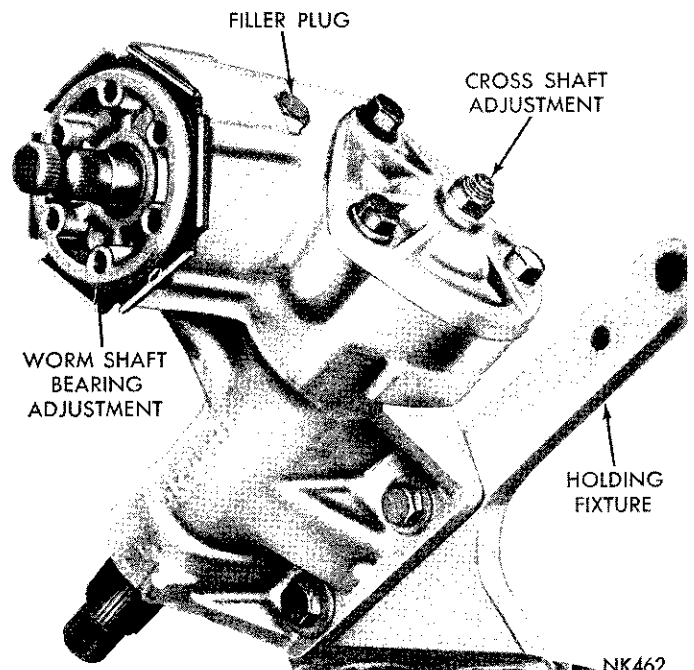
(4) Turn steering wheel two complete turns from straight ahead position, and place torque wrench Tool C-3380 on steering shaft nut.

(5) Rotate steering shaft at least one turn toward straight ahead position, while testing rotating torque with torque wrench.



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Fig. 1—Steering Gear Cross Section



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Fig. 2—Gear Adjustment Locations

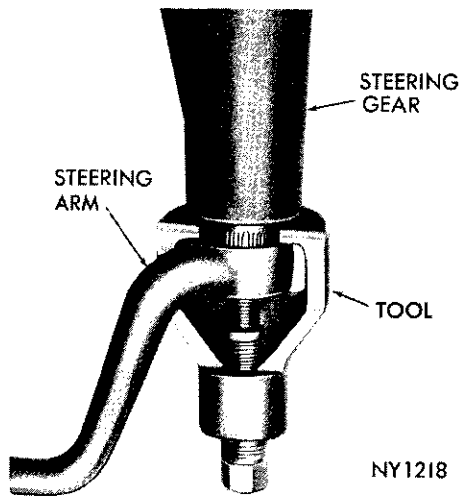


Fig. 3—Removing Steering Gear Arm

The torque required to keep wheel moving should be between 1-1/2 and 4-1/2 inch-pounds. If reading is not within these limits, adjustment can be made in or out of vehicle as follows:

- (a) Loosen adjuster lock nut.
- (b) Use adjuster wrench from Tool C-3884 set and turn adjuster clockwise to increase pre-load, or counterclockwise to decrease pre-load.
- (c) While holding adjuster from turning, tighten lock nut securely. Retest worm bearing pre-load.

Ball Nut Rack and Sector Mesh

The cross shaft adjusting screw, located in housing cover, raises or lowers the shaft to provide proper mesh load between tapered teeth of sector gear and tapered teeth of ball nut. **This adjustment can be accurately made only after proper worm bearing pre-load has been established.**

- (1) Turn steering wheel gently from one stop to the other, carefully counting number of turns. Turn steering wheel back exactly half way, to center position.
- (2) Turn cross shaft adjusting screw clockwise to remove all lash between ball nut rack and sector gear teeth, then tighten adjusting screw lock nut to 35 foot-pounds.
- (3) Turn steering wheel about 1/4 turn away from center or "high spot" position. Using torque wrench Tool C-3380, at steering wheel nut, measure torque required to rotate steering wheel through high spot at center position. The reading should be between 8-1/4 and 11-1/4 inch-pounds. This represents total of worm shaft bearing pre-load and ball nut rack and sector gear mesh load. Readjust cross shaft adjustment screw if necessary, to obtain proper torque reading.
- (4) After adjustments have been completed, place front wheels in a straight ahead position, and with steering gear and steering wheel centered, install steering arm on cross shaft.

- (5) Tighten steering arm retaining nut to 180 foot-pounds.

Gear Removal

To avoid damage to the energy absorbing steering column, it is recommended that the steering column be completely detached from floor and instrument panel before steering gear is removed. See Steering Column Section of this manual for proper removal, alignment and installation procedure.

- (1) Remove steering column.
- (2) From under vehicle, remove steering arm retaining nut and lock washer. Remove steering arm with Tool C-3646 (Fig. 3).
- (3) Remove gear to frame retaining bolts and remove gear.

Gear Installation

- (1) Position gear on frame and install gear to frame retaining bolts and lock washers. Tighten to specifications.
- (2) Rotate worm shaft by hand and center cross shaft to mid point of its travel. Align master serration on cross shaft with splines in steering arm. Install steering arm with lock washer and nut. Tighten to specifications.
- (3) Align and install steering column as outlined. (See "Steering Columns").

Worm Shaft Replacement

The master serration on the steering gear worm shaft spline, used for centering the steering shaft coupling, is machined after the steering gear is completely assembled.

If it should become necessary to replace a steering gear worm shaft, it will be necessary to file a master serration on the spline of the worm shaft, since the replacement part does not have a master serration machined in the spline.

To file a master serration on a worm shaft spline, the steering gear must be completely assembled and the worm shaft centered in its travel, then with the steering gear in its normal upright position remove one tooth of the spline, at the 12 o'clock position, with a suitable file.

Gear Reconditioning

Thoroughly clean entire outside surface of steering gear before disassembly to avoid contaminating worm-shaft and ball nut assembly with dirt or grit.

- (1) Attach steering gear to holding fixture, Tool C-3323 and install holding fixture in a vise (Fig. 2).
- (2) Loosen cross shaft adjusting screw lock nut, and back out screw about two turns to relieve load caused by close mesh between ball nut rack and sector gear teeth. **Remove cross shaft seal as outlined in "Cross Shaft Oil Seal Replacement."**

(3) Position steering wormshaft in straightahead position.

(4) Remove bolts from cross shaft cover and slowly remove cross shaft while sliding arbor Tool C-3786 into housing (Fig. 4).

(5) Remove lock nut from cross shaft adjusting screw and remove screw from cover by turning screw clockwise.

(6) Slide adjustment screw and shim out of slot in end of cross shaft.

(7) Loosen wormshaft bearing adjuster lock nut with a soft drift and remove the lock nut. Hold wormshaft from turning while unscrewing adjuster, using wrench from Tool Set C-3884 (Fig. 5).

(8) Slide worm shaft adjuster off shaft.

CAUTION: The adjuster must be handled carefully to avoid damage to aluminum threads.

Be careful that ball nut does not run down to either end of wormshaft. The ball guide ends can be damaged if ball nut is allowed to rotate until stopped at end of worm.

(9) Carefully remove worm and ball nut assembly (Fig. 6).

The ball nut and wormshaft are serviced as an assembly only, and are not to be disassembled. Do not remove or disturb ball return guides. **Place ball nut and wormshaft assembly in a clean place.**

(10) Remove cross shaft needle bearing by placing steering gear housing in an arbor press; insert Tool C-3786 in lower end of housing (Fig. 7) and press both bearings through housing. **The cross shaft cover assembly, including a needle bearing or bushing, is serviced as an assembly.**

(11) Remove wormshaft oil seal from wormshaft bearing adjuster, by inserting a blunt punch behind seal and tap alternately on each side of seal until seal is driven out of adjuster.

(12) Remove wormshaft spacer and upper bearing cup in same manner. However, this must be done carefully to avoid cocking bearing cup and distorting adjuster counterbore.

(13) Remove lower cup if replacement is necessary by positioning locking head jaws of remover Tool C-3868 (Fig. 8) behind bearing cup and expanding remover head by pressing down on center plunger of

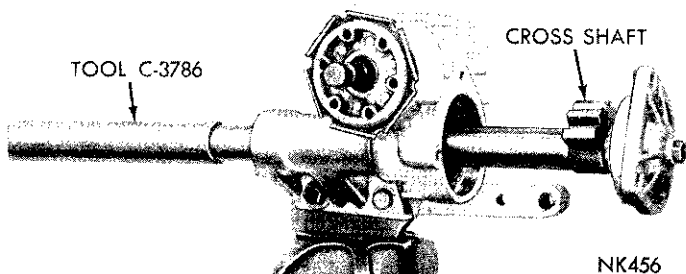


Fig. 4—Removing Cross Shaft

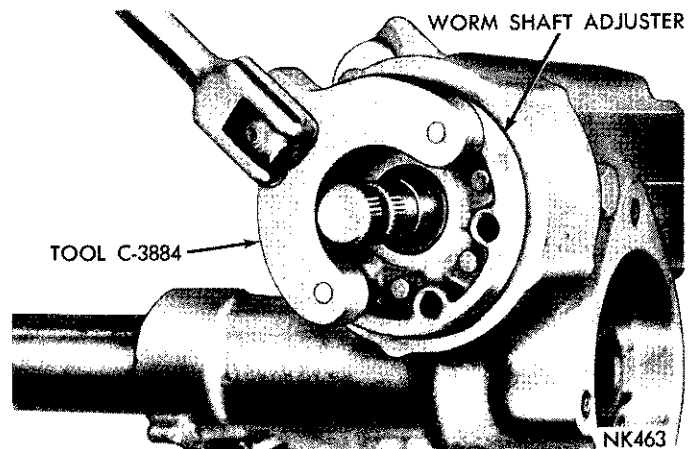


Fig. 5—Removing Worm Shaft Adjuster

tool. Withdraw bearing cup by turning remover screw nut in a clockwise direction while holding center screw.

(14) Wash all parts in clean solvent and dry with compressed air.

(15) Test operation of ball nut assembly on wormshaft. If ball nut does not travel smoothly and freely on wormshaft and there is roughness or binding, assembly must be replaced.

(16) Extreme care is necessary when handling aluminum worm bearing adjuster to avoid damaging threads. It is equally important to avoid damaging mating threads in gear housing. The wormshaft adjuster must **never** be screwed into housing without lubrication, or when threads are dirty or damaged. These precautions **must** be taken to avoid "picking up" threads and ruining housing and/or wormshaft bearing adjuster.

(17) Inspect cross shaft for wear and check fit of

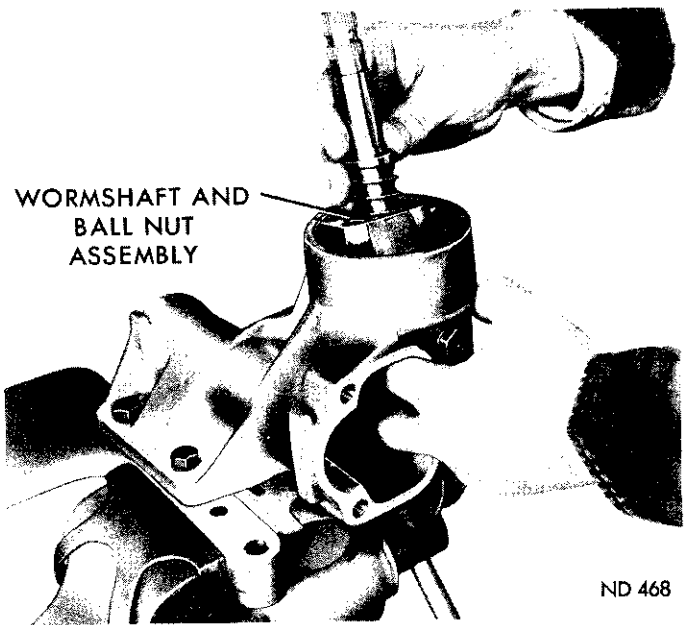


Fig. 6—Removing Worm Shaft And Ball Nut Assembly

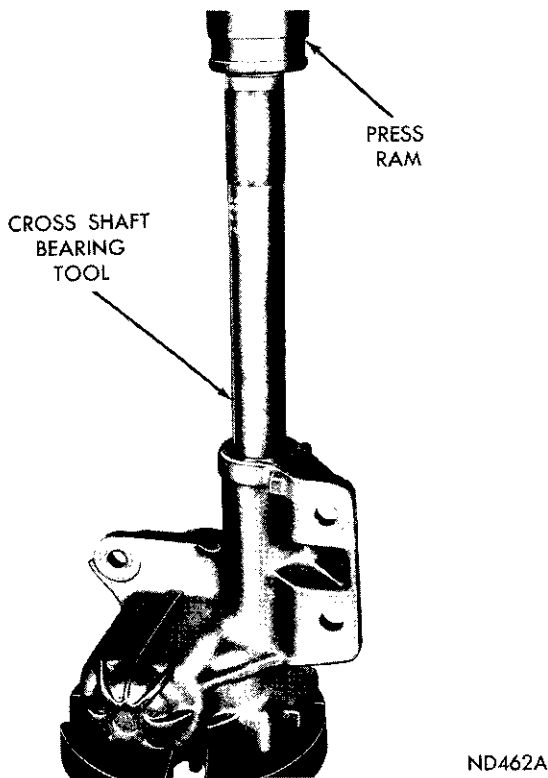


Fig. 7—Removing Cross Shaft Inner and Outer Bearings

shaft in housing bearings. Inspect fit of shaft pilot in cover bearing. Make sure wormshaft has not been bent or otherwise damaged.

(18) The cross shaft and wormshaft oil seals should be replaced when unit is reconditioned.

(19) Install cross shaft outer needle bearing by

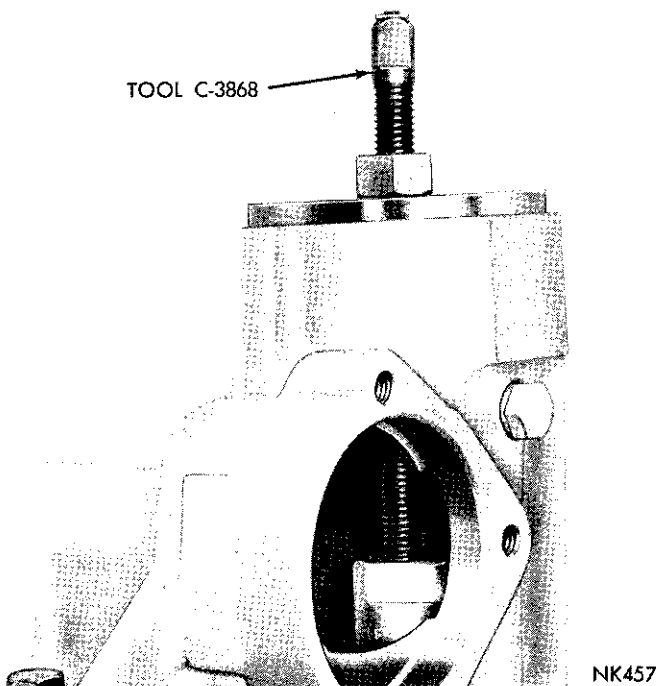


Fig. 8—Removing Lower Bearing Cup

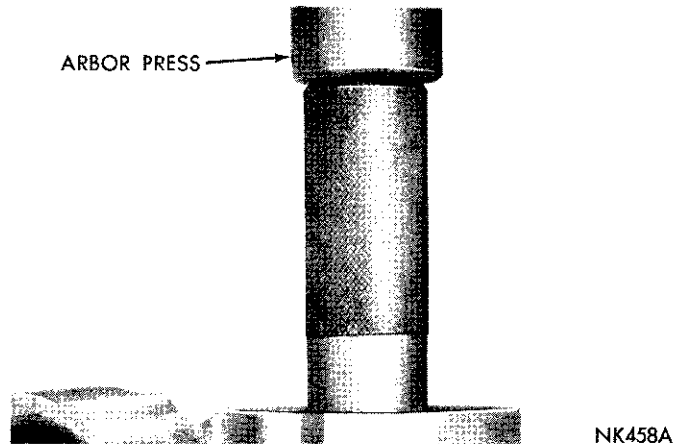


Fig. 9—Installing Inner Bearing

placing bearing on end of Tool C-3786 with adapter ring. Press bearing into housing to 1/2 inch below end of bore to provide space for oil seal.

(20) Install inner needle bearing by placing bearing on Tool C-3786 (Fig. 9). Press bearing into inside end of housing bore flush with inside end of bore surface.

(21) Install wormshaft bearing cups, position bearing cup and spacer into adjuster nut, and press them in place with Tool C-3865 (Figs. 10 and 11).

(22) Install wormshaft oil seal by positioning seal in wormshaft adjuster with seal metal retainer UP. Drive seal into place with a suitable sleeve so it is slightly below end of bore in adjuster.

(23) Apply a coating of steering gear lubricant to all moving parts during assembly, also place lubricant on and around oil seal lips.

(24) Clamp holding fixture and housing in a vise with bearing adjuster opening upward.

(25) Place a thrust bearing in lower cup in housing.

(26) Hold ball nut from turning (Fig. 6), and insert wormshaft and ball nut assembly into housing with end of worm resting in thrust bearing.

(27) Place upper thrust bearing on wormshaft.

Thoroughly lubricate threads on adjuster and threads in housing.

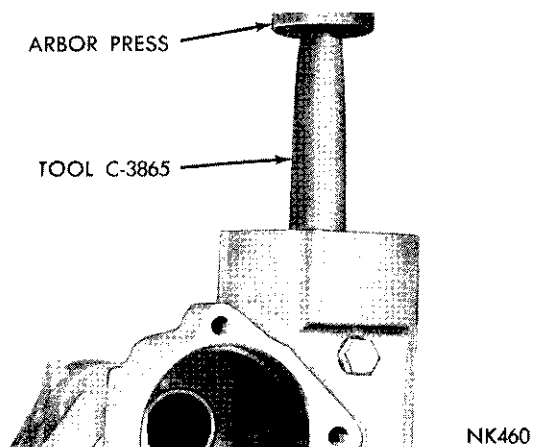


Fig. 10—Installing Wormshaft Lower Bearing Cup

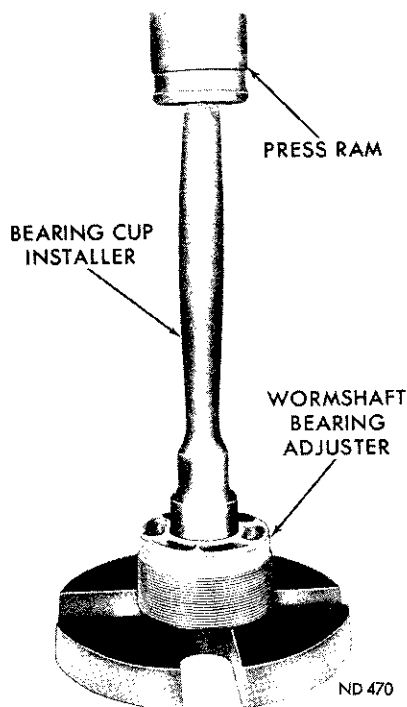


Fig. 11—Installing Wormshaft Upper Bearing Cup

(28) Place a protective sleeve of plastic tape over wormshaft splines so splines do not damage seal. Slide adjuster assembly over shaft.

(29) Thread adjuster into steering housing, and with Tool wrench C-3884 and splined nut set, tighten adjuster to 50 foot-pounds while rotating wormshaft. This is done to effectively seat bearings.

(30) Loosen adjuster so no bearing pre-load exists. Then, using torque wrench Tool C-3380, adjust wormshaft bearing pre-load from 1-1/8 to 4-1/2 inch-pounds.

(31) After adjusting pre-load, tighten bearing adjuster lock nut, and retest to be sure preload remains between 1-1/8 and 4-1/2 inch-pounds.

(32) Before installing cross shaft, pack wormshaft cavities in housing above and below ball nut with steering gear lubricant. Use steering gear lubricant whenever possible, but if not available, a good grade of multi-purpose lubricant may be used. Do not use gear oil. When gear is properly packed with steering gear lubricant it will contain eleven fluid ounces of lubricant, and level of lubricant will be at top of worm.

(33) Slide cross shaft adjusting screw and shim into slot in end of shaft.

(34) Test end clearance (Fig. 12). The screw must be free to turn with zero to .004 inch end play. Three different thickness shims are available to obtain specified clearance.

(35) Start cross shaft and adjuster screw into bearing in housing cover. Using a screw driver through hole in cover, turn screw counterclockwise to pull

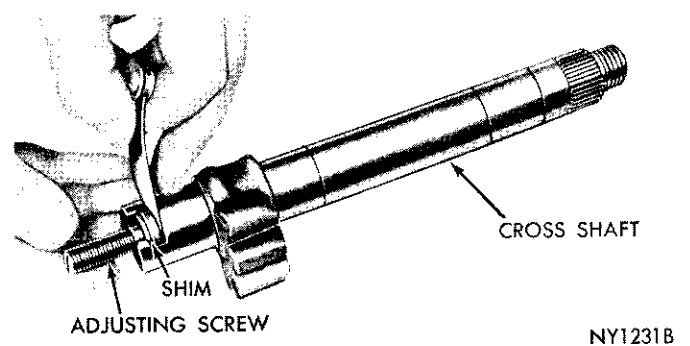


Fig. 12—Measuring Cross Shaft Adjusting Screw End Clearance

shaft into cover.

(36) Install adjusting screw lock nut, but do not tighten at this time.

(37) Rotate wormshaft to centralize ball nut.

(38) Place new cover gasket on housing cover.

(39) Carefully install cross shaft and cover assembly into steering gear housing (Fig. 4).

The cross shaft and sector teeth should be coated with steering gear lubricant before installing cross shaft in housing.

(40) Make certain some lash exists between cross shaft sector teeth and ball nut rack. Install and tighten cover bolts to 25 foot-pounds.

(41) Position cross shaft seal on cross shaft with lip of seal facing gear housing. Place installing adapter SP-3828 from Tool C-3880 against seal with **short step** toward seal (Fig. 14). Position nut from Tool C-3880 on cross shaft and turn it down against adapter, pressing seal into housing until step on adapter contacts end of housing. Remove tool.

(42) Turn worm shaft about 1/4 turn away from center of "high-spot" position. Using torque wrench C-3380 and 3/4 inch socket on worm shaft spline, check torque required to rotate shaft through high spot at center position. The reading should be between 8 and 11 inch pounds. Readjust cross shaft adjusting screw as necessary to obtain proper torque reading. Tighten lock nut to 35 foot pounds and recheck cross shaft torque.

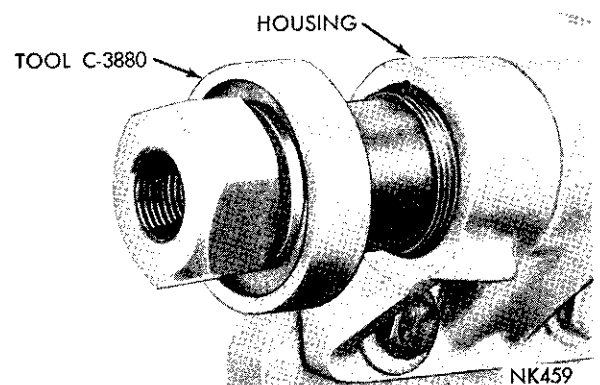


Fig. 13—Removing Cross Shaft Oil Seal

CROSS SHAFT OIL SEAL REPLACEMENT

The cross shaft oil seal may be replaced by the following procedure either on the bench, or without removing steering gear from vehicle.

CAUTION: When replacing oil seal in vehicle, clean the exposed portion of cross shaft to help prolong oil seal life.

(1) Remove steering gear arm retaining nut and lock washer. Remove arm with Tool C-3646 (Fig. 3).

Use Tool C-3880 to service cross shaft seal. The tool consists of adapter SP-3056; half rings SP-1932 and nut SP-3610.

(2) Slide threaded adapter over end of cross shaft and install nut portion of tool on shaft. (Fig. 13).

Maintain pressure on adapter with tool nut while screwing adapter into seal until it grips oil seal firmly. Place two half rings and retainer over both portions of tool. Turn tool nut counterclockwise to withdraw seal from housing.

(3) Place seal onto splines on cross shaft with lip of seal facing gear housing.

(4) Place installing adapter SP-3052 from Tool C-

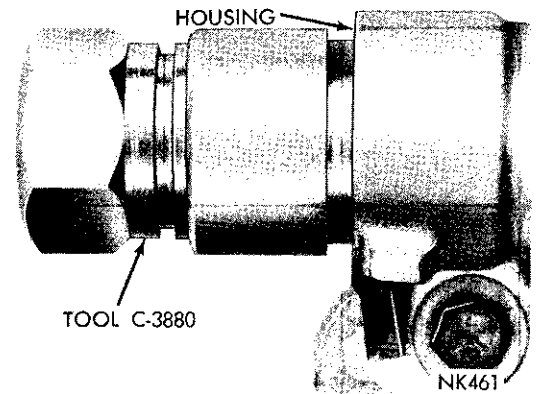


Fig. 14—Installing Cross Shaft Oil Seal

3880 against seal. Press seal in until a gap of 1/4 inch exists between adapter and housings (Fig. 14).

(5) Place nut from Tool Set C-3880 on cross shaft, and turn it down against adapter, pressing seal into housing until step on adapter contacts end of housing.

(6) Remove tool, install steering arm, lock washer and retaining nut and tighten nut to 180 foot-pounds.

POWER STEERING GEAR INDEX

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GENERAL INFORMATION

The power steering gear (Figs. 1 and 2) consists of a gear housing containing a cross shaft with sector gear, a power piston with gear teeth broached into the side of the piston which is in constant mesh with the Cross shaft gear, and a wormshaft connecting the steering wheel to the power piston through a Pot type coupling. The wormshaft is geared to the piston through

recirculating ball contact. The steering valve, mounted on top of the steering gear, directs the flow of fluid in the system.

Fluid is supplied to the steering gear, by an engine driven constant displacement type pump through a pressure hose. Oil is returned to the pump reservoir from the steering gear through a return hose.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
HARD STEERING	(a) Tires not properly inflated.	(a) Inflate tires to recommended pressures.
	(b) Low oil level in pump reservoir (usually accompanied by pump noise).	(b) See "Fluid Level," Power Steering Pump.
	(c) Loose pump belt.	(c) See "Group 7—Cooling."
	(d) Improper caster and camber.	(d) See "Front Wheel Alignment" Front Suspension Group 2.
	(e) Power steering output low.	(e) Pressure test pump.
	(f) Steering linkage binding.	(f) Repair and lubricate as necessary.
	(g) Steering gear malfunctions. 1. Cross shaft adjustment too tight. 2. Faulty or damaged valve lever.	(g) Adjust or repair as follows: 1. See "Cross Shaft Adjustment." 2. Repair as necessary.

Condition	Possible Cause	Correction
POOR RECOVERY FROM TURNS	3. External leakage.	3. Inspect for leakage at the lower sector shaft oil seal; the sector Cross cover "O" ring.
	4. Excessive internal leakage.	4. Recondition steering gear.
	(a) Tires not properly inflated.	(a) Inflate tires to recommended pressures.
	(b) Steering linkage binding.	(b) Repair and lubricate as necessary.
	(c) Improper wheel alignment.	(c) See "Front Wheel Alignment," Front Suspension Group 2.
	(d) Damaged steering tube bearing.	(d) Remove jacket tube and replace bearings.
	(e) Steering wheel column jacket and steering nut improperly aligned.	(e) See "Gear Installation."
	(f) Steering gear malfunctions:	(f) Adjust or repair as follows:
	1. Improper cross shaft adjustment.	1. See "Cross Shaft Adjustment."
	2. Column support spanner nut loose.	2. Repair as necessary.
3. Damaged valve lever.	3. Repair as necessary.	
4. Improper worm thrust bearing adjustment.	4. Recondition steering gear.	
5. Worn or damaged cylinder head worm seal ring or faulty worm piston ring.	5. Recondition steering gear.	
6. Burrs or nicks in the reaction ring grooves in the cylinder head or column support.	6. Repair as necessary.	
7. Dirt or chips in the steering gear unit.	7. Recondition steering gear.	
8. Rough worm in the piston assembly.	8. Recondition steering gear.	
9. Valve binding.	9. Replace valve assembly.	
CAR LEADS TO EITHER SIDE	(a) Tires not properly inflated.	(a) Inflate tires to recommended pressures; See "Wheels and Tires."
	(b) Improper wheel alignment.	(b) See "Front Suspension, Front Wheel Alignment." Group 2.
	(c) Valve body out of adjustment.	(c) If vehicle leads to the left, move the steering valve housing up on the steering housing. If vehicle leads to the right, move the steering valve housing down on the steering housing.
	(d) Valve lever damaged.	(d) Repair as necessary.
	(e) Column support spanner nut loose.	(e) Repair as necessary.
	(f) Coupling not centered.	(f) Center coupling. Refer to "Gear Installation."
	(g) Internal leakage in the steering gear valve body.	(e) Replace the steering gear valve body assembly.
TEMPORARY INCREASES IN EFFORT WHEN TURNING STEERING WHEEL TO THE RIGHT OR LEFT	(a) Oil level low in pump reservoir.	(a) See "Fluid Level."
	(b) Loose pump belts.	(b) See "Group 7—Cooling."
	(c) Oil on pump belt.	(c) Replace the belt and adjust.
	(d) Binding steering linkage.	(d) Lubricate and repair as necessary.
	(e) Engine idle too slow.	(e) See "Fuel Specifications." Group 14.
	(f) Air in the system.	(f) Work the steering wheel from right to left until the air is expelled.
	(g) Power steering pump output low.	(g) See Diagnosis "Hard Steering" correction (e).
	(h) Gear malfunction.	(h) Adjust and repair as outlined under "Hard Steering"—condition and correction (g).
NOISES	(a) Buzzing noise in neutral and stops when the steering wheel is turned.	(a) Noisy pump, make pressure test and repair as necessary. Damaged hydraulic lines or interference of the hoses with components attached to the fender shield. Air in system; work steering wheel from right to left until the air is expelled.

Condition	Possible Cause	Correction
EXCESSIVE STEERING WHEEL FREE-PLAY	(b) Chucking noise. Cause as follows: 1. Improper cross shaft adjustment. 2. Improper worm shaft thrust bearing adjustment. 3. Coupling loose on the worm shaft.	(b) Correct as follows: 1. See "Cross Shaft Adjustment." 2. Recondition steering gear. 3. Inspect worm shaft splines for wear. Inspect coupling bolt for tightness, if loose, replace bolt and inspect worm shaft and coupling. 4. Replace worm and piston assembly.
	(c) Metallic clatter or hissing noise.	(c) Replace back pressure valve cushion.
	(d) Knocking condition at the bracket stop when the engine is running.	(d) Rubber stop worn or missing from pump bracket.
	(e) Loose pump belt.	(e) See Group 7 Cooling.
	(a) Improper gear shaft adjustment.	(a) See "Cross Shaft Adjustment."
LACK OF ASSIST (One Direction)	(b) Column support spanner nut loose.	(b) Repair as necessary.
	(c) Improper worm thrust bearing adjustment.	(c) Repair as necessary.
	(d) Coupling loose on the worm shaft.	(d) Inspect wormshaft splines for wear.
	(a) Oil leaking past worm shaft oil seal ring.	(a) Recondition steering gear.
LACK OF ASSIST (Both Directions)	(b) Broken or worn ring on worm piston.	(b) Recondition steering gear.
	(c) Piston end plug loose.	(c) Replace the worm and piston assembly.
	(d) Reaction seal missing.	(d) Remove the steering gear and repair as necessary.
	(a) Pump belt slipping.	(a) See Group 7.
	(b) Pump output low.	(b) Pressure test pump.
	(c) Broken or worn ring on worm piston.	(c) Recondition steering gear.
	(d) Piston end plug loose.	(d) Replace the worm and piston assembly.

SERVICE PROCEDURES

SERVICE IN VEHICLE

Cross Shaft Adjustment

- (1) Disconnect center link from steering gear arm.
- (2) Start engine and run at idle speed.
- (3) Turn steering wheel gently from one stop to the other, counting number of turns. Then turn wheel back exactly half way, to center position.
- (4) Loosen adjusting screw until backlash is evident in steering gear arm. Feel backlash by holding end of steering gear arm between thumb and forefinger with a light grip. Tighten adjusting screw until backlash just disappears.

Continue to tighten to 3/8 to 1/2 turn from this position and tighten lock nut to 50 foot-pounds to maintain this setting.

Valve Body Recondition

- (1) Disconnect high pressure and return hoses at the valve body and tie the ends above the reservoir fluid level.
- (2) Remove two screws attaching valve body to main gear housing.
- (3) Lift valve body upward to disengage from valve lever (Fig. 8).
- (4) Remove the two screws attaching control valve

body to steering valve body and separate two bodies (Fig. 3).

(5) Remove outlet fitting, washer, spring, valve piston and cushion spring.

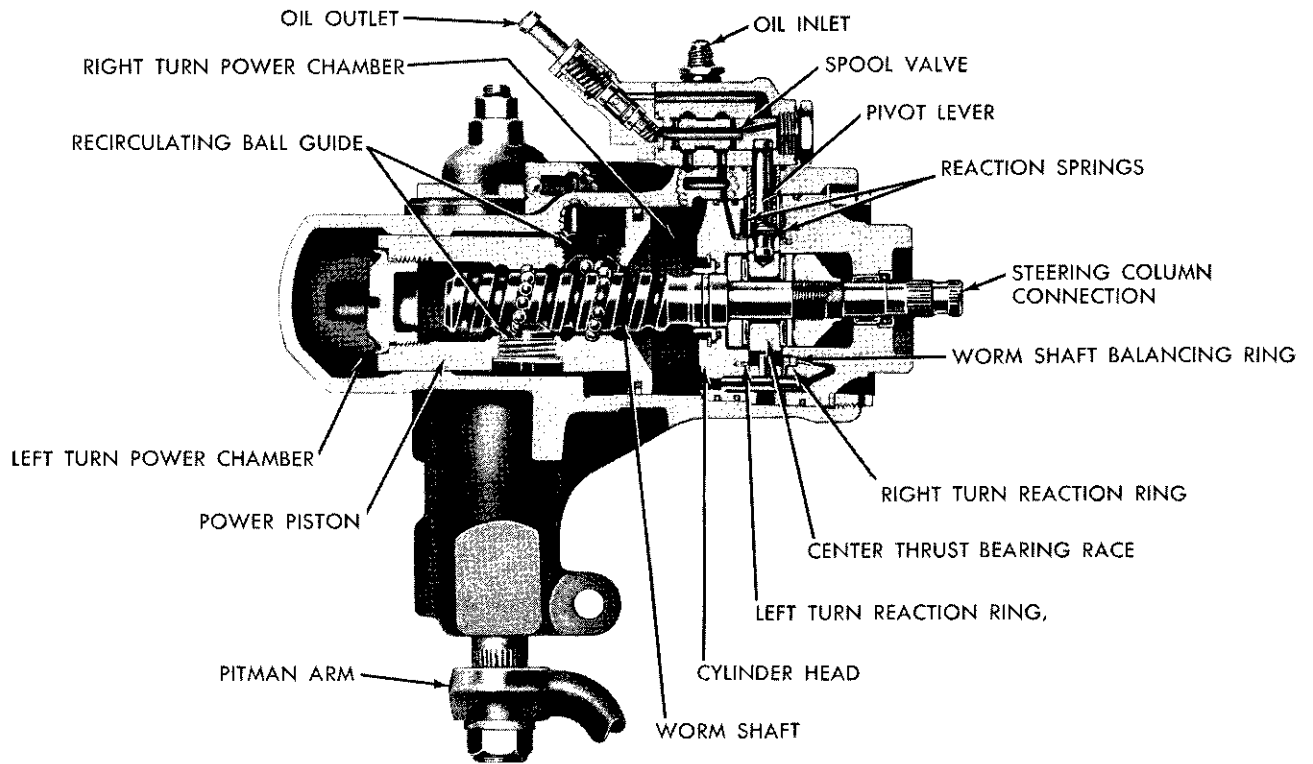
(6) Carefully shake out spool valve and inspect for nicks, burrs and scores. Do not remove valve body end plug unless inspection indicates a leak at gasket. **If spool valve or valve body is damaged, replace valve and body assembly.** Small burrs and nicks may be removed with crocus cloth if extreme care is used not to round off sharp edges of valve. The sharp edge is vitally important to operation of this valve.

(7) Clean valve bodies and valve piston thoroughly in clean solvent. Blow out all passages with compressed air. Lubricate pistons and bores with power steering fluid.

(8) Install steering spool valve in valve body so valve lever hole is aligned with lever opening in valve body. Valve must be perfectly free in valve body without sticking or binding (Fig. 3).

(9) Install a new gasket on end plug (if removed). Tighten plug to 25 foot-pounds.

(10) Install piston cushion spring in control valve body being sure it seats in counterbore at bottom of housing. Lubricate piston and insert nose end of pis-



NH717A

Fig. 1—Power Steering Gear

ton into body bore. Test for smooth operation. Be sure cushion spring is not cocked.

(11) Install spring on top of piston and install copper washer and fitting. Tighten to 20 foot-pounds.

(12) Position two new "O" rings on control valve body and attach to steering valve body. Tighten the two attaching screws to 95 inch-pounds.

(13) If pressure inlet fitting has been removed, tighten fitting to 30 foot-pounds.

(14) Align lever hole in valve spool with lever opening in valve body.

(15) Install on gear housing making sure the valve lever enters hole in valve spool and key section on bottom of valve body nests with the keyway in housing.

CAUTION: These parts should go together with relative ease. Use of force may damage the lever. If they

do not go together easily, lift off valve assembly, realign valve spool hole with lever opening in valve body and install valve body.

(16) Install two screws and tighten to 7 foot-pounds to prohibit leakage during valve centering operation.

(17) Connect high pressure and return hoses to valve body.

(18) Start engine. If unit is self-steering tap the valve up or down to correct. **When tapping valve**

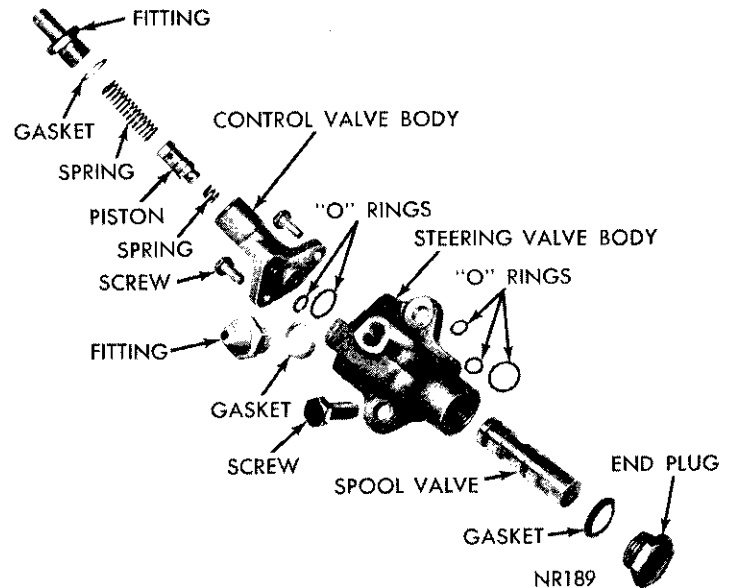


Fig. 3—Valve Body (Disassembled View)

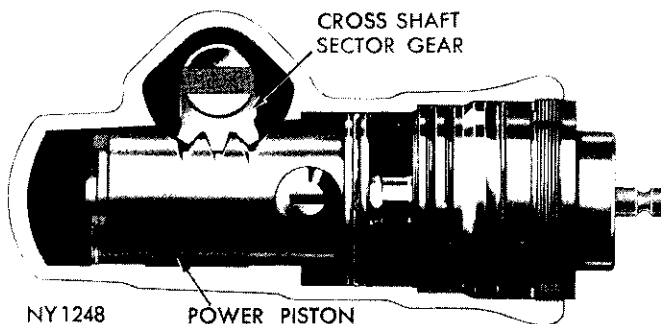


Fig. 2—Steering Gear Housing

"down," hit valve body on end plug. When tapping valve "up," tap on head of the screw attaching valve body to main valve body. Do not hit control valve body.

(19) Turn steering wheel from stop to stop several times to expel air from system. Refill reservoir as required.

CAUTION: Do not turn hard against ends of travel. This will generate high pressure and may blow out the "O" rings since the valve body screws have not been finally tightened.

(20) With steering wheel in straight ahead center position, start and stop the engine several times, tapping the valve body up or down as required until there is no movement of the steering wheel when the engine is started or stopped.

(21) The valve is now centered. Tighten the two screws attaching valve body to housing to 200 inch-pounds.

CROSS SHAFT OIL SEAL REPLACEMENT

The cross shaft oil seal may be replaced without removing the steering gear from the vehicle.

CAUTION: When replacing oil seal in vehicle, clean the exposed portion of cross shaft to help prolong oil seal life.

- (1) Remove steering arm nut.
- (2) Disconnect steering gear arm from sector shaft with Tool C-3646 (Fig. 4).
- (3) Slide threaded adapter SP-3056 of Tool C-3350-A over end of cross shaft and thread tool nut on cross shaft. Maintain pressure on threaded adapter with tool nut while screwing adapter far enough to engage metal portion of grease retainer. Place the two half rings SP-1932, and Tool retainer ring over both portions of the Tool (Fig. 5). Turn the tool nut counter-clockwise to withdraw grease retainer from housing.
- (4) Remove oil seal snap ring with snap ring pliers and remove seal back-up washer.

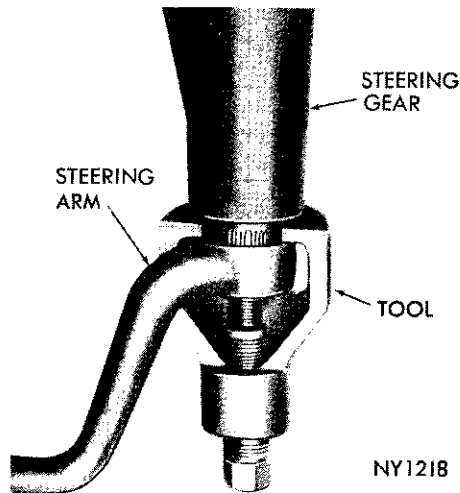


Fig. 4—Removing Steering Gear Arm

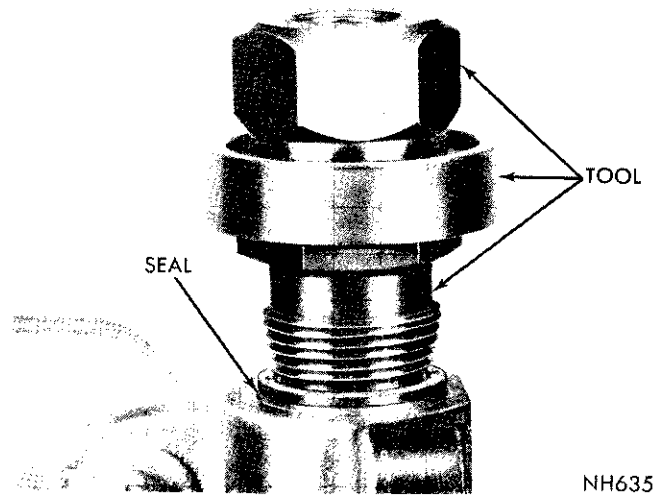


Fig. 5—Removing Gear Shaft Oil Seal

- (5) Use Tool C-3350-A in same manner as outlined in step (3) to remove inner seal.
- (6) Place new oil seal on flat surface, lip down, lubricate inside diameter with power steering fluid and insert seal protector sleeve SP-1601.
- (7) Position seal with protector over cross shaft with lip of seal toward housing.
- (8) Place tool adapter SP-3052 with long step of adapter against new seal (Fig. 6). Install tool nut on cross shaft and tighten tool nut until shoulder of tool adapter contacts gear housing.
- (9) Remove tool nut, adapter and protector. Install seal back-up washer and oil seal snap ring with sharp edge out.
- (10) Position grease retainer in housing bore. Place tool adapter SP-3052 with short step of lip against seal (Fig. 7). Install tool nut on cross shaft and tighten until shoulder of tool adapter contacts gear housing.
- (11) Place steering gear and front wheels in straight ahead position and install steering gear arm and nut.
- (12) Tighten steering gear arm nut to 180 foot-pounds.

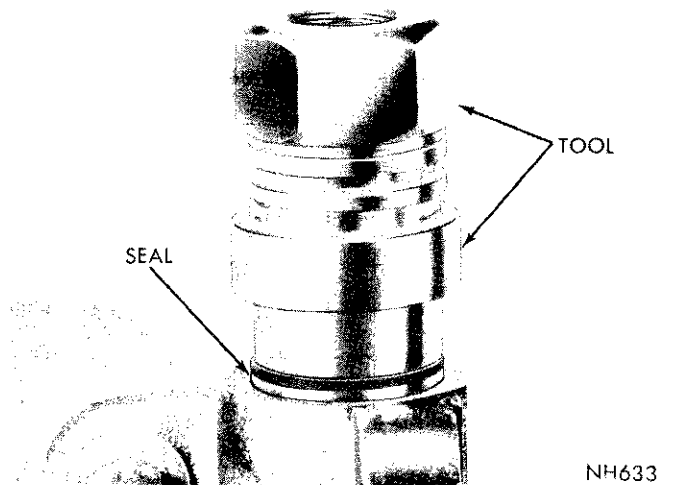


Fig. 6—Installing Gear Shaft Inner Oil Seal

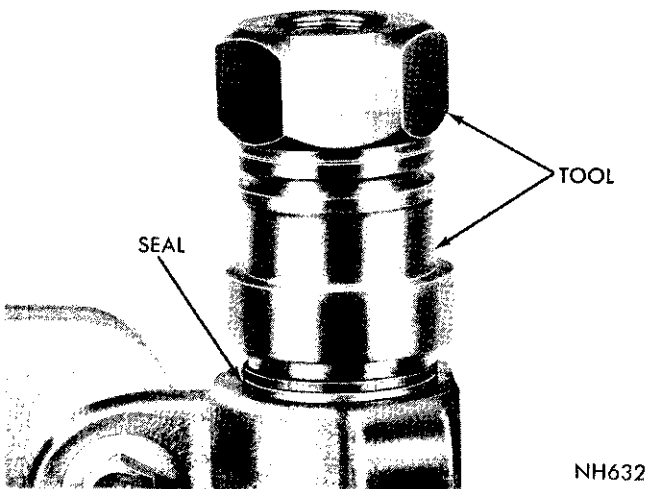


Fig. 7—Installing Gear Shaft Grease Retainer

WORM SHAFT OIL SEAL REPLACEMENT

The worm shaft oil seal may be replaced without removing gear from vehicle. Remove steering column as outlined under "Steering Columns" and remove oil seal with Tool C-3638 (Fig. 8). Drive new oil seal in place (lip of seal toward housing) with Tool C-3650 (Fig. 9). Install and align steering column as described in "Steering Columns".

SERVICE OUT OF VEHICLE

WORM SHAFT AND PISTON REPLACEMENT

The master serration on the power steering gear worm shaft spline, used for centering the steering shaft coupling, is machined after the steering gear is completely assembled.

If it should become necessary to replace a power steering gear worm shaft and piston assembly, it will be necessary to file a master serration on the spline of the worm shaft, since the replacement part does not have a master serration machined in the spline.

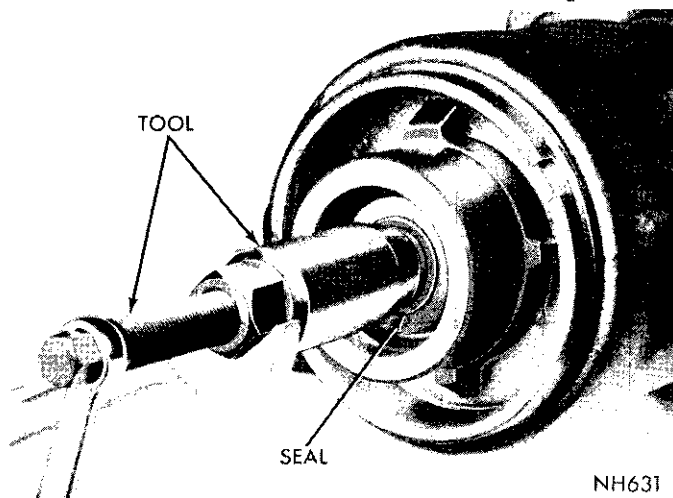


Fig. 8—Removing Worm Shaft Oil Seal

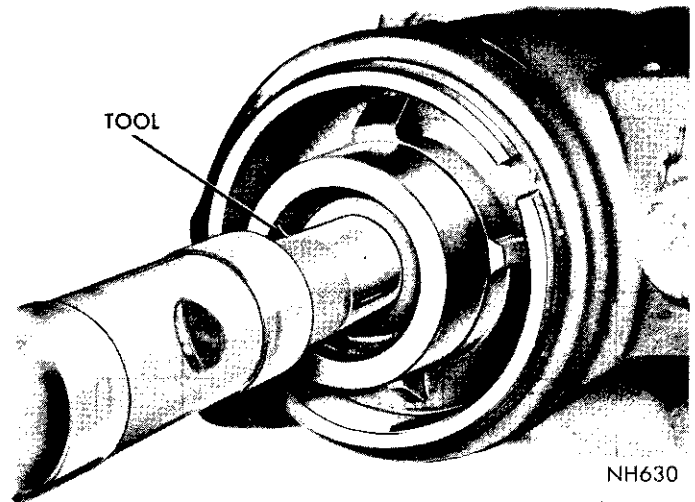


Fig. 9—Installing Worm Shaft Oil Seal

To file a master serration on a worm shaft spline, the power steering gear must be completely assembled and the worm shaft centered in its travel, then with the steering gear in its normal upright position remove one tooth of the spline, at the 12 o'clock position, with a suitable file.

Gear Removal

To avoid damage to the energy absorbing steering column, it is recommended that the steering column be completely detached from floor and instrument panel before steering gear is removed. See Steering Column Section of this Manual for proper removal, alignment and installation procedure.

- (1) Remove steering column.
- (2) Disconnect power steering pressure and return hoses at centering valve on gear. Tie free ends of hoses above pump level to avoid loss of fluid.
- (3) From under vehicle, remove steering arm retaining nut and lock washer. Remove steering arm with tool C-3646.
- (4) Remove three gear to frame retaining bolts (use 1/2 inch twelve point socket) remove gear.

Gear Reconditioning

Clean the gear assembly thoroughly in a suitable solvent and install unit in holding fixture Tool C-3323.

- (1) Drain steering gear through the pressure and return connections by turning steering wormshaft from one extreme of travel to the other.
- (2) Remove valve body attaching screws, and remove valve body and three "O" rings (Fig. 10).
- (3) Remove pivot lever and spring. Pry under spherical head with a screw driver (Fig. 11).

CAUTION: Use care not to collapse slotted end of the valve lever as this will destroy the bearing tolerances of the spherical head.

- (4) Remove gear shaft grease retainer and oil seal as outlined in "Gear Shaft Oil Seal Replacement."

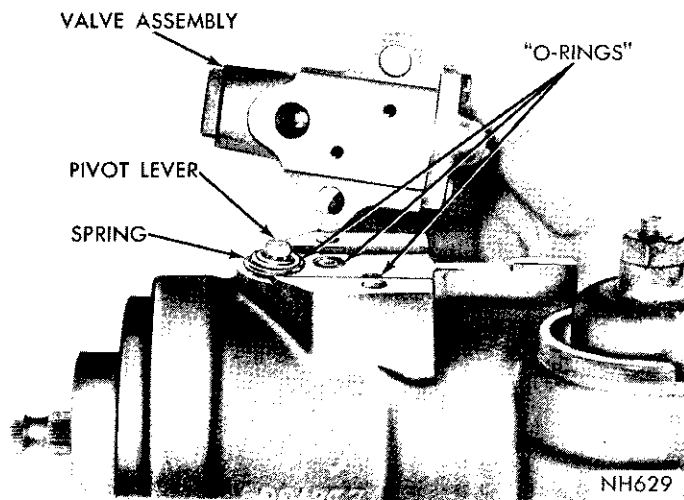


Fig. 10—Removing Valve Body Assembly

(5) Loosen gear shaft adjusting screw locknut and remove gear shaft cover spanner nut with Tool C-3988.

(6) Rotate wormshaft to position gear shaft sector teeth at center of piston travel. Loosen steering power train retaining nut with Tool C-3989.

(7) Position holding Tool C-3323 so sector shaft is in a horizontal position. Place Tool C-3875 on threaded end of gear shaft and slide tool into housing until both tool and shaft are engaged with bearings.

(8) Turn wormshaft to full left turn position to compress power train parts. Remove power train retaining nut with Tool C-3989. Remove housing head tang washer.

(9) While holding power train firmly compressed, pry on piston teeth with a screw driver using gear shaft as a fulcrum and remove complete power train (Fig. 12).

It is important that cylinder head, center race and spacer assembly and housing head be maintained in close contact with each other. This will eliminate the possibility of reaction rings becoming disengaged

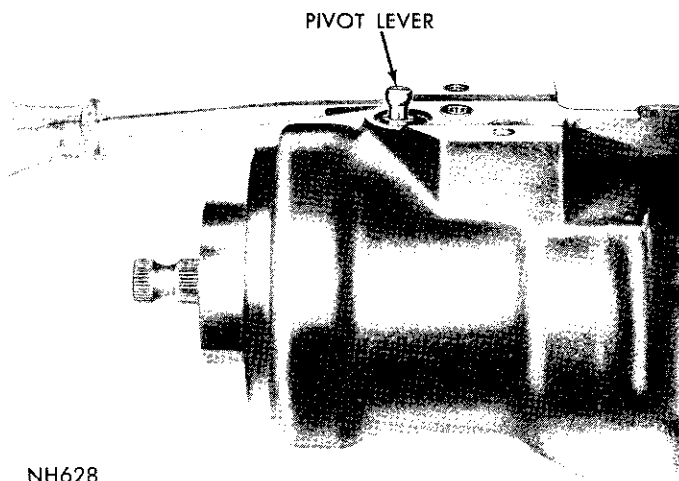


Fig. 11—Removing Pivot Lever

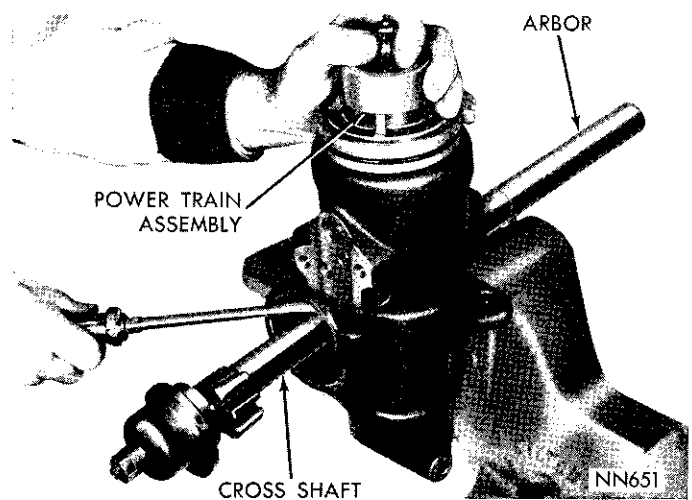


Fig. 12—Removing Power Train

from their grooves in both cylinder head and housing head. It will prohibit center spacer from becoming separated from center race and becoming "cocked" in housing which may make it impossible to remove power train without damaging the spacer, the housing, or both.

(10) Place power train vertically in a vise equipped with soft jaws to avoid damaging piston assembly. See Fig. 13 for parts identification.

The 33 worm bearing needle rollers will fall out when housing head is removed from wormshaft. Use arbor Tool C-3929 (Fig. 14) to hold rollers in position when housing head is removed.

(11) Raise housing head until wormshaft oil seal just clears top of wormshaft and position arbor tool C-3929 on top of wormshaft and into oil seal. With arbor in position pull up on housing head until arbor is positioned in bearing. Remove housing head and arbor.

To reinstall rollers, if they should become dislodged, retain rollers in the cage with wheel bearing lubricant.

CAUTION: If the wormshaft oil seal is to be replaced, perform the operation with the housing head assembled in the steering gear housing.

(12) Remove large "O" ring from groove in housing head.

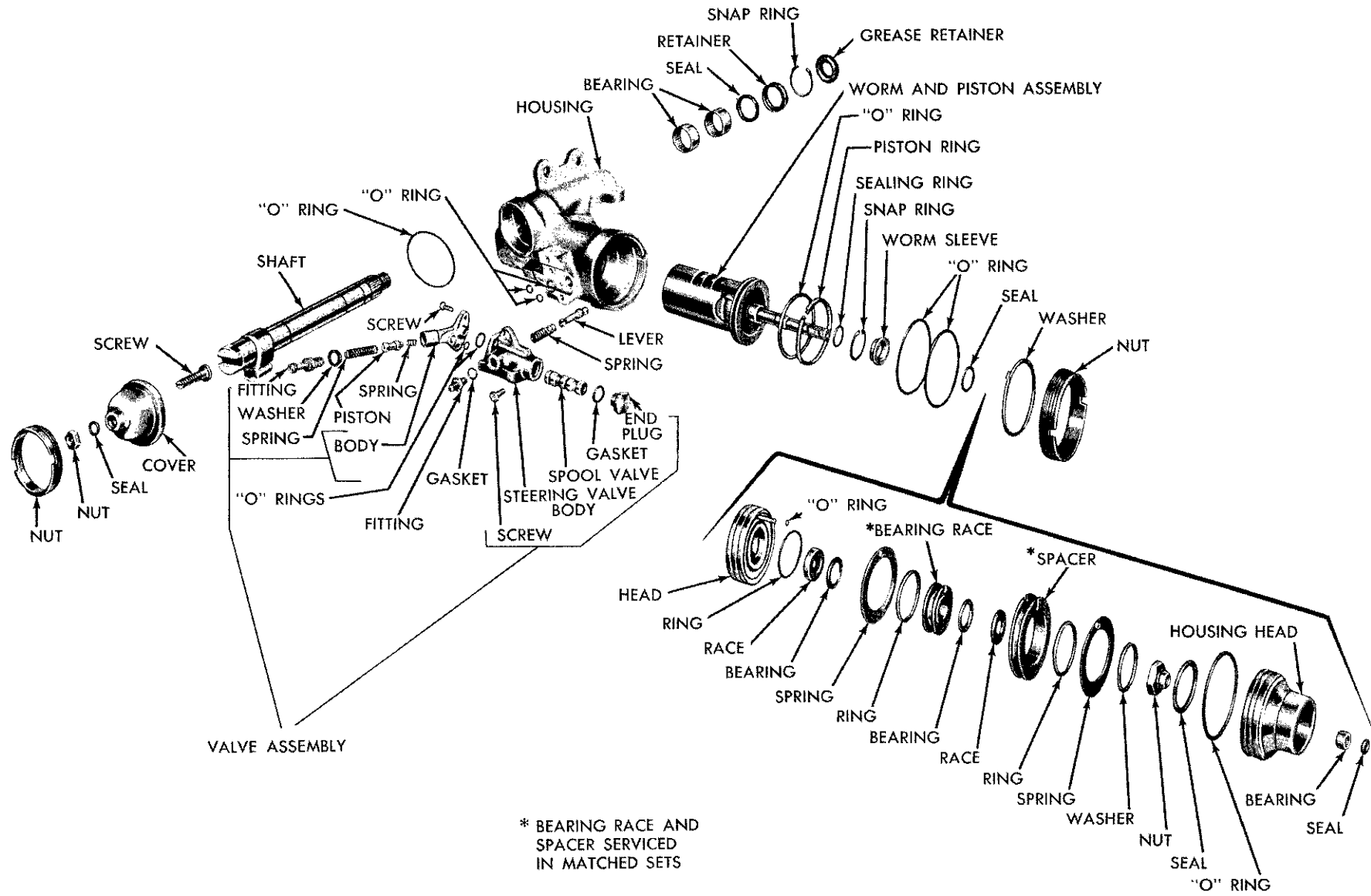
(13) Remove reaction seal from groove in face of housing head with air pressure directed into ferrule chamber (Fig. 15).

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

(15) Remove reaction spring, reaction ring, worm balancing ring and spacer.

(16) Hold wormshaft from turning, then turn nut with sufficient force to release staked portions from knurled section and remove nut.

Wire brush the knurled sections to remove the



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Fig. 13—Steering Gear Disassembled View



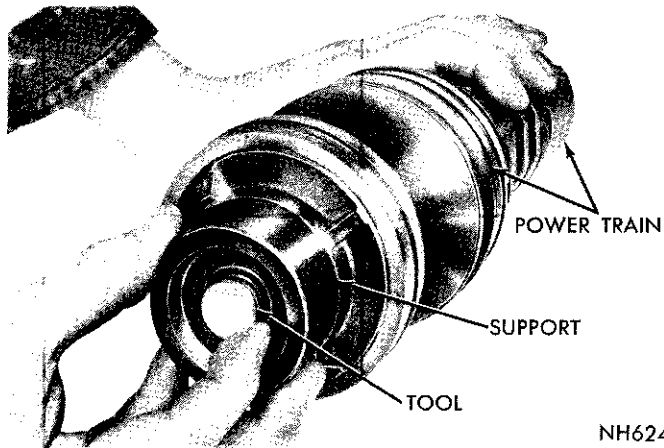


Fig. 14—Retaining Bearing Rollers with Arbor Tool

chips, then blow out the nut and wormshaft to remove any metal particles.

(17) Remove upper thrust bearing race (thin) and upper thrust bearing.

(18) Remove center bearing race.

(19) Remove lower thrust bearing and lower thrust bearing race (thick).

(20) Remove lower reaction ring and reaction spring.

(21) Remove cylinder head assembly.

(22) Remove two "O" rings in two outer grooves in cylinder head.

(23) Remove reaction "O" ring from groove in face of cylinder head with air pressure directed into oil hole located between two "O" ring grooves (Fig. 16).

(24) Remove snap ring, sleeve and rectangular oil seal from cylinder head counterbore (Fig. 17).

(25) Test operation of wormshaft. The torque required to rotate wormshaft throughout its travel in or out of piston must not exceed 2 inch-pounds with a 15 pound side load. The worm should run in and out of piston under its own weight.

The worm and piston is serviced as a complete assembly and should not be disassembled.

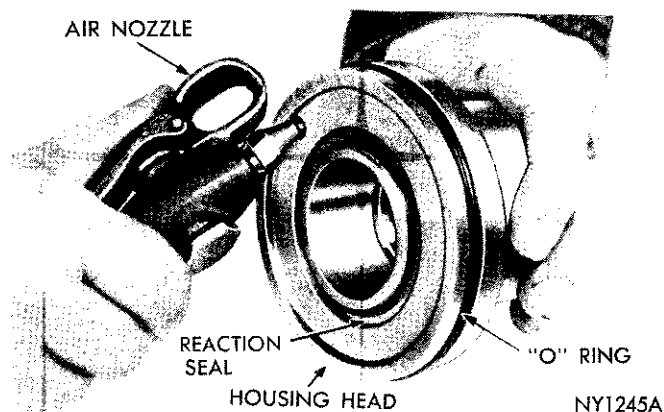


Fig. 15—Removing Reaction Seal From Worm Shaft Support

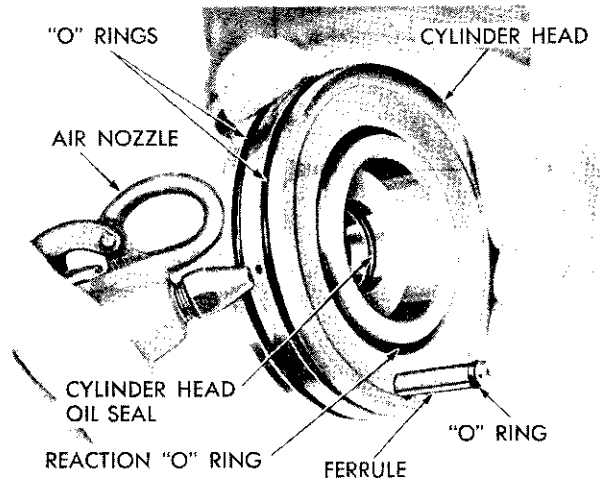


Fig. 16—Removing Reaction Seal from Cylinder Head

(26) Test for excessive side play with the piston held firmly in a vise with the rack teeth up, and the worm in its approximate center of travel. The vertical side play measured at a point 2-5/16 inches from the piston flange should not exceed .008 inch when the end of the worm is lifted with a force of 1 pound (Fig. 18).

(27) Inspect condition of rubber sealing ring located under cast iron ring and replace if necessary. Install cast iron piston ring as follows:

(a) Slide a new piston ring in place in piston groove, then place piston and ring assembly in Tool C-3676 with lower part of piston and ring resting on land of tool (Fig. 19).

(b) Press down on piston to seat ring in piston groove, forcing open ends of ring out for ease of locking the ring.

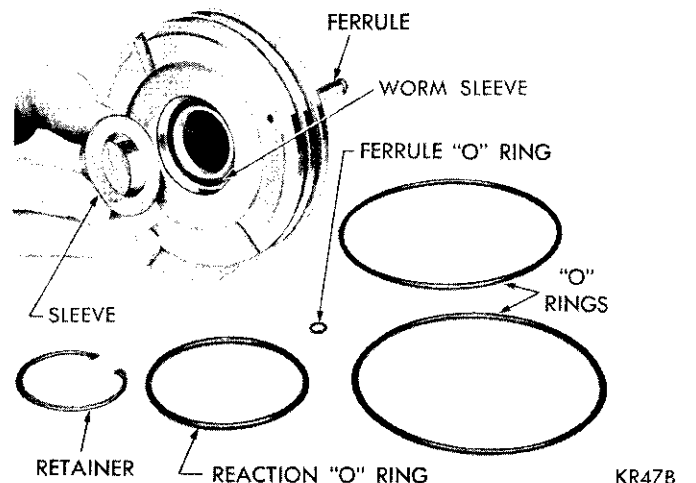


Fig. 17—Removing Cylinder Head Oil Seal

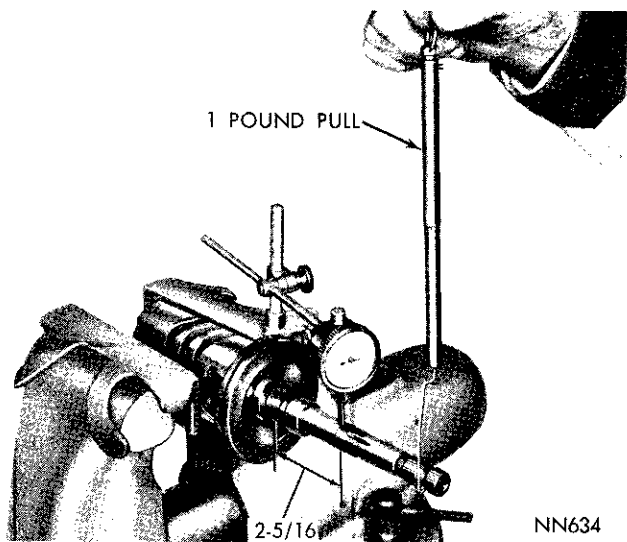


Fig. 18—Checking Worm Shaft Side Play

(28) Place piston assembly in a vertical position (wormshaft up) in a vise equipped with soft jaws.

(29) Inspect cylinder head ferrule oil passage for obstructions and the lands for burrs, then lubricate the two large “O” rings and install them in the cylinder head grooves (Fig. 13).

(30) Install worm sleeve seal, sleeve and snap ring (if removed). Make sure snap ring is seated in groove.

(31) Install lower reaction seal (O-ring) in cylinder head groove.

(32) Slide cylinder head assembly (ferrule up) on wormshaft. Check wormshaft seal ring making sure gap is closed to avoid damaging the ring as the cylinder head moves against piston flange.

(33) Lubricate with power steering fluid, and install parts in the following order:

(a) Lower thrust bearing race (thick).

(b) Lower thrust bearing.

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

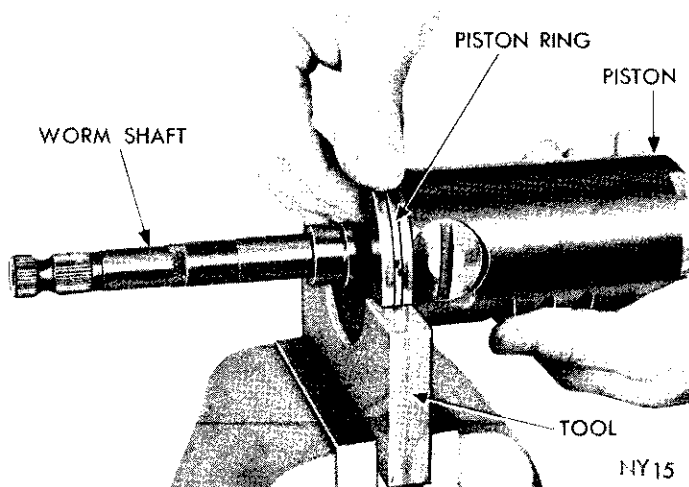


Fig. 19—Installing Piston Ring

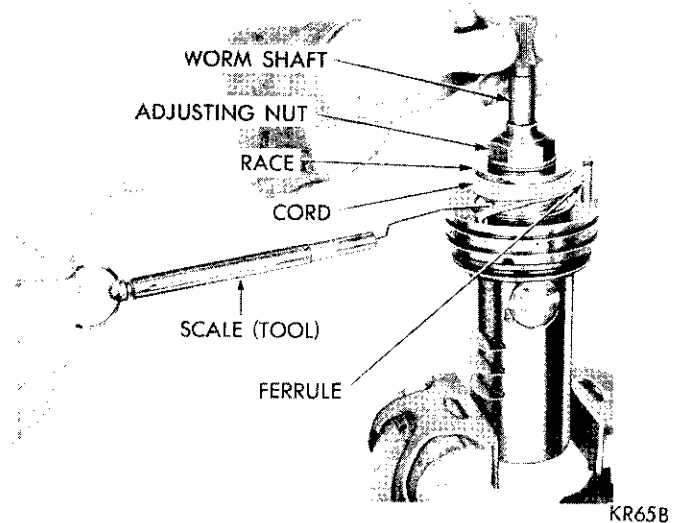


Fig. 20—Checking Center Bearing Preload

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

(e) Center bearing race.

(f) Upper thrust bearing.

(g) Upper thrust bearing race (thin).

(h) Start wormshaft thrust bearing adjusting nut (do not tighten).

(34) Turn wormshaft clockwise one-half turn. Hold wormshaft in this position with splined nut, Tool C-3637 and socket wrench, and hold in this position thru items 35 and 36, then tighten nut to 50 foot-pounds to prestretch wormshaft threads.

(35) Loosen adjusting nut. Place several rounds of cord around center bearing race (Fig. 20). Make a loop in one end of cord and hook loop of a distributor breaker arm spring scale Tool MTU-36 in cord loop. Pulling cord will cause bearing race to rotate. Retighten worm bearing adjusting nut while pulling on cord with scale. When adjusting nut is tightened properly, reading on the scale should be 16 to 24 ounces (20 ounces preferred while the race is turning).

(36) Stake upper part of wormshaft adjusting nut into knurled area of shaft.

(a) Hold a 1/4 inch flat end punch on center line of wormshaft end at a slight angle to nut flange (Fig. 21).

(b) Strike punch a sharp blow with a hammer and test preload.

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

(c) After retesting for proper preload, stake the nut at three more locations 90° apart around upper part of the nut.

(d) To test total staking, apply 20 foot-pounds of

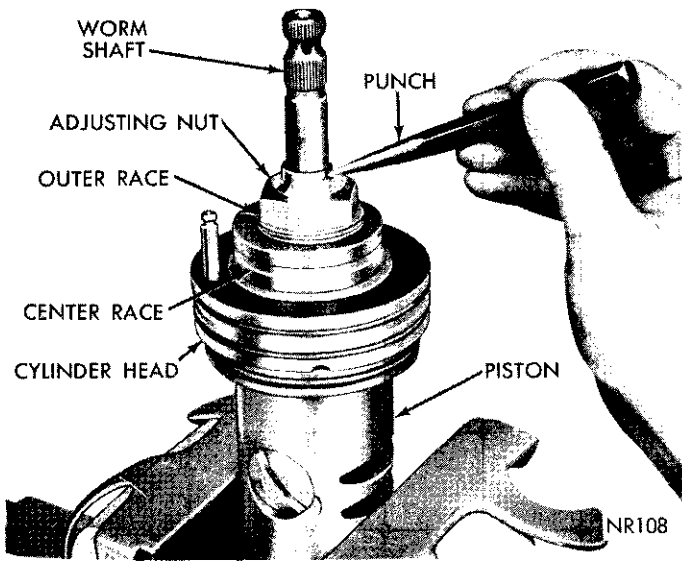


Fig. 21—Staking Worm Shaft Bearing Adjusting Nut

torque in each direction. If nut does not move, staking operation is satisfactory.

Retest wormshaft preload to determine that adjustment remains constant after nut is securely locked.

(37) Position spacer assembly over center race, engaging dowel pin of spacer in slot of race, and slot of spacer entered over cylinder head ferrule.

This will align the valve pivot lever hole in the center bearing race with the valve pivot lever hole in center bearing spacer assembly. The small "O" ring for the ferrule groove should not be installed until after upper reaction spring and spacer have been installed.

(38) Install upper reaction ring on center race and spacer with flange down against spacer.

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

(40) Install worm balancing ring (without flange) inside upper reaction ring.

(41) Lubricate ferrule "O" ring with Petrolatum and install in groove on cylinder head ferrule.

(42) If oil seal was removed from housing head, install a new seal with Tool C-3650 (Fig. 7). See "Wormshaft Oil Seal Replacement." With lip of seal toward bearing, drive seal until tool bottoms on the support.

(43) Lubricate and install reaction seal in groove in face of housing head with flat side of seal out (Fig. 22 and 23). Install "O" ring in groove on housing head.

(44) Slide housing head and arbor, Tool C-3929 over the wormshaft carefully engaging cylinder head ferrule and "O" ring and making sure reaction rings enter circular groove in housing head. The power train is now ready for installation in housing.

(45) It is generally not necessary to remove sector shaft cover. However, this may be easily accomplished

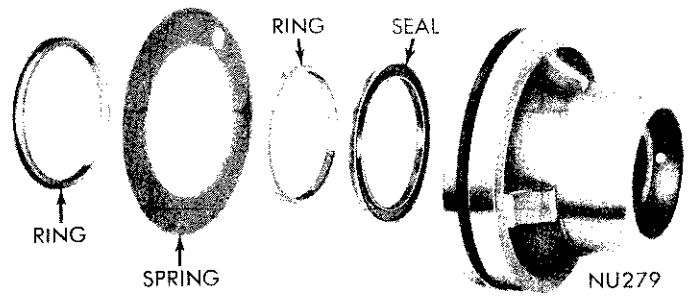


Fig. 22—Reaction Seal Ring In Shaft Support

by removing the adjusting screw. While holding the cover, turn adjusting screw clockwise until the shaft becomes disengaged from cover. The adjusting screw will now slide out of the "T" slot in end of shaft.

Gear Shaft Assembly

(46) To remove gear shaft needle bearings from housing, remove grease retainer, oil seal snap ring with pliers Tool C-3915 and remove seal back-up washer.

(47) Insert Tool C-3875 in steering housing; place housing in a press and press out bearings and oil seal.

(48) To install gear shaft lower needle bearing, place bearing on end of Tool C-3875. Press bearing into steering gear housing 1/32 inch below end of bearing bore to provide space for oil seal, back-up washer and snap ring and cross shaft grease retainer. See "Cross Shaft Oil Seal Replacement."

CAUTION: The arbor adapter ring must be used with C-3875 Remover and Installer Arbor, otherwise the bearings may be crushed.

(49) To install upper needle bearing, place bearing on end of Tool C-3875. Press bearing into housing flush with end surface of bore.

(50) Insert gear shaft and adjusting screw into cover and using a screwdriver through the threaded hole in cover, turn screw counterclockwise to pull shaft completely into the cover. Lubricate a new

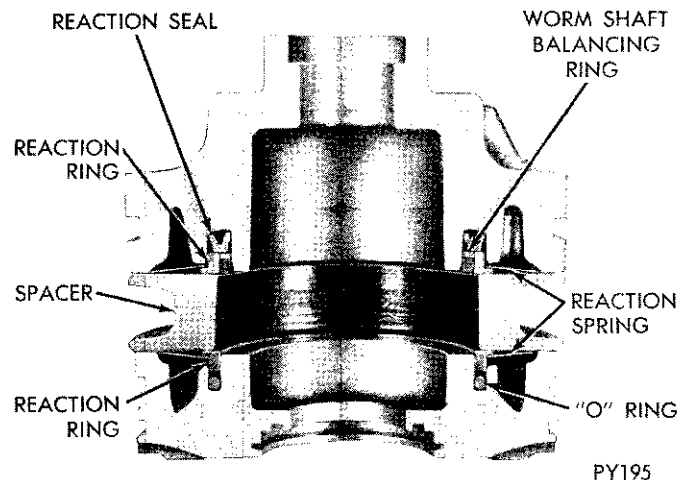


Fig. 23—Reaction Rings Installed (Cut-Away View)

square section seal ring and slide it over adjusting screw into position on top of cover. Install adjusting screw lock nut, but do not tighten at this time.

(51) Lubricate cross shaft cover "O" ring with wheel bearing grease and install on shelf of gear housing.

(52) Lubricate power train bore of the housing with power steering fluid, and carefully install power train assembly. To keep reaction rings from coming out of their grooves keep worm turned fully counterclockwise. The piston teeth must be facing to the right and the valve lever hole in center race and spacer must be in the "up" position.

CAUTION: Make sure the cylinder head is bottomed on the housing shoulder (Figs. 1 and 2).

(53) Align valve lever hole in center bearing race and spacer exactly with the valve lever hole in the gear housing. Turn the housing head by tapping on a reinforcing rib with hammer and drift. Use Tool C-3649 to maintain alignment (Fig. 24). **The aligning tool should not be removed until the spanner nut is securely tightened.**

(54) Install housing head tang washer to index with groove in housing. Install spanner nut and tighten to 110 to 200 foot-pounds with Tool C-3634.

(55) Set the power piston at the center of travel and install gear shaft and cover assembly so that sector teeth index with piston rack teeth. Make sure cover "O" ring is properly installed on shelf in housing.

(56) Install cover spanner nut and tighten 110 to 200 foot-pounds with Tool C-3988.

(57) Install valve pivot lever (double bearing end first) (Fig. 25) into center race and spacer through hole in steering housing so that slots in valve lever are parallel to wormshaft in order to engage the anti-rotation pin in center race. Install valve pivot lever spring small end first.

Turn worm until the piston bottoms in both directions and observe the action of the lever. It must be in the center of the hole and snap back to its center

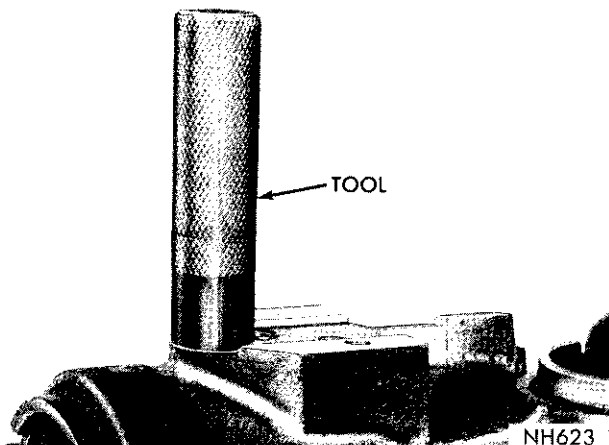


Fig. 24—Aligning Center Bearing Spacer with Steering Valve

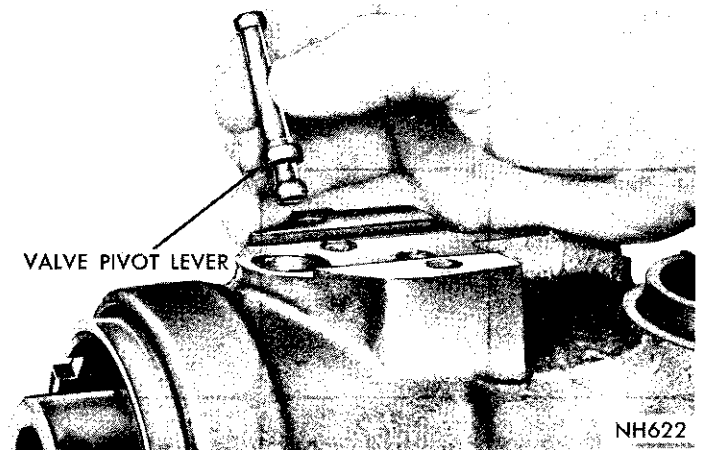


Fig. 25—Installing Valve Pivot Lever

position when the worm torque is relieved.

(58) Install valve body on housing making sure valve pivot lever enters hole in valve spool (Fig. 1). Be sure "O" ring seals are in place. Tighten valve mounting screws to 7 foot-pounds.

(59) Install new gear shaft seal followed by seal back-up washer and snap ring and a new grease retainer as outlined under "Gear Shaft Oil Seal Replacement."

Final Tests and Adjustments

(1) Remove oil reservoir cover and fill reservoir with Power Steering Fluid, Part No. 2084329 or equivalent, to the level mark.

(2) Connect test hoses with proper adapters to hydraulic pump on vehicle with pressure gauge C-3309B installed between pump and steering gear.

(3) Start the engine.

(4) Center valve until unit is not self-steering. Tap on the head of valve body attaching screws to move valve body up on steering housing, and tap on end plug to move valve body down on housing. Expel all air from the unit by turning wormshaft back and forth through the travel several times.

(5) Refill reservoir before proceeding with following tests and adjustments on the bench.

(a) With steering gear on center, tighten gear shaft adjusting screw until backlash in steering gear arm just disappears. See "Gear Shaft Adjustment."

If power train has been removed, tighten 1-1/4 turns from this position and while holding adjusting screw in this position, tighten lock nut (Fig. 26).

This is a temporary adjustment to bring piston rack and sector teeth in full alignment.

(b) Operate unit through full travel several times to align piston rack and sector teeth.

(c) With gear on center, readjust sector shaft backlash. This will require loosening adjusting screw until backlash is evident. Then retighten adjusting screw until backlash just disappears. Continue to

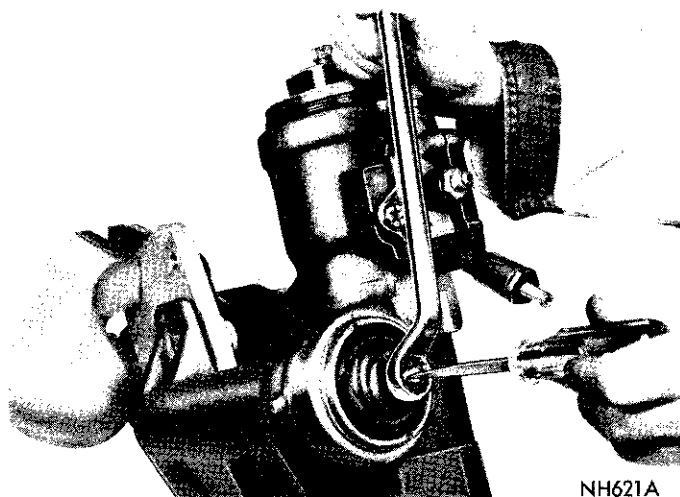


Fig. 26—Adjusting Steering Gear Mesh

tighten for 3/8 to 1/2 turn from this position and tighten lock nut to 50 foot-pounds to maintain this setting.

(d) Starting from a point at least one full turn of the wormshaft either side of center, torque at the sector shaft required to turn the unit through center at 2 rpm in each direction shall not exceed 20 foot-pounds or vary more than 5 foot-pounds from left to right.

(e) Adjust the torque to be equal in both directions by readjusting the valve.

Tighten valve body adjusting screw to 200 inch-pounds.

(f) With gear at or near full turn in either direction, attempt to return unit to center by applying a torque wrench at steering gear shaft. Hold wormshaft until cross shaft torque builds up to 50 foot-pounds. Release wormshaft and maintain a constant steady pull at 2 rpm on the gear shaft. If cross shaft torque does not drop to 20 foot-pounds maximum as the unit passes through center, check for too much interior drag; binding valve lever, binding spool valve, or

tight cross shaft adjustment.

(6) With unit under power, but with no load, torque required to rotate wormshaft through an included angle of 180° (90° either side of center) at 6 rpm (or one revolution every ten seconds) shall be 6-10 inch-pounds. Disconnect test equipment and mounting fixture and install unit in vehicle.

Gear Installation

(1) From under vehicle, position steering gear on mounting bracket. Install three mounting bolts and tighten to 100 foot-pounds.

(2) Center the steering gear wormshaft. Wormshaft master spline should be in 12 o'clock position. With front wheels in straight ahead position, install steering arm, lock washer and nut. Tighten nut to 180 foot pounds.

(3) Connect pressure and return hoses to steering valve. (See Hose Installation).

(4) With steering wheel centered, lower steering column till column shaft indexes with wormshaft master spline. Master spline is indicated on lower coupling flange by a 1/4 inch hole next to roll pin hole.

(5) Install coupling roll pin.

(6) Install and adjust steering column as outlined in "Column" section of this manual.

Hose Installation

When either hose is reinstalled or replaced, it is essential that the sponge sleeve hose protector be installed as follows:

(1) Avoid sharp bends in a large section of hose (about 10 inch diameter is recommended).

(2) Hose must remain at least 1 inch away from all pulleys, battery case and brake lines and 2 inches away from exhaust manifold.

(3) Sponge sleeves must be installed where hose contacts composition or metal.

(4) Tighten pump end hose fitting to 24 foot-pounds and gear end fitting to 160 inch-pounds.

POWER STEERING PUMPS

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GENERAL INFORMATION

The .94 pump and the 1.06 pump are used on Chrysler models. Imperial models use only the 1.06 pump.

The .94 pump can be identified by the long oval shape of the filler neck and a drive pulley secured to the drive shaft with a large nut. (Fig. 1). Rectangular pumping vanes carried by a shaft driven rotor, move the fluid from the intake to the pressure cavities of the cam ring. As the rotor begins to rotate, centrifugal force throws the vanes against the inside surface of the cam ring to pick up residual oil which is forced into the high pressure area. As more oil is picked up by the vanes, oil is forced into the cavities of the thrust plate, through two cross-over holes in the cam ring and pressure plate which empty into the high pressure area between the pressure plate and the housing end plate.

Filling the high pressure area causes oil to flow under the vanes in the slots of the rotor forcing the vanes to follow the inside oval surface of the cam ring. As the vanes rotate to the small area of the cam ring, oil is forced out from between the vanes.

The 1.06 pump can be identified by a 3/8 inch threaded hole in the pulley end of the drive shaft (Fig. 2). The operation of the 1.06 pump is similar to the vane type pump but differs in appearance and design. The rotor is star shaped and upon rotation, propels 12 steel rollers against the inside surface of the cam ring. As the rollers follow the eccentric pattern of the cam ring, oil is drawn into the inlet ports and exhausted through the discharge ports as the rollers are forced into vee shaped cavities of the rotor.

A flow control valve permits a regulated amount of oil to return to the intake side of the pump when ex-

cess output is generated during high speed operation. This reduces the power requirements to drive the pump and minimizes temperature build-up.

The 1.06 pump incorporates a two-stage flow control valve. High pressure oil passes through two orifices in a metering insert. (The metering insert is located in an oil passage sealed with a 1/8 inch pipe plug.) At low speed, approximately 2.7 gpm is passed to the gear. As speed increases and the valve moves, excess oil is by-passed to inlet and the valve acts to block flow through one orifice. This drops flow to the gear to approximately 1.6 gpm at high speeds. Two-stage flow control provides high flow at low speed for improved steering, while reducing the flow at high speed to reduce the power steering system oil temperature.

When steering conditions exceed maximum pressure requirements, such as turning the wheels against the stops, the pressure built up in the steering gear also exerts pressure on the spring end of the flow control valve. This end of the valve houses the pressure relief valve on both the .94 and 1.06 models. High pressure lifts the relief valve ball from its seat and allows oil to flow through a trigger orifice located in the outlet fitting of the .94 pump and in the front land of the flow control valve of the 1.06 pump. This reduces pressure on the spring end of the valve which then opens and allows the oil to return to the intake side of the pump. This action limits maximum pressure output of the pump to a safe level.

Under normal operating conditions, the pressure requirements of the pump are below maximum, causing the pressure relief ball and the flow control valve to remain closed.

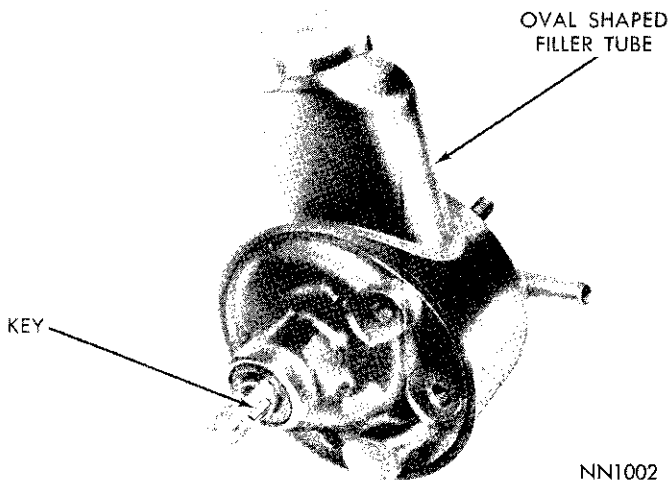


Fig. 1— .94 Pump

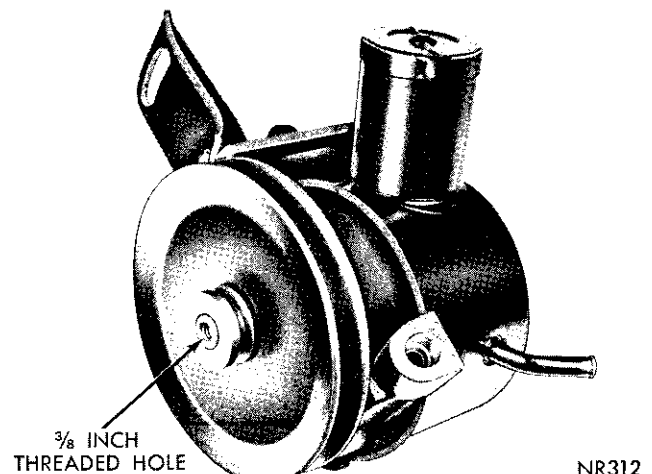


Fig. 2— 1.06 Pump

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction	
INTERMITTENT OR NO ASSIST	(a) Loose belt.	(a) Tighten belt.	
	(b) Low fluid level.	(b) Inspect and correct fluid level.	
	(c) Low pump efficiency.	(c) Service as necessary.	
	* (d) Pump seizure.	(d) Replace pump.	
	(e) Flow control bore plug ring not in place.	(e) Replace snap ring. Inspect groove for depth.	
	(f) Flow control valve sticking.	(f) Service flow control valve as necessary.	
	(g) Wrong pressure-relief valve setting.	(g) Replace flow control valve—.94 pump. Replace pump partial assembly—1.06 pump.	
	(h) Damaged "O" ring on flow control bore plug.	(h) Replace "O" ring.	
	(i) Loose plug in end of flow control valve.	(i) Tighten plug. See "Tightening Reference".	
	(j) Distorted pressure plate.	(j) Replace pressure plate—.94 pump.	
	* (k) Cam ring badly worn.	(k) Replace cam ring—.94 pump.	
	(l) Vanes improperly installed.	(l) Install vanes properly—.94 pump.	
	(m) Plugged metering orifice(s) or trigger orifice.	(m) Disassemble pump and clean.	
	(n) Damaged or leaky pressure relief valve seat (plug) or ball.	(n) Replace seat and ball—1.06 pump; replace flow control valve—.94 pump.	
	(o) Damaged housing bore "O" ring(s) or pressure plate "O" ring.	(o) Replace "O" rings.	
	* (p) Scored pressure plate, thrust plate, cam, rotor or rollers.	(p) Replace rotating group package—1.06 pump.	
NOISY PUMP	(a) Low fluid level.	(a) Inspect and correct fluid level.	
	(b) Belt noise.	(b) Inspect for pulley alignment, paint or grease on pulley and correct.	
	(c) Belt loose (causing pump rattling noise).	(c) Adjust belt. See "Cooling System" Group 7—1.06 pump.	
	(d) Foreign material blocking pump housing oil inlet hole.	(d) Remove reservoir, visually check inlet oil hole and service as necessary.	
	(e) Vanes improperly installed.	(e) Install properly or replace if necessary—.94 pump.	
	(f) Vanes sticking in rotor.	(f) Recondition pump and correct cause—.94 pump.	
	(g) Faulty flow control valve.	(g) Replace flow control valve—.94 pump.	
	* (h) Pressure plate, thrust plate or rotor scored.	(h) Replace badly scored part or lap in if lightly scored—.94 pump.	
	* (i) Pressure plate, thrust plate, cam, rotor or rollers scored.	(i) Replace rotating group package—1.06 pump.	
	(j) Pump hose interference with sheet metal or brake lines.	(j) Reroute hoses.	
	(k) Pulley loose.	(k) Retorque pulley retaining nut .94 pump.	
	PUMP VIBRATION	(a) Pump hose interference with sheet metal or brake lines.	(a) Reroute hoses.
		(b) Faulty or loose belt.	(b) Replace or adjust belt as necessary. See "Cooling System," Group 7.
(c) Pulley loose or out of round.		(c) Replace pulley.	
(d) Crankshaft pulley loose or damaged.		(d) Replace crankshaft pulley.	
PUMP LEAKS	(a) Cap or filler neck leaks.	(a) Correct fluid level. (Fluid Level Too High).	
	(b) Reservoir solder joints leak.	(b) Resolder or replace reservoir as necessary.	
	(c) Reservoir "O" ring leaking.	(c) Inspect sealing area of reservoir. Replace "O" ring or reservoir as necessary.	
	(d) Shaft seal leaking.	(d) Replace seal.	

Condition	Possible Cause	Correction
	(e) Loose rear bracket bolts.	(e) Tighten bolts. See "Tightening Reference".
	(f) Loose or faulty pressure hose ferrule.	(f) Tighten fitting to 24 foot-pounds, 1.06 pump—20 foot-pounds, .94 pump, or replace as necessary.
	(g) Damaged pressure hose "O" ring.	(g) Replace "O" ring—1.06 pump.
	(h) Housing ball plug leaking.	(h) Replace pump partial assembly. Valve—1.06 pump.
	(i) Rear bolt holes stripped or casting cracked.	(i) Repair, if possible, or replace pump.

*Clean and flush high pressure and return hoses. Recondition gear valve body (see "Power Steering Gear")

SERVICE PROCEDURES

Checking Fluid Level

1.06 Model

(1) Start engine, turn steering wheel from stop to stop several times to expel air from system, then shut off engine.

(2) Wipe reservoir filler cap free of dirt, remove cap and visually inspect oil level in reservoir.

Engine Hot—Oil level should be one-half way up in filler neck. **Engine at room temperature**—Oil should just cover filler neck/reservoir joint (1-3/4 inches to 2 inches from top of filler neck).

.94 Model

The oil level in the .94 pump should be checked **only** after pump has reached normal operating temperature. A dip stick, built into the reservoir cap, indicates "FULL" or "ADD". Fluid level should be at the "FULL" mark when hot.

Replenish the fluid, if necessary, in all pumps with Power Steering Fluid, Part No. 2084329 or equivalent.

Pressure Test—All Models

(1) Inspect fluid level in reservoir. Fill to correct level indicated on dip stick if necessary.

(2) Measure belt tension and correct if necessary. See "Cooling System," Group 7.

(3) Disconnect the high pressure hose at the steering gear and connect the free end of the hose to the gauge side of C-3309D. Connect a second pressure hose from the valve side of C-3309D to the steering gear. The valve must be installed on the outlet side of the gauge. (Fig. 3).

(4) Insert thermometer in fluid reservoir, start engine and warm up fluid to a temperature between 150 and 170 degrees Fahrenheit.

Turning the wheels from stop to stop will aid in warming the fluid. Do not hold wheels against stop for extended period as undue internal pump overheating will result.

(5) With engine idling at 650 RPM, and gauge valve open, note pressure while turning steering wheel from one extreme position to the other. Turn the wheels all the way to one or the other stop momen-

tarily and note the maximum pressure. A pressure of at least the minimum pressure shown for the particular pump in "Specifications" should be read.

(6) If pressure is under the specified rating, the steering system is not functioning properly. To determine which unit is faulty, momentarily close the pressure gauge valve and note maximum pressure registered on gauge. If the pressure reads less than the maximum pressure shown for the particular pump in "Specifications" the pump is faulty and should be reconditioned. Should pressure reading in step 5 read low but not in step 6, the steering gear is faulty.

When removing test equipment, be sure to reinstall hoses in original position to avoid interference with engine or sheet metal.

Pump Removal—All Models

(1) Loosen pump mounting and locking bolts and remove belt.

(2) Disconnect both hoses at pump.

(3) Remove mounting and locking bolts and remove pump and brackets.

PUMP INSTALLATION—All Models

(1) Position pump on engine and install mounting and locking bolts.

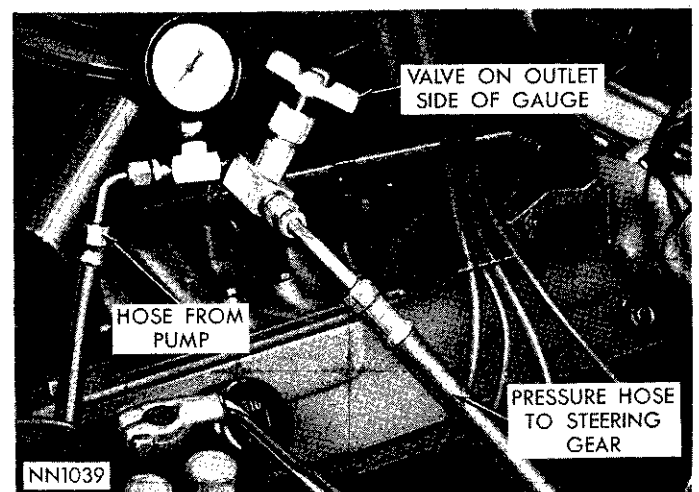


Fig. 3—Pressure Test

(2) Install drive belt and adjust. See "Cooling System—Group 7". Tighten mounting bolts to 30 foot-pounds.

(3) Connect pressure and return hoses. (Use new pressure hose "O" ring—1.06 pump only). See "Hose Installation".

(4) Fill pump reservoir to top of filler neck with Power Steering Fluid, Part No. 2084329 or equivalent.

(5) Start engine and turn steering wheel several times from stop to stop to bleed the system. Stop engine, check oil level and correct if necessary. See "Checking Fluid Level".

HOSE INSTALLATION—All Models

When either hose is reinstalled or replaced, the following points are essential:

(1) Route hoses in same position they were in before removal.

(2) Route hoses smoothly, avoiding sharp bends and kinking.

(3) When properly installed, the pressure hose tube ends should rest against the outside of the pump reservoir neck on one end, and the outside of the gear valve body on the other end. (Fig. 4).

(4) Tighten pump end hose fitting to 24 foot-pounds and gear end fitting to 160 inch-pounds.

(5) Hoses must remain at least one inch away from all pulleys, battery case and brake lines, and two inches away from exhaust manifold.

(6) When used, protective sponge sleeves must be properly positioned to prevent hose contact with other components in engine compartment.

(7) After hoses are installed, check for leaks while system is being bled. See "Pump Installation".

OIL SEAL REPLACEMENT

.94 Model

To service the drive shaft oil seal, it is necessary

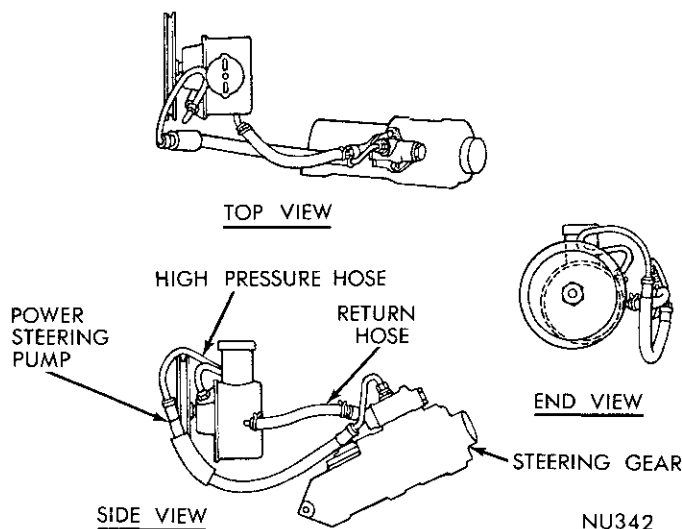


Fig. 4—Hose Routing—1.06 Pump 8 Cylinder Engines

to remove the pump from the vehicle, disassemble and reassemble the pump as outlined in "Reconditioning—.94 Model."

Reconditioning—.94 Model Disassembly

(1) Remove pulley retaining nut before loosening power steering pump belts. Remove pump from engine as an assembly.

(2) Tap pulley off shaft with plastic hammer.

(3) Remove brackets from pump, drain reservoir and clean exterior of pump with solvent.

(4) Remove key from drive shaft.

(5) Using soft protective jaws, clamp pump (shaft down) in vise between square boss and shaft housing (Fig. 5).

(6) Remove two mounting studs and pressure hose fitting. Gently tap reservoir filler tube back and forth with plastic hammer to loosen. Work reservoir off pump body (Fig. 5). Discard reservoir, two mounting stud and pressure fitting "O" rings.

(7) Using a punch, tap end cover retainer ring around till one end of ring lines up with hole in pump body. Insert punch in hole far enough to disengage ring from groove in pump bore and pry ring out of pump body (Fig. 6).

(8) Tap end cover with plastic hammer to jar it loose. Spring under cover should push cover up.

(9) Remove pump body from vise, place in inverted position on flat surface and tap end of drive shaft with plastic hammer to loosen pressure plate, rotor and thrust plate assembly from body. Lift pump body off of rotor assembly. Flow control valve and spring should slide out of bore also (Fig. 7).

(10) Remove and discard end plate and pressure plate "O" rings.

(11) Place pump body on flat surface and pry drive shaft oil seal out with a screw driver (Fig. 8).

(12) Inspect seal bore in housing for burrs, nicks

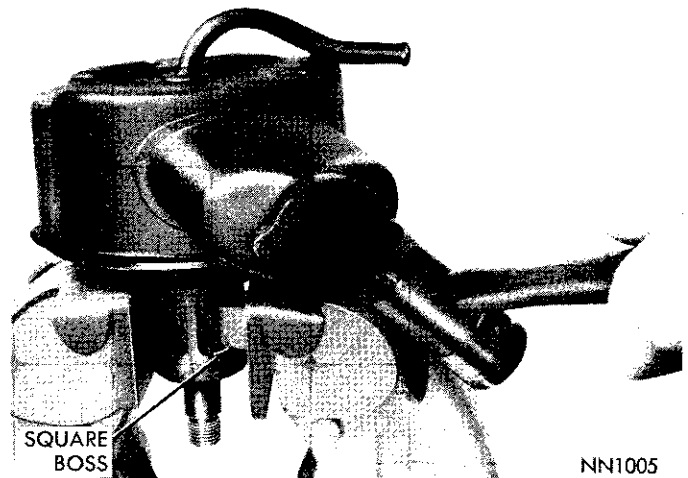


Fig. 5—Removing Reservoir

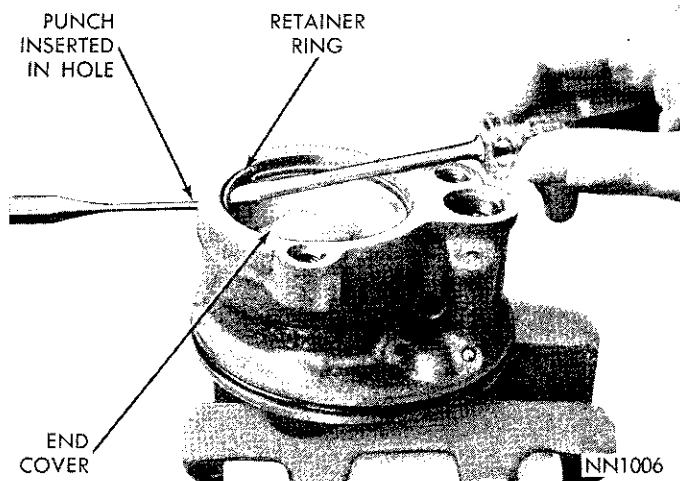


Fig. 6—Removing End Cover Retainer Ring

or score marks that would allow oil to bypass outer seal surface.

(13) If necessary to disassemble flow control valve for cleaning, see "Flow Control Valve Disassembly".

(14) After lifting pressure plate and cam ring from rotor, remove ten vanes from slots in rotor.

(15) Clamp drive shaft in soft jawed vise, with rotor and thrust plate facing up.

(16) Remove rotor lock ring, pry ring off drive shaft using a screw driver (Fig. 9). Exercise care to avoid nicking the rotor end face. Discard ring.

(17) Slide rotor and thrust plate off of shaft and remove shaft from vise.

Inspection

(1) Wash all parts in clean solvent, blow out all passages with compressed air and air dry cleaned parts.

(2) Inspect drive shaft for excessive wear and seal area for nicks or scoring. Replace if necessary.

(3) Inspect fit of vanes in rotor. Vanes must slide freely in slots of rotor without binding. Excessively

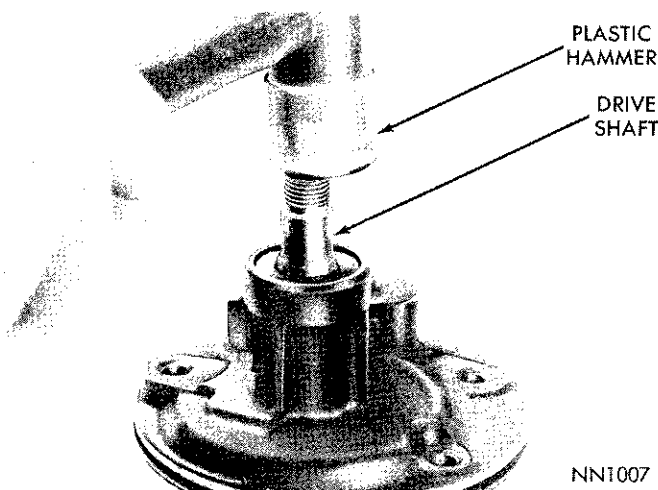


Fig. 7—Removing Drive Shaft Assembly

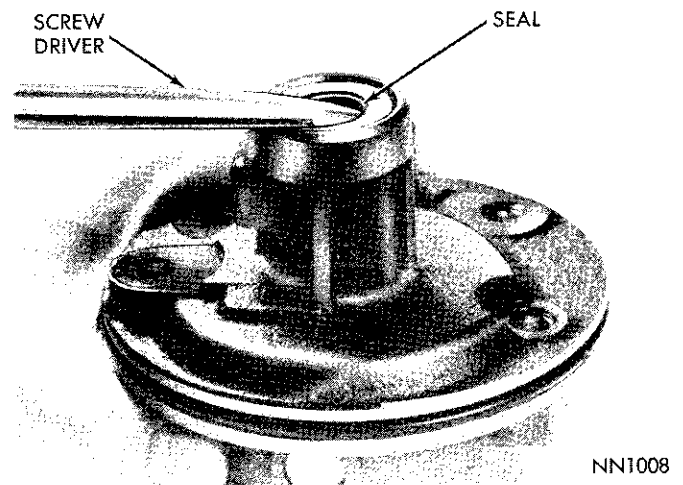


Fig. 8—Oil Seal Removal

loose vanes require replacement of rotor and/or vanes. Binding can be relieved by cleaning or removal of burrs with a thin fine file.

(4) Inspect flat surfaces of pressure and thrust plates for wear or scoring. Light scoring can be removed by lapping on a flat surface. Remove all lapping compound thoroughly before reassembly.

(5) Inspect inner surface of cam ring for heavy scuff or chatter marks. Replace if necessary. Light score or scuff marks can be removed by polishing with a small, flat oil stone.

(6) Inspect end cover for nicks or burrs on surface contacting "O" ring and remove with a fine stone.

(7) Inspect pump body drive shaft bushing for excessive wear. Replace pump body and bushing as an assembly if badly worn or scored.

Assembly

(1) Place pump body on flat surface and drive new drive shaft seal into bore with a 7/8 or 15/16 inch socket till seal bottoms on shoulder (Fig. 10).

CAUTION: Excessive force will distort the seal.

(2) Lubricate seal with power steering fluid and clamp pump body in vise, (shaft end down).

(3) Install end cover and pressure plate "O" rings in grooves in pump cavity. These rings are the same

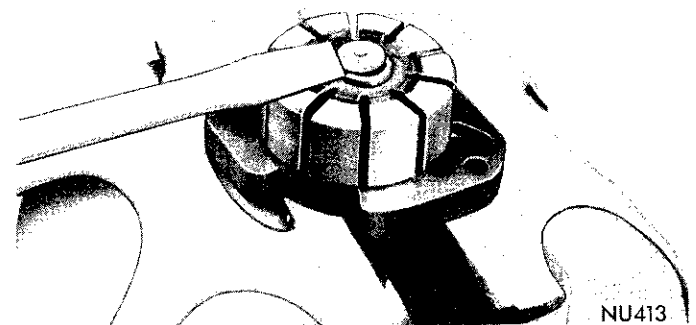


Fig. 9—Removing Full Diameter Lock Ring

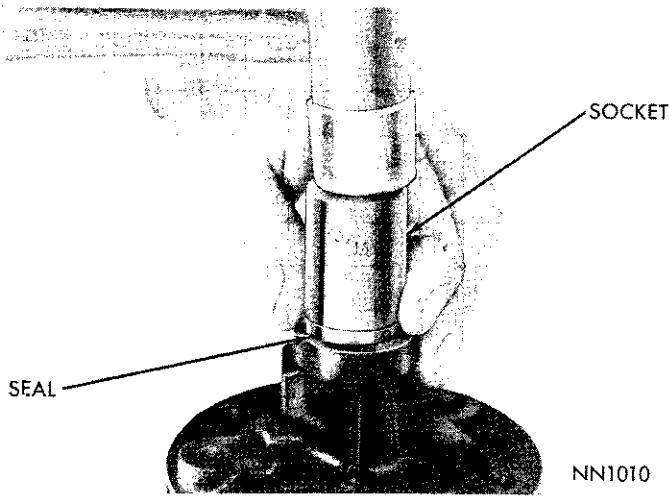


Fig. 10—Oil Seal Installation

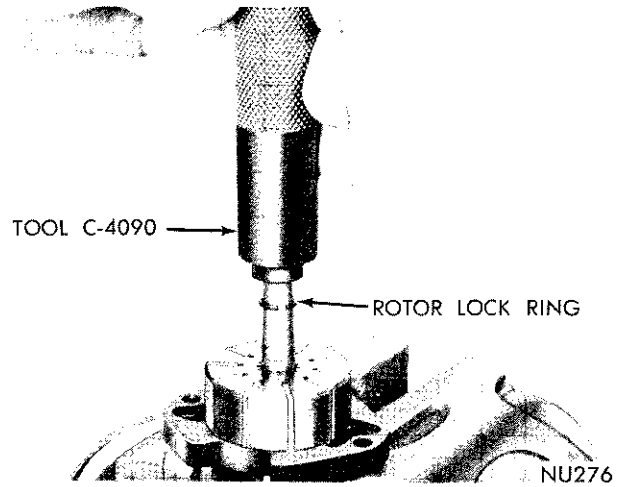


Fig. 12—Installing Rotor Lock Ring

size. Lubricate with power steering fluid.

(4) Lubricate large pump body to reservoir "O" ring and install on pump body.

(5) With drive shaft clamped splined end up in soft jawed vise, install thrust plate on drive shaft (smooth, ported side up) (Fig. 11).

(6) Slide rotor over splines with the counterbore of rotor facing **down**. Install rotor lock ring making sure ring is seated in groove (Fig. 12).

(7) Install two dowel pins in holes in pump cavity. Carefully insert drive shaft, rotor and thrust plate assembly in pump cavity indexing locating holes with dowel pins (Fig. 13).

(8) Slide cam ring over rotor on dowel pins with arrow on ring facing "UP" (Fig. 14).

(9) Install ten vanes in rotor slots with radius edge facing out towards cam ring inner surface (Fig. 15).

CAUTION: Vanes installed with flat edge out will result in noisy pump operation.

(10) Position pressure plate on dowel pins. Place a 1-1/4 inch socket in groove of pressure plate and seat entire assembly on "O" ring in pump cavity by

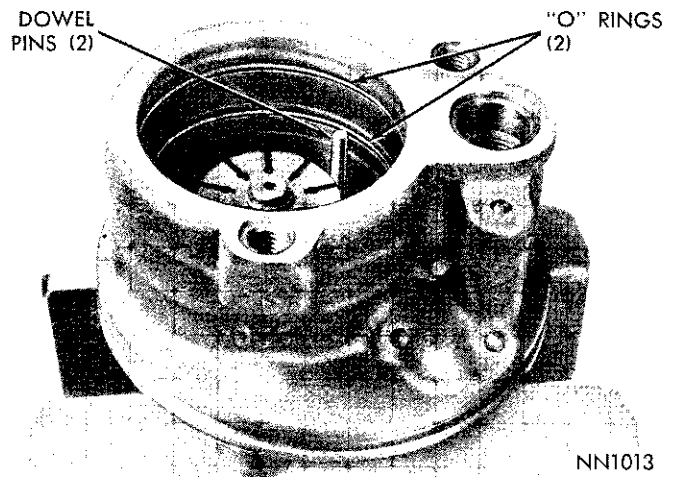


Fig. 13—Rotor and Thrust Plate Installed

pressing down on socket with both thumbs (Fig. 16).

(11) Place spring in groove in pressure plate and position end cover lip edge UP over spring.

(12) Press end cover down below retaining ring

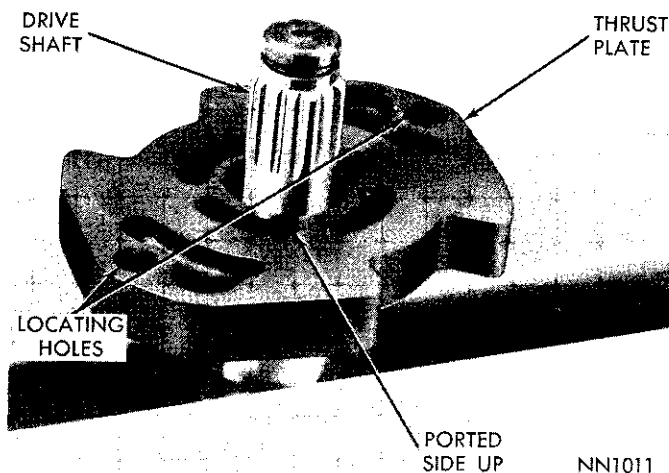


Fig. 11—Installing Thrust Plate

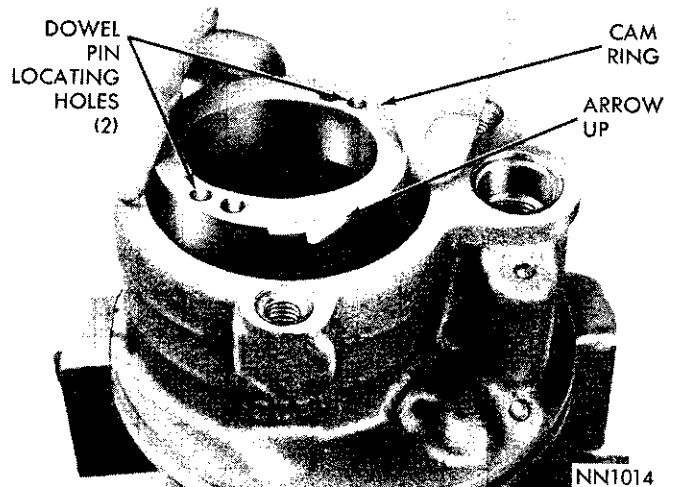


Fig. 14—Installing Cam Ring

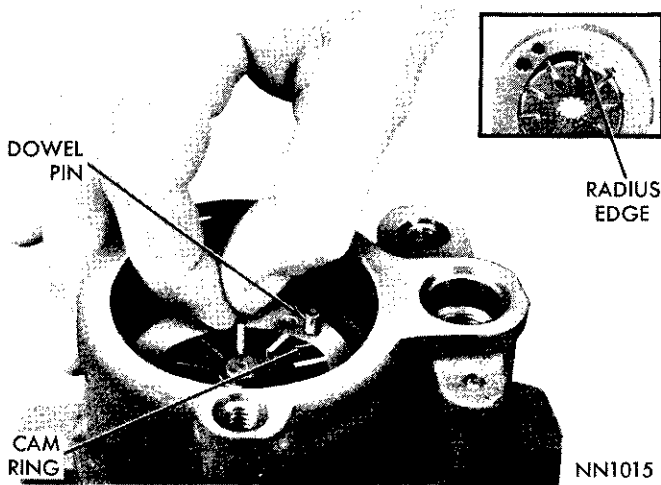


Fig. 15—Installing Rotor Vanes

groove with thumb and install ring making sure it is seated in groove (Fig. 16).

This operation can be performed in an arbor press if available. Care should be exerted to prevent cocking the end cover in the bore or distorting the assembly.

(13) Using a punch, tap retainer ring ends around in the groove until opening is opposite flow control valve bore. This is important for maximum retention of the retainer ring (Fig. 17).

(14) Replace reservoir "O" ring seal, two mounting stud "O" ring seals and flow control valve "O" ring seal on pump body, lubricate with power steering fluid and carefully position reservoir on pump body. Visually align the mounting stud holes till studs can be started in threads.

(15) Using a plastic hammer, tap reservoir down on pump and insert flow control valve spring and valve (slotted end up).

(16) Replace "O" ring on pressure hose fitting and lubricate with power steering fluid (Fig. 18).

CAUTION: Be sure "O" ring is installed on upper

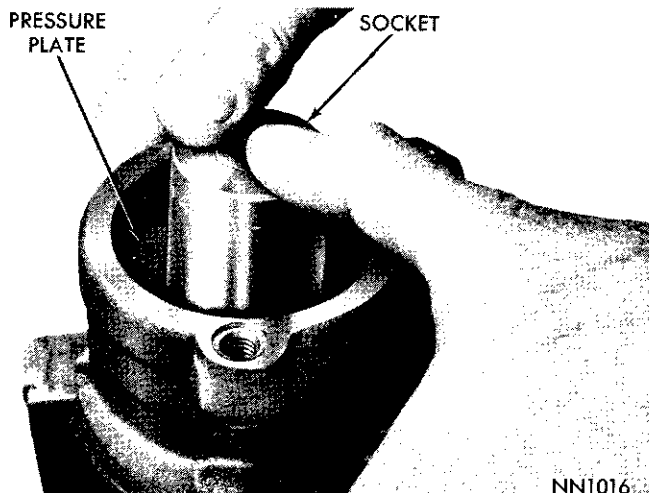


Fig. 16—Seating Pressure Plate

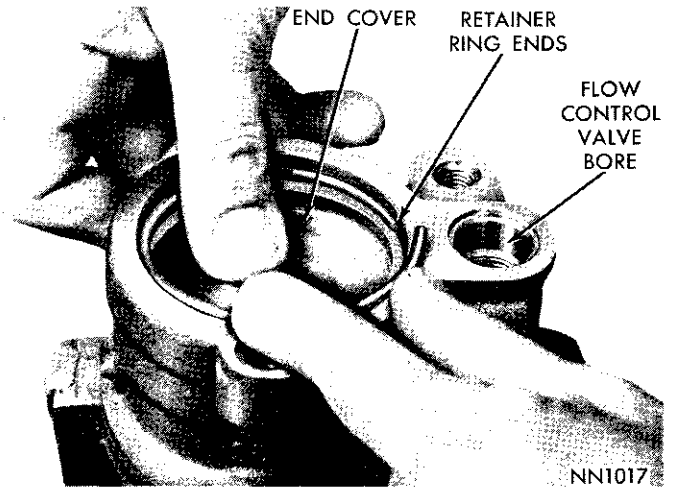


Fig. 17—Installing End Cover Plate and Retainer Ring

groove. It is possible to install "O" ring in lower groove. This would restrict relief outlet orifice.

(17) Install pressure hose fitting and tighten mounting studs. Tighten pressure hose fitting to 20 foot-pounds and rear mounting studs 25-35 foot-pounds.

(18) Remove pump assembly from vise and install mounting brackets and drive shaft key.

(19) Install pulley on shaft and secure with retaining nut. **Tighten nut to 45-55 foot-pounds.**

(20) Install pump assembly on engine and refill reservoir. Start engine and inspect for leaks.

FLOW CONTROL VALVE

.94 Model

The flow control valve is serviced as an assembly. Nicks or burrs that might cause the valve to stick in the bore may be removed by rubbing valve over flat surface covered by crocus cloth. Care should be taken to prevent rounding the sharp edges of the lands.

The valve may be disassembled for cleaning if dirt has caused pump failure. It is important that if the

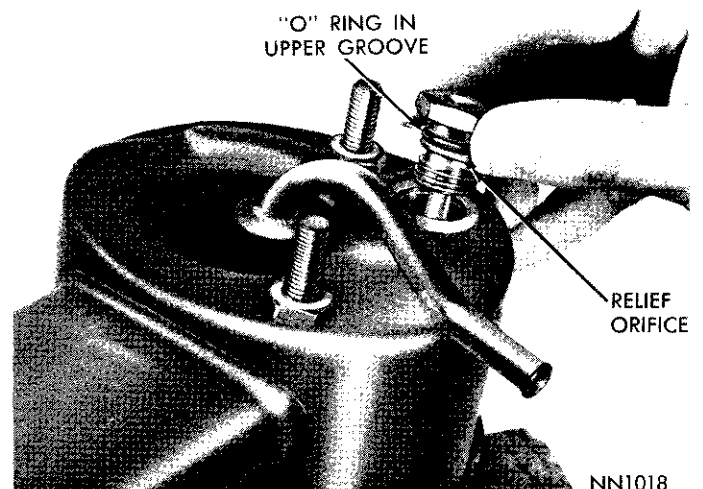


Fig. 18—Installing Pressure Hose Fitting

valve is disassembled for cleaning purposes, the entire pump should be disassembled and cleaned.

Disassembly

- (1) Remove pressure hose fitting from pump reservoir. Discard "O" ring on fitting.
- (2) Withdraw valve with a magnet. If valve is stuck in bore, it may be necessary to push in on valve against spring pressure. Release pressure exerted against valve abruptly and allow valve to spring out of bore.
- (3) Clamp land end of valve in a soft-jawed vise and remove hex head plug and shim(s). Note number of shims on plug. Same number of shims should be installed on assembly of valve.
- (4) Remove valve from vise and remove pressure relief ball, guide and spring.

Assembly

- (1) Insert spring, guide and pressure relief ball in end of flow control valve (Fig. 19).
- (2) Install hex head plug using the same number of shims as were removed. **Altering shim thickness will change relief pressure.**
- (3) Install hex head plug and tighten to 50 inch-pounds.
- (4) Insert flow valve spring and valve in bore. Install new "O" ring on pressure hose fitting and lubricate with power steering fluid.
- (5) Thread fitting into pump body and tighten to 20 foot-pounds.

Oil Seal Replacement—1.06 Model

- (1) Remove pump from engine. Drain reservoir and clean exterior before servicing.
- (2) Clamp pump in vise securely at mounting bracket.
- (3) Remove pulley with Tool C-4068 (Fig. 20).
- (4) Position seal remover adapter SP-5323A over end of drive shaft with large opening toward pump.
- (5) Place seal remover Tool C-4062 over shaft, through adapter and screw tapered thread well into metal portion of seal. Tighten large drive nut and remove seal (Fig. 21).
- (6) Inspect seal bore in housing for burrs, nicks,

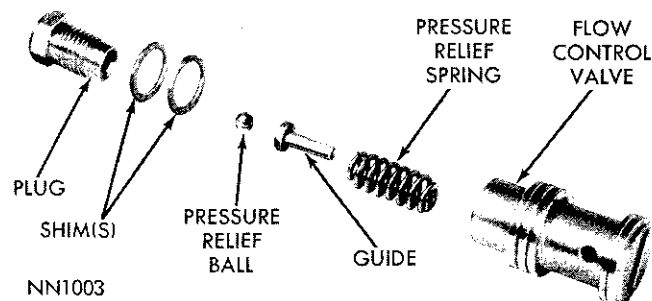


Fig. 19—Flow Control Valve (.94 Pump)

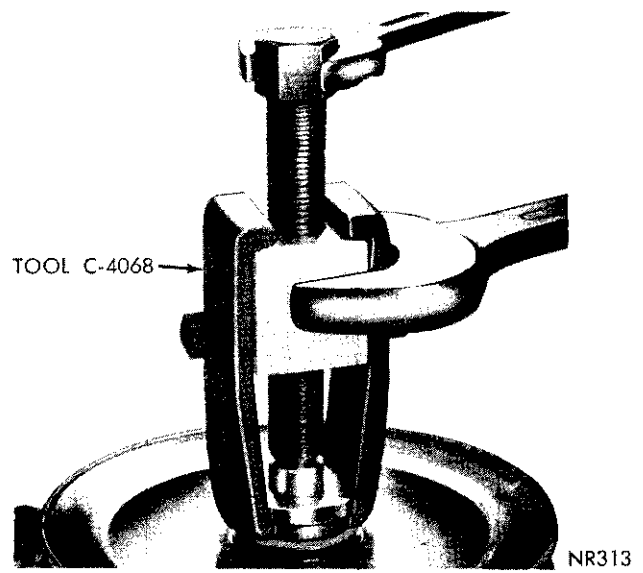


Fig. 20—Removing Drive Pulley (1.06 Pump) or score marks that would allow oil to by-pass outer seal surface.

- (7) Inspect shaft for scratches or burrs, if any, remove with crocus cloth. Lubricate new seal and install with lip toward pump. Use Tool C-4061 to drive seal flush with housing (Fig. 21).
 - (8) Install drive pulley. See "Pulley Installation". (Fig. 32).
 - (9) With installer shaft clamped securely in vise, tighten drive nut against thrust bearing and press pulley onto shaft.
- CAUTION: Do not attempt to press pulley on to shaft without the use of special tool as serious damage will result to interior of pump.**
- A small amount of drive shaft end play will be observed when pulley is installed flush with end of shaft. This movement is necessary and will be minimized by a thin cushion of oil between the rotor and end plates when pump is in operation.
- (10) Install pump and adjust belt as outlined under "Cooling" Group 7.

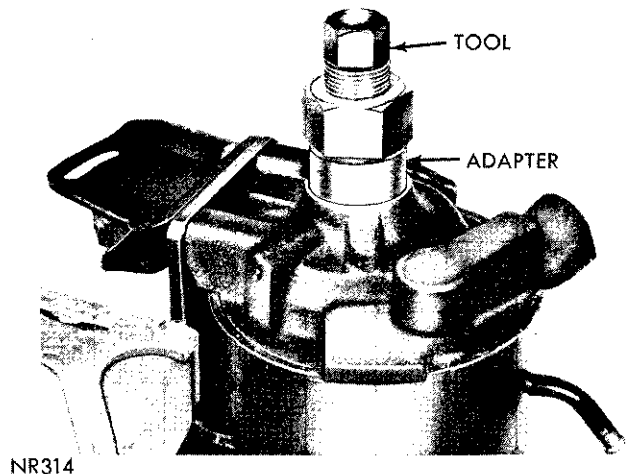
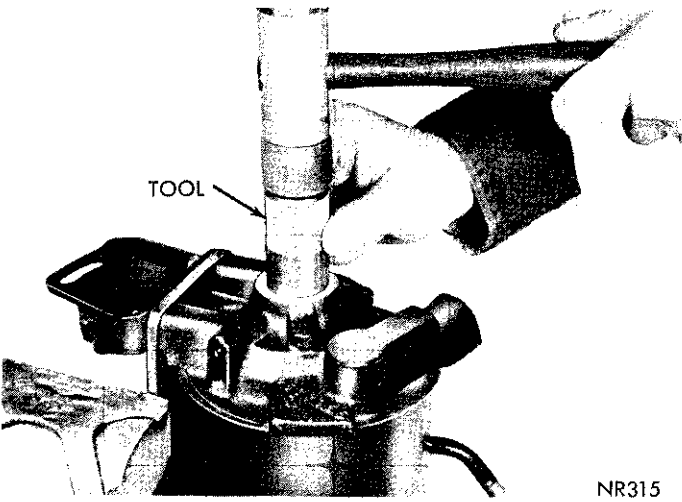


Fig. 21—Removing Shaft Seal



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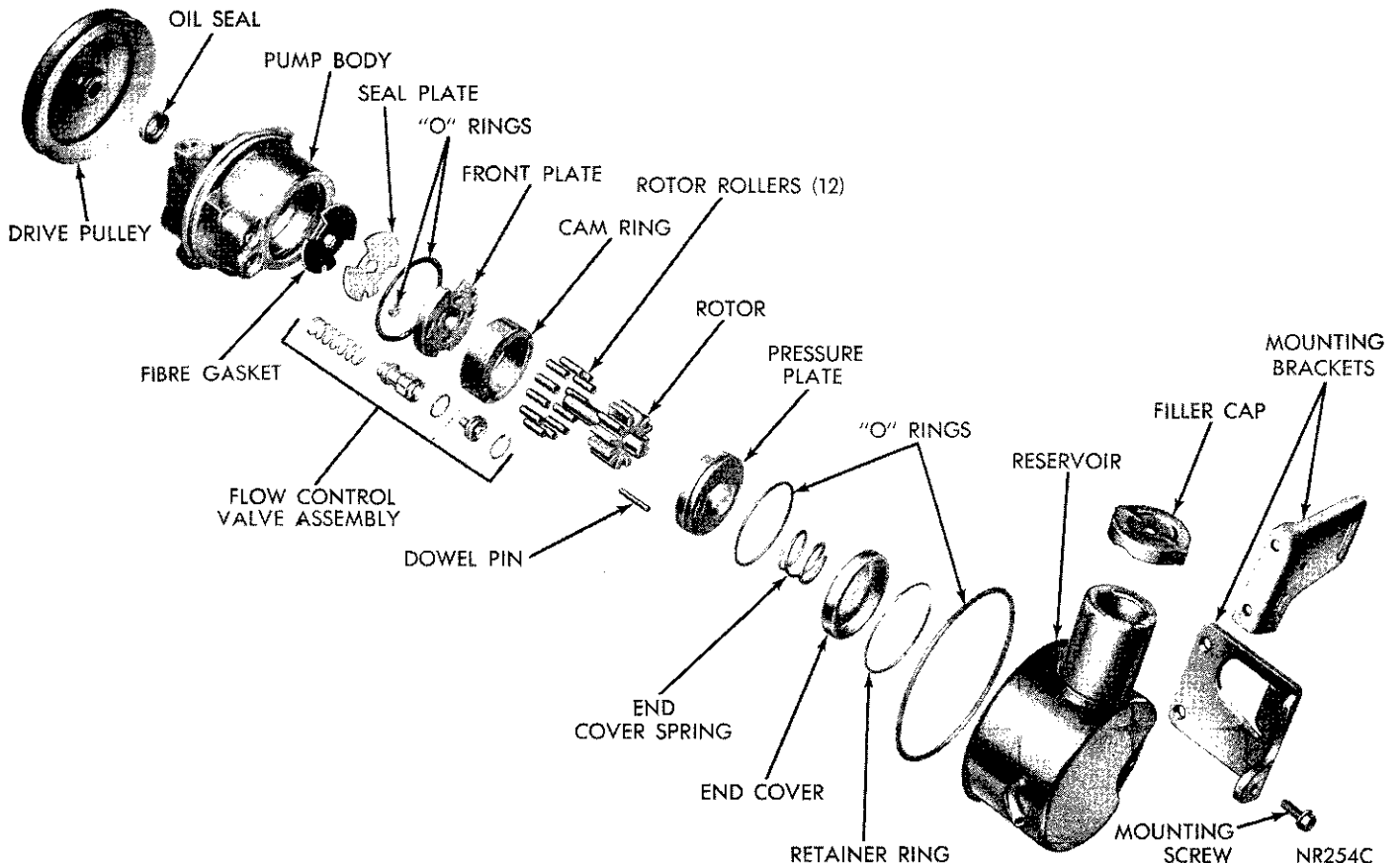
Fig. 22—Installing Shaft Seal

RECONDITIONING—1.06 Model

Disassembly (Fig. 23)

- (1) Remove pump from engine. Drain reservoir and clean exterior before servicing.
- (2) Clamp pump securely in vise at mounting bracket.
- (3) Remove pulley with Tool C-4068 (Fig. 20).
- (4) Remove oil seal as described in "Oil Seal Replacement" section.

- (5) Remove pump from vise and remove three mounting bracket bolts, remove bracket.
- (6) Remove reservoir and place pump in vise with shaft down (use vise with soft protective jaws). Discard mounting bolt and reservoir "O" rings.
- (7) Using a punch, tap end cover retaining ring around until one end of ring lines up with hole in pump body. Insert punch in hole far enough to disengage ring from groove in pump bore and remove ring from body (Fig. 24).
- (8) Tap end cover with plastic hammer to jar it loose. Spring under cover should push cover up.
- (9) Remove pump body from vise, place in inverted position on clean flat surface and tap end of drive shaft to loosen rotating group. Lift pump body off rotating group.
- (10) Remove and discard brass seal plate and fibre gasket. (Some pumps may be assembled with brass plates only). The fibre gasket may be found stuck to housing floor; it can easily be lifted or pulled away. Insure that all portions of gasket are removed and that housing floor is not scratched or damaged.
- (11) Discard pressure plate and end cover "O" rings.
- (12) Remove snap ring, bore plug, flow control valve and spring from housing. Discard "O" ring.
- (13) If necessary to disassemble flow control valve



NR254C

Fig. 23—1.06 Pump Disassembled View

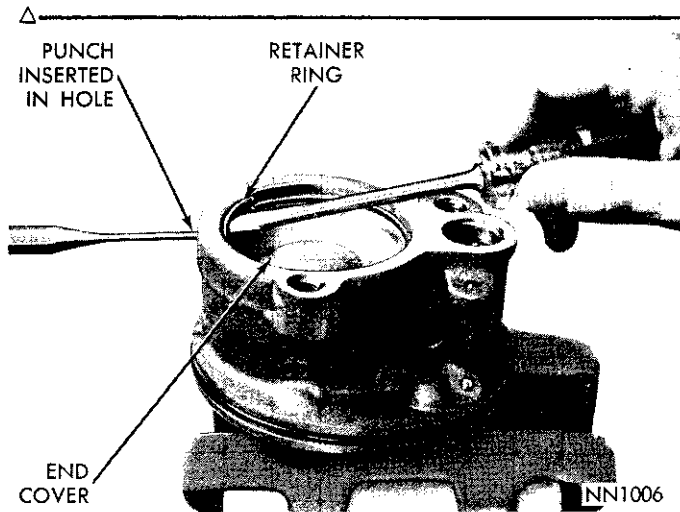


Fig. 24—Removing End Cover Retaining Ring

for cleaning, see "Flow Control Valve Disassembly".

Inspection

- (1) Remove clean out plug with allen wrench (Fig. 24).
- (2) Wash all parts in clean solvent, blow out all passages with compressed air and air dry all cleaned parts.
- (3) Inspect drive shaft for excessive wear and seal area for nicks or scoring. Replace if necessary.
- (4) Inspect end plates, rollers, rotor and cam ring for nicks, burrs, or scratches. If any of the components are damaged to a degree that the efficiency of the pump is affected it is recommended that all the interior parts be replaced.
- (5) Inspect pump body drive shaft bushing for excessive wear. Replace pump with pump partial assembly if badly worn or scored. Pump partial assembly includes the entire pump with the exception of the reservoir, filler cap, mounting brackets, and drive pulley.

Assembly

- (1) Install 1/8 inch pipe clean out plug. Tighten to 80 inch-pounds.
- (2) Place pump body on flat surface and drive new shaft seal into bore with Tool C-4061.
- (3) Install new end cover, "O" ring in groove in pump bore. Lubricate with power steering fluid.
- (4) Lubricate new large pump body to reservoir "O" ring and install on pump body.
- (5) Install new fibre gasket and brass seal plate to bottom of housing floor (fibre gasket on floor and brass seal plate on top of fibre). Note: **Pumps originally built with brass seal plate only, must be serviced with both brass seal plate and fibre gasket. Align index notches in plate and gasket with dowel pin hole in housing; cut-out sections of gasket and plate should be in line with core pockets on side of housing bore (Fig. 25). Caution: Pump will not operate properly if either gasket or seal plate are improperly installed.**

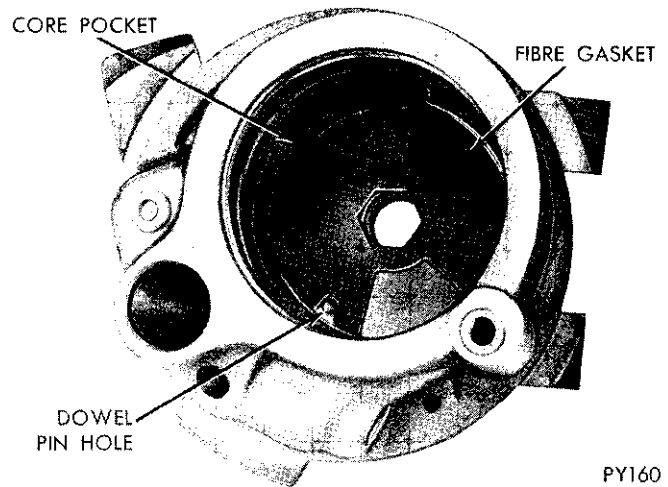


Fig. 25—Fibre Gasket Installed

(6) Carefully install front plate in pump bore. Chamfered edge first. Align index notch in plate with dowel pin hole in housing.

CAUTION: Use extreme care in aligning dowel pin. Pump can be completely assembled with dowel pin improperly positioned in end plates and not in indexing hole in housing.

(7) Place dowel pin in cam ring and position cam ring inside pump bore. Notch on cam ring must be up or away from pulley end of pump (Fig. 26). If cam ring has two notches, one machined and one cast, install with machined notch up. Machined notch has sharp corners and cast notch rounded corners.

If end of dowel pin in cam ring is more than 3/16 inch above surface of installed cam ring, it is not seated in index hole in housing.

(8) Install rotor and shaft in cam ring and carefully place 12 rollers in cavities of rotor (Figs. 27 and 28). Lubricate rotor, rollers, and cam I.D. with power steering fluid.

(9) Before installing pressure plate, rotate shaft by hand to make sure rollers are all seated parallel with pump shaft.

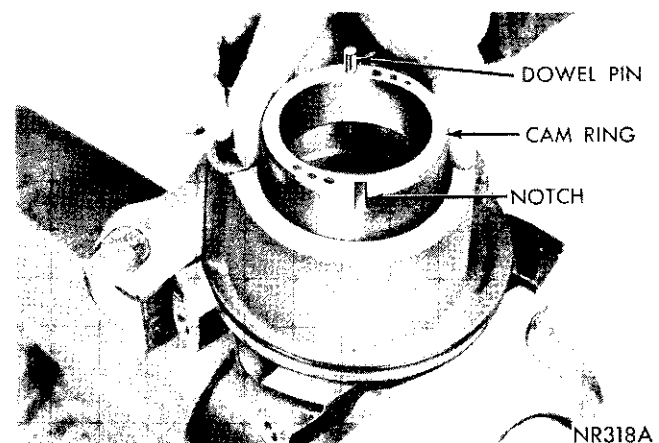


Fig. 26—Installing Cam Ring

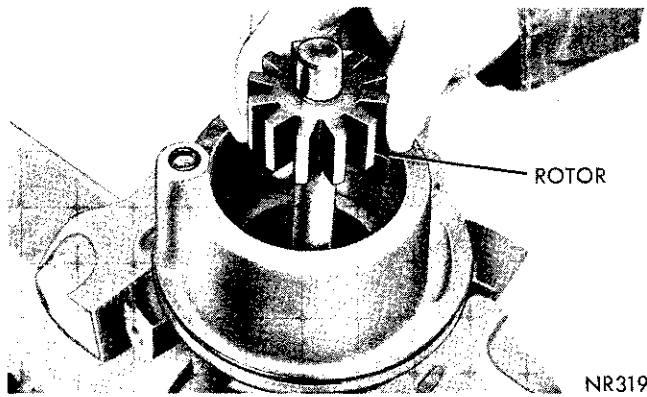


Fig. 27—Installing Rotor

(10) To insure proper alignment of pressure plate to dowel pin, insert the largest possible number drill into the large 3/16 inch diameter oil hole in the cam ring, next to the cam notch. Select from a number 13 through 16 drill, clean thoroughly, and bottom on housing floor (Fig. 29).

(11) Install new "O" ring on pressure plate, lubricate with power steering fluid and carefully position in pump bore. Before seating plate in pump bore, align index notch in plate with dowel pin and oil passage slot in plate with number drill. Seat plate on cam ring using a clean 1-1/8 inch socket and plastic hammer (Fig. 30 and 31). Remove drill. Inspect pressure plate at both oil passage slots to insure that plate is squarely seated on cam ring end face.

(12) Place large coil spring over raised portion of installed pressure plate.

(13) Position end cover, lip edge UP, over spring. Press end cover down below retaining ring groove with thumb and install ring making sure it is seated in groove. Light tapping on the end cover may be necessary to insure that the end cover chamfer is squarely seated against snap ring.

(14) Replace reservoir mounting bolt seal.

(15) Lubricate flow control valve with power steering fluid and insert valve spring and valve into bore. (Spring first then hex plug end of valve). Install new "O" ring on bore plug, lubricate with power steering

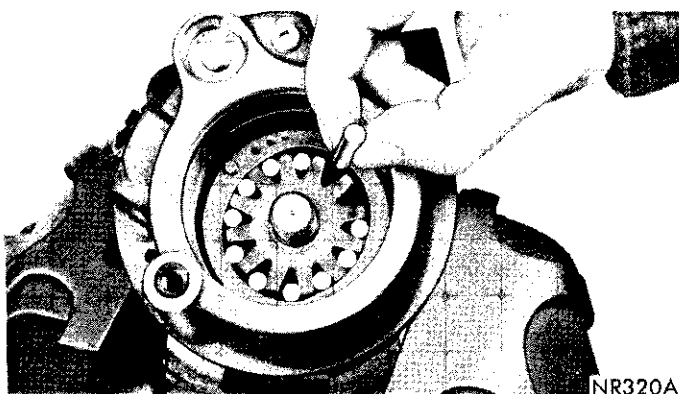


Fig. 28—Installing Rollers In Rotor

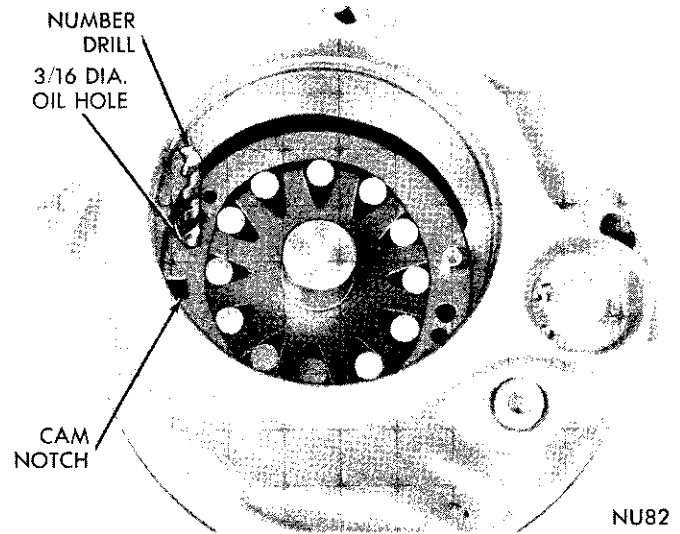


Fig. 29—Aligning Oil Holes

fluid and carefully install into bore. Install snap ring, with sharp edge UP.

CAUTION: Do not depress the bore plug more than 1/16 inch beyond snap ring groove.

(16) Place reservoir on pump body and visually align mounting bolt hole. Tap reservoir down on pump with plastic hammer.

(17) Remove pump from vise and install mounting brackets with three mounting bolts, tighten to 18 foot-pounds.

(18) Install drive pulley. See "Pulley Installation" (Fig. 32).

Pumps installed on eight cylinder engines have drive pulleys pressed flush with the end of the pump shaft. With drive pulley placed on end of shaft, securely thread installer Tool C-4063, with adapter SP-5399, into 3/8 inch threaded hole in end of shaft (Fig. 32).

(19) With installer shaft clamped securely in vise,

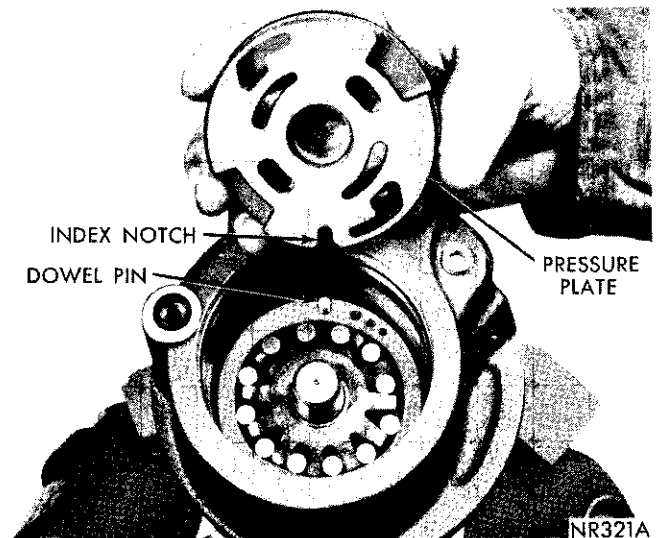


Fig. 30—Installing Pressure Plate

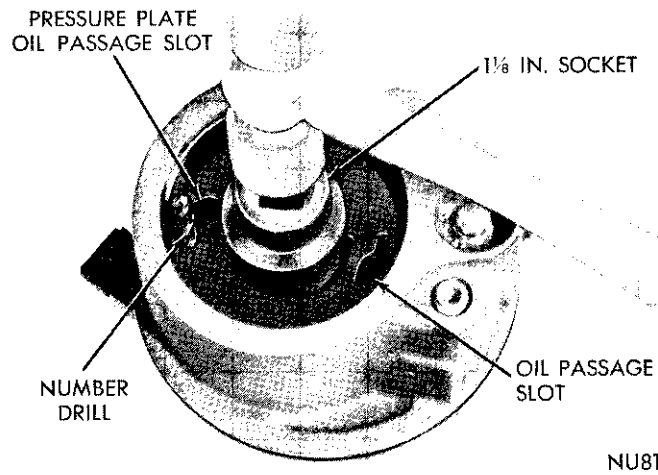


Fig. 31—Seating Pressure Plate

tighten drive nut against thrust bearing and press pulley onto shaft.

CAUTION: Do not attempt to press pulley on to shaft without the use of special tool as serious damage will result to interior of pump.

A small amount of drive shaft end play will be observed when pulley is installed. This movement is necessary and will be minimized by a thin cushion of oil between the rotor and end plates when pump is in operation.

(20) Install pump assembly on engine, connect hoses (using new pressure hose "O" ring), and tighten drive belt see "Cooling System" Group 7. Fill reservoir with power steering fluid, test and inspect for leaks.

FLOW CONTROL VALVE

Disassembly—1.06 Model

- (1) Remove pump from engine and reservoir from pump.
- (2) Remove snap ring and plug from flow bore. Discard "O" ring from plug.
- (3) Depress control valve against spring pressure and allow to spring back. The valve should pop out of bore far enough to be lifted out. Light tapping on rear face of pump body may be necessary to remove a stuck valve.

If dirt or foreign particles are found on valve or within valve bore, entire pump should be disassembled, cleaned and rebuilt. The high pressure and return hoses must also be flushed and the steering gear valve body reconditioned see "Power Steering Gear". If valve bore is badly scored, replace pump with pump partial assembly.

- (4) Remove nicks or burrs that might cause the valve to stick by rubbing valve over a flat surface

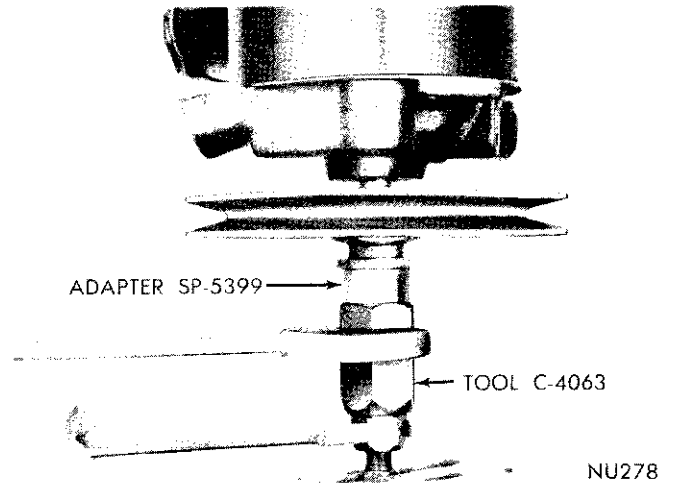


Fig. 32—Pulley Installation

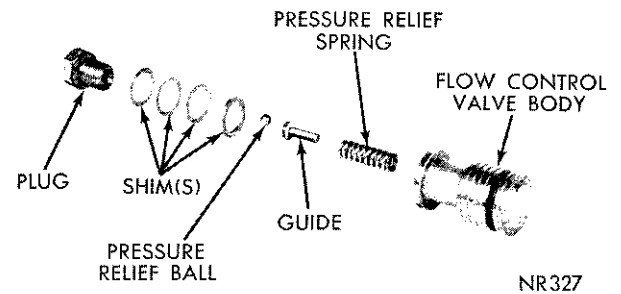


Fig. 33—Flow Control Valve Disassembled View

covered with crocus cloth.

(5) Clamp land of valve in a soft jawed vise and remove hex head ball seat and shim(s). Note number and gauge of shims on ball seat. Same number and gauge of shims must be installed on assembly of valve. Altering shim thickness will change relief pressure.

(6) Remove valve from vise and remove pressure relief ball, guide and spring.

(7) Clean all parts thoroughly. **Dirt Particles On Ball Or Ball Seat Will Cause Improper Pump Operation.**

Assembly

(1) Insert spring, guide and pressure relief ball in end of flow control valve (Fig. 33).

(2) Install hex head ball seat using the same number and thickness shims as were removed. Tighten to 50 inch pounds.

(3) Lubricate valve with power steering fluid and insert flow valve spring and valve in bore. Install new "O" ring on bore plug, lubricate with power steering fluid and carefully install into bore. Install snap ring. **CAUTION:** Do not depress the bore plug more than 1/16 inch beyond snap ring groove.

STANDARD STEERING COLUMN

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GENERAL INFORMATION

The steering column under head-on collision conditions is designed to telescope at a controlled rate. The telescoping action reduces the likelihood of the steering wheel being driven rearward toward the driver. If the driver is thrown forward into the wheel, the column can telescope further at the controlled rate, thereby, reducing force of the impact.

The column assembly (Fig. 1 or 2) has four principal components.

1. A column jacket with a mesh section designed to shorten in "accordion" fashion.
2. A two-piece telescoping transmission gearshift tube interconnected by plastic inserts and shear pins.
3. A two-piece telescoping steering shaft with upper and lower sections connected by plastic friction collars and shear pins.
4. A mounting bracket connecting steering column

to the instrument panel, which allows the column to slide forward but blocks its rearward movement toward the driver.

The center section of the column jacket has diamond-shaped perforations and is formed with accordion pleats. These pleats allow it to compress like a bellows from impact forces.

The gearshift tube is made up of two sections designed to telescope together. These sections are interconnected and held together by injections of plastic that form the interconnecting inserts and shear pins. Under impact, the pins shear first, followed by a gradual paring away of the inserts by the knife-like edge in the adjoining tube section.

The steering shaft is a two-piece assembly. The upper piece is solid and has a double-flatted lower section. The lower piece is hollow and formed to fit

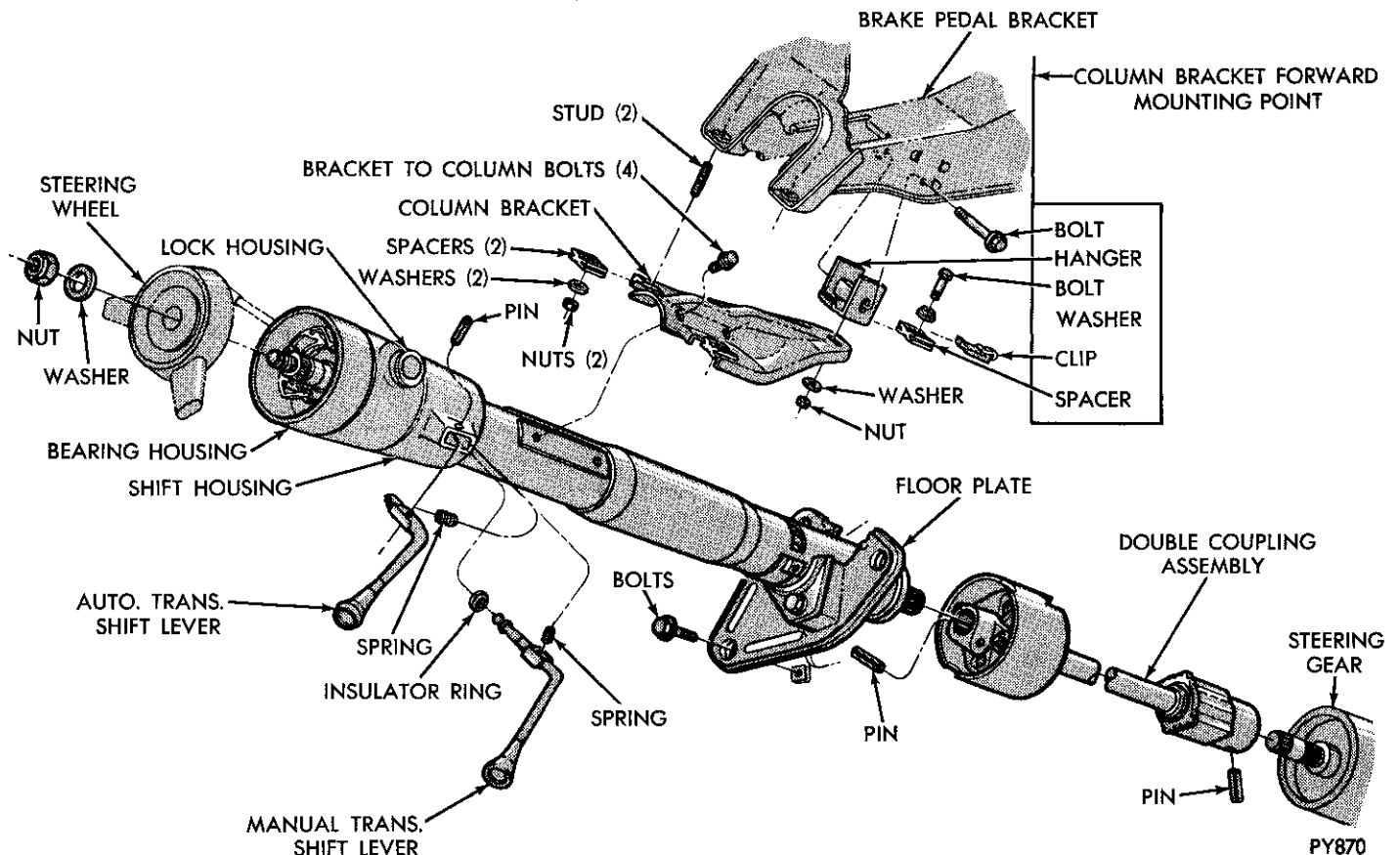


Fig. 1—Column Installation (Double Coupling)

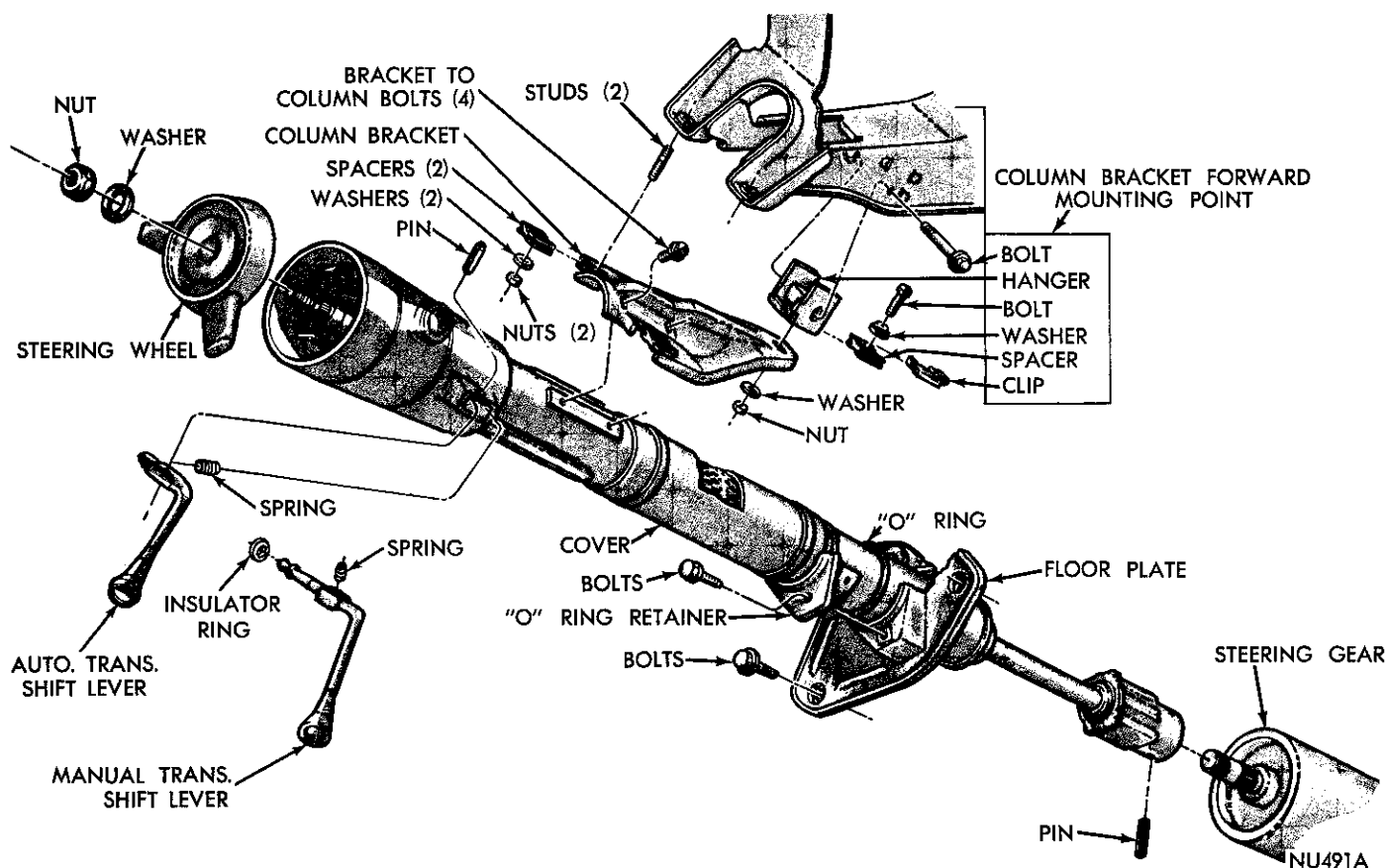


Fig. 2—Column Installation (Single Coupling)

over the double-flatted section of the upper piece. The purpose of the flatted section is to provide continued steering action even though completely telescoped. Plastic is injected through two small holes in the hollow piece into a pair of annular grooves on the solid portion of the shaft. The four small holes filled with plastic form the shear pins. Upon impact, the shear pins break off and the shaft gradually telescopes against a resistance provided by the plastic collars in the annular grooves.

The mounting bracket is designed to restrain the column from being shifted toward the driver during impact. It incorporates three "break-away capsules" that allow the mounting bracket to slip off the attaching points, permitting the steering column to compress or yield in a forward direction under a severe impact from the driver side.

When the column is installed in a car it is no more susceptible to damage through ordinary usage than

previous columns; however, when it is removed, special care must be taken in handling this assembly. When the column is removed from the car such actions as a sharp blow on the end of the steering shaft or shift levers, leaning on the column assembly, or dropping of the assembly could shear or loosen the plastic shear joints that maintain column rigidity. It is, therefore, suggested that the removal and installation, and the disassembly and reassembly procedures be carefully followed when servicing this assembly.

IMPORTANT: Bumping, jolting and hammering on the steering shaft and gearshift tube must be avoided during all servicing operations. If the shear pins are broken, the controlled rate of the impact-absorbing features will be destroyed making these parts unfit for further use. The Special Tools required and their usage are covered in the following service procedures.

SERVICE PROCEDURES

COLUMN REMOVAL (Figs. 1 and 2)

- (1) Disconnect negative (ground) cable from battery.
- (2) Disconnect linkage from lower end of steering

column.

- (3) Remove steering shaft lower coupling to wormshaft roll pin.
- (4) Disconnect wiring connectors at steering column jacket.

- (5) Remove horn ring ornament assembly.
- (6) Disconnect wire at horn switch. Remove screws attaching horn ring and switch to steering wheel, then remove horn ring and switch.
- (7) Remove steering wheel retaining nut and washer. Remove steering wheel with Tool C-3428A. **Do not bump or hammer on steering shaft to remove wheel.**
- (8) Remove turn signal lever (Fig. 3).
- (9) Remove floor plate to floor pan attaching screws. Remove finish plate from under instrument panel to expose steering column bracket. If so equipped, disconnect automatic shift indicator pointer from shift tube bracket.
- (10) Remove nuts or bolts attaching steering column bracket to instrument panel support.
- (11) Carefully pry lower coupling from steering gear wormshaft, then remove column assembly out through passenger compartment being careful not to damage paint or trim.

COLUMN DISASSEMBLY

- (1) Remove four bolts attaching bracket assembly to column jacket.
- (2) Remove two screws and lift off wiring trough.
- (3) Attach Column Holding Fixture C-4132 to column jacket and clamp the assembly in a vise.
- (4) Drive out gearshift lever pin, then remove lever and spring from housing.
- (5) Remove turn signal switch and upper bearing retainer screws. Remove retainer and lift switch upward out of the way (Fig. 4).
- (6) Remove two retaining screws and lift the ignition key lamp assembly out of the way (Fig. 5).
- (7) Remove snap ring from upper end of steering shaft (Fig. 6).

Steering Shaft

- (1) Remove three screws which hold bearing housing to lock housing.

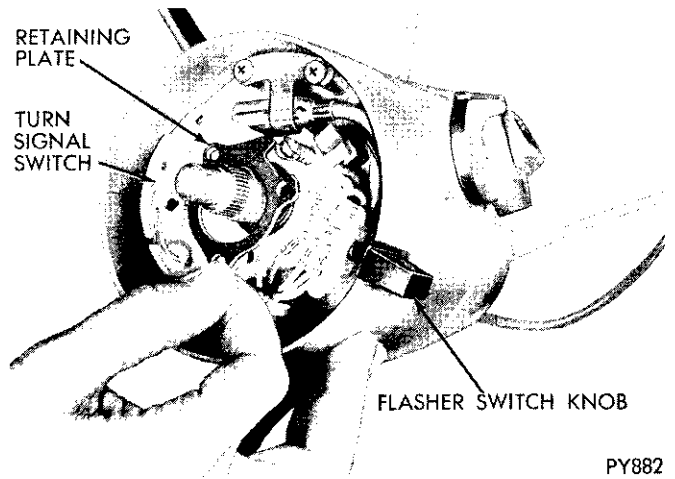


Fig. 4—Retainer and Turn Signal Switch

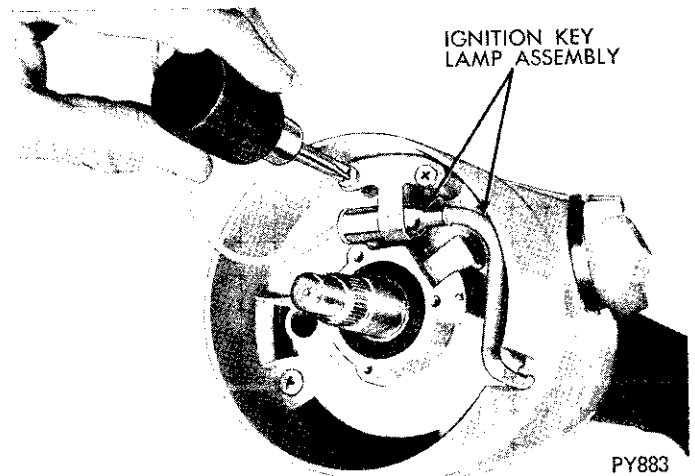


Fig. 5—Ignition Key Lamp

CAUTION: These screws must be removed before steering shaft removal.

- (2) Install steering shaft remover C-4044 and press

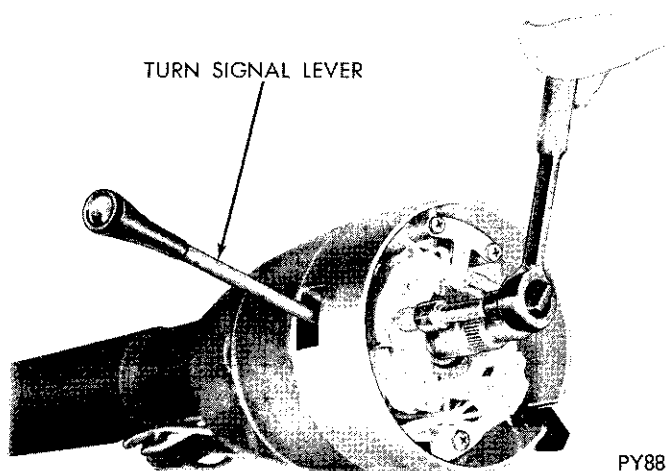


Fig. 3—Turn Signal Lever

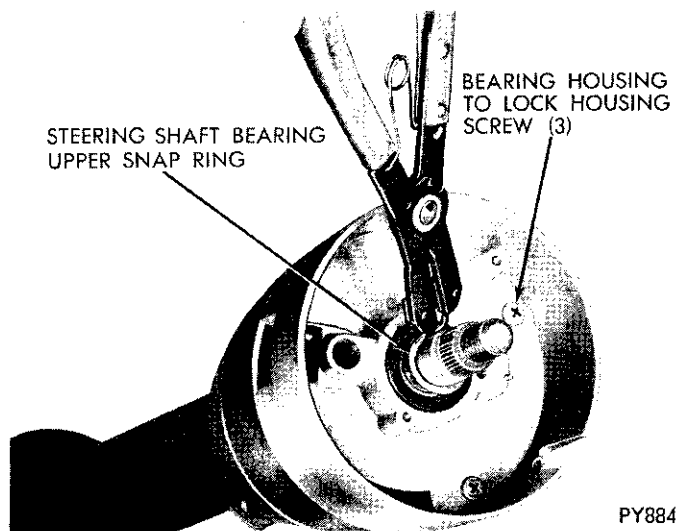


Fig. 6—Steering Shaft Bearing Upper Snap Ring

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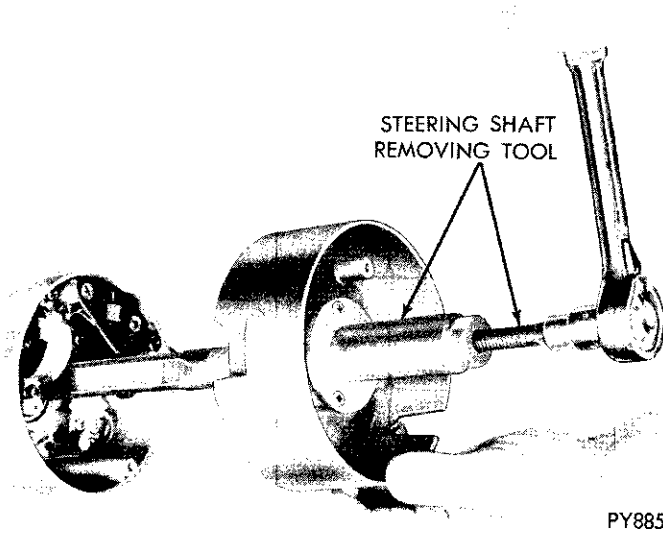


Fig. 7—Pressing Shaft Out of Bearing

shaft out of bearing and remove bearing housing from shaft (Fig. 7).

- (3) Remove bearing lower snap ring from shaft.
- (4) Pry sleeve off steering shaft lock plate hub to expose pin.
- (5) Install Tool C-4113 on steering shaft lock plate hub to press pin out of shaft, **DO NOT HAMMER** (Fig. 8).
- (6) Remove tool and lock plate from shaft.
- (7) Remove shaft through lower end of column.

Lock Housing

- (1) Remove two screws and lift out buzzer switch (Fig. 9).
- (2) Remove two retaining screws and the lock lever

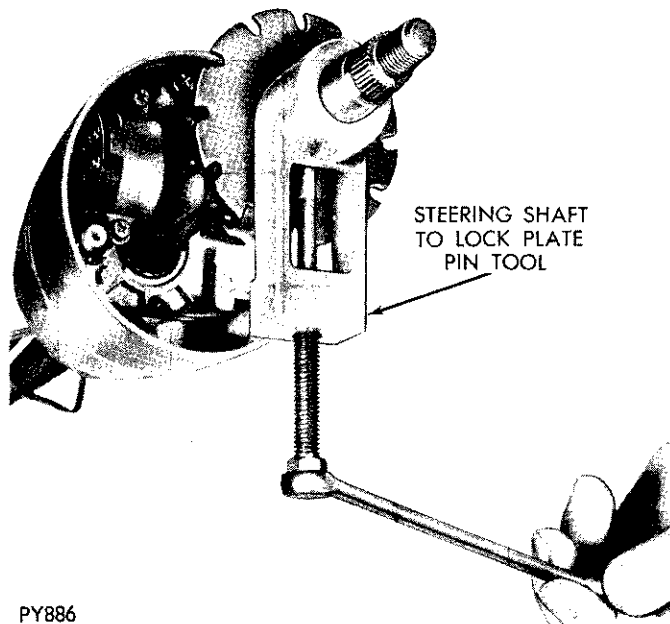


Fig. 8—Lock Plate Pin—Removal or Installation

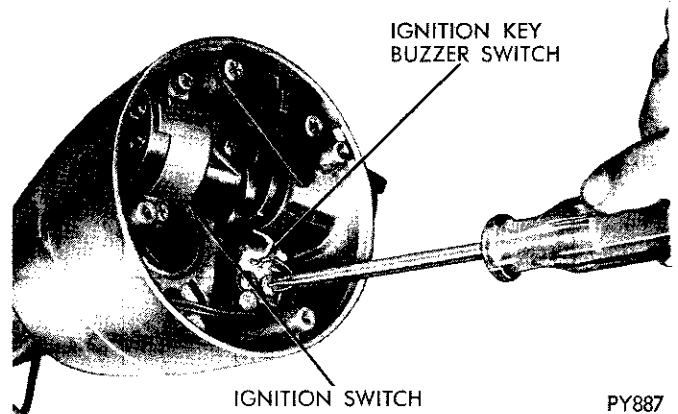


Fig. 9—Ignition Key Buzzer Switch

guide plate which will expose the lock cylinder release hole (Fig. 10).

- (3) Place cylinder in "lock" position and remove key. Insert a small diameter screwdriver or similar tool into lock cylinder release hole and push in to release spring loaded lock retainer. At same time pull lock cylinder out of housing bore (Fig. 11).
- (4) Remove the three retaining screws and the ignition switch assembly (Fig. 11).
- (5) Grasp lock lever and spring assembly and pull straight out of housing (Fig. 12).
- (6) Remove four lock housing to column jacket hex head retaining screws and remove housing from jacket (Fig. 13).

Shift Tube (Figs. 14, 15, 16 & 17)

- (1) To remove shift tube from column shift automatic or floor shift models, first straighten the tabs at top of shift tube which are bent outward against shift housing casting. If so equipped, remove shift indicator bracket from shift tube. Remove shift tube

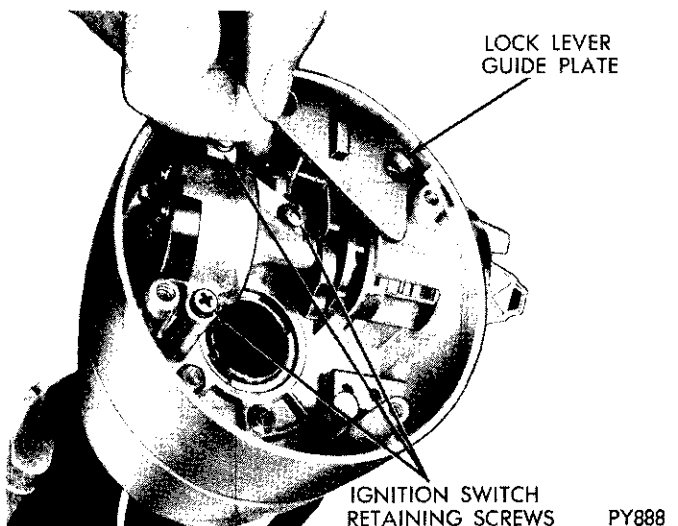


Fig. 10—Lock Lever Guide Plate

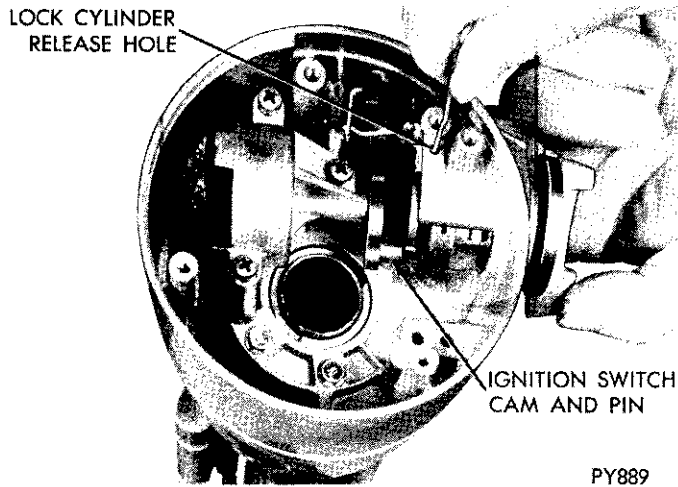


Fig. 11—Removing Lock Cylinder

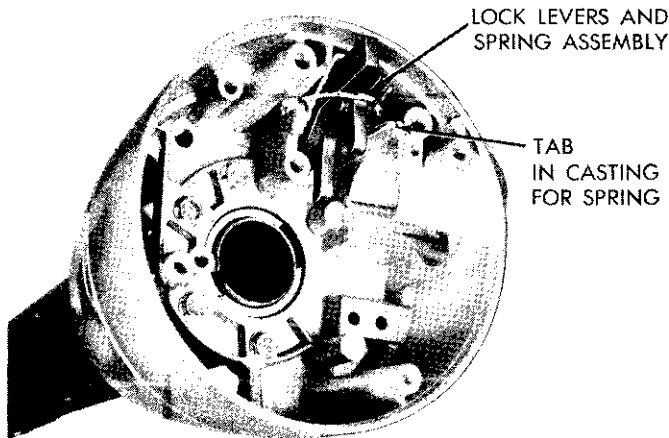


Fig. 12—Lock Levers and Spring Assembly Installed in Housing

support retaining clip from slots at bottom of jacket. Loosen shift tube set screw in shift housing and remove parts from jacket.

Models equipped with double coupling (Fig. 1) have

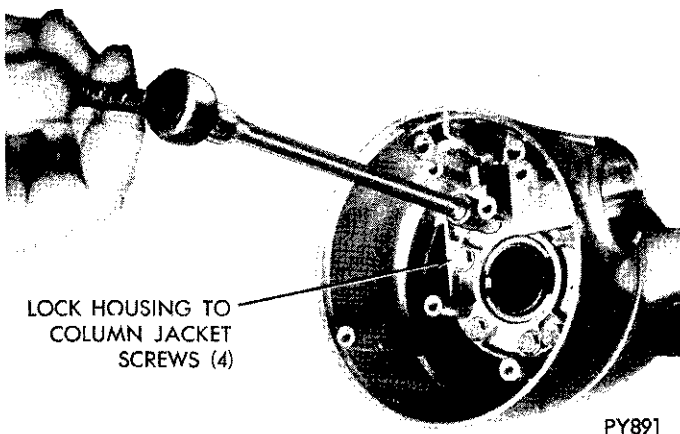


Fig. 13—Lock Housing to Column Jacket, Retaining Screws

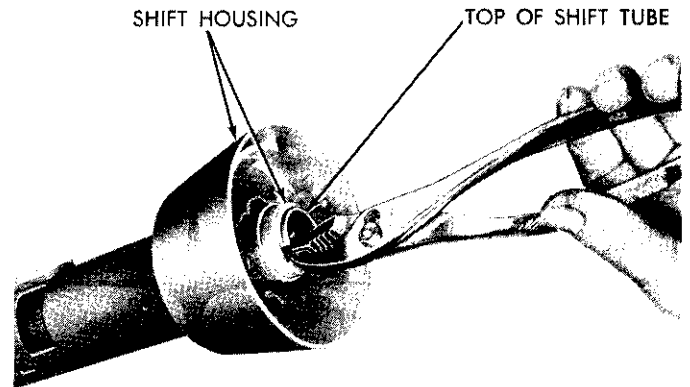


Fig. 14—Bending Shift Tube Tabs

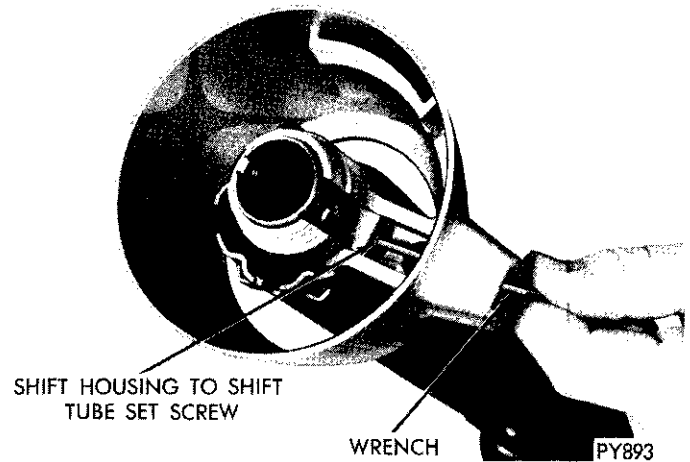


Fig. 15—Shift Tube Set Screw

a shift tube support with a bearing in it for the steering shaft. To remove shift tube, remove the two

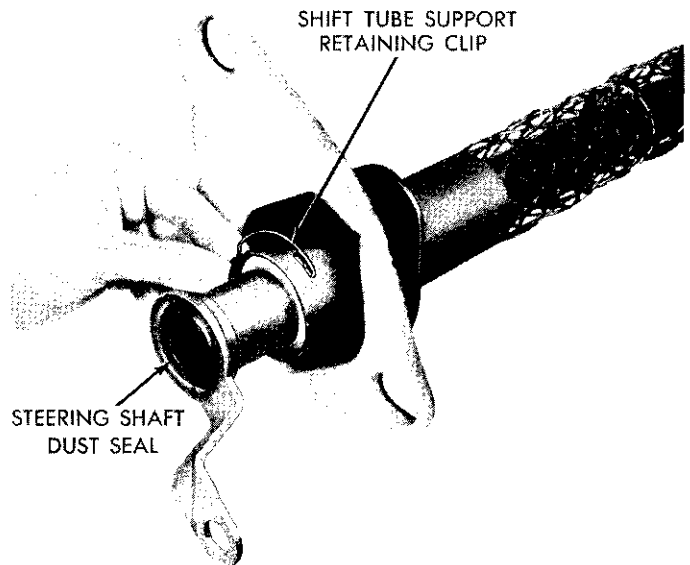


Fig. 16—Shift Tube Support Retaining Clip

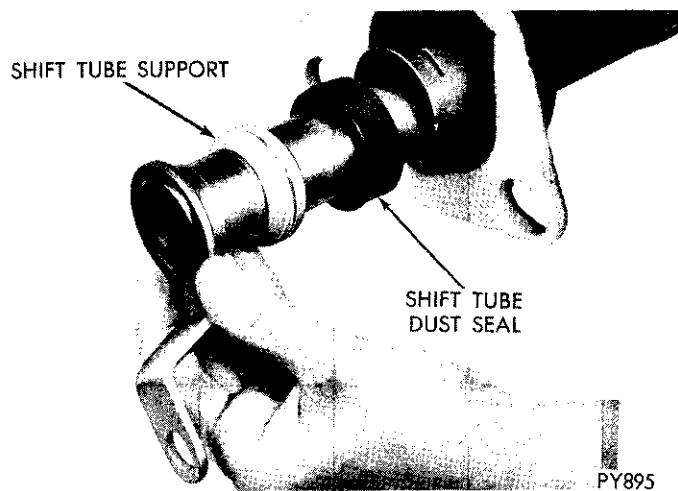


Fig. 17—Shift Tube Assembly—Removal or Installation

screws attaching the bearing and support to column jacket lower end.

(2) To remove shift tube from column shift manual models, remove the three bearing support screws at lower end of jacket and the two adjustable bushing screws from cam slots in jacket. Pull the tube and lever assembly out of jacket lower end (Figs. 18 & 19).

Steering Shaft Coupling (Fig. 20)

- (1) Pry cover tangs out from coupling body and pull seal and cover from body.
- (2) Drive the small short dowel pin at edge of coupling body, down into coupling and discard.
- (3) Pull body off the shaft and shoe assembly.
- (4) Separate and clean all parts.

Inspection

After cleaning, inspect all parts for wear or damage. Note condition of shift lever gate and inner end of

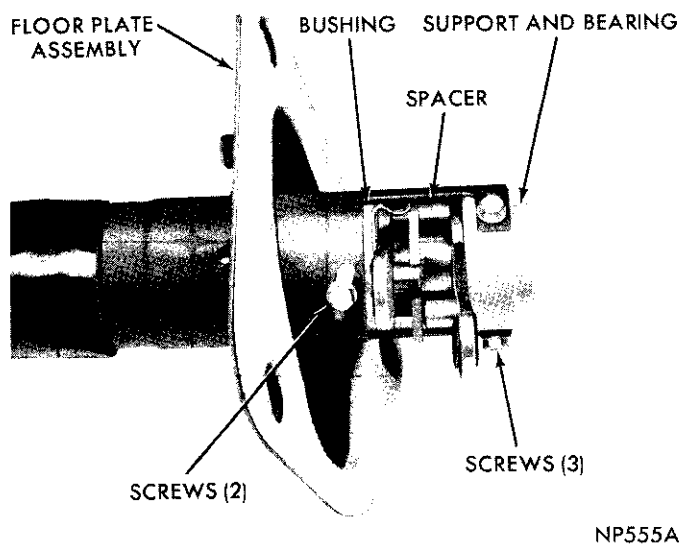


Fig. 18—Shift Tube and Levers Assembled

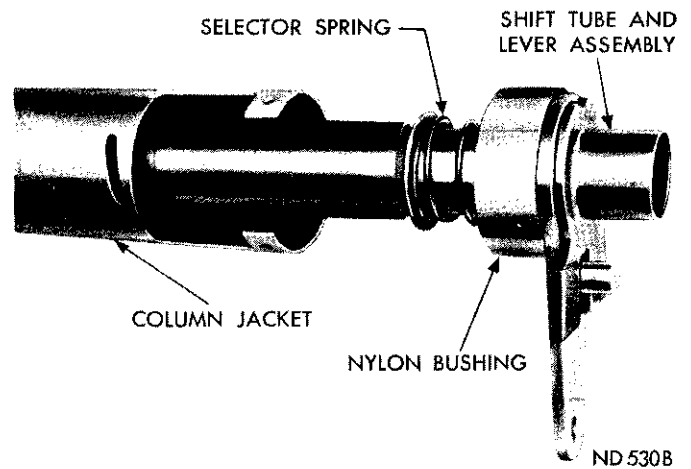


Fig. 19—Shift Tube Assembly—Removal or Installation

shift lever. Inspect turn signal switch for distortion, broken or damaged parts. Inspect wiring insulation for worn or bare spots.

Inspect steering shaft bearing for smooth operation, and lubricate with Multi-Purpose Chassis Lubricant or similar lubricant. If bearing has any signs of roughness or wear, it should be replaced.

COLUMN ASSEMBLY (Fig. 21)

The grease recommended for use during reassembly procedures is Automotive Multi-Purpose Grease NLGI Grade 2 E.P. or Multi-Mileage Lubricant, Part Number 2525035. Apply a thin coating to all friction surfaces.

(1) Install column holding tool C-4132 and clamp column in a vise with both ends of column accessible.

(2) Install the O-ring retainer, O-ring, and floor plate on lower end of column jacket. **This must be done before installing shift tube.**

(3) Coat spring washer with grease and install on lower hub of gearshift housing. Position gearshift housing on the jacket (Fig. 21).

- (4) **Column Shift Automatics and Floor Shift Models**
 - (a) With dust seal and shift tube support installed

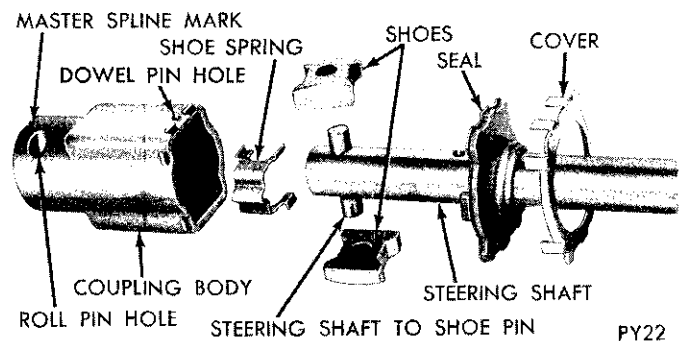


Fig. 20—Steering Shaft "Pot" Coupling Disassembled

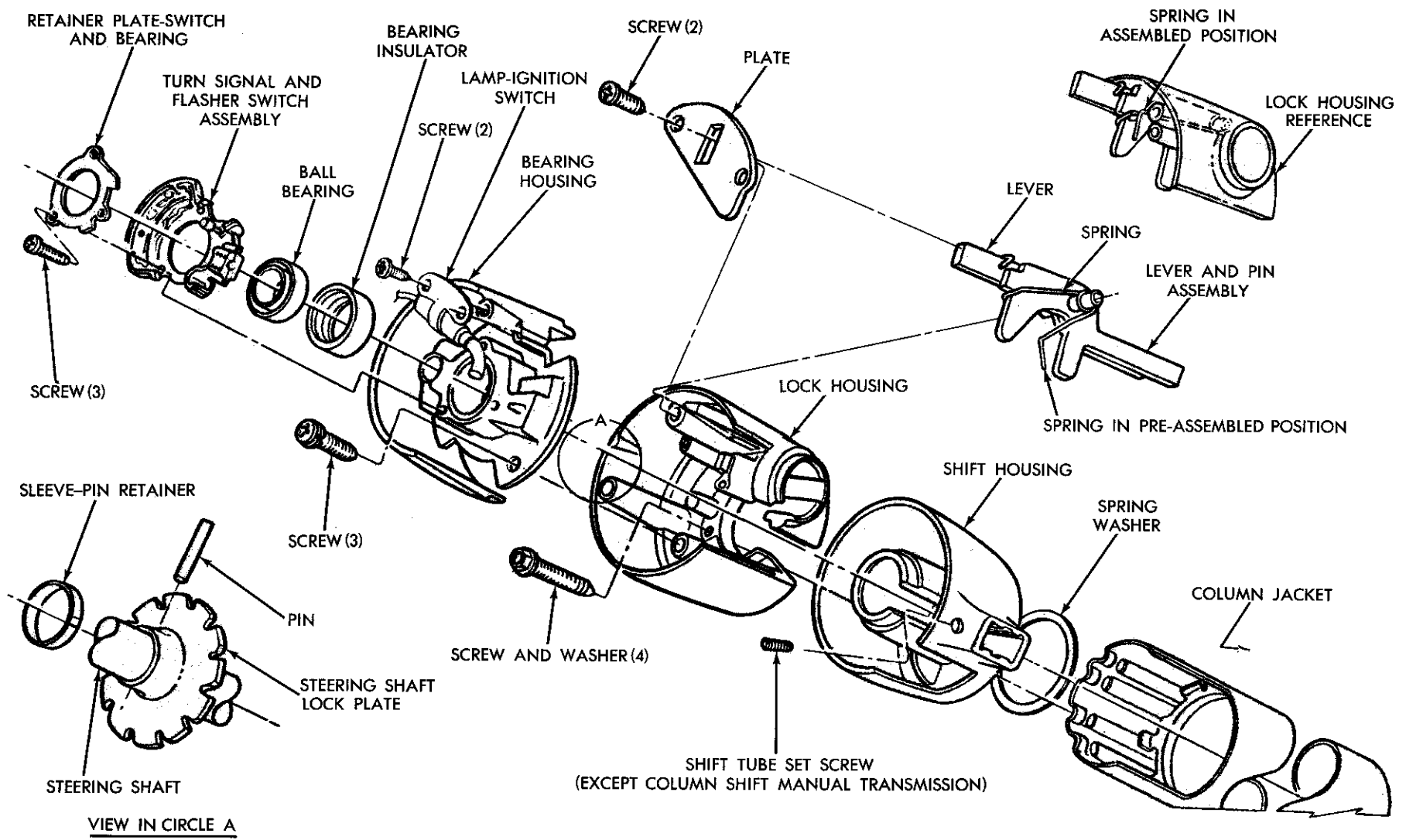


Fig. 21—Steering Column Upper End—Disassembled

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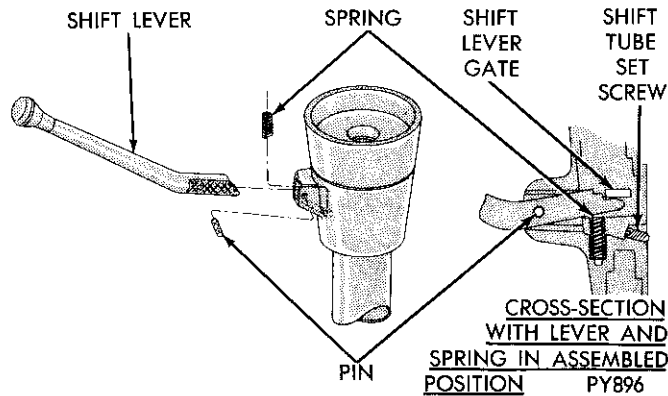


Fig. 22—Install Shift Lever—Automatic

on shift tube, slide the assembly into jacket. Guide key on upper end of tube into slot in gearshift housing. Hold firmly together and tighten lock screw in shift housing (Fig. 15).

(b) Bend corners of shift tube slot out against shift housing casting (Fig. 14).

(c) Insert wire retainer in slots in lower end of jacket and into groove in shift tube support (Fig. 16). **Models equipped with double coupling (Fig. 1)** have a shift tube support with a bearing in it for the steering shaft. Attach this support to the column jacket with two screws and tighten to 30 inch-pounds.

(d) **Column Shift Automatics only** Position the shift lever and crossover load spring in the gearshift housing and tap in the pivot pin (Fig. 22).

Install the shift lever gate on the lock housing (Fig. 23).

With gearshift lever in neutral position, attach indicator operating bracket to shift tube with two new plastic rivets (Fig. 24).

(5) Seat the lock housing on top of the jacket, indexing the key in the housing with the slot in the jacket. Insert all four screws and tighten them alter-

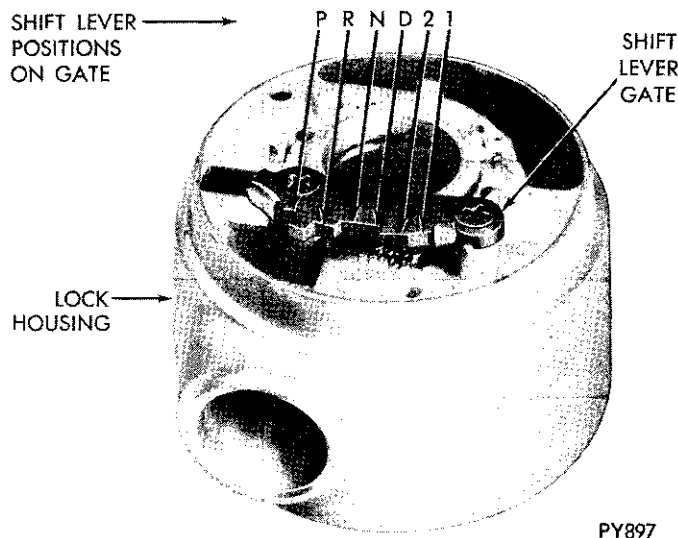


Fig. 23—Lock Housing and Shift Gate

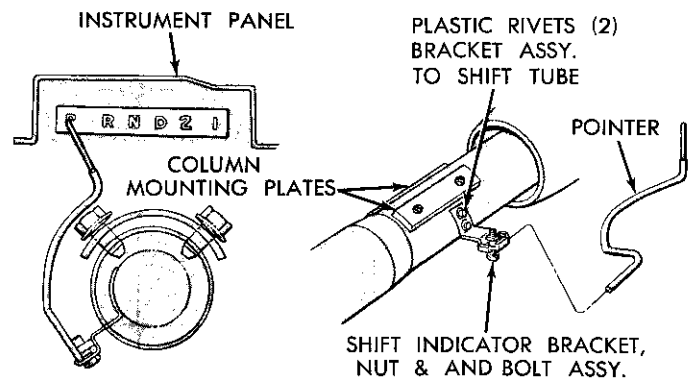


Fig. 24—Gear Selector Indicator Bracket

nately in steps to insure proper seating of the housing on the jacket. Tighten to 80 inch-pounds (Fig. 13).

(6) **Column Shift Manual Transmission Only**

(a) Turn bushing on shift tube (Fig. 19) so the two holes in bushing are aligned with centerline of 2nd and direct shift lever. Slide shift tube and lever assembly through jacket and into gearshift housing. Start the two bushing retaining screws through slots in jacket but do not tighten.

(b) Install spacer (Fig. 18) over crossover blade so it rests against the 2nd and direct shift lever. Install low and reverse lever, then install support and bearing assembly. Install and tighten the three retaining screws to 30 inch-pounds.

(c) Rotate bushing (Fig. 18) with screws so all play at shift levers and spacer is eliminated, but no binding occurs. With bushing in this position tighten the two bushing to jacket screws to 30 inch-pounds.

(d) Place a screwdriver blade between 2nd and direct shift lever and crossover blade, so it will be held in neutral position half-way between the two shift levers (Fig. 25).

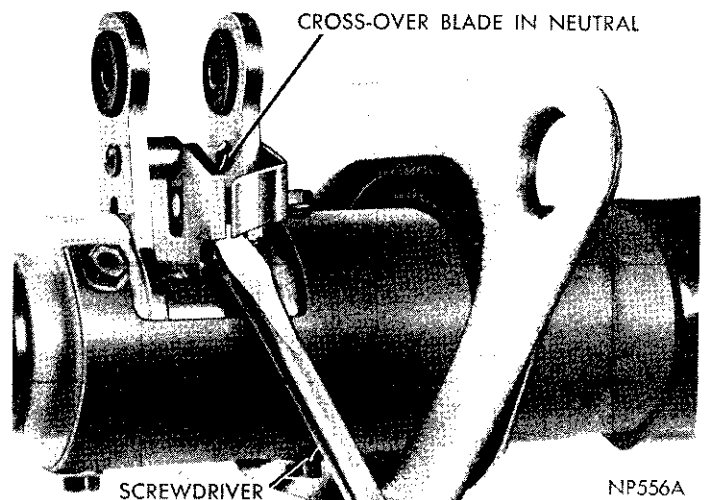
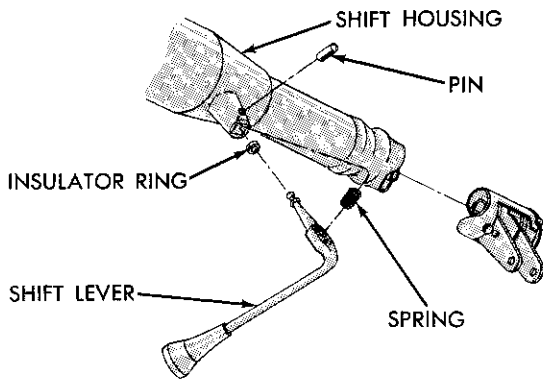


Fig. 25—Holding Crossover Blade in Neutral Position



PY899

Fig. 26—Install Shift Lever—Manual

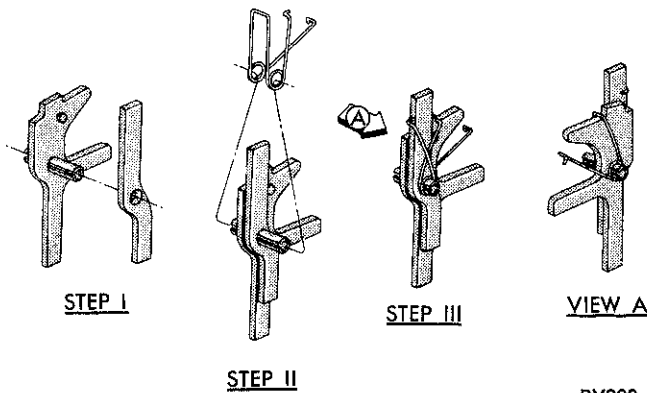
(e) Position gearshift lever and spring in housing so ball end with insulator ring engages hole in shift tube key. Align and install retaining roll pin (Fig. 26).

(7) Grease and assemble the two lock levers, lock lever spring, and pin (Fig. 27).

(8) Install the resulting assembly in the lock housing. Seat the pin firmly into the bottom of the slots. Make sure that the lock lever spring leg is firmly in place in lock casting notch (Fig. 12).

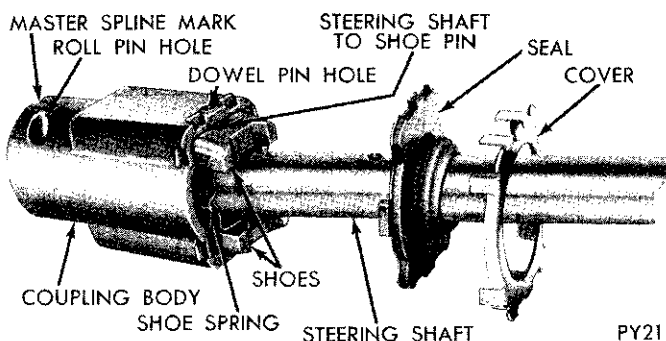
(9) Install the lock lever guide plate and retaining screws (Fig. 10).

(10) Position ignition switch to center detent (OFF) position. Feed wires down through the space between



PY900

Fig. 27—Lock Levers and Spring—Assembly



PY21

Fig. 28—Assembling Steering Shaft Coupling

housing and jacket. Position switch in housing and tighten three mounting screws (Fig. 11).

(11) Feed buzzer switch wires behind wiring post and down through space between housing and jacket. Position switch in housing and tighten two mounting screws (Fig. 9).

(12) **With the ignition key cylinder in the LOCK position, and with the key removed,** insert the key cylinder into the lock housing. Press the cylinder into place until contact is made with the pin on the ignition switch cam. Insert the key into the lock and rotate the lock until the slot in the cylinder plate lines up with the pin. Press the key cylinder the remaining way into the lock housing, making sure the retainer bar snaps into its slot in the lock housing.

Steering Shaft Coupling Assembly (Fig. 20)

(1) Fill coupling body with grease to approximately 1/2 inch from top.

(2) Place cover and seal on shaft.

(3) Press shoe pin into steering shaft so that it projects an equal distance on each side of shaft.

(4) Place spring on side of shaft, straddling the shoe pin.

(5) Place shoes on pin ends with flat side toward spring engaging tangs.

(6) Squeeze shoes together, compressing spring, and push assembly into coupling body (Fig. 28) with gauge hole in shaft aligned with master spline in coupling.

(7) Drive in a new dowel pin flush to outer surface of coupling body.

(8) Position seal and cover on body and crimp cover tangs over the projections on body securely.

Steering Shaft Installation

(1) Insert the steering shaft assembly into the column and shift tube assembly.

(2) Install the lock plate on the steering shaft and press the pin into place. **DO NOT HAMMER** use tool C-4113 (Fig. 8). Make sure pin is centered.

(3) Install steering column shaft lock plate sleeve over shaft lock plate pin and against lock plate.

(4) Install the bearing lower snap ring on the steering shaft.

Bearing Housing Assembly (Fig. 21)

(1) Place rubber insulator with ground staple, over column upper bearing and install assembly into bearing housing bore. Use a soap solution or rubber lubricant to ease installation.

(2) Install the turn signal switch in the bearing housing, feeding the wires through the opening in the housing. Feed the ignition key lamp assembly wires through the opening in the housing at this time.

(3) Install the retaining plate over the switch and tighten 3 screws to 27 in.-lbs. (Fig. 4).

(4) Install the turn signal lever or turn signal/speed control lever on the turn signal switch. If speed control, feed the wires through the opening provided in the bearing housing (Fig. 3).

(5) Position the bearing housing assembly on the column jacket assembly, feeding the wires through the space between the lower housings and the jacket.

(6) When installing this housing, the steering shaft must be drawn, not pushed, through the bearing, using the bearing inner race as a reaction member, or damage to the shaft plastic shear pins, lock housing components, or bearing could result. **DO NOT DRIVE THE SHAFT INTO THE BEARING.**

(7) Install on steering shaft, Tool C-3879, with washer and steering wheel nut (Fig. 29). Turn nut to pull shaft through bearing. Remove tool and install upper snap ring on shaft.

(8) Install and tighten to 35 in.-lbs. the 3 bearing housing to lock housing screws.

(9) Carefully install the ignition key lamp assembly in the bearing housing (2 screws).

(10) Install the wiring trough in place over the wires, being careful to not pinch wires between trough and jacket.

COLUMN INSTALLATION (Fig. 1 or 2)

(1) Tool C-4134 must be used to hold the steering shaft in the center of the shift tube while installing and aligning the column in the vehicle.

(This operation is not necessary on Column shift manual transmission columns or columns with a double coupling on the steering shaft or tilt columns.)

(a) Remove thumbscrew and open tool to straddle shift tube lever and steering shaft (Fig. 30).

(b) Close tool and tighten thumbscrew.

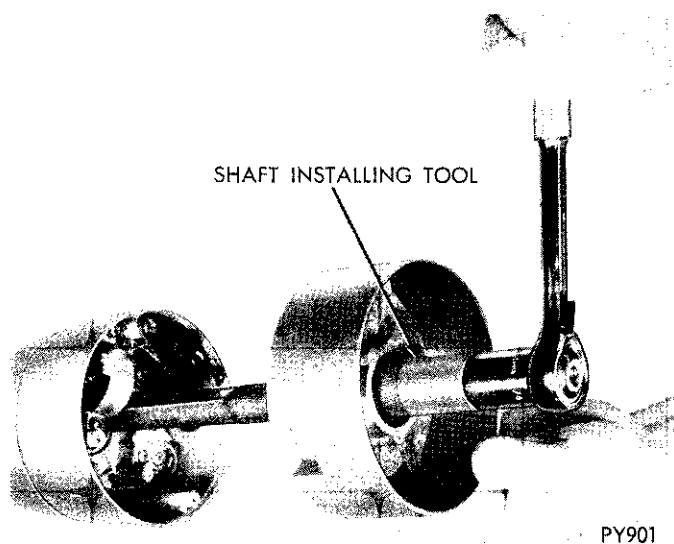


Fig. 29—Pulling Shaft into Bearing

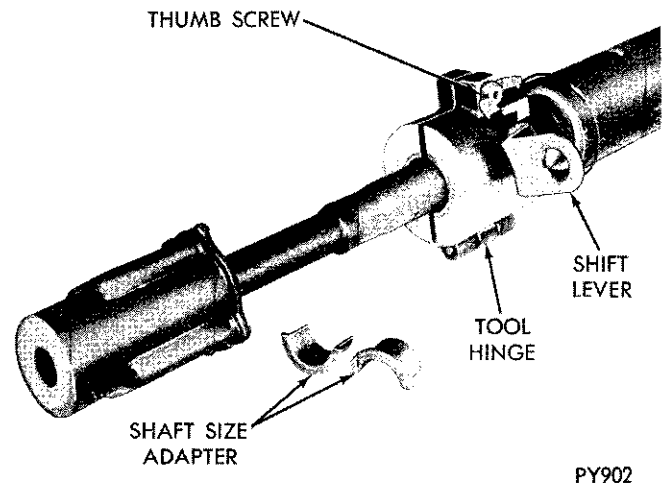


Fig. 30—Shaft Centering Tool

(c) If hole in tool is too large to grip steering shaft, add the split insert to adapt tool to smaller shaft diameter.

(2) Position bracket assembly on steering column (Fig. 1), install ground wire and tighten the four short retaining screws to 120 inch-pounds. Plastic capsules should be pre-assembled in bracket slots. Insert column assembly through floor pan opening, being careful not to damage paint or trim.

(3) With front wheels in straight ahead position and master splines on wormshaft and coupling aligned, engage coupling with wormshaft and install the roll pin. **CAUTION: Do not apply end loads to steering shaft.**

(4) Hold column assembly with bracket against the instrument panel support. Install but **do not tighten** the two upper bracket nuts.

(5) **Center steering shaft coupling at midpoint of its travel.** This is accomplished by moving column and bracket assembly fore and aft in the instrument panel support so dimension between top of coupling and center of gauge hole is 13-16 inch (Fig. 31). Tighten the two upper bracket nuts to 110 inch-

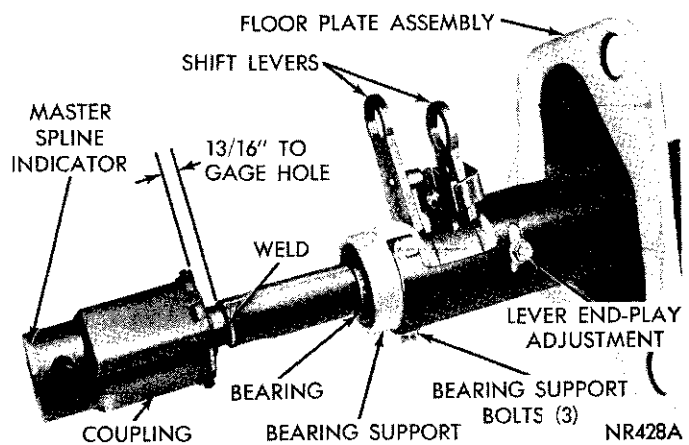


Fig. 31—Shaft Coupling Adjustment

pounds. Attach electrical ground wire to one of the rear mounting studs.

(6) Position floor plate over floor pan opening, centering it around the column, then install and tighten retaining bolts. Slide "O" ring down the jacket and into recess in floor plate, position retaining plate over "O" ring and secure with the two bolts. **Do not pry to align plates and attaching bolts or column misalignment will occur.**

(7) Loosen bolt attaching the forward adjustable hanger to the instrument panel support. Attach column bracket forward leg to the hanger and tighten to 110 inch-pounds. **Then tighten the hanger to instrument panel support bolt to 200 inch-pounds.**

(8) Connect gearshift indicator pointer (Fig. 24) to operating bracket on shift tube in its approximate original location. Slowly move gearshift lever from

"1" (low) to "P" (park) pausing briefly at each selector position. The indicator pointer must align with each selector position. If necessary, loosen the bolt and re-adjust to align pointer correctly.

(9) Attach finish plate to bottom of instrument panel.

(10) Place steering wheel on steering shaft with master splines aligned. Install retaining nut and washer, tighten nut to 27 foot-pounds. **Do not drive wheel on shaft, draw wheel down with retaining nut.**

(11) Install horn switch parts previously removed from steering wheel. Connect horn switch wire.

(12) Connect wiring connectors at steering column jacket. Connect battery ground cable, test operation of lights and horns.

(13) Connect and adjust gearshift linkage, refer to "Transmission Group".

STEERING COLUMN (TILT-A-SCOPE)

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GENERAL INFORMATION

This optional steering column has the same impact absorbing design as the other columns described in this section. The installation is the same, therefore

only the disassembly and reassembly of the column will be detailed here.

SERVICE PROCEDURES

REMOVAL (See Standard Columns)

Disassembly (Fig. 1)

(1) Remove four bolts attaching bracket assembly to column jacket.

(2) Unsnap and remove the wiring protector from column jacket.

(3) Attach column Holding Fixture C-4132 to jacket pads and clamp the assembly in a vise.

(4) Drive out gearshift lever pivot pin, then remove lever from housing. Remove tilt release lever and turn signal switch lever. If equipped with "Speed Control" see Accessories Group 1.

(5) Lock telescoping shaft with a set screw and install lock plate compressing tool C-4118 (Fig. 2). Depress lock and carrier far enough to remove "C" ring. Remove tool, lock plate, carrier and spring (Fig. 1).

(6) Remove three turn signal switch attaching screws, place shift bowl in low (1) position, and remove switch and wiring (Fig. 1).

(7) The buzzer switch can be pulled straight out of the housing. A flat spring wedges the switch toward the lock cylinder (Fig. 3). (This may be done without the removal of the lock cylinder.) If the lock cylinder is in the housing, it must be in the "ON" position.

(8) The lock cylinder may be removed in any position from "Accessory" to "ON". However, the "LOCK" position is recommended because of its positive location.

(9) Insert a thin tool (small screw driver or shim stock) into the slot next to the switch mounting screw boss (right-hand slot) and depress spring latch at bottom of slot, which releases lock. Remove lock (Fig. 4). NOTE: If lock cylinder has never been removed, the slot will be covered by a thin casting flash, which must be broken through when tool is inserted.

(10) Remove three housing cover screws and remove housing cover (Fig. 3).

(11) Install tilt release lever and place column in full "Up" position. Remove tilt spring retainer using

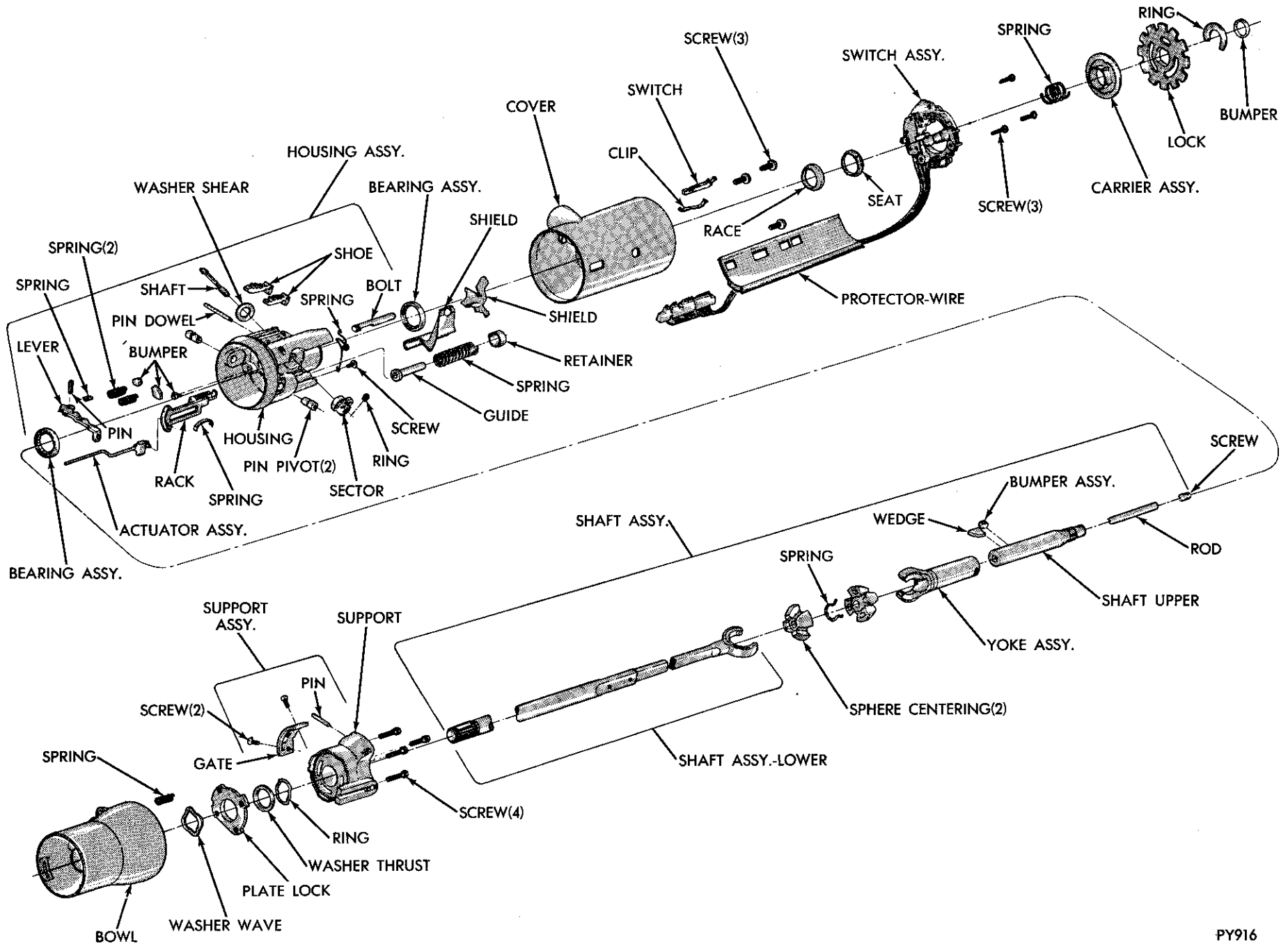
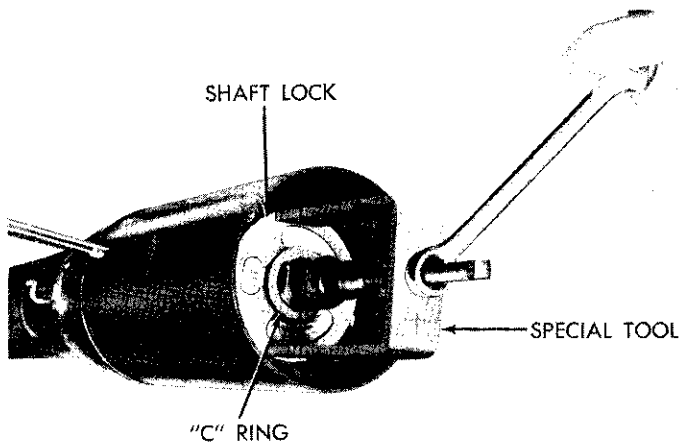
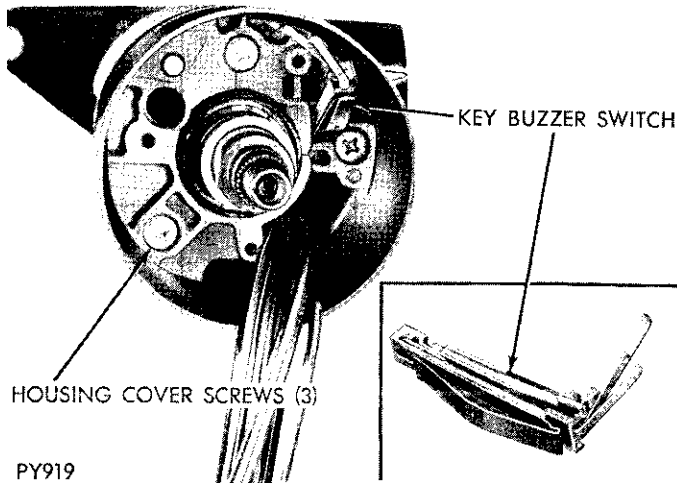


Fig. 1—Tilt-A-Scope Column Upper End—Disassembled



PY941

Fig. 2—Removing or Installing Lock Plate "C" Ring

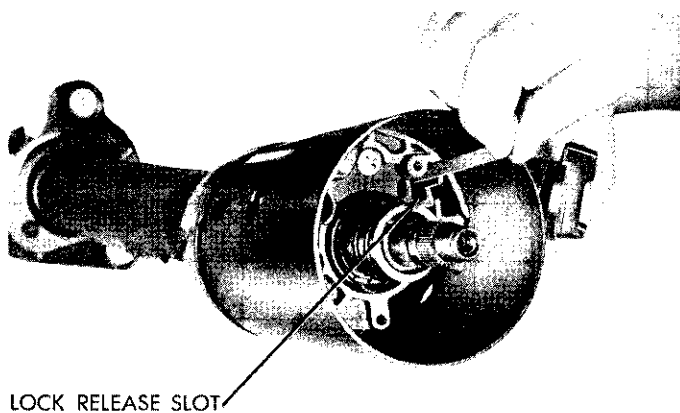


PY919

Fig. 3—Key Buzzer Switch

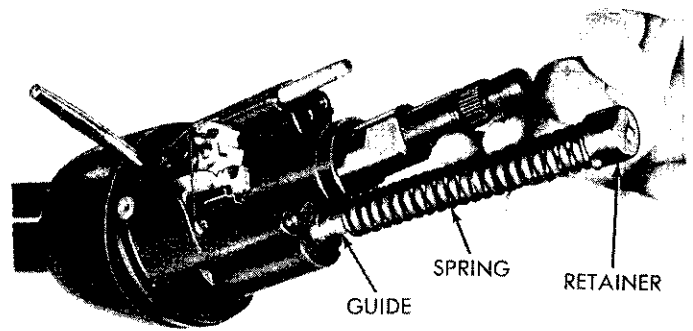
screw driver blade that just fits into slot opening. Insert screw driver in slot, press in approximately 3/16", turn approximately 1/8 turn counterclockwise until ears align with grooves in housing and remove spring and guide (Fig. 5).

(12) Remove seat and upper bearing race (Fig. 1).



PY920

Fig. 4—Removing Lock Cylinder



PY942

Fig. 5—Tilt Spring, Retainer, and Guide

(13) With ignition switch in "LOCK" position, remove two ignition switch mounting screws and ignition switch (Fig. 6).

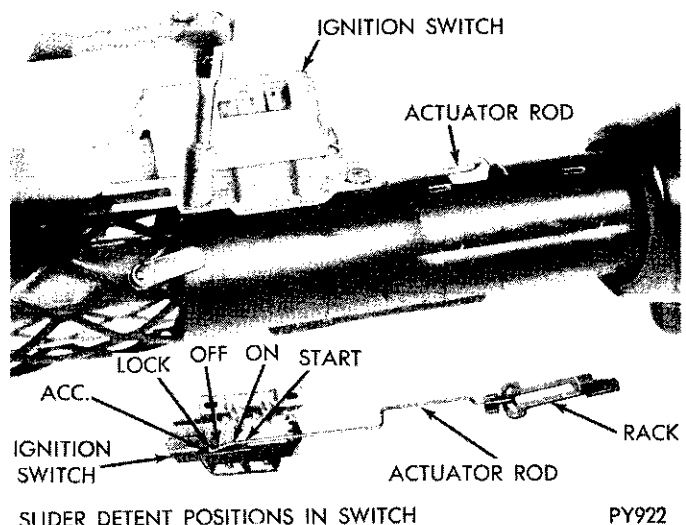
(14) Place Pivot Pin Remover C-4016 over pivot pin and thread small portion of screw firmly into the pin. Hold screw from turning with one wrench, turn nut clockwise with a second wrench to withdraw pivot pin from the support (Fig. 7). Remove opposite pivot pin in same manner.

(15) Use tilt release lever to disengage lock shoes. Remove bearing housing assembly by pulling upward to extend rack full down and moving housing assembly to the left to disengage rack from actuator. Remove actuator rod assembly.

NOTE: If shaft has double coupling, remove pin and upper coupling from shaft. If equipped with a single coupling, it must be disassembled to remove shaft from column.

(16) Disassemble shaft coupling assembly (See Standard Columns). Press shoe pin out of steering shaft with an arbor press. Do not hammer on coupling or steering shaft to remove.

(17) Remove steering shaft assembly from upper end.



PY922

Fig. 6—Ignition Switch

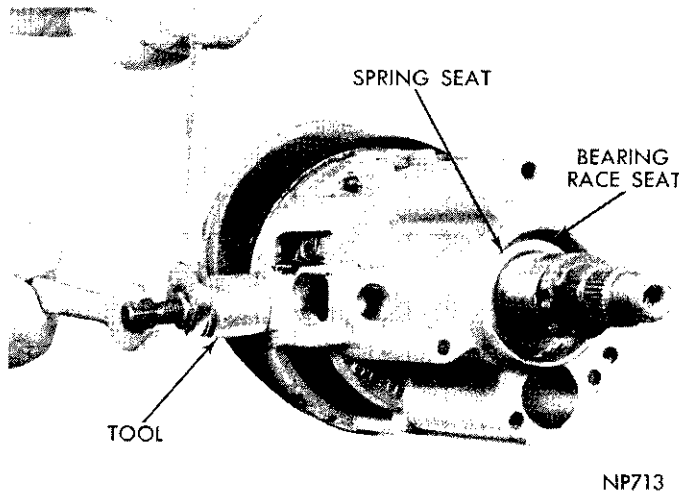


Fig. 7—Pivot Pin Removing Tool

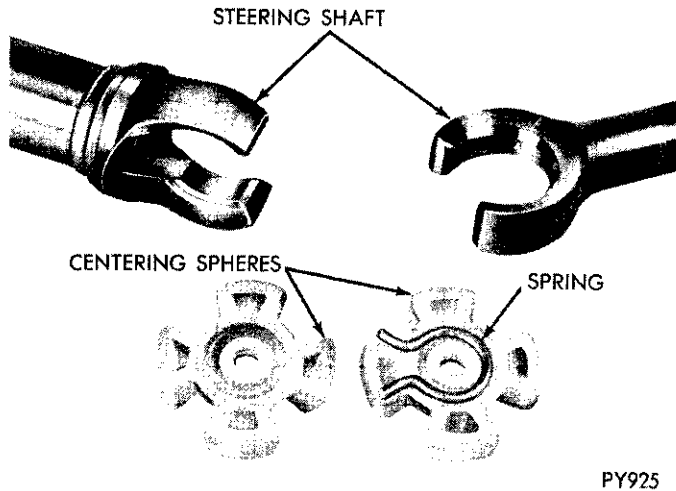


Fig. 8—Shaft Centering Spheres—Disassembled

(18) Disassemble steering shaft assembly by removing centering spheres and anti-lash spring (Fig. 8).

Disassemble upper steering shaft, locking wedge, locking rod and up bump stop from upper yoke (Fig. 9).

(19) Remove four bolts securing support to lock plate and remove support from end of column jacket. If necessary, remove two attaching screws and shift gate from the support.

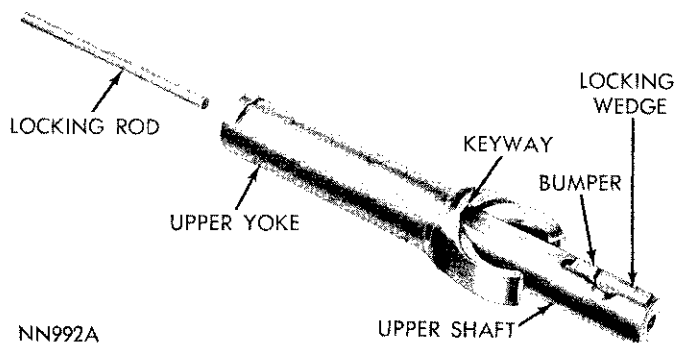


Fig. 9—Upper Steering Shaft and Yoke—Disassembled

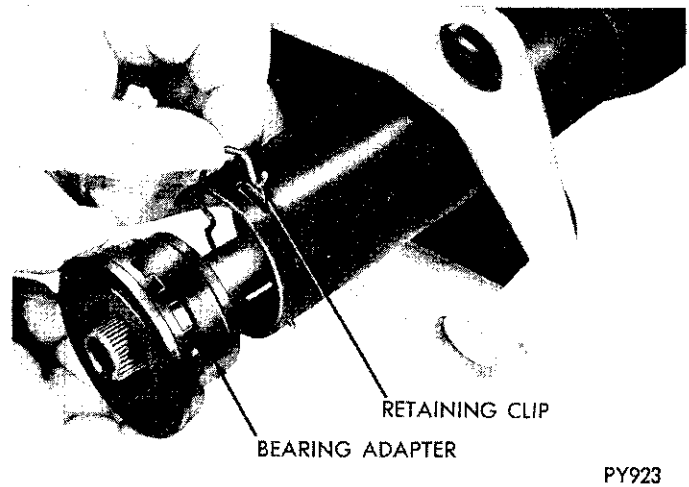


Fig. 10—Shaft Lower Bearing Adapter

(20) Remove shift tube retaining ring with screw driver. Remove thrust washer.

(21) Remove clip and bearing adapter from lower end of column jacket (Fig. 10).

(22) The column jacket with shift tube and bowl are serviced as an assembled unit.

BEARING HOUSING DISASSEMBLY (Fig. 1)

(1) Remove tilt lever opening shield and turn signal lever opening shield from housing.

(2) Remove lock bolt spring by removing spring retaining screw and moving spring clockwise to remove from bolt (Fig. 11).

(3) Remove snap ring from sector drive shaft. With small punch, lightly tap drive shaft from sector. Remove drive shaft, washer, sector and bolt. Remove rack and rack spring.

(4) Remove tilt release lever pin with punch and

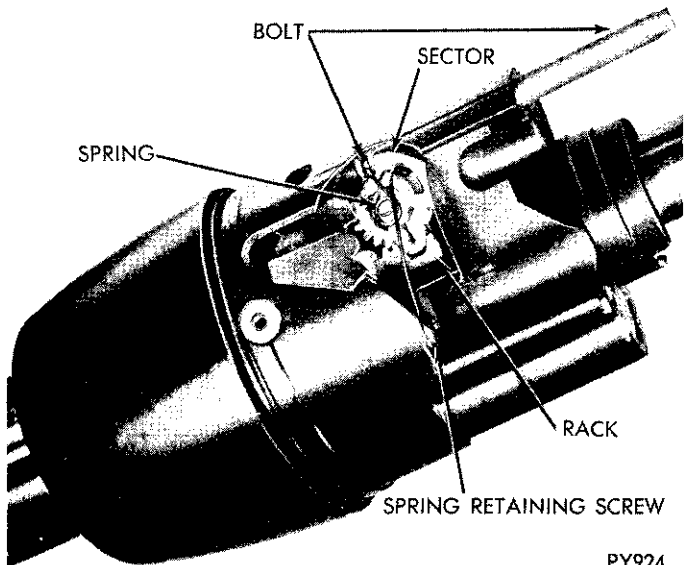


Fig. 11—Sector and Bolt Spring

hammer. Remove lever and release lever spring. (To relieve load on release lever, hold shoes inward and wedge block between top of shoes (over slots) and bearing housing).

(5) Remove lock shoe pin with punch and hammer. Remove lock shoes and lock shoe springs.

NOTE: With tilt lever opening on left side, shoes facing up, the four slot shoe is on the left.

(6) Remove bearings from bearing housing **only if they are to be replaced**. Remove separator and balls from bearing. Place housing on work surface. With a pointed punch against back surface of race, carefully hammer race out of housing until bearing puller can be used. Repeat for other race.

Inspection

(1) Inspect all bearings and race seats for brinelling, nicks, scratches and wear.

(2) Inspect centering sphere for nicks, damage or wear. If damage is found, check shaft couplings for nicks, burrs or rough spots.

(3) Inspect actuator housing, shift lever bowl and support for cracks or other damage.

(4) Inspect turn signal switch unit for distortion, broken or damaged parts.

(5) Inspect horn and turn signal wires for worn or bare spots.

(6) Inspect the steering shaft and gearshift tube for loose or broken plastic shear joints.

(7) Inspect steering column mesh cover, mend with electricians tape if loose or torn.

Assembly

The grease recommended for use during reassembly procedures is Automotive Multi-Purpose Grease NLGI Grade 2 E.P. or Multi-Mileage Lubricant, Part Number 2525035.

BEARING HOUSING ASSEMBLY (Fig. 1)

(1) Install bearings in bearing housing, if removed.

(2) Install lock shoe springs, lock shoes and shoe pin in bearing housing. Use approximately .180 rod to line up shoes for pin installation.

(3) Install spring, release lever and pin in bearing housing. (Again, relieve load on release lever as in step (4) of disassembly procedure.)

(4) Install washer and drive shaft in housing. Lightly tap sector onto the shaft far enough to install snap ring.

(5) Install lock bolt and engage with sector cam surface.

(6) Install rack and spring. Block tooth on rack to engage block tooth on sector. Install external tilt release lever.

(7) Install bolt spring and spring retaining screw. Tighten to 35 inch-pounds (Fig. 11).

COLUMN ASSEMBLY (Fig. 1)

(1) Install thrust washer and retaining ring by pulling bowl up to compress wave washer.

(2) Install support by aligning "V" in support with "V" notch in jacket. Insert screws through support into lock plate. Tighten screws to 60 inch-pounds torque.

(3) Align lower bearing adapter notches in jacket and push in lower end of column jacket. Shift tube should pilot in adapter at this time. Install clip (Fig. 10).

(4) Install centering spheres and anti-lash spring in upper steering yoke. Install lower steering shaft from same side of spheres that spring ends protrude (Fig. 8). Install upper steering shaft, locking wedge, locking rod and up bump stop in yoke (Fig. 9).

(5) Install steering shaft assembly in shift tube from upper end. Carefully guide shaft through shift tube and bearing.

(6) Install ignition switch actuator rod through bowl from bottom and insert in slot in support. Extend rack downward from bearing housing. Assemble bearing housing over steering shaft and engage rack over end of actuator rod.

(7) Install external tilt release lever and, holding lock shoes in disengaged position, assemble bearing housing over steering shaft until the pivot pin holes line up.

(8) Install pivot pins.

(9) Place housing in full "UP" position and install guide, tilt spring and tilt spring retainer, using screw driver in retainer slot. Turn retainer clockwise to engage (Fig. 5).

(10) Install tilt lever opening shield and turn signal lever opening shield in housing.

(11) Remove tilt release lever, install housing cover and tighten three screws to 45 inch-pounds (Fig. 3).

(12) Assemble buzzer switch to spring clip with formed end of clip under end of switch and spring bowed away from switch on side opposite contact. Push switch and spring into hole in cover to the step with the contacts toward lock cylinder bore (Fig. 3).

(13) Install signal switch wires and connector through cover, bearing housing and bowl. Install switch and tighten screws to 35 inch-pounds.

(14) Install over the upper steering yoke the upper bearing race, followed by the seat, spring, carrier assembly and lock plate (Fig. 1). Lock the telescoping shaft with a set screw and install lock plate compressing Tool C-4118. Depress lock plate and carrier just far enough to install "C" ring on yoke (Fig. 2). Remove tool and set screw from shaft.

(15) Install tilt release lever and signal switch lever. Install shift lever and drive in pivot pin.

(16) To install key cylinder, place cylinder in

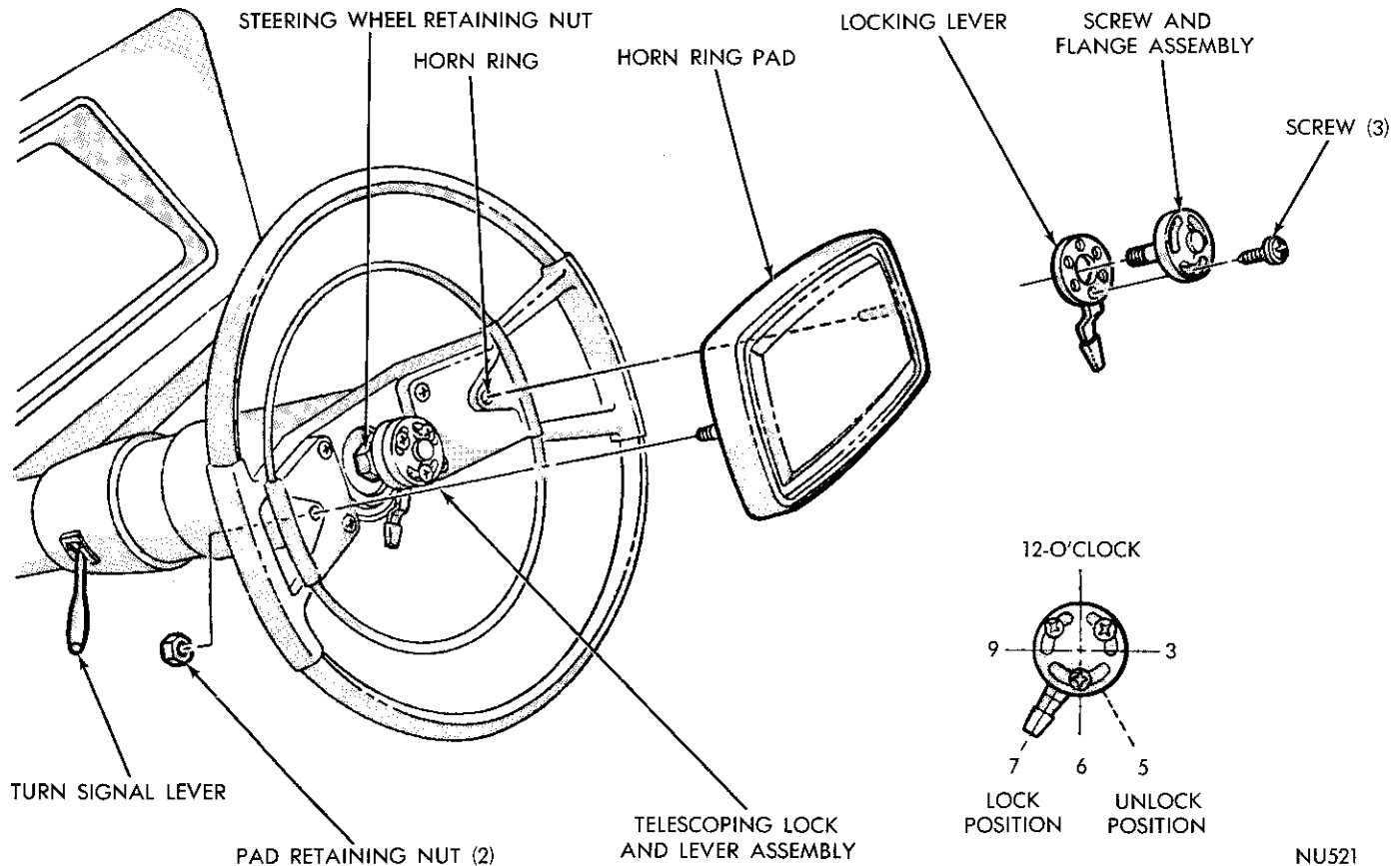


Fig. 12—Telescoping Steering Wheel—Locking Mechanism

“LOCK” position and remove key. Insert key cylinder into housing until contact is made with sector shaft. Place key in cylinder and rotate, while pressing inward, until cylinder slot aligns with shaft. Press key cylinder the remaining way into housing until its retainer snaps into place in housing slot.

(17) When replacing ignition switch, place the lock in “LOCK” detent position. Place the switch in “LOCK” by the following procedure:

- (a) Position the switch as it is shown in (Fig. 6).
- (b) Move the slider to the extreme left.
- (c) Move the slider back one position to the right to the “LOCK” position.

Fit the actuator rod into the slider hole and assemble to the column with two screws. Push the switch lightly down the column (away from the steering wheel), to take out lash in the actuator rod, and tighten mounting screws. Caution should be exercised to prevent moving the switch out of detent. Use only the correct screws. Tighten to 35 inch-pounds.

(19) Install wire protector over wires on column jacket. Be careful to not pinch any wires.

(20) Remove column from vise and Holding Fixture from column. Position bracket assembly on steering column. Install and torque the four short retaining screws to 120 inch-pounds.

NOTE: If equipped with double coupling install upper coupling and pin on steering shaft (step 21 not necessary).

(21) Reassemble steering shaft coupling (see standard columns). Press shoe pin into steering shaft, **do not hammer**.

Installation (See Standard Columns)

See Brakes, Group 5, for installation of Imperial parking brake vacuum valve.

STEERING WHEEL (Figs. 12 and 13)

Removal

(1) Remove 2 retaining nuts from underside of horn ring and lift off pad.

(2) Move lever to unlock position then remove 3 locking lever retaining screws then remove screw and flange assembly with locking lever.

(3) Remove 4 horn ring retaining screws and bushings then lift off horn ring and spring.

(4) Scribe an alignment mark on steering wheel hub in line with mark on end of steering shaft to aid in reassembly.

(5) Remove steering wheel retaining nut and washer. Remove steering wheel with Tool C-3428A. **Do not bump or hammer on steering shaft to remove wheel.**

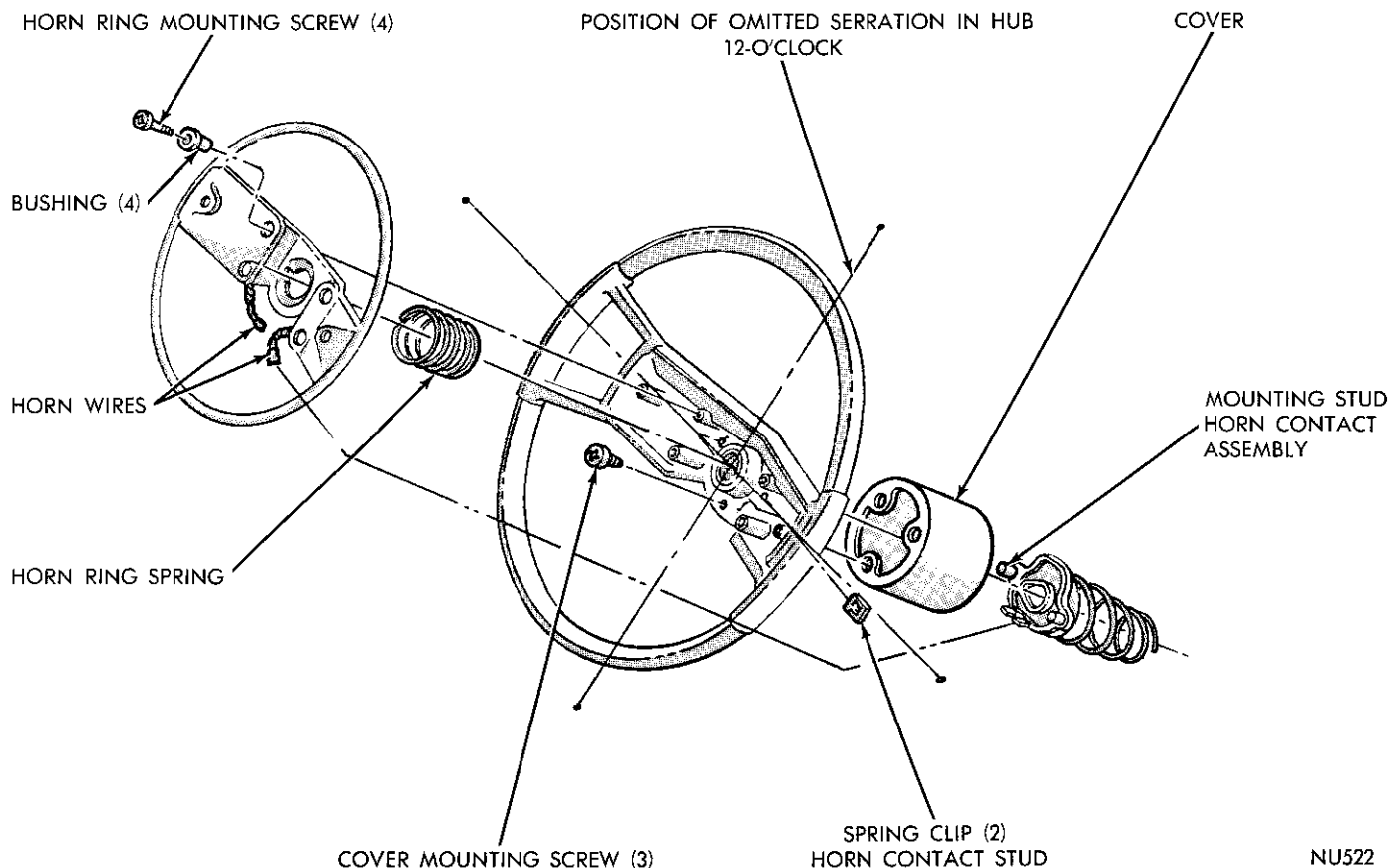


Fig. 13—Telescoping Steering Wheel—Disassembled

NU522

Disassembly

Figure 13 shows a disassembled view of the tilting and telescoping steering wheel.

- (1) Remove 2 spring clips and remove horn contact and spring assembly.
- (2) Remove 3 screws and lift off cover.

Assembly

(1) Place cover on bottom of steering wheel and fasten with 3 screws.

(2) Position horn contact assembly studs through steering wheel and fasten with 2 spring clips. Wire connectors to be in 6 o'clock position.

(3) Place spring and horn ring on steering wheel and attach with 4 bushings and screws.

(4) Attach horn wires to horn contact terminals.

Installation

(1) Install steering wheel with scribed mark on hub

aligned with mark on end of steering shaft. Install and tighten retaining nut to 27 foot-pounds.

(2) With steering wheel in normal position place locking lever on steering shaft and tighten screw and flange assembly to 45 inch-pounds to lock telescoping action.

(3) Attach locking lever finger tight to flange with 3 screws (Fig. 12).

(4) Position lever in lock (7 o'clock) position and tighten screws to 24 inch-pounds.

(5) Check operation of telescoping mechanism as follows:

Rotate locking lever counterclockwise to 5 o'clock position. The wheel should be entirely free to telescope.

Rotate locking lever clockwise making certain it secures wheel in any telescoped position.

(6) Place pad on horn ring and tighten two nuts to 35 inch-pounds.

SPECIFICATIONS

MANUAL STEERING GEAR

Type	Recirculating Ball Nut
Ratio	24 to 1
Cross Shaft Bearings	3-Needle Bearings

Wormshaft Bearings	2-Caged Ball Bearings
Cross Shaft Adjusting Screw End Play000-.004 Inch
Worm Bearing Preload	1 to 4 in. lbs. to Keep Wheel Moving
Sector Mesh Adjustment Preload Torque— Includes Worm Bearing Preload	8 to 11 in. lbs. Pull through high spot

POWER STEERING GEAR

Type	Constant Control Full Time Power
Ratio	15.7 to 1
Wheel Turns—Stop to Stop	3-1/2
Cross Shaft Bearings	2 Needle Bearings and 1 Direct Bearing on Grey Iron Cover
Worm Shaft Thrust Bearing Pre-Load	16-24 Ozs.
Cross Shaft Adjustment	Tighten Adjusting Screw 3/8 to 1/2 turn past Zero Back Lash (Center of High Spot)
Fluid Capacity of Hydraulic System	4 Pts. (3-3/4 Imperial Pts.
Type of Fluid	Power Steering Fluid Part No. 2084329 or equivalent

PUMP

Type	Constant Displacement— 1.06 Cu. In. per revolution 1200 to 1300 PSI
Maximum Pressure	
.94 Pump	1075 to 1200 PSI
1.06 Pump Chrysler	1100 to 1300 PSI
Imperial	1200 to 1300 PSI
Pump Output	
.94 Pump	2.1 to 2.6 gpm
1.06 Pump	
High level	2.5 to 3.0 gpm
Low level	1.4 to 1.8 gpm
Type of Fluid	Power Steering Fluid—Part No. 2084329 or equivalent— Do Not Use Type "A" Transmission Fluid

TIGHTENING REFERENCE

MANUAL STEERING GEAR

	Foot Pounds		Foot Pounds
Cross Shaft Adjusting Screw Lock Nut	35	Steering Arm Nut	180
Cross Shaft Cover Bolt	25	Steering Wheel Nut	27
Gear Assembly to Frame Bolt	100		

POWER STEERING GEAR

	Foot Pounds		Pounds	
		Foot	Inch	
Gear Housing to Frame Bolt	100	Steering Column Support Nut		140
Gear Shaft Adjusting Screw Lock Nut..	50	Steering Shaft Coupling Bolts.....		200
Gear Shaft Cover Nut	20	Valve Body Attaching Bolts		200
Pump Inlet Fitting	30	Valve Body End Plug	25	
Steering Arm Nut	120	Steering Wheel Nut	27	

PUMPS

Location	Foot Pounds	Location	Foot Pounds
High Pressure Hose Fittings		Flow Control Valve Plug	
Gear End		.94 pump	4
All Models	12-14	1.06 pump	5-7
Pump End		Pulley Retaining Nut (.94 pump)	45-55
All Models	21-27	Bracket Mounting Bolts	25-35
Bracket Bolts		1.06 pump	
.94 pump	30-40	1/8 inch pipe clean out plug	7
1.06 pump	18		