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TM 9-1813

WAR DEPARTMENT TECHNICAL MANUAL

ORDNANCE MAINTENANCE

6-TON, 6x6 TRUCK

(WHITE, CORBITT, BROCKWAY, AND
WARD LA FRANCE)—

**POWER TRAIN, CHASSIS,
AND WINCHES**

WAR DEPARTMENT TECHNICAL MANUAL

TM 9-1813

This TM, together with TM 9-813, dated 19 Feb 44; and TM 9-1832A, dated 17 May 44, supersedes TM 10-1109, dated 27 Aug 41; TM 10-1159, dated 29 Aug 41; TM 10-1221, dated 3 Feb 42; TM 10-1529, dated 29 Sep 42; and TM 10-1553, dated 14 May 42. This TM supersedes portions of WDTB ORD 12, dated 12 Jan 44; WDTB ORD 147, dated 24 Jul 43; and OFSTB 800-17, dated 24 Jul 43, which apply to the materiel covered in this TM; however, these TB's remain in force until incorporated in all other affected TM's or specifically rescinded.

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WAR DEPARTMENT

Washington 25, D. C., 8 November 1945

TM 9-1813, Ordnance Maintenance: 6-ton, 6 x 6 Truck (White, Corbitt, Brockway, and Ward La France)—Power Train, Chassis, and Winches, is published for the information and guidance of all concerned.

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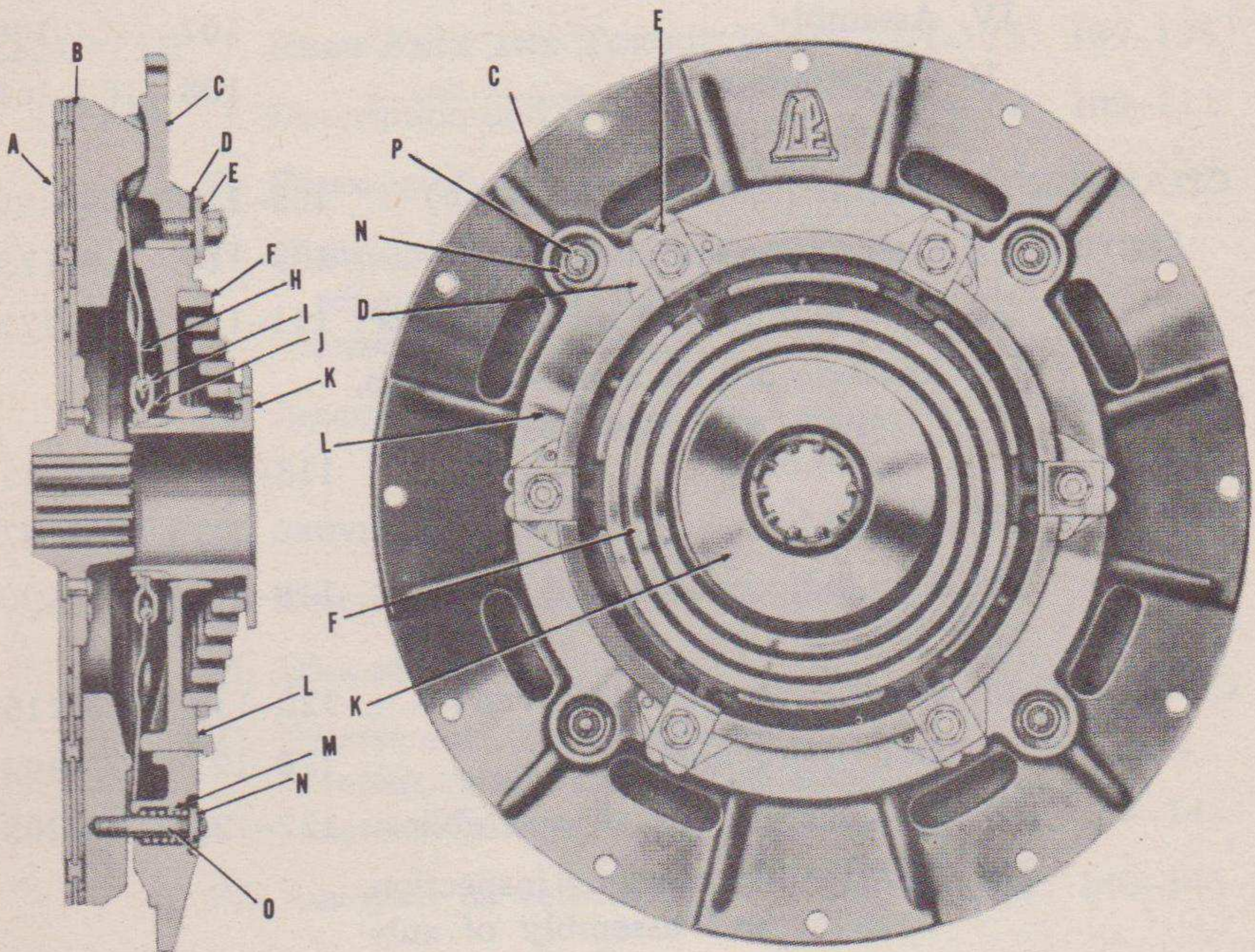
(For explanation of symbols, see FM 21-6.)

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- D—ADJUSTING SHIMS
- E—LOCK PLATE
- F—PRESSURE SPRING
- H—PRESSURE LEVER
- I—PRESSURE LEVER BALL

**PARTS OF
PRESSURE PLATE
ASSEMBLY**

- J—SNAP RING
- K—CLUTCH SLEEVE
- L—ADJUSTING PLATE
- M—RETRACTOR SPRING
- N—WASHER
- O—PRESSURE PLATE STUD
- P—RETRACTOR SPRING
RETAINING PIN

RA PD 353058

Figure 1 — Clutch — Sectional and Assembled View

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CHAPTER 1

INTRODUCTION

1. SCOPE.

a. The instructions contained in this manual are for the information and guidance of personnel charged with the maintenance and repair of the 6-ton, 6 x 6 White, Brockway, Corbitt, and Ward La France trucks. These instructions are supplementary to field and technical manuals prepared for the using arms. This manual does not contain information which is intended primarily for the using arms, since such information is available to Ordnance maintenance personnel in 100-series TM's or FM's.

b. This manual contains a description of, and procedure for, disassembly, cleaning, inspection, repair, and assembly of subassemblies for the clutch, transmission, transfer case, propeller shafts, propeller shaft brake, front axle, steering gear, rear axle, springs, winch, and service brakes of the 6-ton 6 x 6 White, Brockway, Ward La France, and Corbitt trucks.

c. TM 9-813 contains operating instructions for this equipment.

d. TM 9-1832A contains Ordnance maintenance instructions for the engine.

e. TM 9-1825A contains Ordnance maintenance instructions for the ignition, starting, and generating systems.

f. TM 9-1826C contains Ordnance maintenance instructions for the carburetor.

g. TM 9-1827A contains Ordnance maintenance instructions for the power brake system.

h. TM 9-1829A contains Ordnance maintenance instructions for the speedometer and tachometer.

i. TM 9-1828A contains Ordnance maintenance instructions for the fuel pump.

2. FORMS, RECORDS, AND REPORTS.

a. **General.** Forms, records, and reports are designed to serve necessary and useful purposes. Responsibility for the proper execution of these forms rests upon commanding officers of all units maintaining vehicles and components. It is emphasized, however, that forms, records, and reports are merely aids. They are not a substitute for thorough practical work, physical inspection, and active supervision.

b. **Authorized forms.** The forms, records, and reports generally applicable to units maintaining vehicles or components are listed below with brief explanations of each. No forms other than approved War Department forms will be used. Pending availability of forms listed, old forms may be used. For a current and complete listing of all forms, see current FM 21-6 (Lists and Index of War Department Publications).

(1) **WAR DEPARTMENT LUBRICATION ORDER.** War Department Lubrication Orders Nos. 9-813 and 9-813-1 prescribe lubrication maintenance for these vehicles. A lubrication order is issued with each vehicle and is to be carried with it at all times. Instructions contained therein are mandatory to all users of the equipment and supersede all conflicting lubrication instructions of prior date.

(2) **WD AGO FORM 9-71, LOCATOR AND INVENTORY CONTROL CARD.** Except when specified otherwise by the War Department, this form will be used as a bin tag, locator card, or inventory control card by all units authorized automotive spare parts.

(3) **WD AGO FORM 9-72, ORDNANCE STOCK RECORD CARD.** This form is prescribed for use by ordnance maintenance and depot companies.

(4) **WD AGO FORM 9-74, MOTOR VEHICLE OPERATOR'S PERMIT.** This form will be issued by commanders to all operators of vehicles who are qualified to operate the particular vehicles noted on the permit.

(5) **WD AGO FORM 9-76, REQUEST FOR WORK ORDER.** This form will be used for requesting repairs, alterations, or other type of work within or between organizations and departments.

(6) **WD AGO FORM 9-77, JOB ORDER REGISTER.** This form will be used to keep a chronological record of work orders.

(7) **WD AGO FORM 13-1, AUTOMOTIVE DISABILITY REPORT OF VEHICLES DISABLED MORE THAN THREE DAYS.** This form will be accomplished and submitted as directed in current War Department instructions.

Introduction

(8) WD AGO FORM 461, WORK SHEET FOR WHEELED AND HALF-TRACK VEHICLES. This form will be used for maintenance services and for all technical inspections performed on wheeled or half-track vehicles.

(9) WD AGO FORM 461-5, LIMITED TECHNICAL INSPECTION. This form will be used for limited technical inspections to classify vehicles as to general over-all condition.

(10) WD AGO FORM 478, MODIFICATION WORK ORDER AND MAJOR UNIT ASSEMBLY REPLACEMENT RECORD AND ORGANIZATION EQUIPMENT FILE. This form will be kept in possession of second echelon personnel and will accompany vehicles upon transfer and evacuation to higher echelon. It will be a record of all modifications made and exchanges of major unit assemblies. Minor repairs, parts and accessory replacements will not be recorded. In the field, where no filing facilities are available, this form will be kept in a filing jacket.

(11) WD AGO FORM 811, WORK REQUEST AND JOB ORDER. This form will be used by organizational maintenance units when requesting repair by a higher echelon repair unit.

(12) WD AGO FORM 866, CONSOLIDATION OF PARTS. This form will be used by a maintenance company for the periodic report required by higher headquarters showing the parts and materials used and issued by the company for a given period.

(13) WD AGO FORM 867, STATUS OF MODIFICATION WORK ORDER. This form provides a record of the status at any time of any modification work order being performed by a maintenance shop.

(14) WD AGO FORM 461-3, WORK SHEET FOR WHEELED AND HALF-TRACK VEHICLES (PRODUCTION LINE MAINTENANCE). This form will be used for production line maintenance services.

CHAPTER 2
CLUTCH

Section I
DESCRIPTION AND DATA

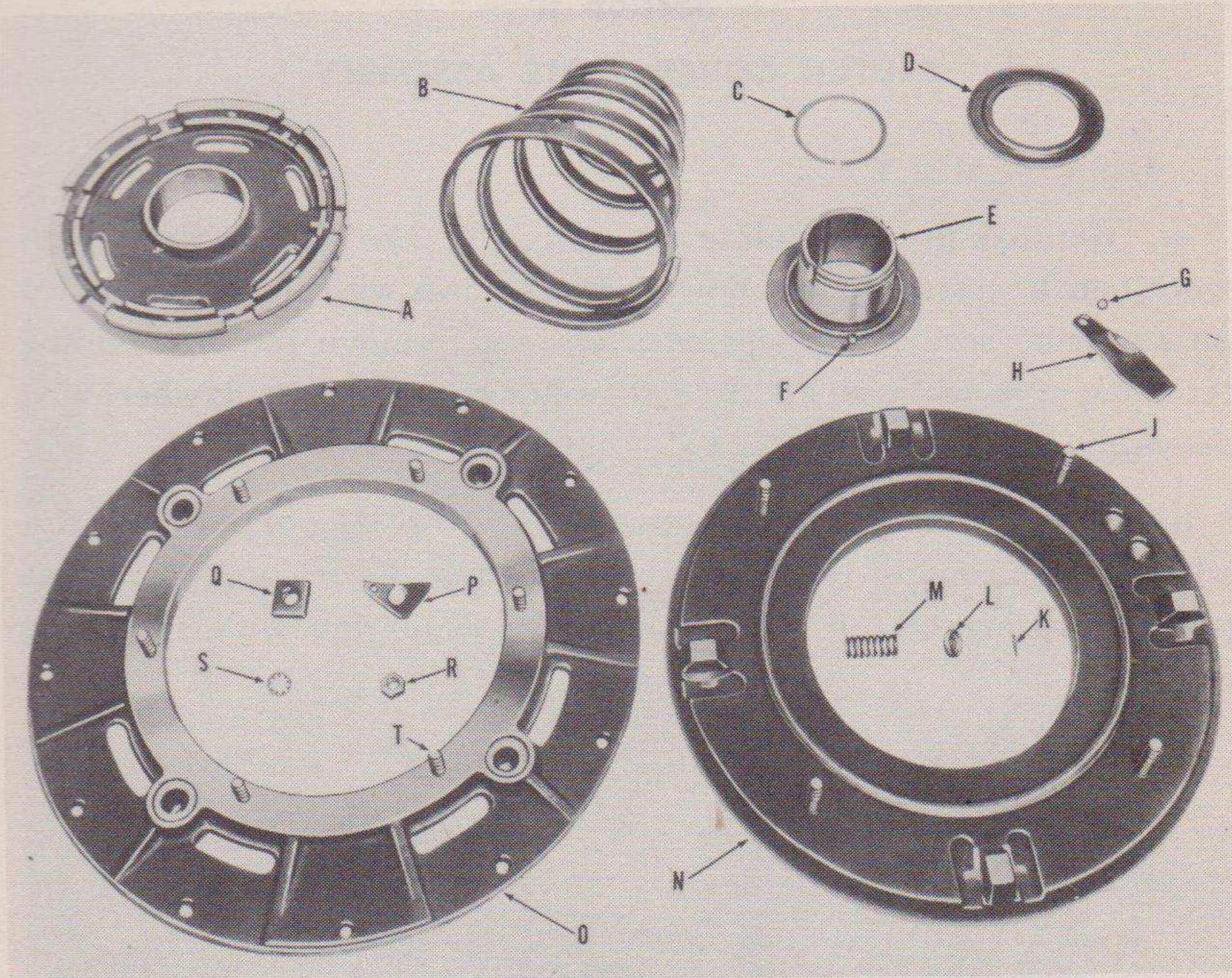
3. DESCRIPTION AND OPERATION.

a. **General.** The clutch consists of a clutch pressure plate assembly and a driven disk assembly. The clutch functions by clamping the driven disk, splined to the transmission drive shaft, between the face of the flywheel and the clutch pressure plate. When the clutch is engaged, the pressure spring acts on a sleeve which transmits the energy to 20 ball-bearing hinged levers. The levers multiply the pressure of the spring and transmit the increased pressure to the pressure plate. When the clutch is released, the sleeve moves toward the flywheel, causing the outer end of the hinged levers to move in a direction opposite to the spring pressure on these levers. As the pressure on the pressure plate is relieved, the retractor springs pull the pressure plate out of contact with the driven disk (figs. 1 and 2).

4. DATA.

Make W. C. Lipe
Type Single Plate "Push"
Model 15-SP-Z40-SX
Size 15 in.
Driven disk—facings:
 Outside diameter 15 in.
 Inside diameter 8 in.
 Facing thickness (each facing) $\frac{5}{32}$ in.
 Area of one face 256 sq in.

Description and Data



- | | |
|-------------------------------------|--------------------------------------|
| A—ADJUSTING PLATE | M—RETRACTOR SPRING |
| B—PRESSURE SPRING | N—PRESSURE PLATE AND STUD ASSEMBLY |
| C—SNAP RING | O—FLYWHEEL RING AND STUD ASSEMBLY |
| D—FULCRUM RING | P—ADJUSTING SHIM |
| E—SLEEVE ASSEMBLY | Q—ADJUSTING STRAP |
| F—SPRING STOP PIN | R—FLYWHEEL RING STUD NUT |
| G—LEVER LOCKING BALL | S—FLYWHEEL RING STUD NUT LOCK WASHER |
| H—PRESSURE LEVER | T—FLYWHEEL RING STUD |
| J—PRESSURE PLATE STUD | |
| K—RETRACTOR SPRING RETAINING PIN | |
| L—RETRACTOR SPRING RETAINING WASHER | |

RA PD 334413

Figure 2 — Clutch Pressure Plate Assembly — Disassembled

Pressure plate:

Adjusting shims—quantity under each strap

(new) 7 (6 steel, 1 copper)

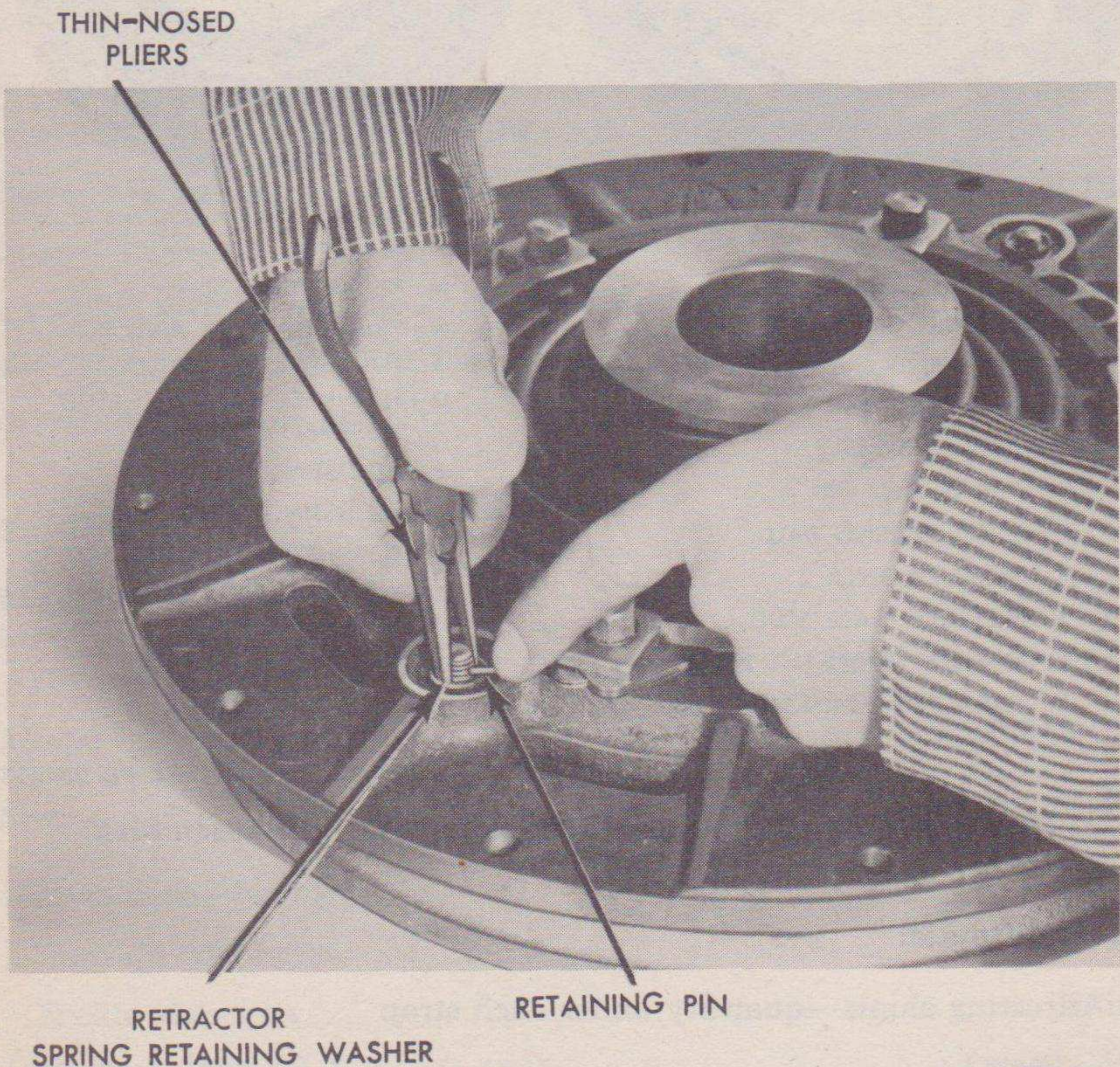
Pressure spring—pressure at 1¼-in. height..... 665 lb

Section II
CLUTCH COVER PLATE ASSEMBLY

5. DISASSEMBLY.

a. **Remove pressure plate assembly (fig. 3).** Place assembly on work bench, pressure plate down. Press down with thin-nosed pliers on retractor spring retaining washers and remove retractor spring retaining pins, washers, and four retractor springs. Lift flywheel ring assembly from pressure plate.

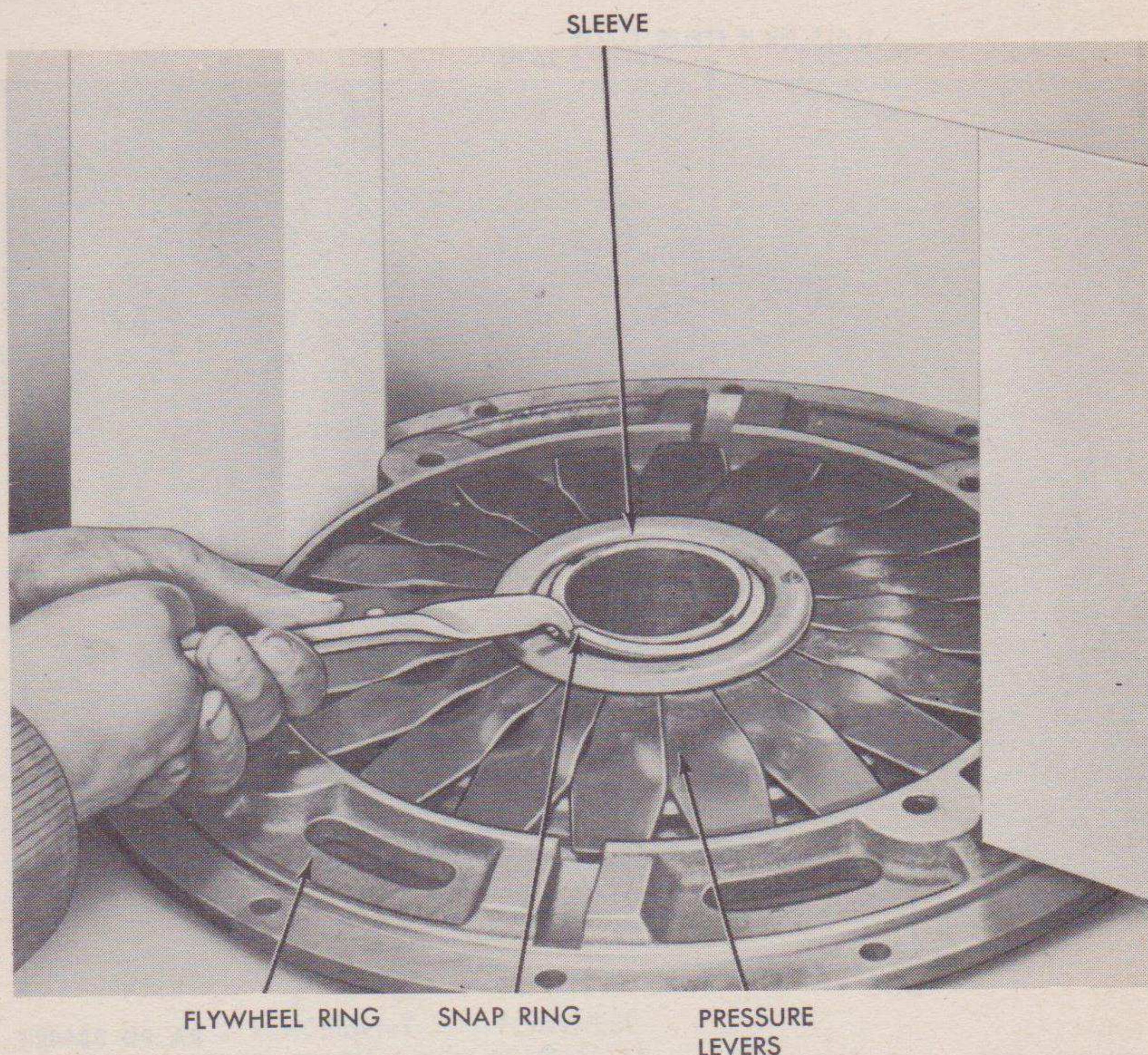
b. **Remove clutch release sleeve assembly (fig. 4).** Place flywheel ring assembly in a press with pressure levers up. Compress pressure spring to full extent. Remove snap ring with snap ring



RA PD 334416

Figure 3 — Removing Retractor Spring Pins

Clutch Cover Plate Assembly



RA PD 334415

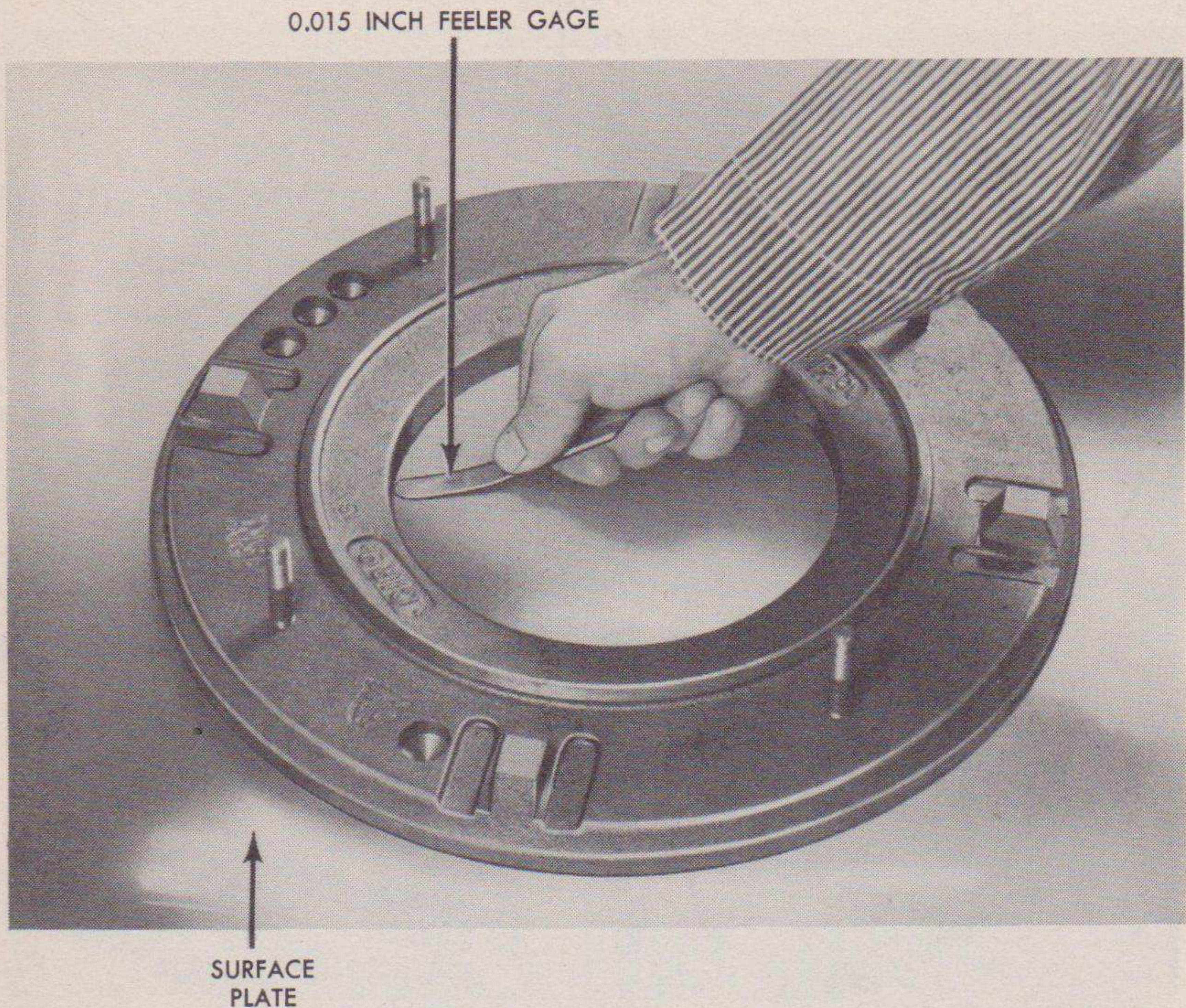
Figure 4 — Removing Fulcrum Ring Snap Ring

pliers. Lift off upper fulcrum ring, then remove 20 pressure levers and lever locking balls. Lift off lower fulcrum ring. Release pressure on press completely and raise flywheel ring assembly. The sleeve will then drop from the flywheel ring.

c. Remove adjusting plate. Remove six nuts and lock washers from flywheel ring studs, and lift adjusting straps from adjusting plate. Pull adjusting plate from flywheel ring. Remove adjusting shims from each flywheel ring stud (fig. 2).

6. CLEANING, INSPECTION, AND REPAIR.

a. Clean and inspect. Clean all parts (sleeve, fulcrum rings, levers, balls, and snap ring) thoroughly with dry cleaning solvent. Inspect all parts for excessive wear, roughness, or distortion. Replace all unserviceable parts.



RA PD 334423

Figure 5 — Testing Pressure Plate Distortion

b. **Pressure plate distortion** (fig. 5). Lay pressure plate, studs up, on a surface plate. At equal points around the outside rim and the bore rim, attempt to insert a 0.015-inch feeler gage. If at any point the gage can be inserted easily, reface the plate or replace the unit.

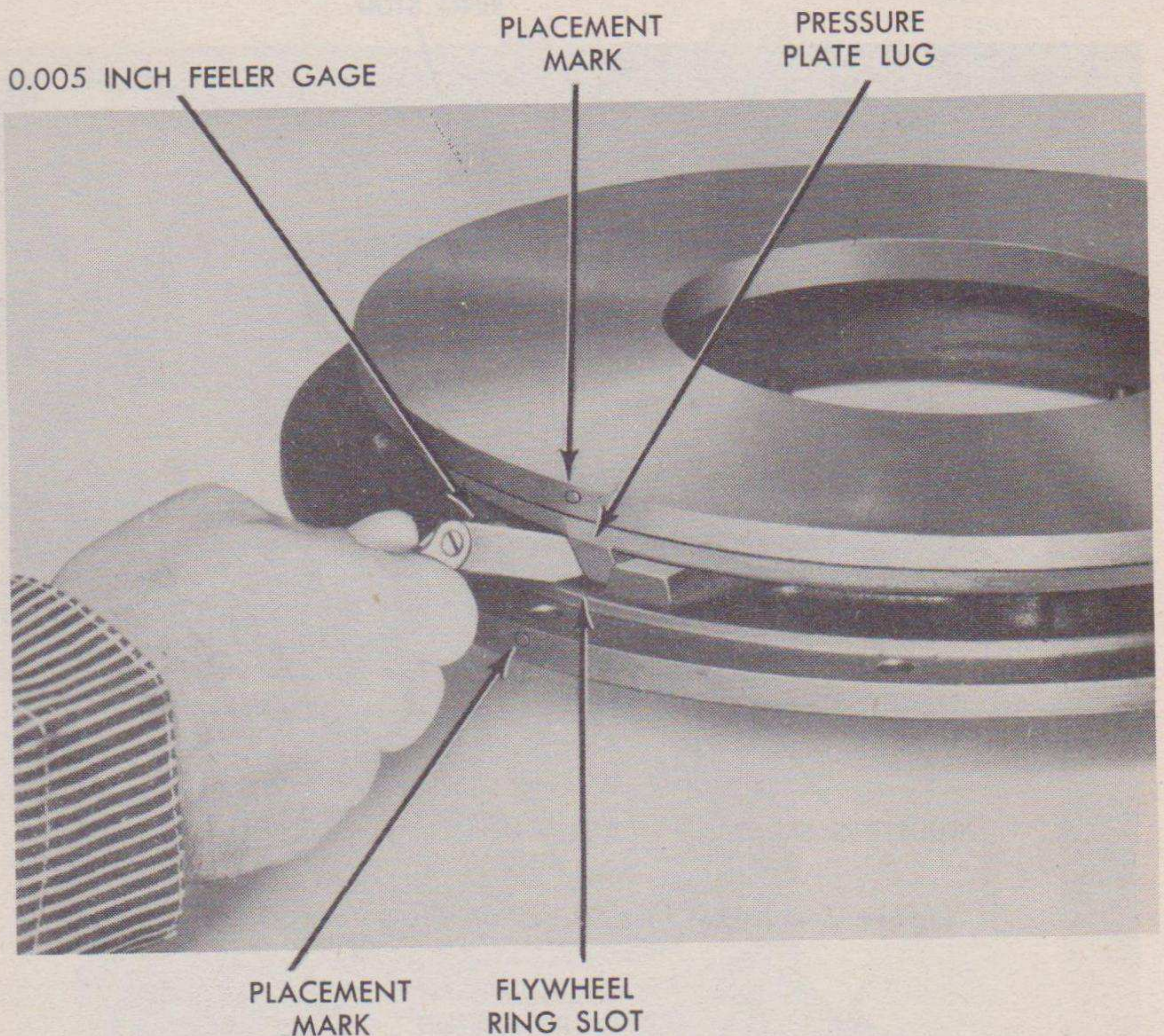
c. **Driving lugs and slots.** The clearance between the flywheel ring slots and the lugs on the pressure plate should not be less than 0.004 or more than 0.006 inch. If the clearance does not come within these limits, replace either or both the pressure plate and flywheel ring.

7. ASSEMBLY.

a. Install adjusting plate.

(1) **INSTALL SHIMS.** If the pressure plate is new or has not been resurfaced, place seven adjusting shims on each of six flywheel ring

Clutch Cover Plate Assembly



RA PD 334422

Figure 6 – Testing Lug and Slot Clearance

studs (six steel, with one copper shim on bottom), and line up inner edges of shims with inner edges of flywheel ring (fig. 7). If the pressure plate has been resurfaced, reduce the total shim thickness by the amount removed from the pressure plate.

(2) **INSTALL ADJUSTING PLATE.** Press adjusting plate into bore of flywheel ring and down onto adjusting shims. Install six adjusting straps (fig. 8), and install and tighten toothed lock washers and nuts on all studs.

b. Install sleeve in flywheel ring. Place clutch sleeve, flange down, on base of press. Lay pressure spring, large end up, with end of coil (at small end) butting against boss on clutch sleeve flange. Place flywheel ring assembly on top of coil, with end of spring butting against boss on adjusting plate (fig. 1). Place wood block arbor

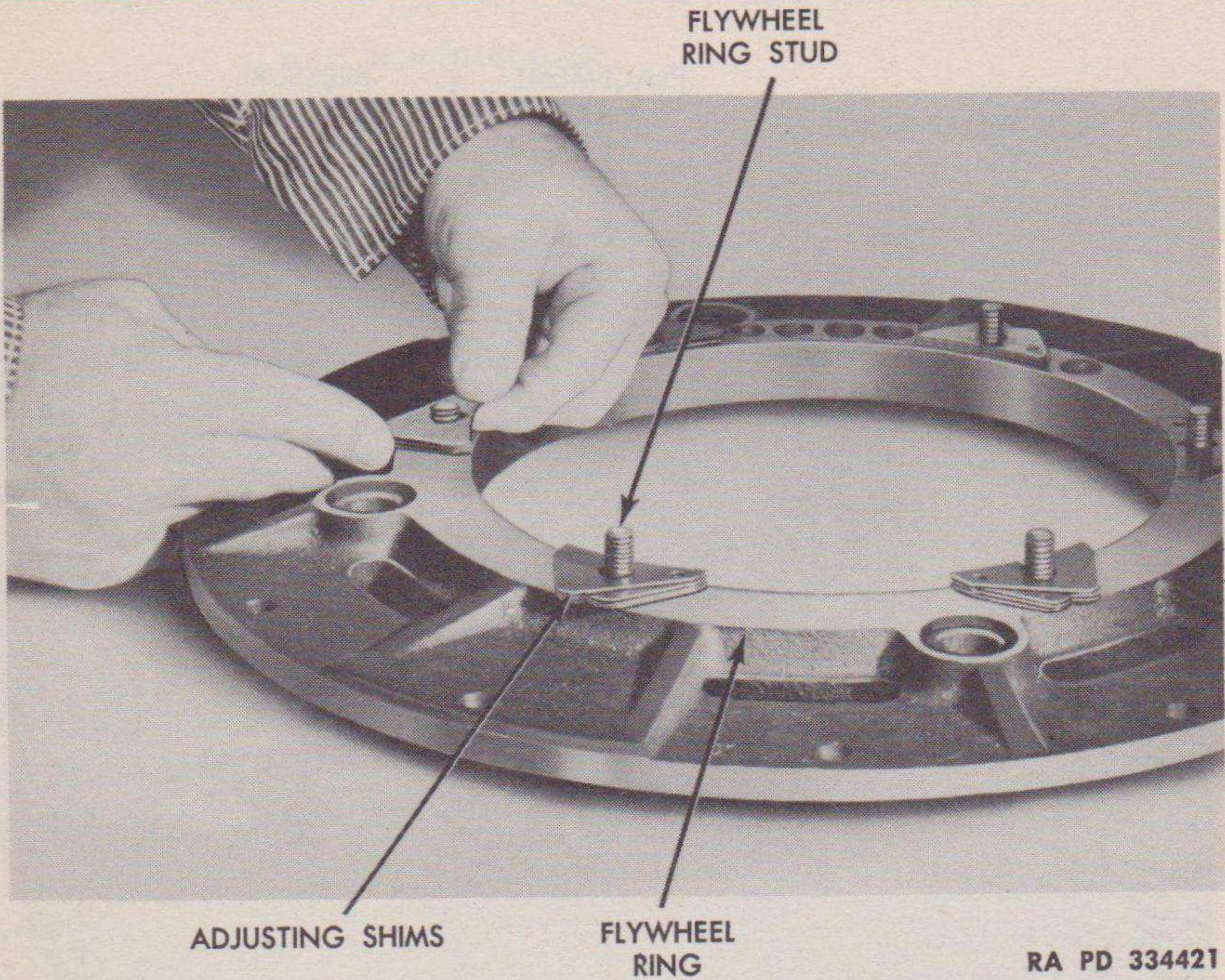


Figure 7 — Installing Shims on Flywheel Ring

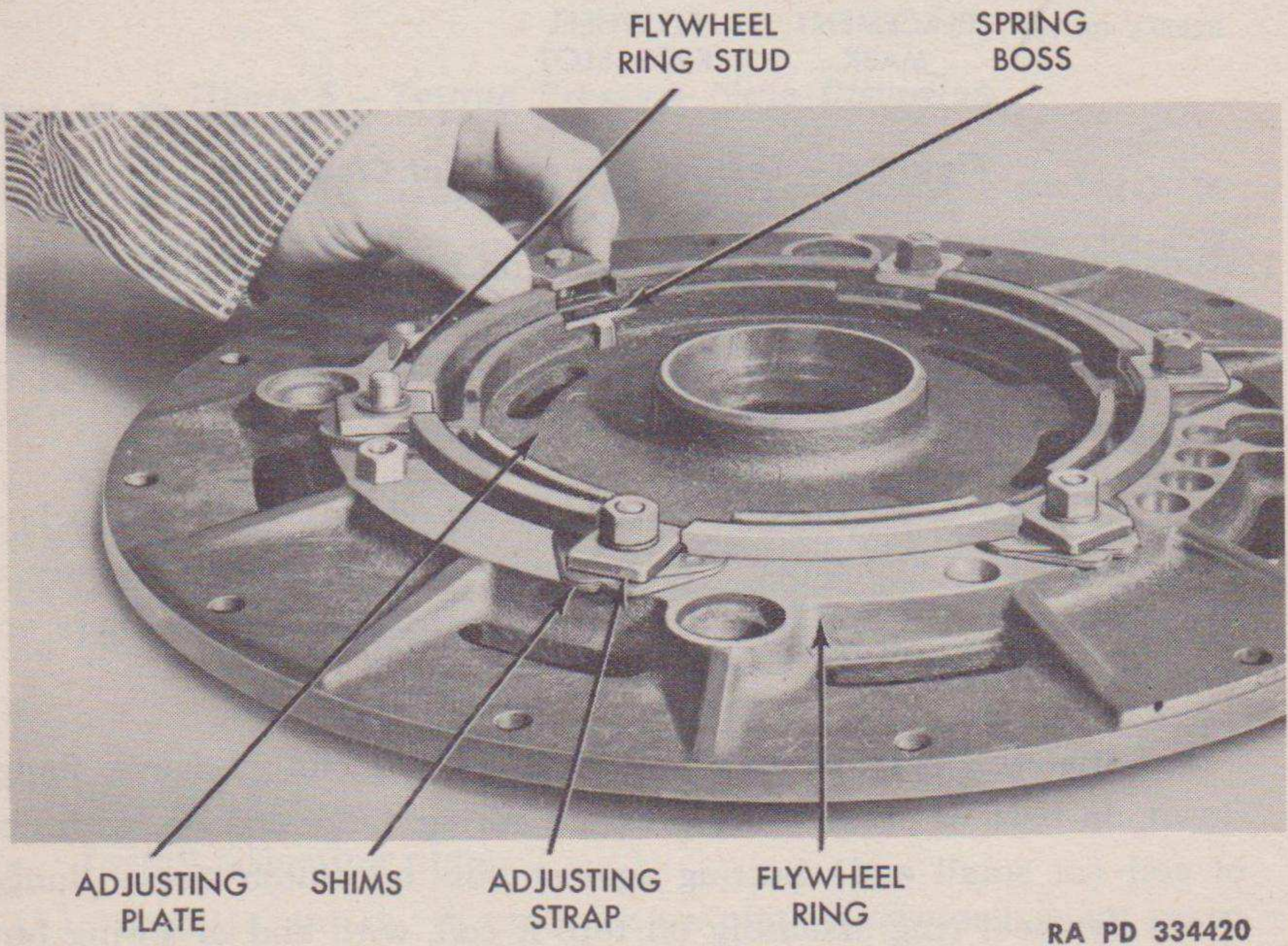
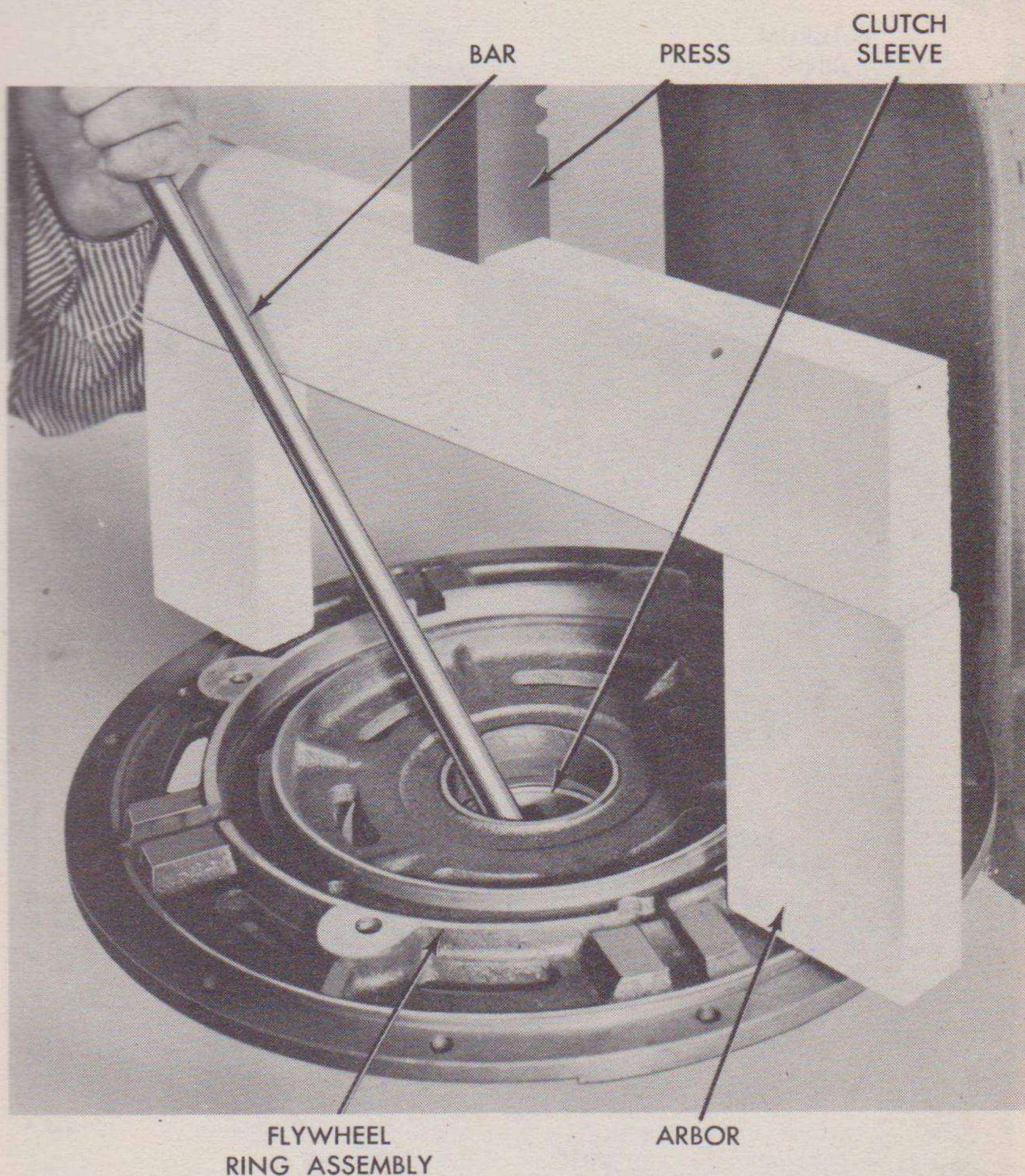


Figure 8 — Installing Adjusting Straps

Clutch Cover Plate Assembly



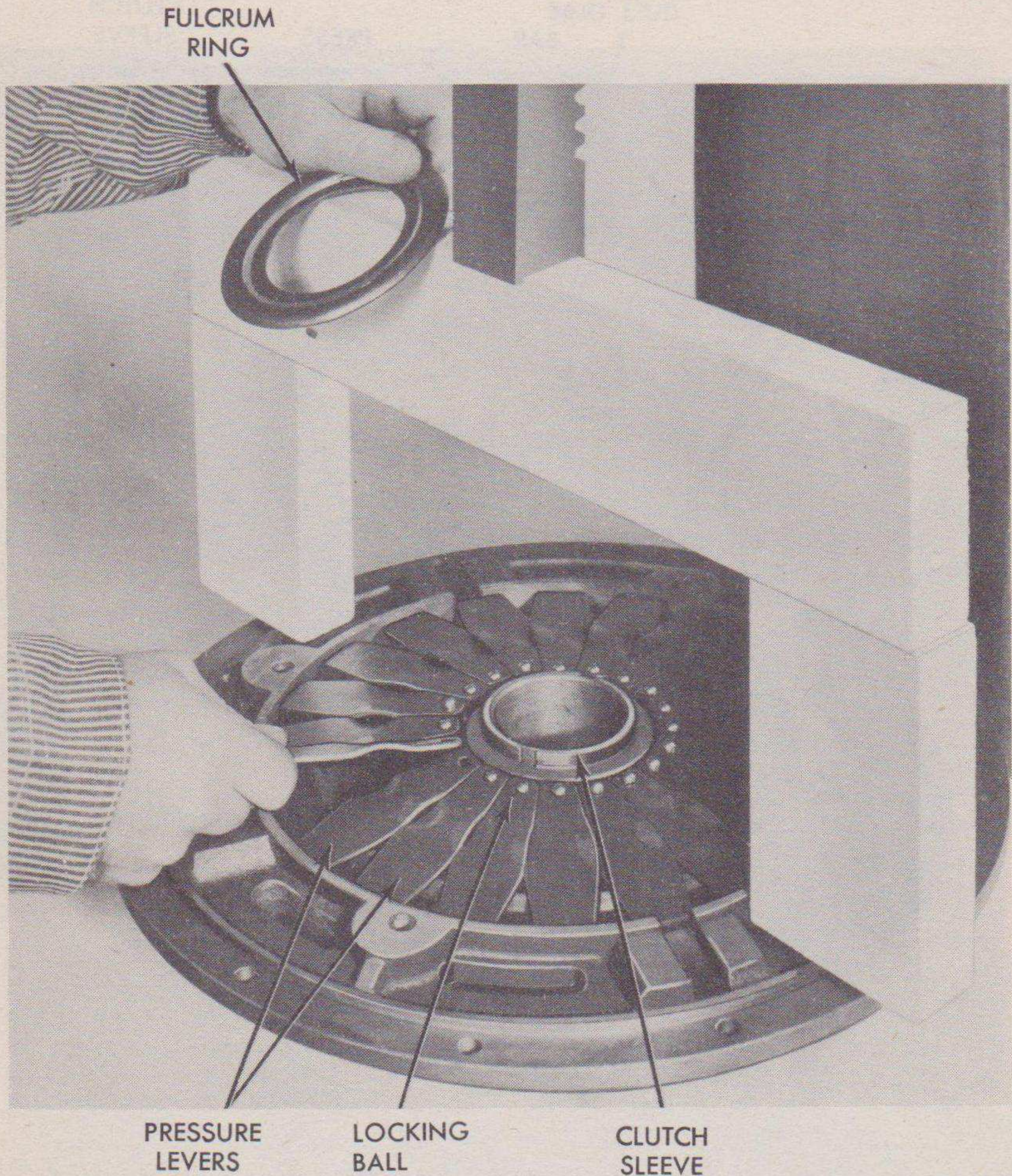
RA PD 334418

Figure 9 – Guiding Clutch Sleeve in Bore

in position, compress pressure spring guiding sleeve through adjusting plate bore (fig. 9), and lock press in position.

c. Install pressure levers. Lay fulcrum ring over sleeve. Place 20 pressure levers in position (fig. 10), and insert locking balls. **CAUTION:** *Be sure no levers overlap and that all balls are in position.*

d. Install snap ring. Lay top fulcrum ring over sleeve, balls, and inner ends of levers. Press snap ring on sleeve and tap lightly



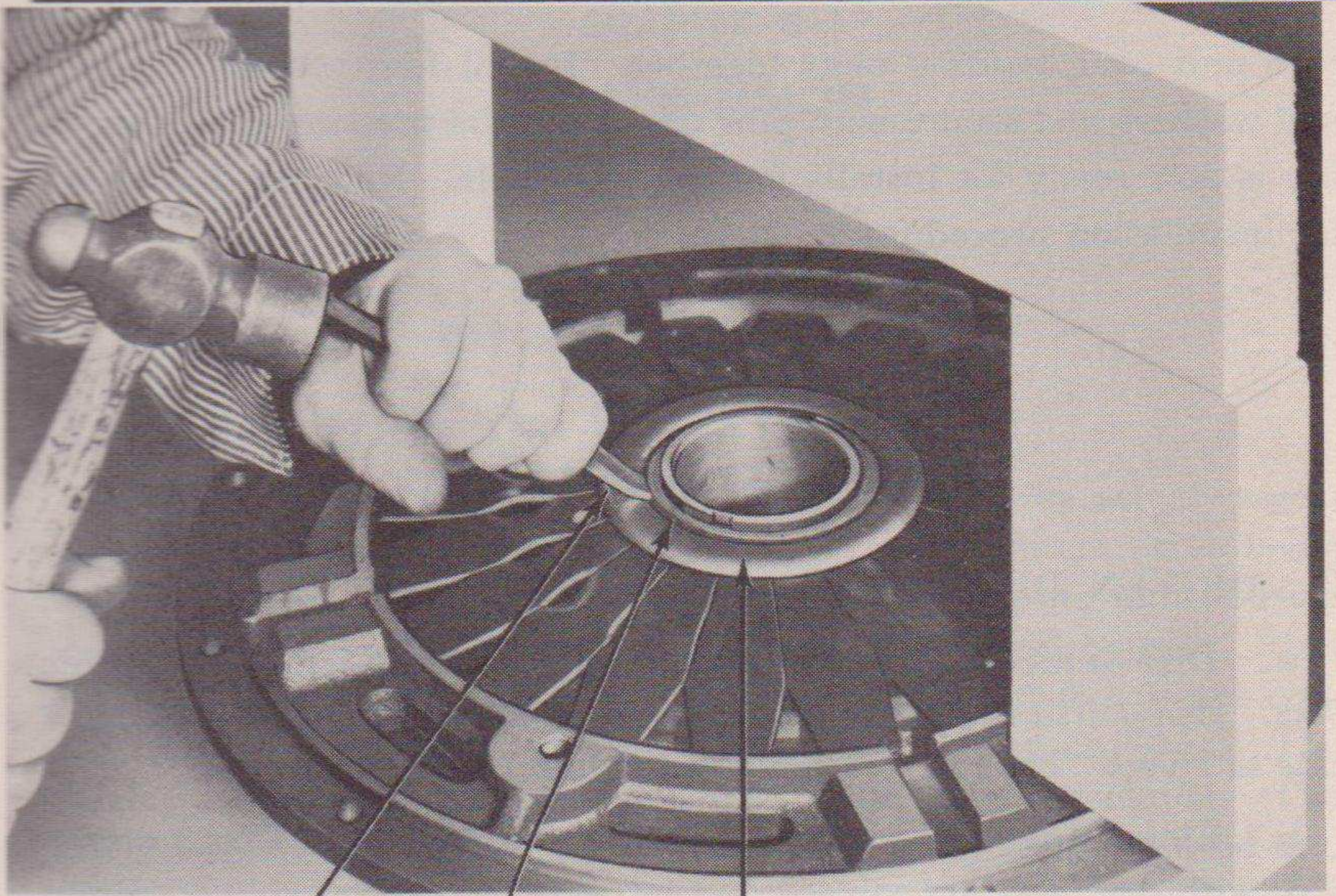
RA PD 334419

Figure 10 — Installing Pressure Levers and Balls

around ring until it seats on fulcrum ring. Place opening in snap ring away from slots in sleeve. Using staking tool, tap snap ring securely into sleeve groove (fig. 11). Release press slowly.

e. Install pressure plate. Lay flywheel ring and clutch sleeve assembly on bench, pressure levers up. Hold pressure plate (fig. 12) and line up "0" marks on rims of both assemblies. Lower pressure plate, guiding lugs into slots of flywheel ring. When these are engaged,

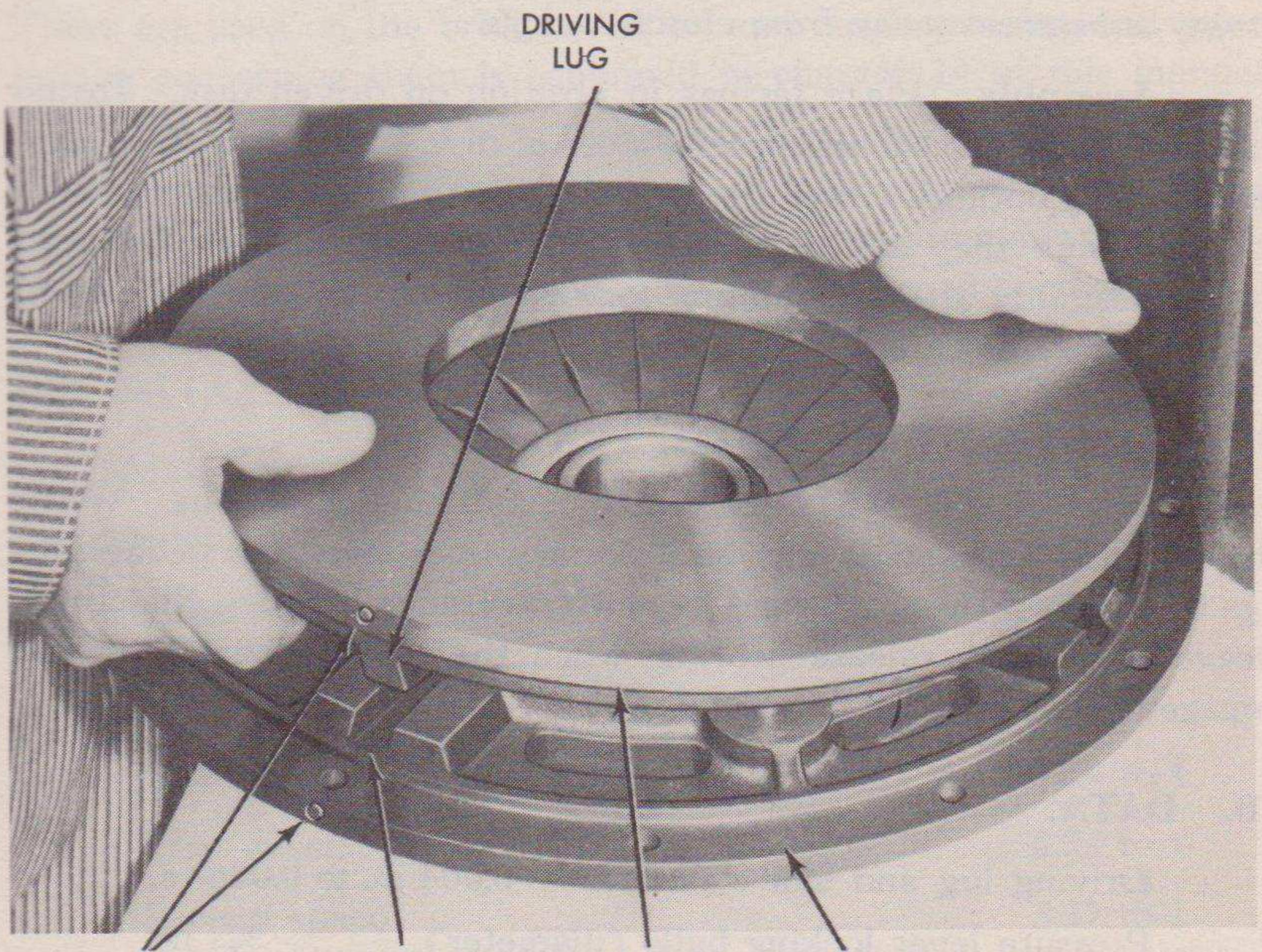
Clutch Cover Plate Assembly



STAKING TOOL SNAP RING FULCRUM RING

RA PD 334424

Figure 11 – Staking Snap Ring Into Groove



DRIVING LUG
PLACEMENT MARKS FLYWHEEL RING SLOT PRESSURE PLATE FLYWHEEL RING

RA PD 334417

Figure 12 – Installing Pressure Plate

turn unit over, holding units together. Install four retractor springs and washers and secure with pins (fig. 1). The pressure plate assembly is now ready for installation in the vehicle. Refer to TM 9-813 for installation procedure.

Section III

DRIVEN DISK AND FACINGS

8. DRIVEN DISK AND FACINGS.

a. **Disassembly.** Drill out 36 rivets holding facings on driven disk. Use a drill slightly smaller than rivet shank and drill from head side of rivets. **NOTE:** *Do not remove hub from driven disk.*

b. **Clean, inspect, and repair disk and facings.** Clean driven disk with dry cleaning solvent and inspect for cracked splines, rough spots, or burs. Dress all rough spots with hand stone. Lay driven disk on surface plate and inspect for distortion or warping (par. 6, fig. 5). Replace all unserviceable parts. **NOTE:** *Keep all oily or greasy substances away from clutch facings.*

c. **Assembly.** Place facings in position on driven disk. Install and tighten two rivets on opposite sides of disk. Alternate rivet head installations until all rivets are installed, then tighten. Inspect rivets to make sure they are tight and below facings. Inspect disk and facing assembly after installation for distortion. If distorted, install complete new assembly.

9. ADJUSTMENT OF PEDAL TRAVEL.

a. Refer to TM 9-813 for clutch installation directions. When the clutch is installed, it may be necessary to readjust the pedal linkage to obtain between $\frac{1}{8}$ - and $\frac{5}{32}$ -inch clearance between the clutch sleeve and clutch release bearing, when the clutch pedal is in the engaged (out) position.

10. DATA.

Driving lug and slot clearance.....	0.004 in. to 0.006 in.
Pressure lever locking balls (diameter).....	$\frac{9}{32}$ in.
Spline diameter	1 $\frac{3}{4}$ in.
Spring pressure, compressed 1 $\frac{1}{4}$ in.....	665 lb

CHAPTER 3 TRANSMISSION

Section I DESCRIPTION AND DATA

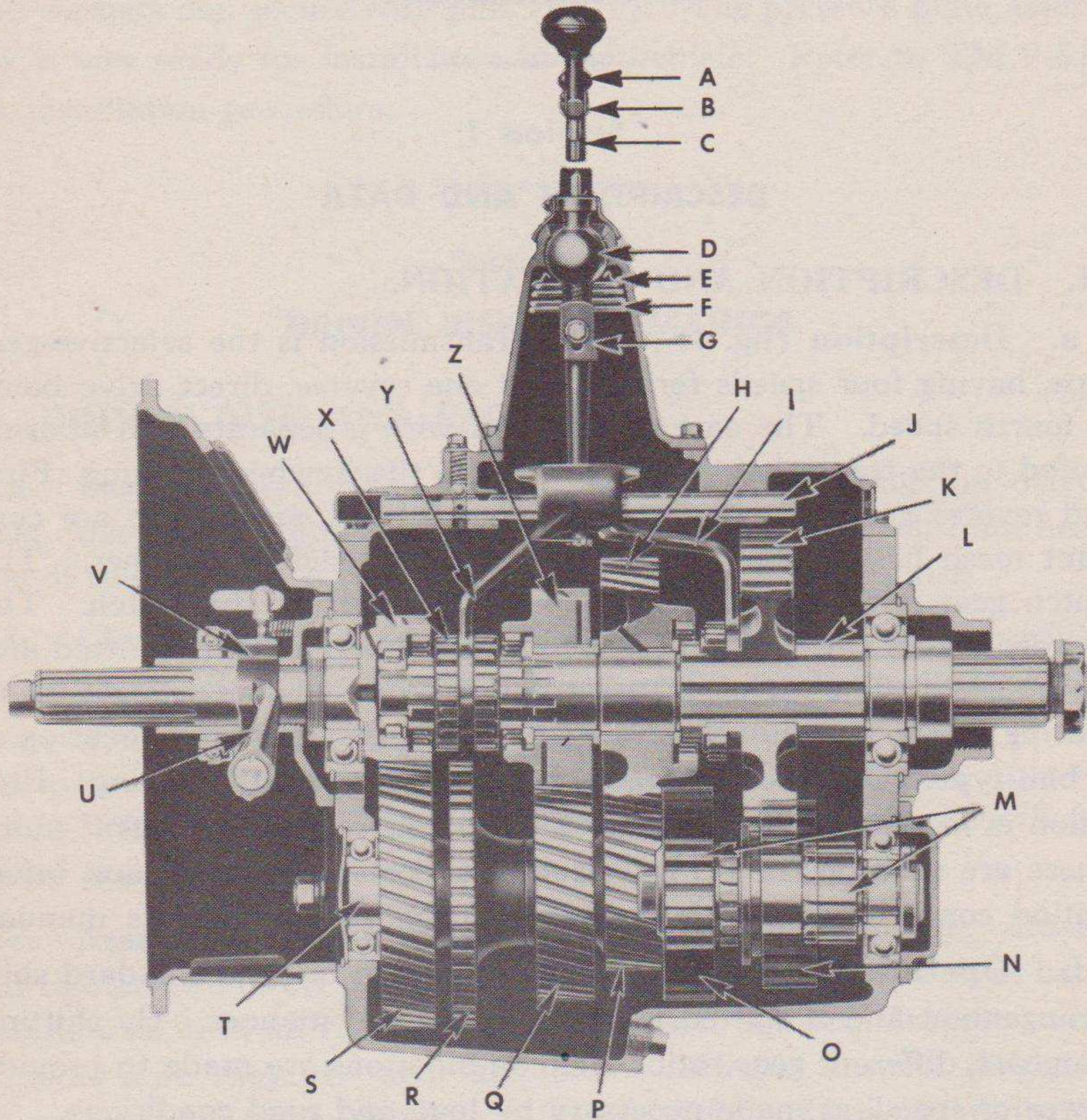
11. DESCRIPTION AND OPERATION.

a. **Description** (fig. 13). The transmission is the selective-gear type, having four speeds forward and one reverse, direct drive being in fourth speed. The case is cast iron with a separate bell housing bolted to the transmission and directly to the flywheel housing. First and reverse gears are spur type. Second, third, and fourth are constant mesh helical gears and are engaged by sliding clutches. The clutch gear is driven through a splined shaft from the clutch. The forward end of this clutch gear is mounted in a ball bearing fitted into the housing. The mainshaft pilot end is mounted in a straight roller bearing inside the clutch drive gear. The rear mainshaft bearing is of ball type. The countershaft is mounted in two ball bearings. Provision is made on both sides for attachment of power take-off units. These are used on the bridge erection and crane vehicles, and information concerning them is contained in chapter 14 of this manual.

b. **Operation** (fig. 14). The transmission has the standard shift arrangement and is shifted in the conventional manner. By shifting the gears, different gear ratios and combinations are made to provide power or speed, as made necessary by load and road conditions.

12. DATA.

Make	Fuller
Model	4A-86
Bell housing	SAE No. 1
Gear ratios:	
Reverse	7.24 to 1
First speed	6.54 to 1
Second speed	3.27 to 1
Third speed	1.76 to 1
Fourth speed	1.00 to 1



A—LEVER SPOON LATCH
B—GEARSHIFT LEVER
C—LEVER LATCH ROD
D—GEARSHIFT LEVER BALL
E—SPRING RETAINER WASHER
F—SPRING
G—REVERSE STOP PLATE
H—SECOND SPEED GEAR
I—FIRST AND SECOND SPEED SHIFTING FORK
J—THIRD AND FOURTH SPEED YOKE BAR

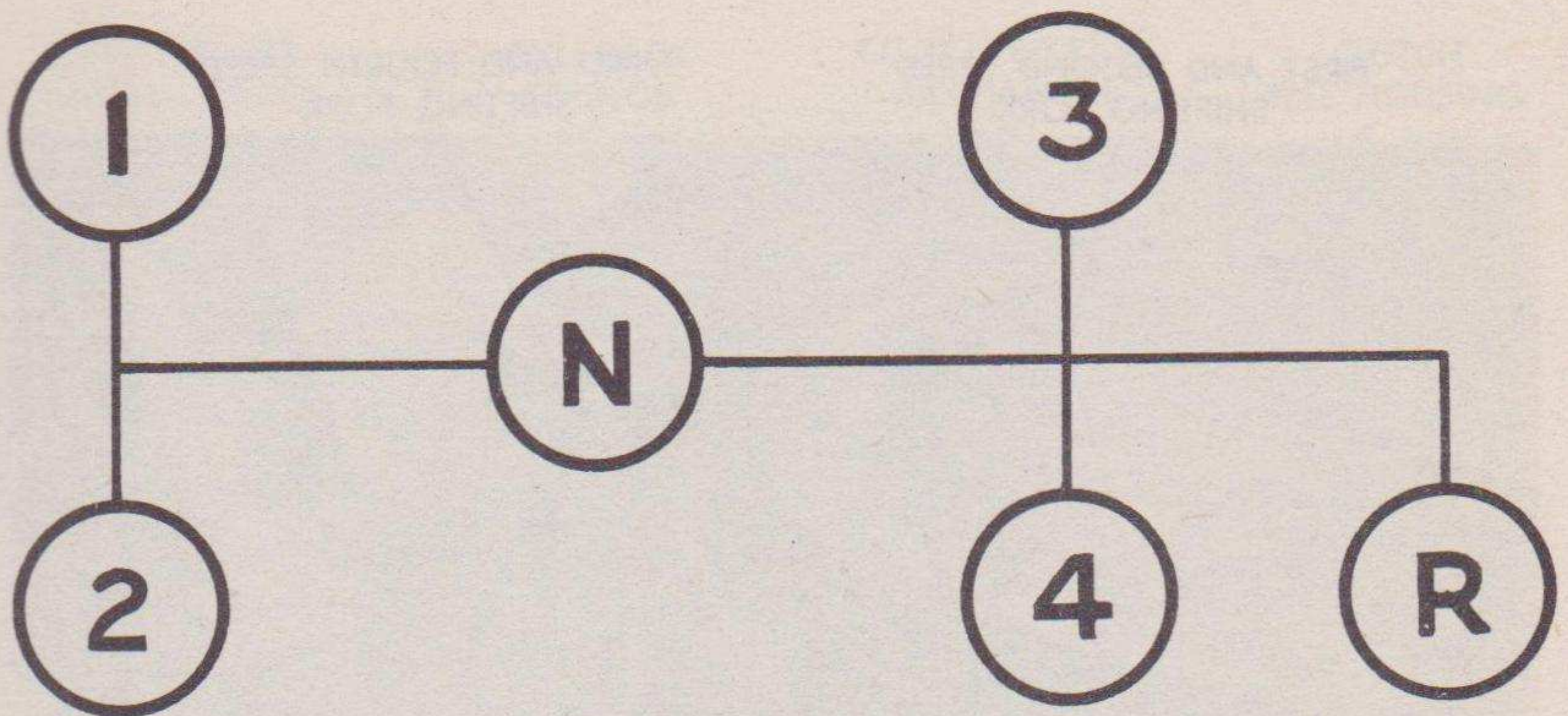
K—FIRST SPEED SLIDING GEAR
L—MAINSHAFT
M—COUNTERSHAFT GEARS (FIRST AND REVERSE)
N—IDLER GEAR (PHANTOM)
O—REVERSE IDLER GEAR (PHANTOM)
P—COUNTERSHAFT, SECOND SPEED GEAR
Q—COUNTERSHAFT, THIRD SPEED GEAR
R—POWER TAKE-OFF GEAR

S—COUNTERSHAFT DRIVE GEAR
T—COUNTERSHAFT
U—CLUTCH RELEASE YOKE
V—CLUTCH RELEASE ASSEMBLY
W—CLUTCH MAIN DRIVE GEAR
X—SLIDING CLUTCH GEAR
Y—THIRD AND FOURTH SPEED SHIFTING FORK
Z—THIRD SPEED GEAR

RA PD 353218

Figure 13 — Transmission — Sectional View

Disassembly Into Subassemblies



RA PD 334399

Figure 14 — Gearshift Diagram

Bearings:

Countershaft (front)	MRC 309-MF
Countershaft (rear)	MRC 310-MFG
Mainshaft (rear)	MRC 312-SG
Drive gear	MRC 311-MFG
Reverse idler	Fuller 5242, Hyatt 95732
Mainshaft pilot ..	Fuller 5892, Morma-Hoffman R-335-LR, Bower BS-1307B
Clutch release	B. C. of A., CTDES-88
Weight	420 lb

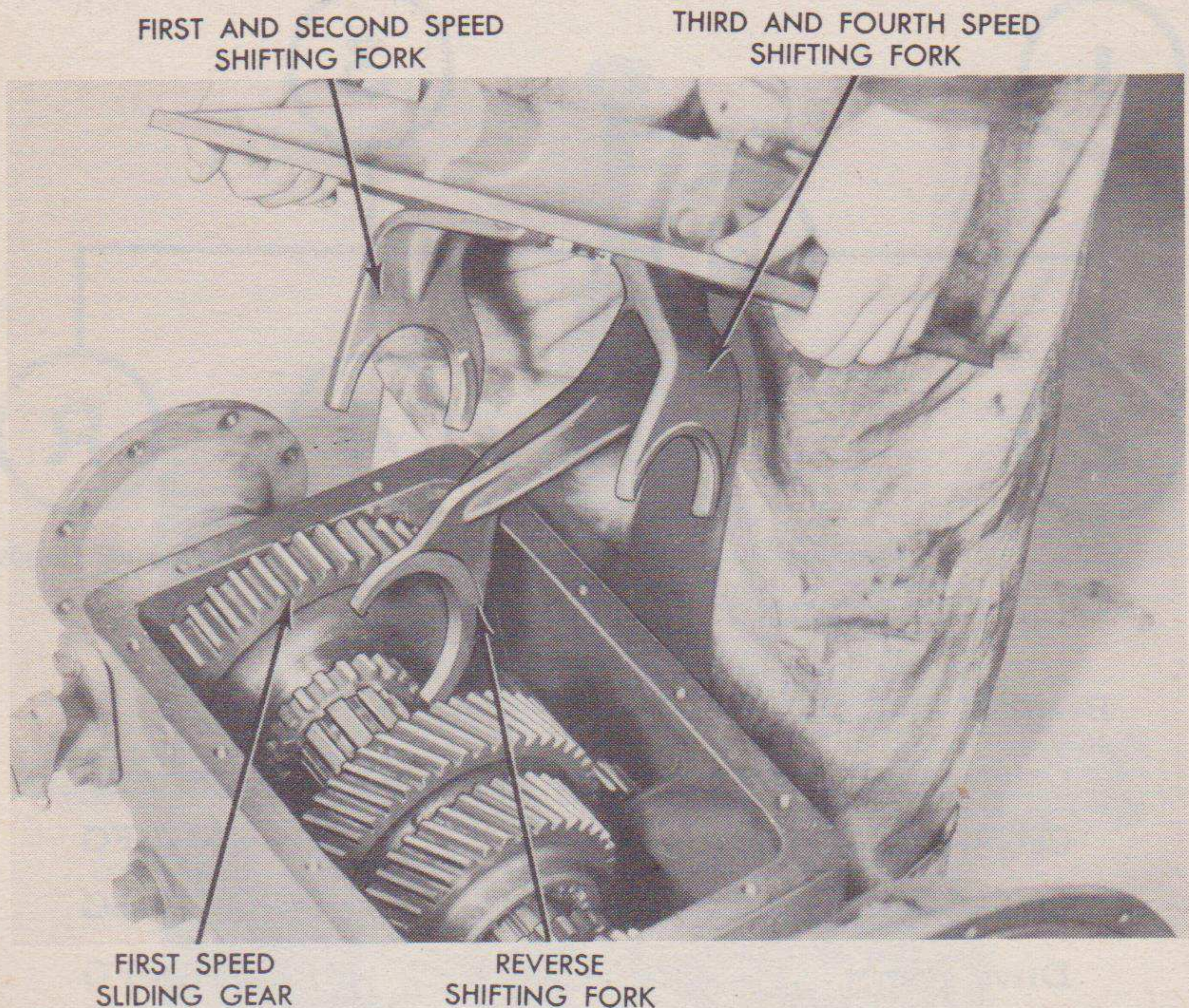
Section II

DISASSEMBLY INTO SUBASSEMBLIES

13. PRELIMINARY INSTRUCTIONS.

a. **Remove transmission.** Refer to TM 9-813 for instructions on removing transmission.

b. **Cleaning.** Remove all foreign material from the exterior of the transmission with a wire brush and a putty knife. Place the unit in a container of dry cleaning solvent and wash thoroughly. Wipe



RA PD 334404

Figure 15 — Removing Shifting Bar Housing

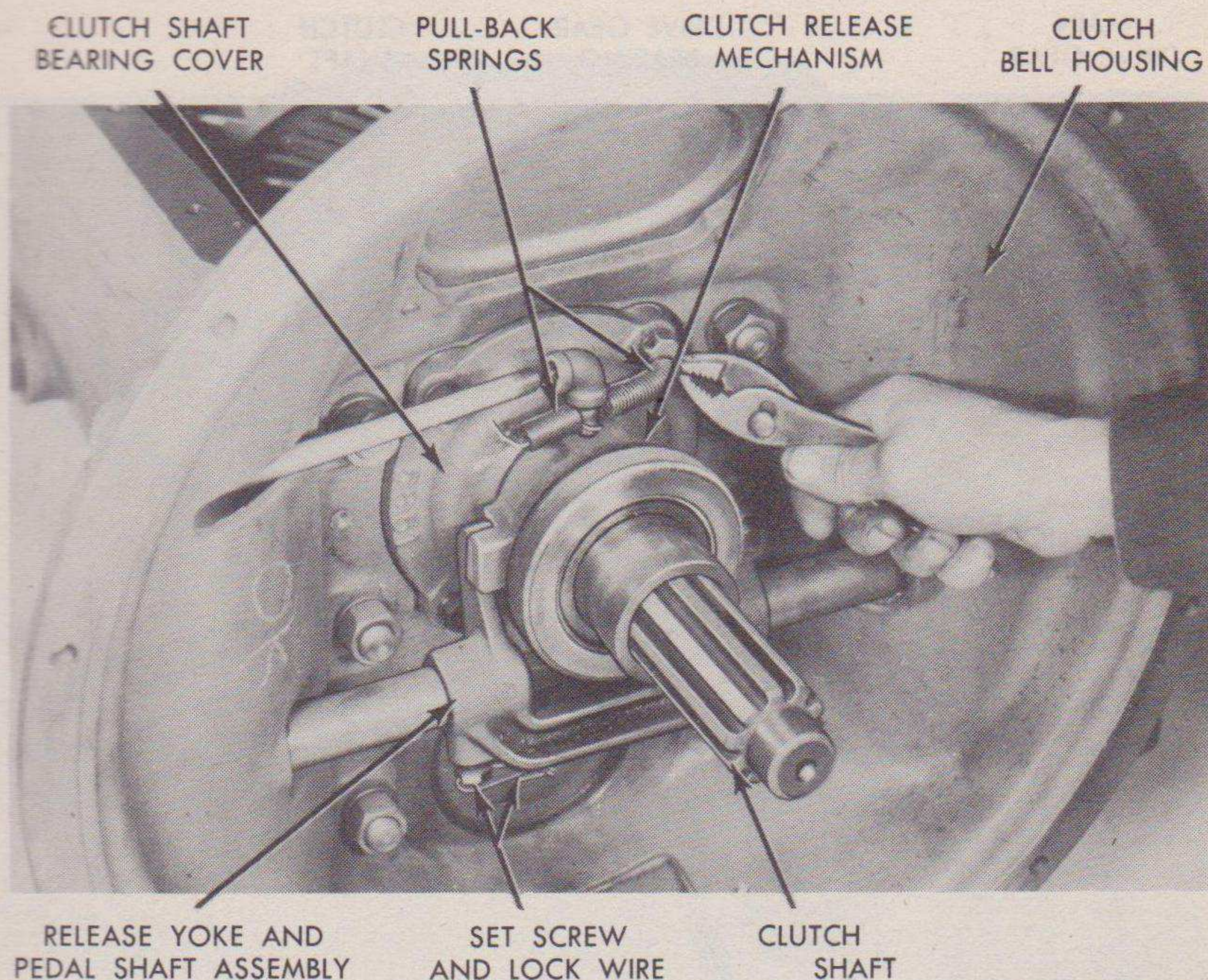
dry with clean cloth. Keep all dirt or foreign material from the transmission. **NOTE:** *As disassembly proceeds, clean all parts and wrap in paper or cloth.*

14. DISASSEMBLY OF TRANSMISSION.

a. **Remove gearshift lever housing assembly (fig. 23).** Unscrew drain plug at bottom rear of transmission and drain lubricant. Shift the transmission into first speed position. Remove four cap screws and lock washers from gearshift lever housing, and lift gearshift lever assembly from the transmission.

b. **Remove shifting bar housing assembly.** Place assembly in first speed position. Remove 12 cap screws and lock washers that attach housing assembly to the transmission, and lift from the case. Guide edge of reverse shifting fork (fig. 15) into and up through the space between first speed sliding gear and countershaft gears until clear, and then remove assembly from transmission.

Disassembly Into Subassemblies



RA PD 334412

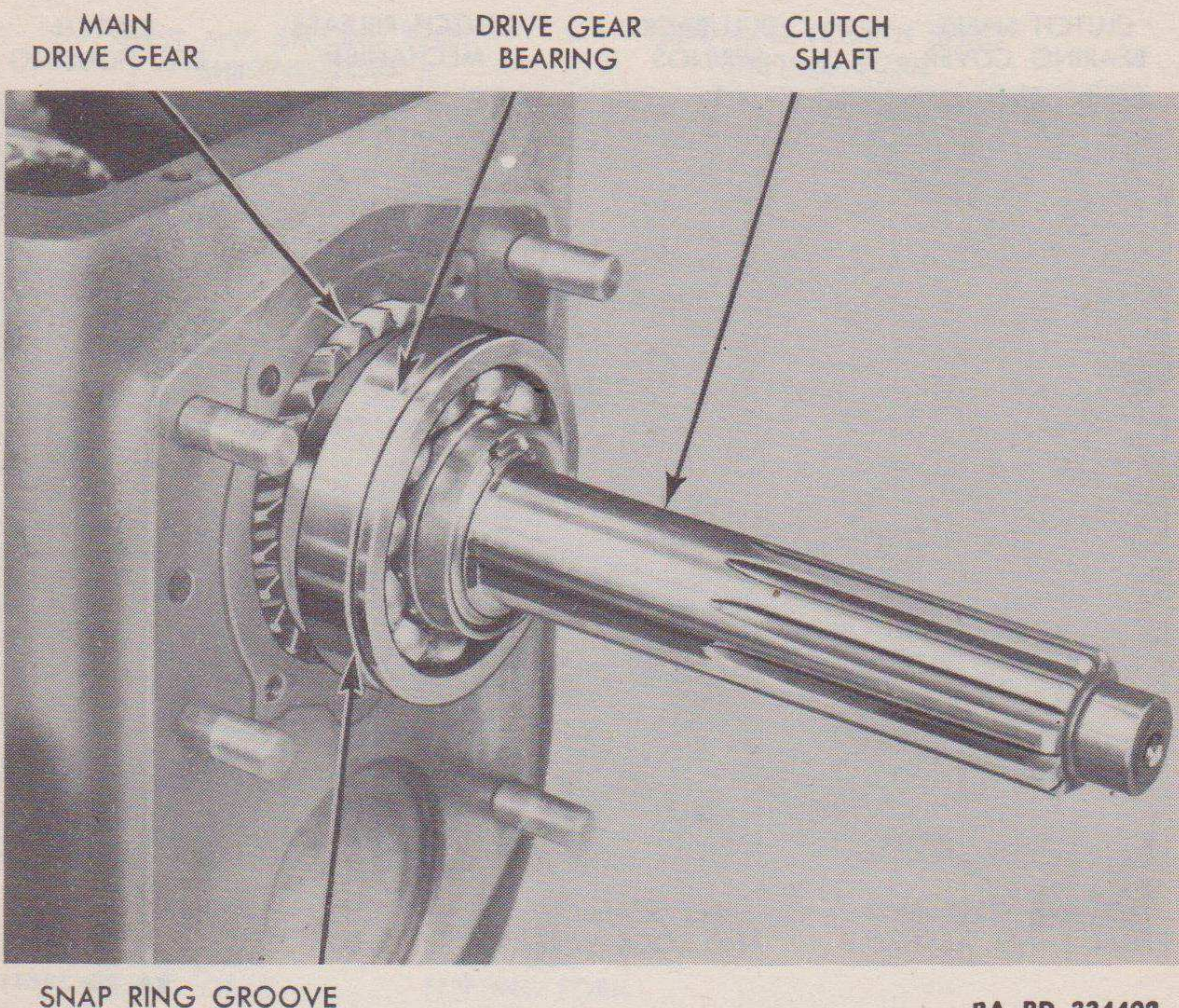
Figure 16 — Removing Pull-back Springs From Clutch Release Mechanism

c. Remove clutch release assembly (fig. 16).

(1) **REMOVE BEARING CARRIER.** Unscrew lubrication pipe from elbow of clutch release mechanism. Unhook bearing carrier pull-back springs from cap screws of front bearing cover. Slide bearing carrier forward and remove from clutch shaft.

(2) **REMOVE CLUTCH PEDAL SHAFT.** Cut lock wire and remove screws from clutch release yoke. Drive short pedal shaft from yoke and housing, applying force against inside end. Drive long pedal shaft from yoke in the same direction. Remove Woodruff key assembled in inner end, and withdraw shaft. Remove six nuts and lock washers and pull bell housing from transmission. **CAUTION: Do not bur dowel pin holes, dowels, or machined surfaces, since these determine alignment between engine and transmission.**

d. Remove clutch shaft and drive gear. Remove four cap screws that attach drive gear bearing cover to housing and remove cover.



SNAP RING GROOVE

RA PD 334402

Figure 17 — Removal of Clutch Shaft and Drive Gear

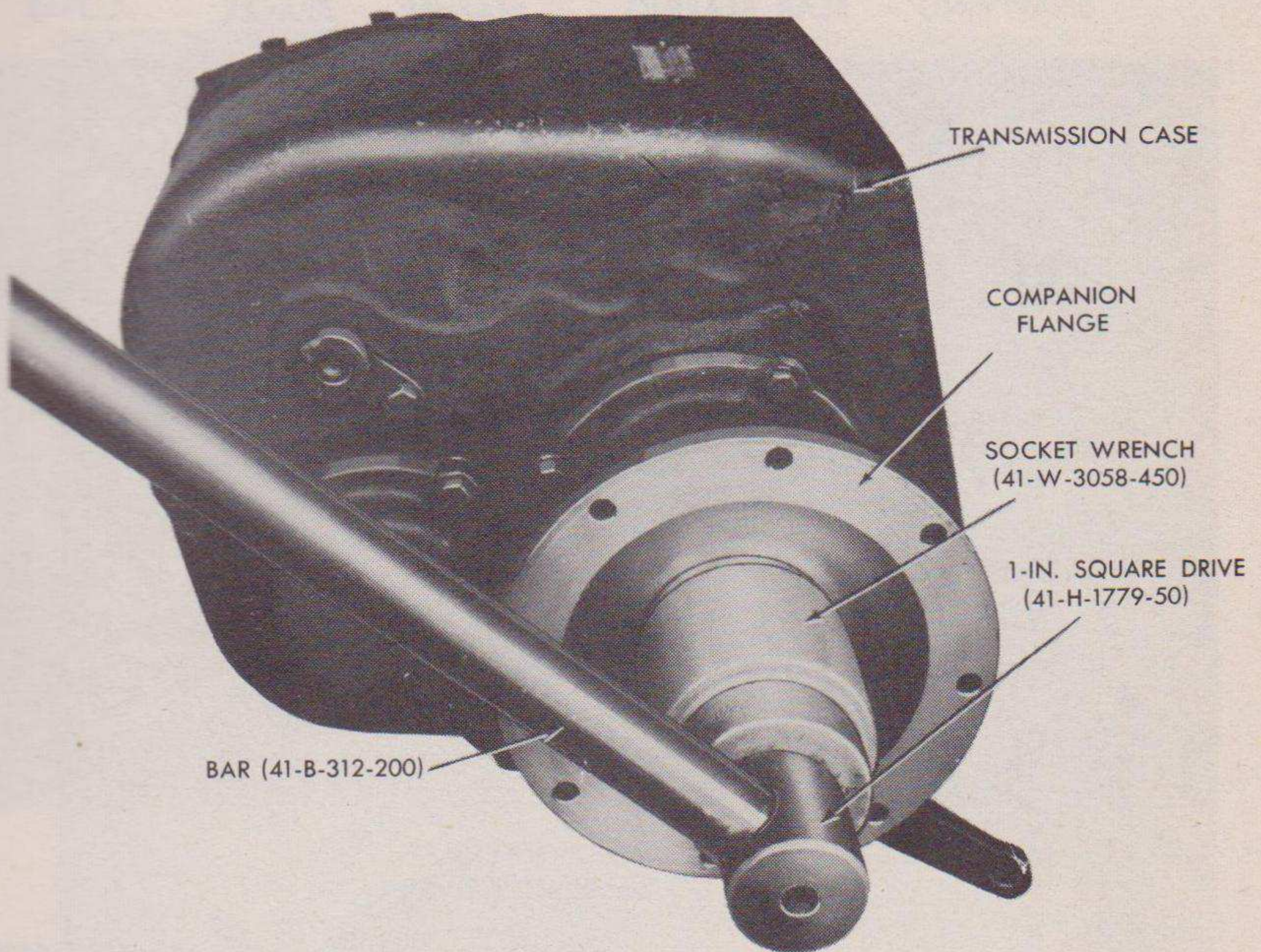
Pry snap ring from bearing. Place a pinch bar in snap ring groove, pry bearing shaft and drive gear forward (fig. 17), and remove from housing.

e. Remove mainshaft assembly.

(1) **REMOVE COMPANION FLANGE** (fig. 18). Lock transmission by moving first speed sliding gear up against case. Remove cotter pin, nut, and washer from rear end of mainshaft. Use bar (41-B-312-200), 1-inch square drive head (41-H-1779-50), and socket wrench (41-W-3058-450) and remove companion flange nut. Remove companion flange. Remove four cap screws and lock washers from mainshaft rear bearing cover and remove cover, spacer, and plain washer (fig. 19).

(2) **REMOVE REAR MAINSHAFT BEARING.** Pry snap ring from rear mainshaft bearing. Using a soft drift and hammer, drive on opposite end to remove mainshaft rear bearing from case. Use a puller to remove mainshaft rear bearing from mainshaft.

Disassembly Into Subassemblies



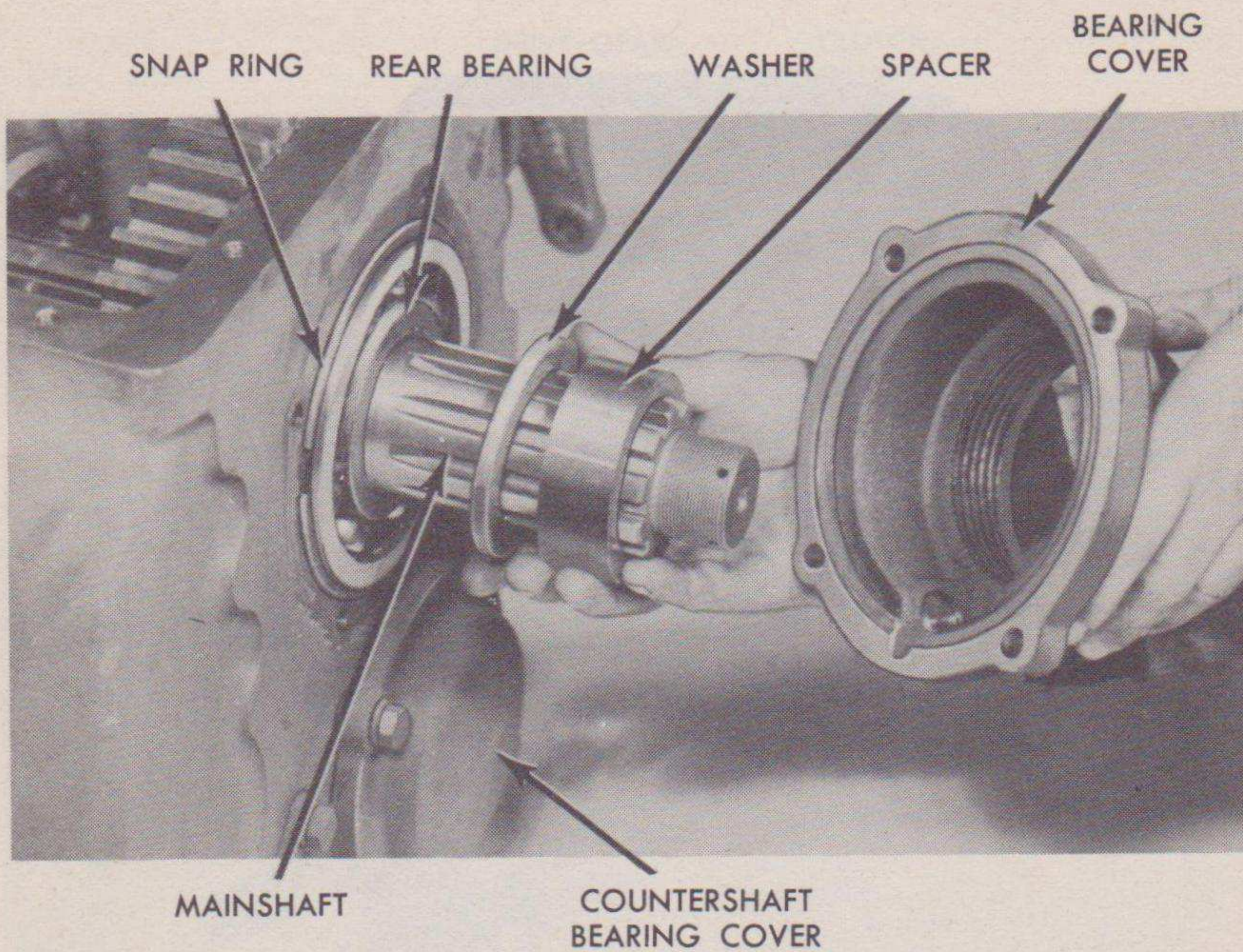
RA PD 353219

Figure 18 — Removal of Companion Flange Nut

(3) **REMOVE MAINSHAFT ASSEMBLY FROM HOUSING.** Tilt forward end of mainshaft assembly upward and withdraw it through top of case, leaving first speed sliding gear inside. Remove loose sliding gear from the case.

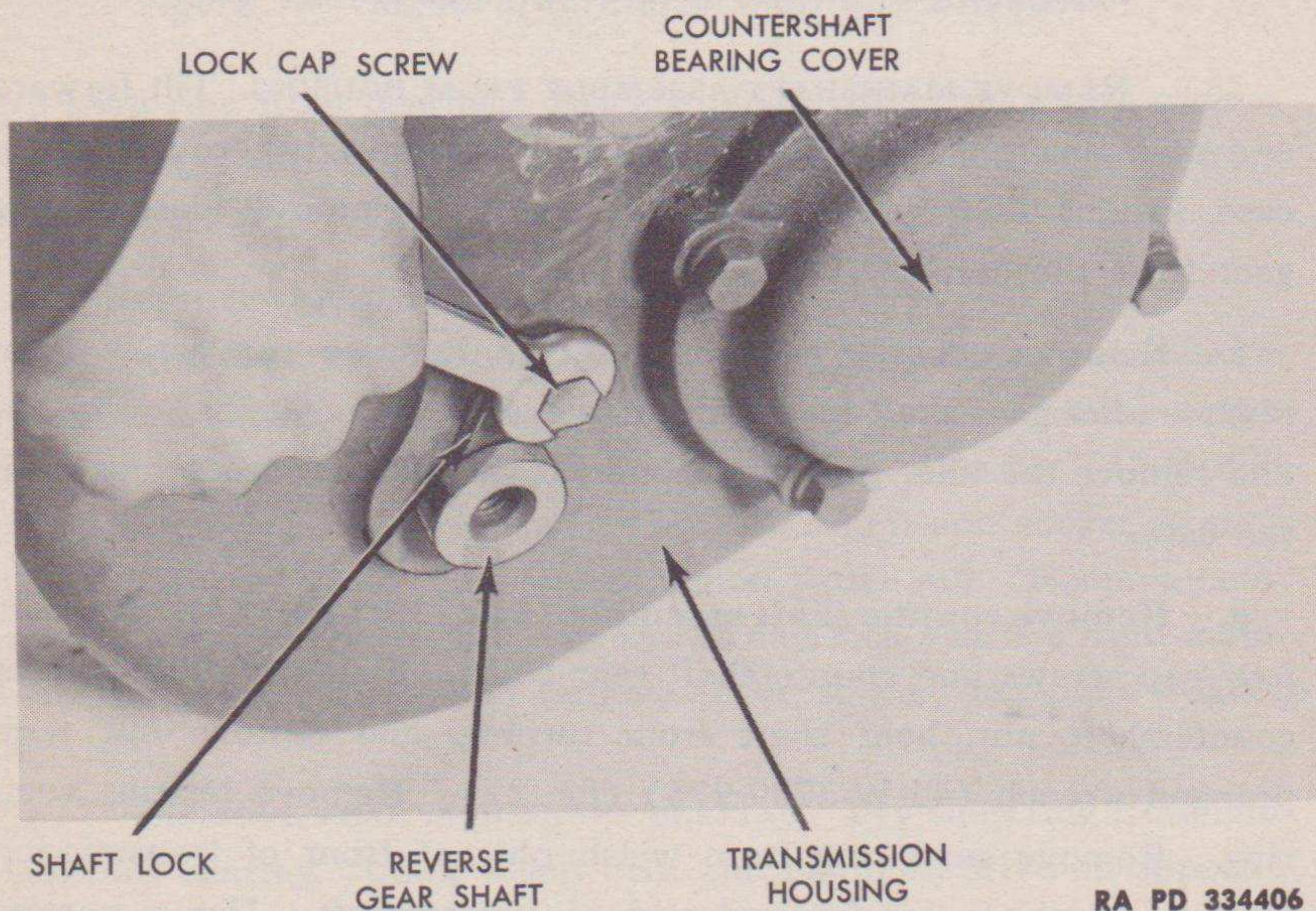
f. **Remove reverse gear assembly.** Remove cap screw from reverse idler gear shaft lock and remove shaft lock (fig. 20). Pry out and remove the idler gear shaft, and lift the gears and bearings from the case.

g. **Remove countershaft assembly** (figs. 13, 21 and 22). Remove four cap screws and countershaft rear cover. Remove staking from countershaft nut, hold shaft from turning, and remove nut with pronged wrench (41-W-3739-975) (fig. 22). Remove bearing snap ring. Remove snap ring from welsh plug at front of transmission housing which covers forward end of countershaft. Use a narrow chisel to puncture the welsh plug at the center and remove welsh



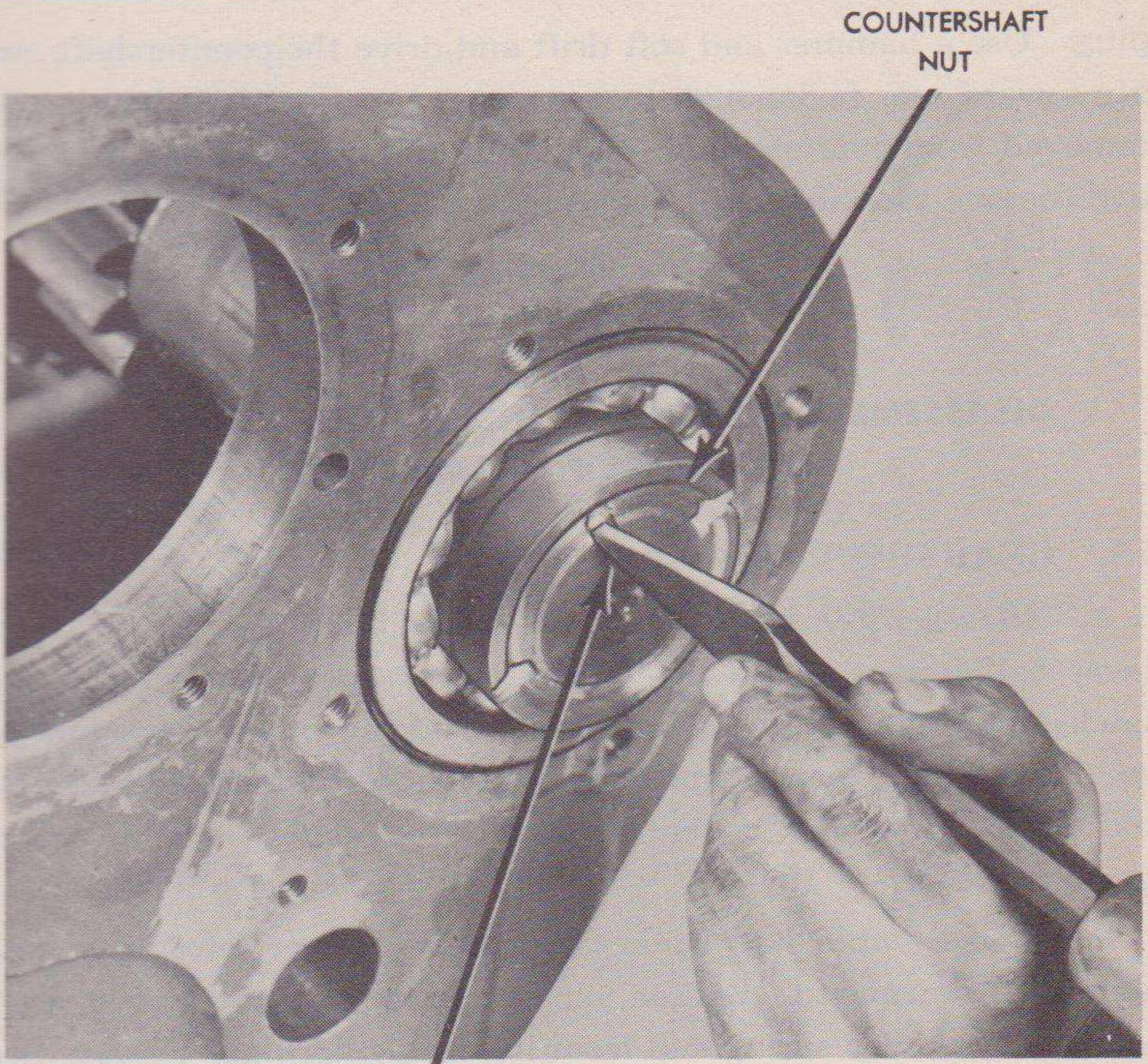
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Figure 19 — Removing Mainshaft Rear Bearing Cover, Spacer, and Washer



RA PD 334406

Figure 20 — Removing Reverse Gear Shaft Lock



RA PD 334401

Figure 21 — Removing Stake From Countershaft Nut

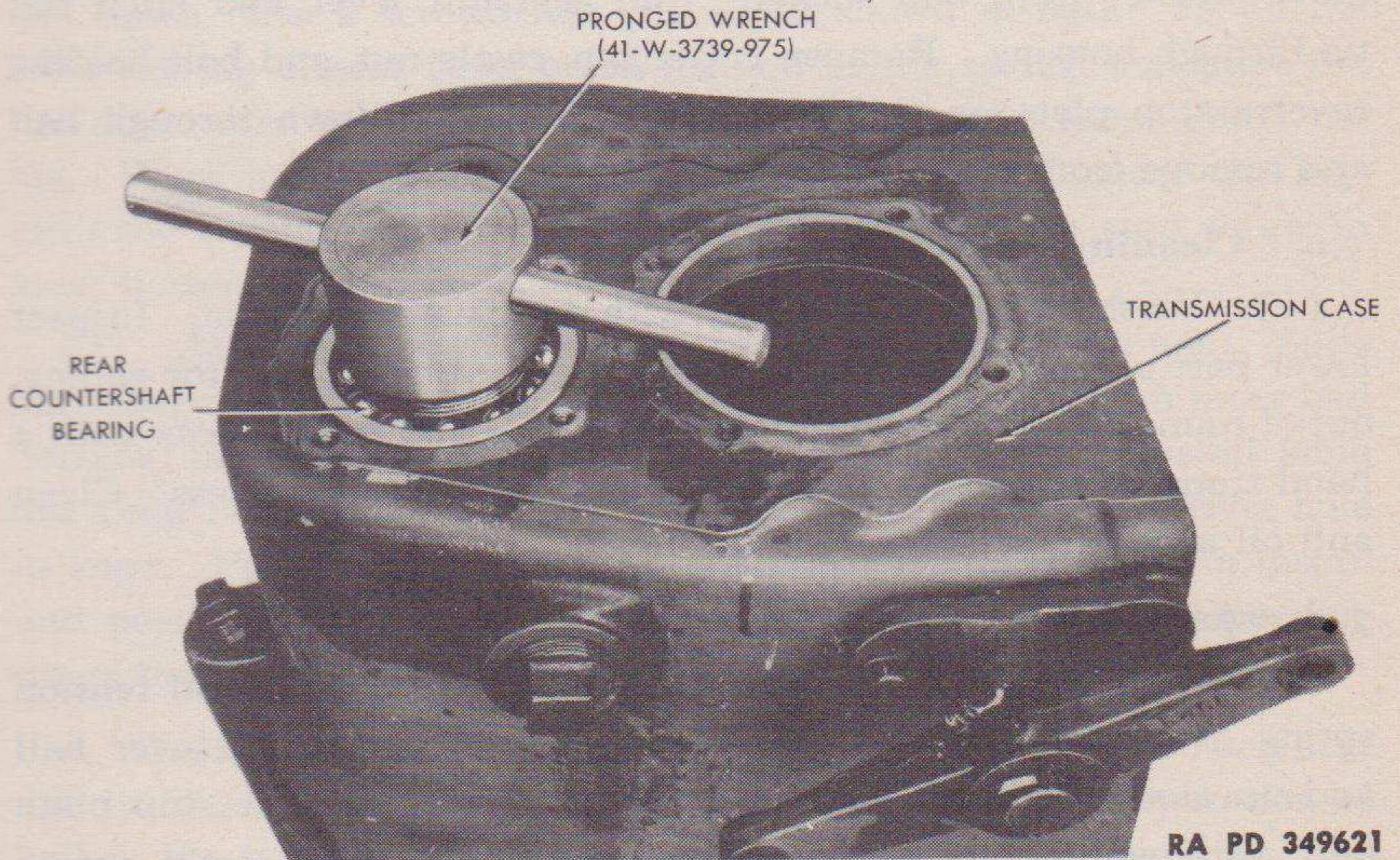


Figure 22 — Removal of Countershaft Nut

plug. Use a hammer and soft drift and drive the countershaft assembly toward rear far enough to permit rear countershaft bearing to be removed from countershaft. Tilt front end of countershaft assembly and remove assembly from transmission housing.

Section III

DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY OF SUBASSEMBLIES

15. GEARSHIFT LEVER HOUSING.

a. **Disassemble lever ball and spoon latch (fig. 23).** Unscrew lever ball from top end of gearshift lever and remove. File spoon latch hinge rivets flush on small side, and tap out of lever and latch rod hinge nut. Remove spoon nut and latch rod hinge nut. Remove lock screw from dust cover, tap cover from flange, and lift off over gearshift lever.

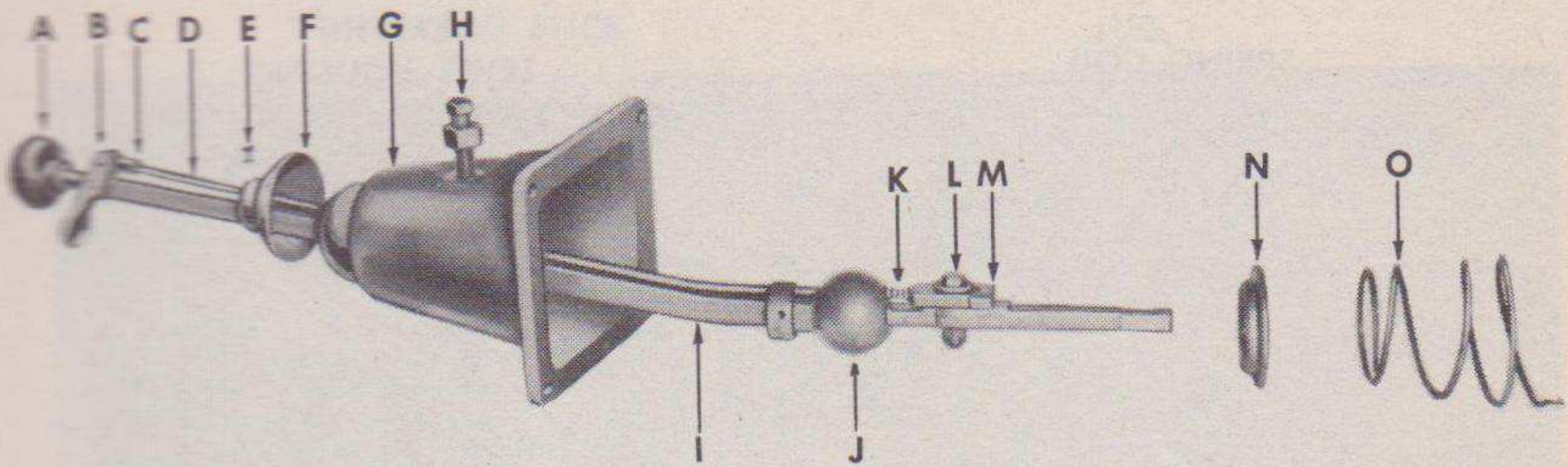
b. **Disassemble ball socket assembly.** Place housing in a vise, shift lever downward. Loosen jam nut on reverse stop screw; unscrew and remove. Pry spring end from lug inside housing. Grasp wire at large spring end with pliers (fig. 24) and apply twisting motion in clockwise direction, threading spring out of lugs and housing. Remove washer from ball socket. Pull gearshift lever and latch rod up through housing. Remove cotter pin, castle nut, and bolt holding reverse stop plate on shift rod. Push latch rod down through ball and remove from lever. Slide spring off rod.

c. **Cleaning, inspection, and repair.**

(1) Wash all parts thoroughly with dry cleaning solvent. Inspect lower part of shift lever rod for straightness. Inspect ball for galling, out-of-round, or rough spots. Dress all burs and rough spots with a hand stone. Inspect all springs for tension and completeness. Clean and oil all parts before assembly.

d. **Assembly of ball socket assembly (fig. 26).**

(1) **ASSEMBLE BALL SOCKET ASSEMBLY.** Slide latch rod tension spring over rod. Push threaded end of rod up through lever ball and up alongside lever until in position. Install reverse stop plate bolt, with washer, through plate and lever. Tighten castle nut to finger-tight position and lock with a cotter pin. Place gearshift lever



- | | |
|--------------------------------|--|
| A—GEARSHIFT LEVER BALL | I—GEARSHIFT LEVER |
| B—SPOON LATCH W/RIVETS | J—GEARSHIFT LEVER BALL |
| C—LATCH ROD HINGE NUT | K—LATCH ROD SPRING |
| D—LATCH ROD | L—REVERSE PLATE BOLT, W/WASHER
AND CASTLE NUT |
| E—DUST CAP LOCK SCREW | M—REVERSE PLATE |
| F—DUST CAP | N—WASHER |
| G—GEARSHIFT LEVER HOUSING | O—SPRING |
| H—REVERSE STOP SCREW W/JAM NUT | |

RA PD 353060

Figure 23 — Gearshift Lever and Housing Assembly

housing upside down in vise. Place gearshift lever in housing, pushing through until ball fits into socket. Make sure that positioning lug in housing fits into slot in ball.

(2) **ASSEMBLE WASHER AND LEVER BALL SPRING.** Place spring washer in position against lever ball. Place spring in housing, small coil down. Use a screwdriver placed as shown in figure 25 on the retaining lug closest (and below) a coil of the spring, and push the coil down over the lug with a hardwood stick until it snaps under the lug. Work around the housing lugs, forcing the coil under the lugs until the complete coil is in position. Install reverse stop screw in lever housing and tighten jam nut.

(3) **ASSEMBLE DUST COVER, SPOON LATCH, AND LEVER BALL.** Slide dust cover over latch rod and lever, and place in position on lever ball housing; insert and tighten set screw and lock washer. Install latch rod hinge nut, screwing it down until rivet hole is level with rivet hole in lever. Place latch spoon in position on nut and lever, then install and peen over rivets. Do not bind latch spoon clevis by peening rivets too tightly. Screw lever ball on top end of gearshift lever.

e. Test operation of assembly. With gearshift lever housing held tightly in a vise, rotate gearshift lever, inspect for free operation of ball in the housing socket. Operate latch spoon and check for free travel and return operation of latch rod.



RA PD 353061

Figure 24 — Removing Ball Spring

16. SHIFTING BAR HOUSING.

a. Disassemble shifting bar assembly (fig. 26).

(1) REMOVE SPRINGS, BALLS, AND SHIFTING FORK SET SCREWS. Secure assembly in a vise. Using a pinch bar, place the lever slots in the shifting forks in a straight-across position (neutral). Remove the locking wires and set screws from the shifting forks. Remove cap screws from the shifting bar spring cover, and remove cover. Turn housing upside down to remove the three springs and balls and one interlock cross pin, then install housing in vise.

(2) REMOVE SHIFTING BARS AND SHIFTING FORKS. Remove expansion plugs from housing. Tap bars through front of housing, starting with the top bar. This will also drive the covers (and balls from front of third and fourth speed shifting bar, and reverse shifting bar) from the front end of the housing. Tag bars to insure correct assembly. *NOTE: With spring tension removed, some hand adjustment may be necessary to place bars in neutral position before the upper bar will move. Be sure all small parts are carefully noted and put in a clean, safe place.*

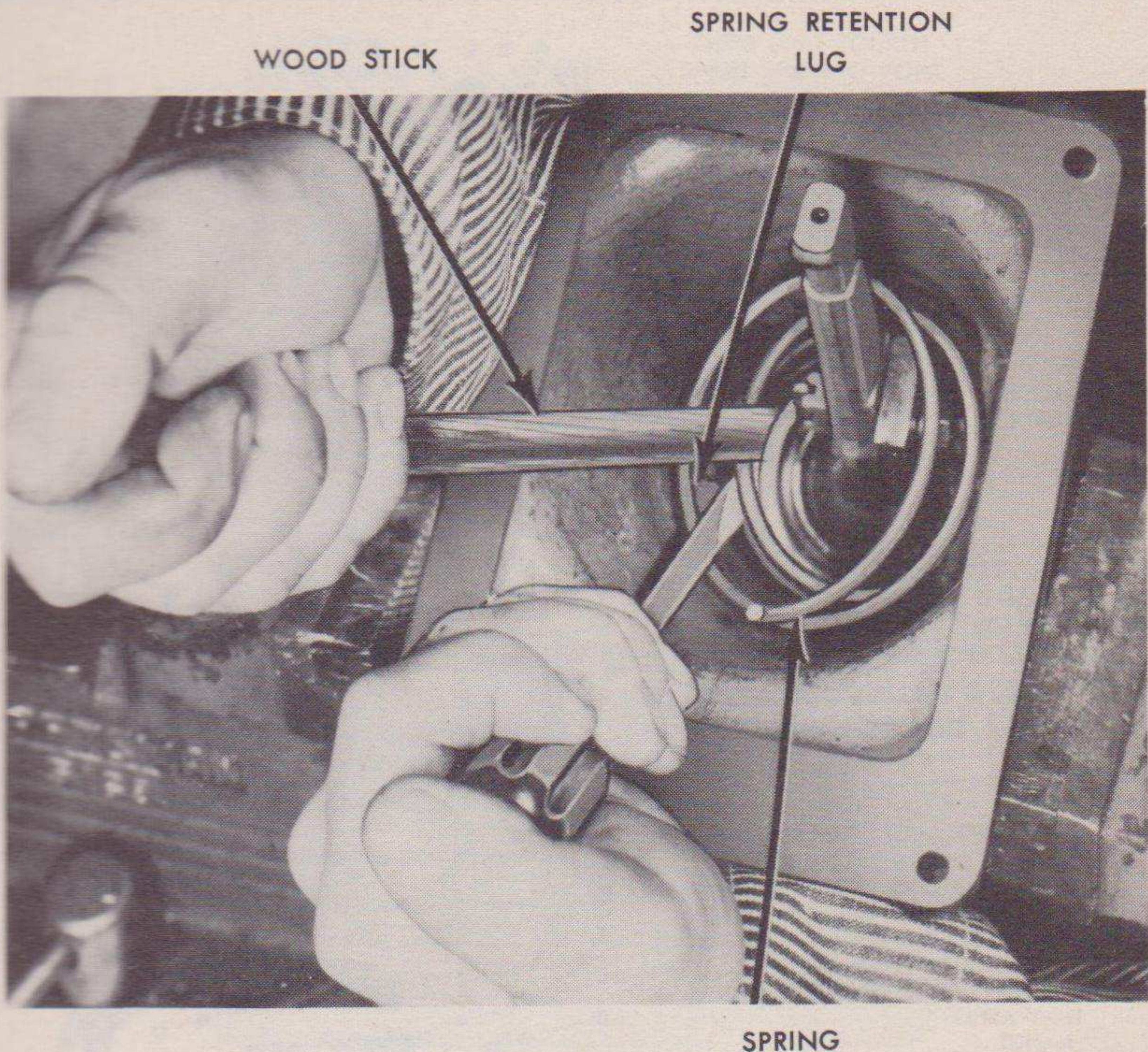
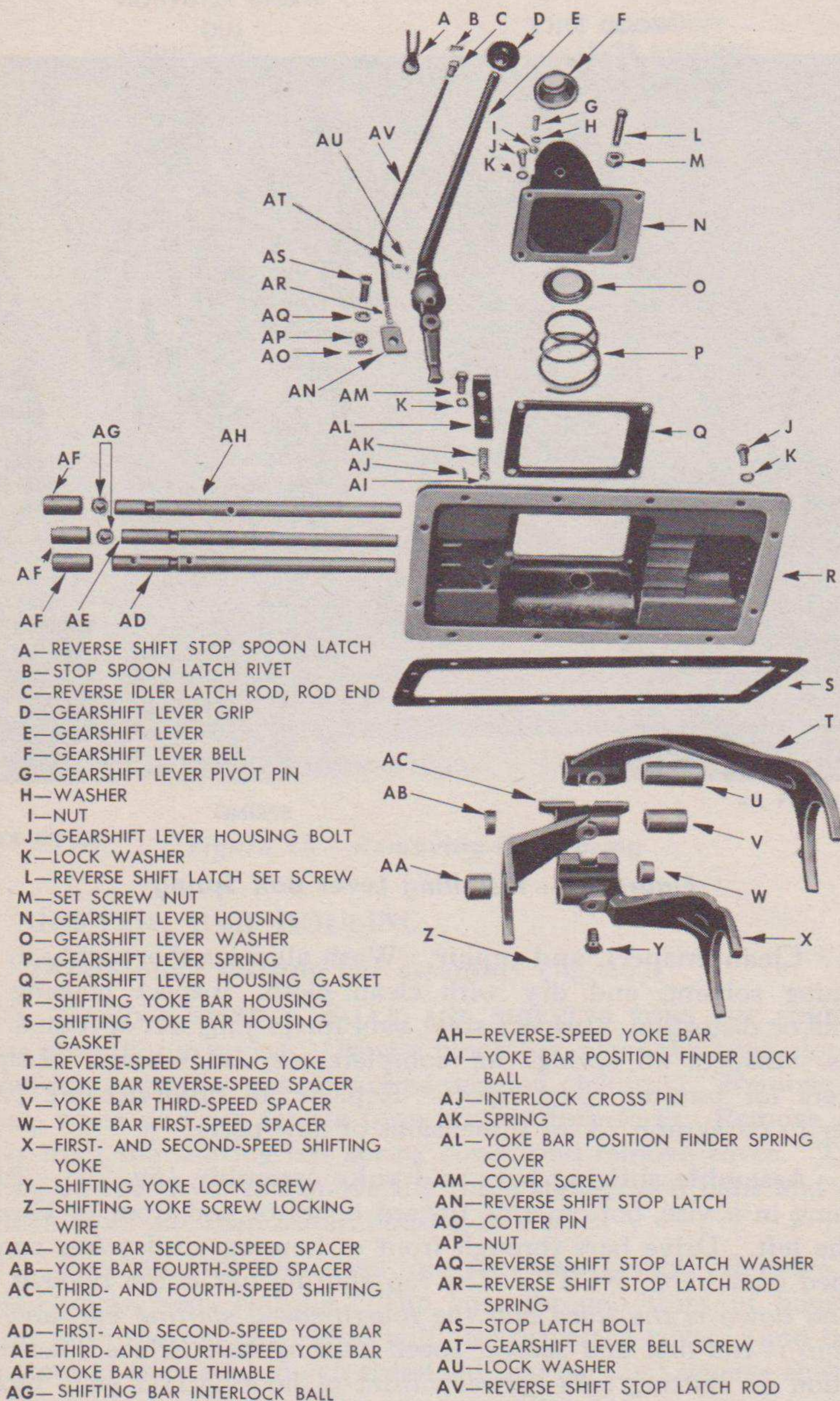


Figure 25 — Installing Lever Ball Spring

RA PD 334411

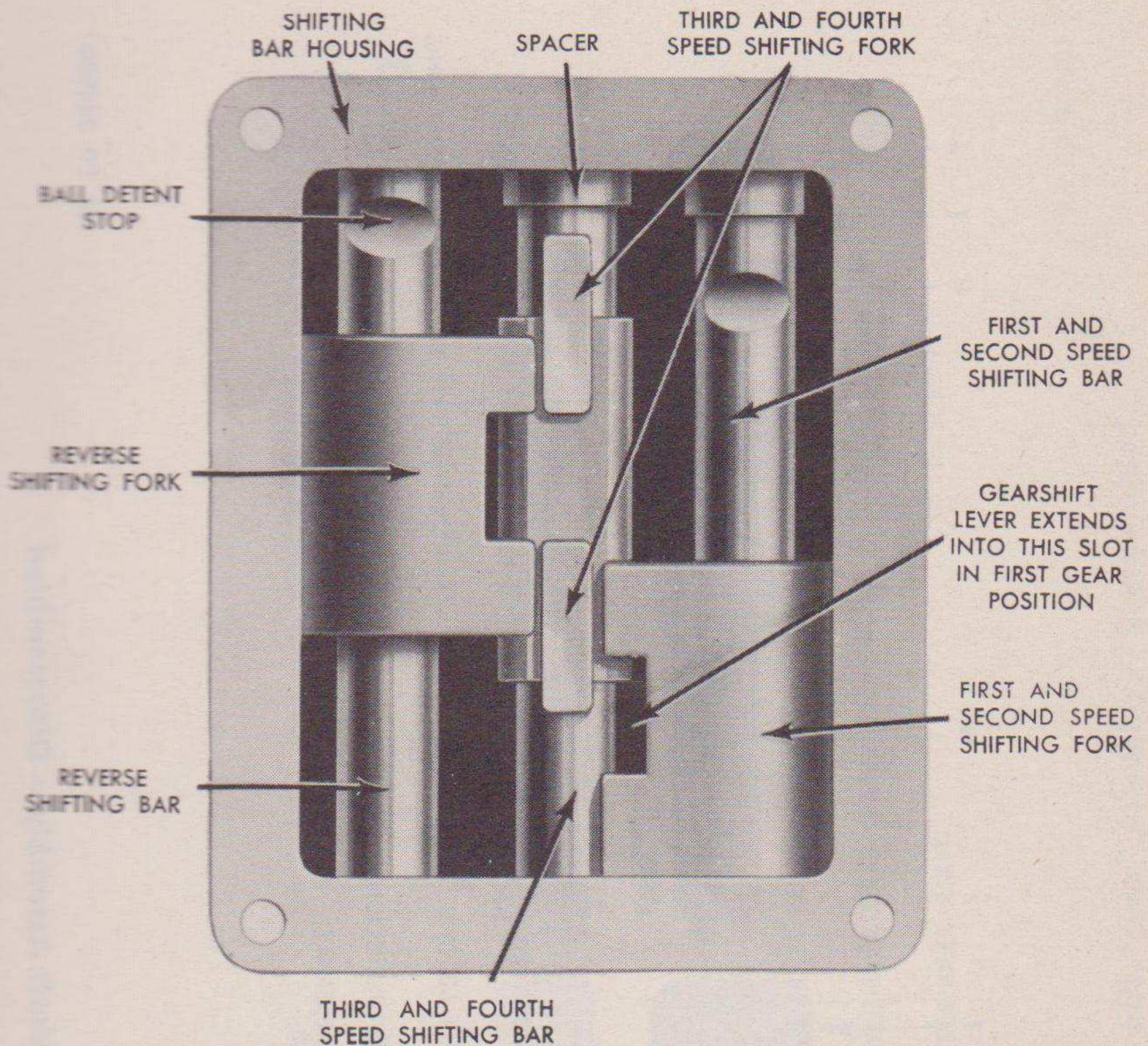
b. **Clean, inspect, and repair.** Wash all parts thoroughly in dry cleaning solvent, and dry with clean cloth. Inspect housing for cracks or distortion. Inspect steel bars for galling, out-of-round, and nicks. Inspect all springs for completeness and tension. Inspect spacers for burs or rough spots. Replace all unserviceable parts. Refer to paragraph 25 for dimensions of new parts.

c. **Assemble shifting bars and yoke assembly (fig. 26).** Place housing in a vise, bottom side toward operator and front of housing to the left. Drive bars through front of housing until yokes can be slipped over bars. **NOTE:** *The top shifting bar is the reverse, the second down is the third and the fourth speed shifting bar, and the bottom is the first and second speed shifting bar.* Place spacers in position on shifting bars between front of housing and yoke blocks. This applies only to the first and second speed, and third and fourth speed shifting bars. After yokes have been placed on bars, install other three spacers (one on each bar) and drive bars until they enter rear of housing. Refer to figure 26 for correct order of assembly. Insert retaining balls ($\frac{1}{2}$ -in. dia) in holes in top of housing; install



RA PD 353062

Figure 26 — Gearshift Lever Housing and Shifting Bar Housing Assemblies — Disassembled



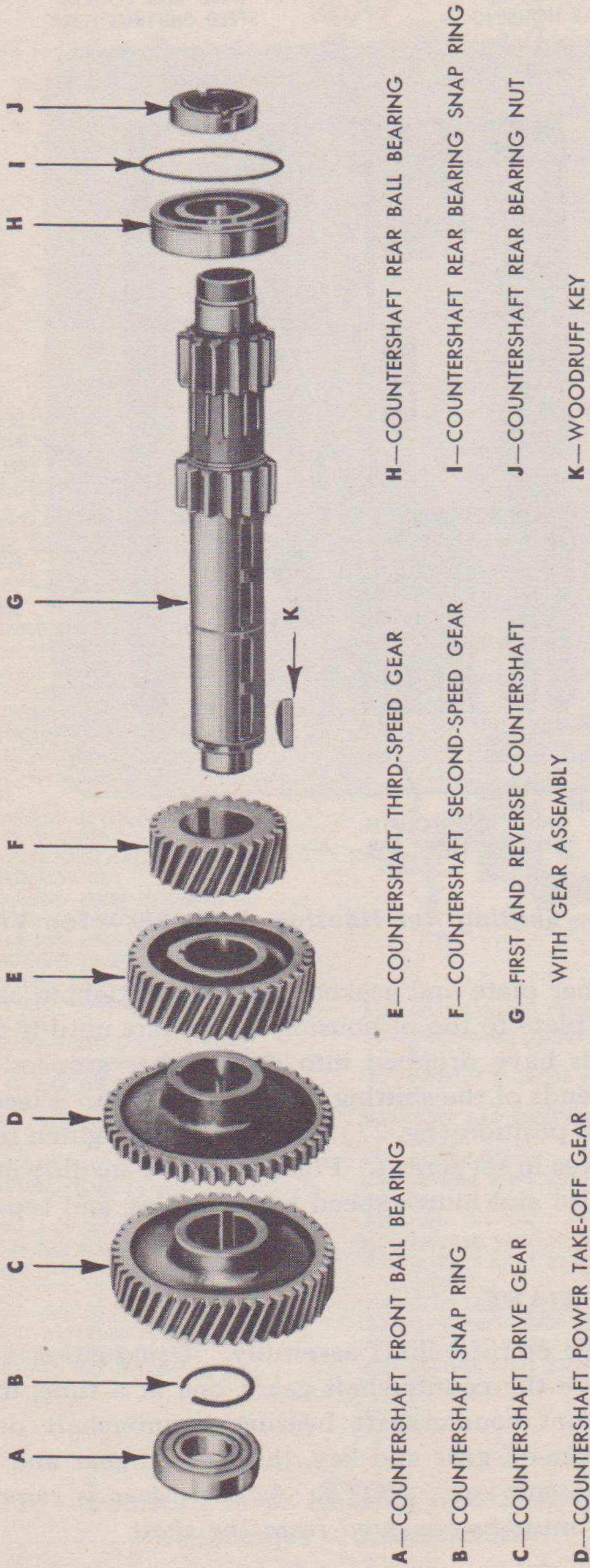
RA PD 353063

Figure 27 — Shifting Bar Housing Assembly — Top View

springs and retainer plate and gasket. Insert and tighten cap screws securing retainer plate to top of housing. Tap bars until it is evident that retainer balls have dropped into shifting bar grooves. In this position the rear ends of the shifting bars will be even. Place shifting forks in first speed position (fig. 27), and insert and tighten set screws. Install locking wires in set screws. Place balls ($\frac{3}{4}$ -in. dia) in position in reverse and third and fourth speed bar thimbles, and tap all thimbles into position.

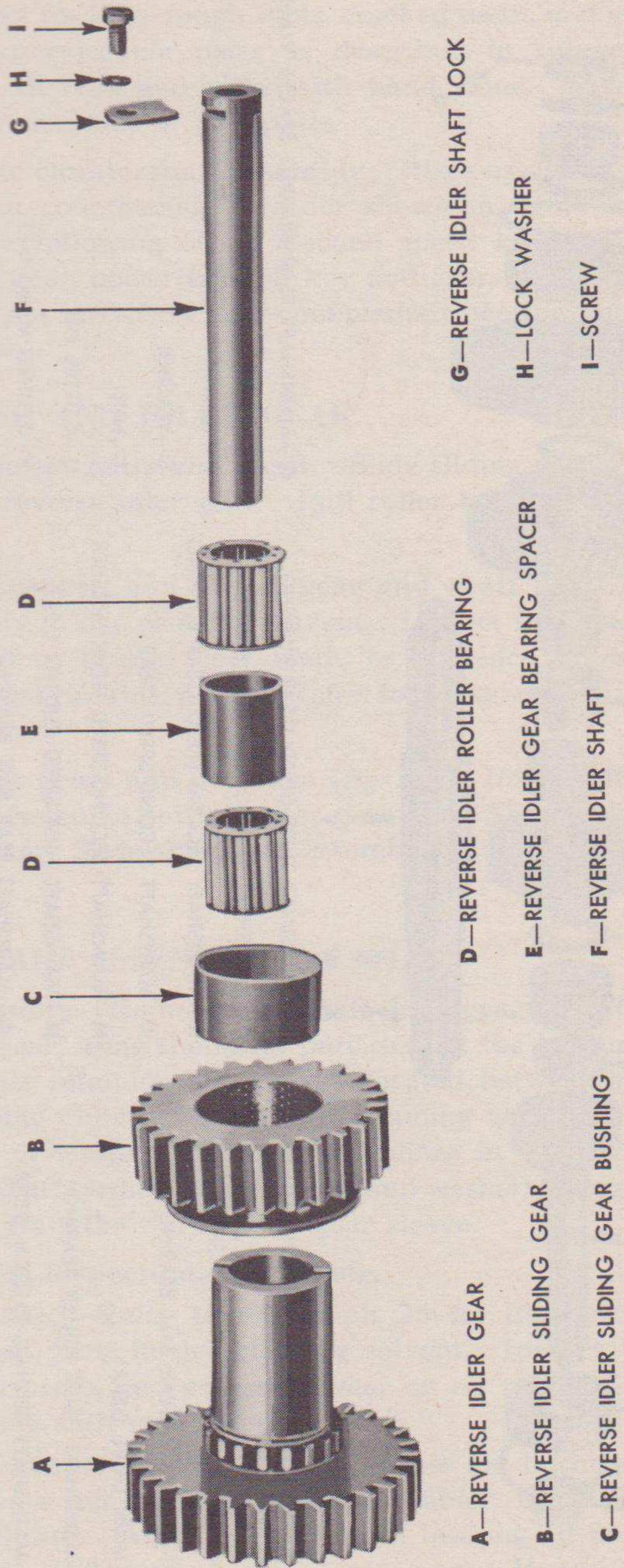
17. COUNTERSHAFT.

a. **Disassemble countershaft assembly.** Using either a press or gear puller, remove the countershaft gears, one at a time, in the following order: Front countershaft bearing, countershaft drive gear and key, power take-off gear and key, third speed gear and key, and second speed gear and key. **NOTE:** As each gear is removed, the key for that gear must be removed from the shaft.



RA PD 344900

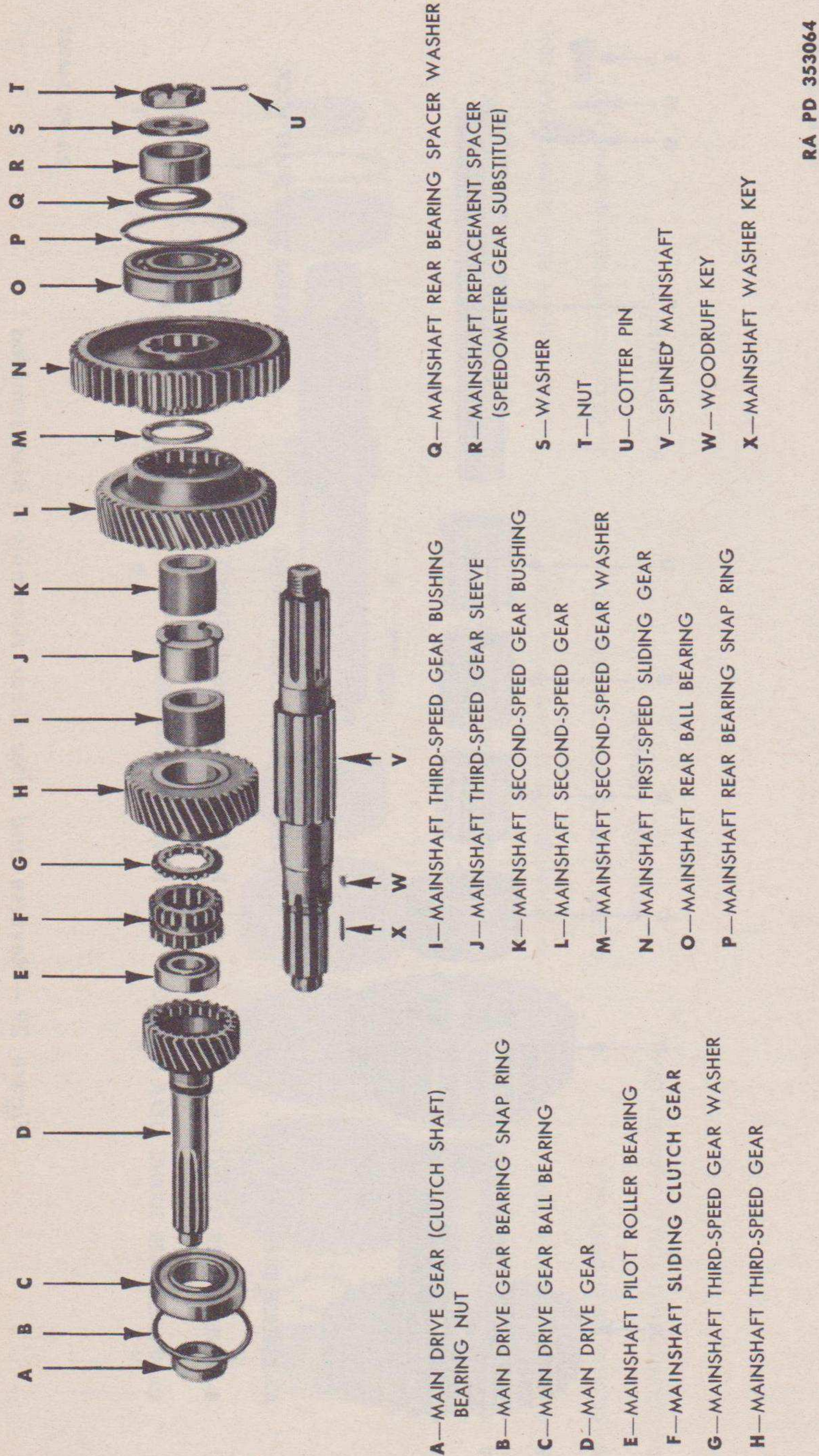
Figure 28 — Countershaft Assembly — Disassembled



- A—REVERSE IDLER GEAR
- B—REVERSE IDLER SLIDING GEAR
- C—REVERSE IDLER SLIDING GEAR BUSHING
- D—REVERSE IDLER ROLLER BEARING
- E—REVERSE IDLER GEAR BEARING SPACER
- F—REVERSE IDLER SHAFT
- G—REVERSE IDLER SHAFT LOCK
- H—LOCK WASHER
- I—SCREW

RA PD 344901

Figure 29 — Reverse and Idler Gear Assembly — Disassembled



A—MAIN DRIVE GEAR (CLUTCH SHAFT)
BEARING NUT

B—MAIN DRIVE GEAR BEARING SNAP RING

C—MAIN DRIVE GEAR BALL BEARING

D—MAIN DRIVE GEAR

E—MAINSHAFT PILOT ROLLER BEARING

F—MAINSHAFT SLIDING CLUTCH GEAR

G—MAINSHAFT THIRD-SPEED GEAR WASHER

H—MAINSHAFT THIRD-SPEED GEAR

I—MAINSHAFT THIRD-SPEED GEAR BUSHING

J—MAINSHAFT THIRD-SPEED GEAR SLEEVE

K—MAINSHAFT SECOND-SPEED GEAR BUSHING

L—MAINSHAFT SECOND-SPEED GEAR

M—MAINSHAFT SECOND-SPEED GEAR WASHER

N—MAINSHAFT FIRST-SPEED SLIDING GEAR

O—MAINSHAFT REAR BALL BEARING

P—MAINSHAFT REAR BEARING SNAP RING

Q—MAINSHAFT REAR BEARING SPACER WASHER

R—MAINSHAFT REPLACEMENT SPACER
(SPEEDOMETER GEAR SUBSTITUTE)

S—WASHER

T—NUT

U—COTTER PIN

V—SPLINED MAINSHAFT

W—WOODRUFF KEY

X—MAINSHAFT WASHER KEY

RA PD 353064

Figure 30 — Mainshaft and Main Drive Gear Assemblies — Disassembled

b. **Clean and inspect.** Wash all parts thoroughly in dry cleaning solvent. Inspect for burs, rough spots, cracked teeth, and excess wear. Replace all unserviceable parts as described in subparagraphs b and c. Dress all burs and nicks with hand stone. Refer to paragraph 25 for dimensions of new parts.

c. **Assemble countershaft assembly.** Place assembly in position. Install parts on countershaft in order shown in figure 28, pressing gears on in the following order: Second speed key and gear, third speed key and gear, power take-off key and gear, and drive gear key and gear. Do not install the rear countershaft bearing, snap ring and nut at this time.

18. REVERSE AND IDLER GEAR.

a. **Disassemble gears and shaft.** Slide sliding gear and bushing from shaft of reverse idler gear. Pull roller bearings from bore of idler gear.

b. **Clean, inspect, and repair gear and shaft parts.** Wash all parts thoroughly in dry cleaning solvent. Inspect for broken bearing rollers, cracked or broken gear teeth, or evidence of excess wear. Replace all unserviceable parts. Refer to paragraph 25 for dimensions of new parts.

c. **Assemble gears and bearings (fig. 29).** Insert roller bearings with spacer between, in reverse idler gear bore. Slide sliding gear on reverse idler gear. Slide shaft into assembly until ready for installation.

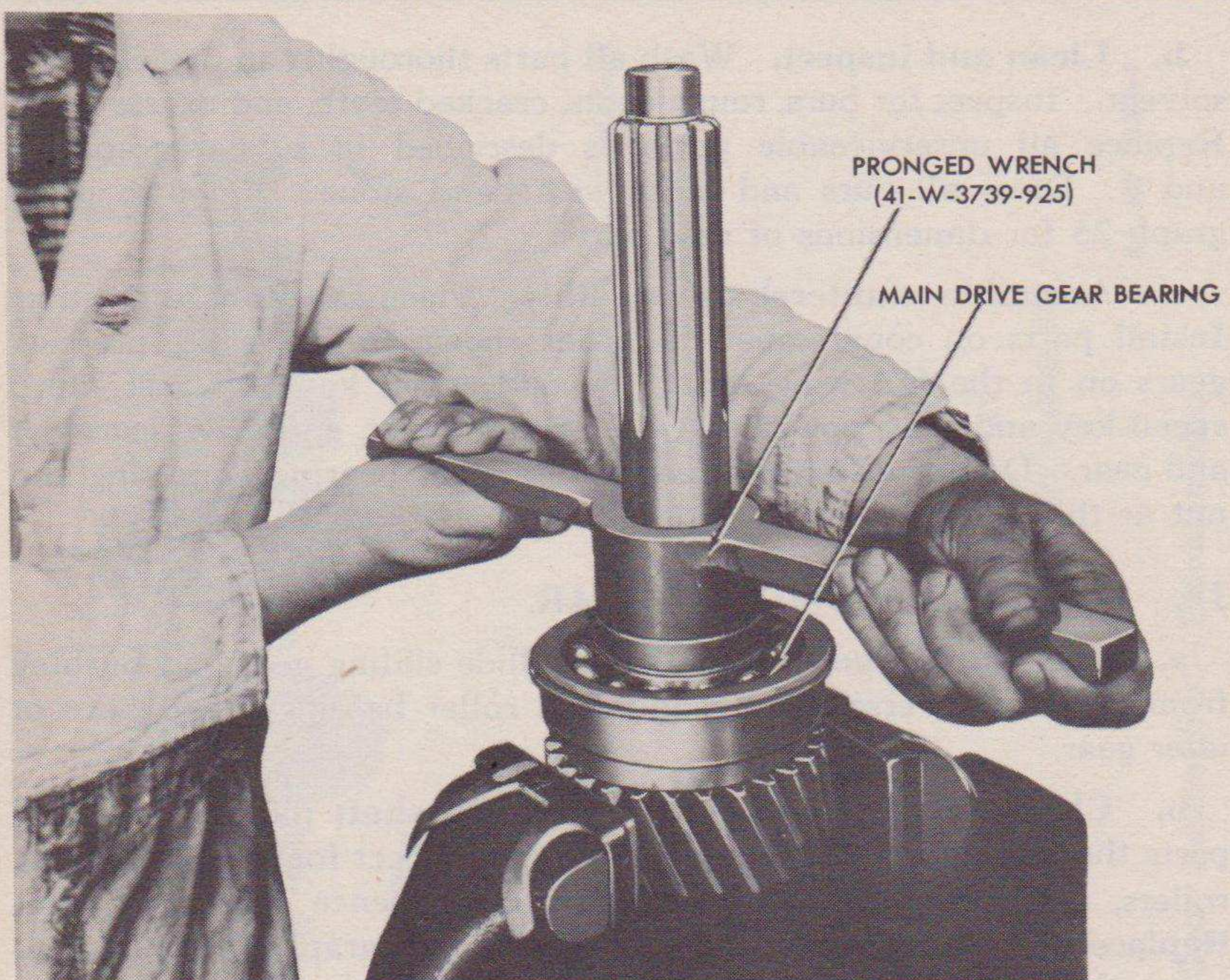
19. MAINSHAFT ASSEMBLY (fig. 30).

a. **Disassembly.** Remove mainshaft drive gear roller bearing and sliding clutch gear, using the latter part to start the bearing. Remove third speed gear retaining washer key located between splines over which the sliding clutch fits. Rotate retaining washer in its groove until the lugs of washer line up with splines in shaft and remove. Remove mainshaft bushed gears, sleeve, and washers, using the second speed gear to start the third speed gear sleeve.

b. **Cleaning, inspection, and repair.**

(1) **GENERAL.** Refer to paragraph 25 for dimensions of new parts. Wash all parts in dry cleaning solvent. Inspect for cracked or broken gear teeth, and excessive wear on all parts. Replace unserviceable parts with new parts.

(2) **GEAR BUSHING REPLACEMENT.** Press old bushing from gear if bushing is worn out and gear is unserviceable. Clean bore of gear and remove all burs. Aline locking lugs of bushing (if present) with notches in gear and press bushing into gear. If end of bushing



RA PD 349622

Figure 31 — Removing Main Drive Gear Bearing Nut

projects from gear hub face, machine bushing flush with gear hub face. Drill oilholes in bushing, using holes in gear for size and to act as a guide for drill. Make sure all oilholes are open, and remove all burs and sharp edges with a hand stone.

c. **Assembly.** Coat parts with recommended lubricant (TM 9-813). Install second speed gear washer followed by second speed gear onto mainshaft. Install third speed gear sleeve key in mainshaft, and press third speed gear sleeve onto mainshaft. Install third speed gear, mainshaft third speed retaining washer, third speed gear retaining washer key, sliding clutch gear, and main drive gear roller bearing onto mainshaft in the above-mentioned order. Slide first speed sliding gear onto mainshaft, and place with remaining parts of mainshaft assembly until ready to install in transmission case.

20. MAIN DRIVE GEAR ASSEMBLY (fig. 30).

a. **Disassembly.** Remove front bearing nut from shaft, using pronged wrench (41-W-3739-925) (fig. 31). Remove bearing.

b. **Cleaning, inspection, and repair.** Wash all parts thoroughly in dry cleaning solvent. Inspect shaft for burs and rough spots.

Assembly

Inspect bearing for evidence of cracked balls or distortion. Inspect gear for cracked or broken teeth, excess wear, and roughness. Replace all unserviceable parts. Refer to paragraph 25.

c. **Assemble shaft and gear assembly.** Push bearing over shaft and against drive gear. Install and tighten bearing nut on shaft, using pronged wrench (41-W-3739-925) (fig. 31).

21. CLUTCH RELEASE ASSEMBLY.

a. **Disassembly.** Refer to paragraph 14 c.

b. **Cleaning, inspection, and repair.** Wash all parts in dry cleaning solvent. Inspect clutch sleeve, yoke, cross shaft, and housing bores for roughness burs, and excessive wear. Replace all unserviceable parts, including throw-out bearing if original is not serviceable.

c. **Assembly.** Refer to paragraph 23 e.

22. TRANSMISSION CASE.

a. Wash case in dry cleaning solvent and inspect case for cracks and wear in bearing bores. Remove all burs from machined surfaces with a hand stone. If old case is unserviceable and cannot be repaired, use a new or reconditioned case. Refer to paragraph 25.

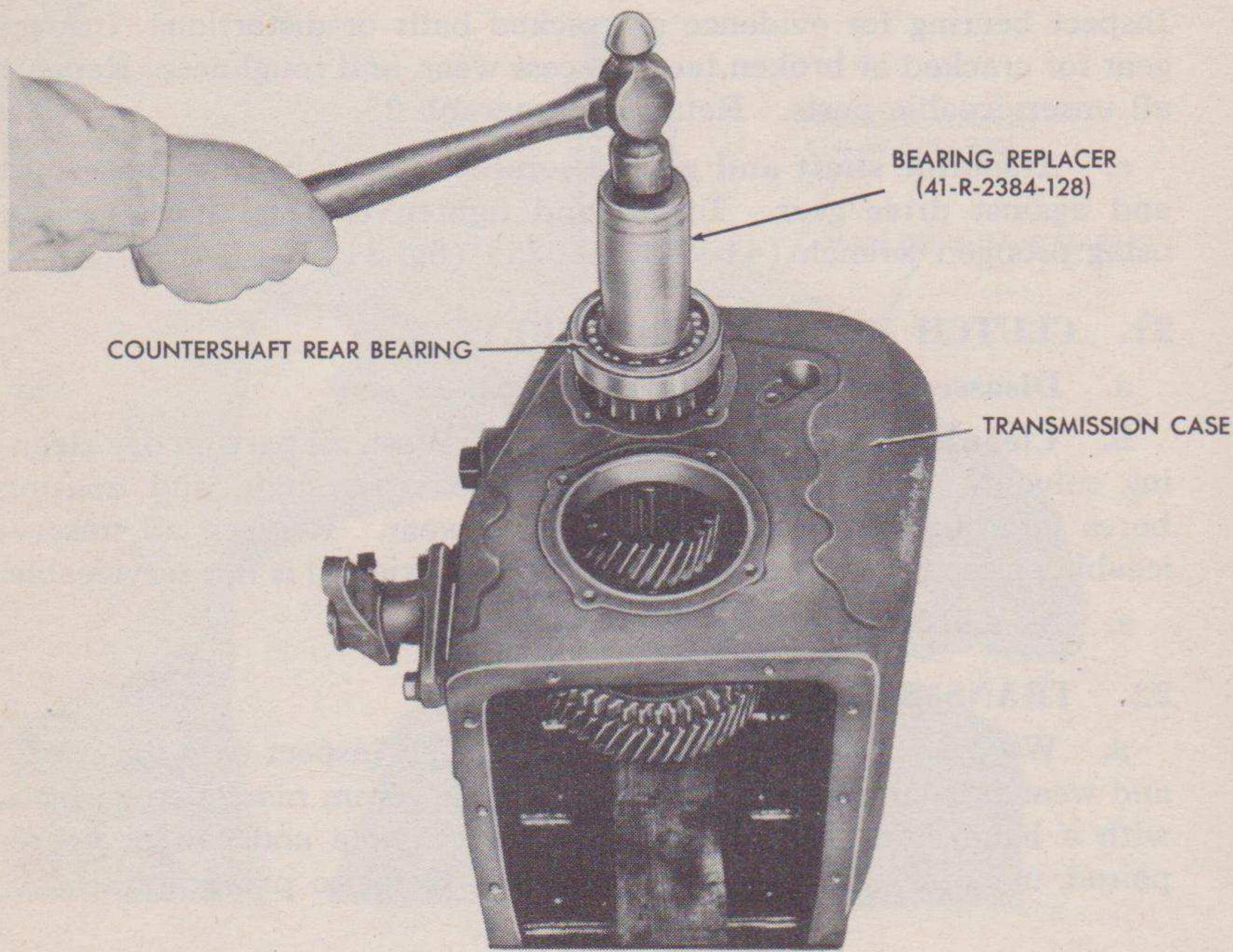
Section IV ASSEMBLY

23. ASSEMBLY.

a. **Preliminary instructions.** Lubricate all parts with recommended lubricant (see lubrication order) before final assembly.

b. **Install countershaft** (figs. 13 and 28). Press countershaft front ball bearing into lower front bore of transmission housing. Place countershaft and gear assembly in housing, guiding rear of shaft out through rear lower bore of housing. Move assembly forward, insert shaft in front bearing bore, and tap forward until tight. Drive rear bearing on shaft and into housing bore with bearing replacer (41-R-2384-128) (fig. 32). Install countershaft nut using pronged wrench (41-W-3739-975) (fig. 32). Stake nut to shaft. Install rear bearing cover, using a new gasket; install and tighten four lock washers and cap screws. Install expansion plug and snap ring in housing, securing front bearing.

c. **Install reverse gear, idler gear, and shaft** (figs. 13 and 29). Hold gear assembly in position in case and tap shaft through into bracket bore in housing. Be sure slot in shaft faces lock plate cap screw bore. Install lock plate in shaft, and insert and tighten cap screw in lock plate.



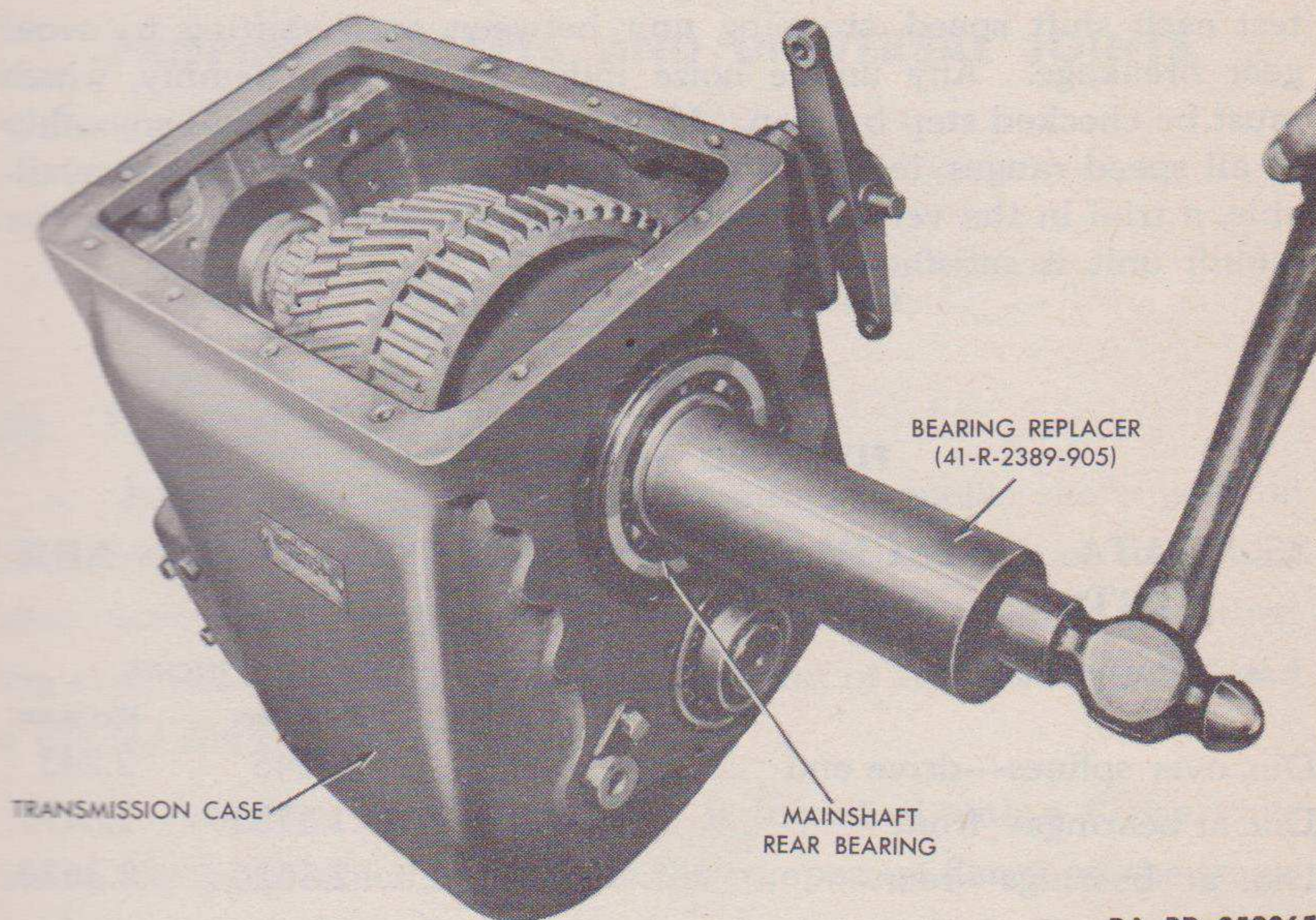
RA PD 349623

Figure 32 — Replacing Countershaft Rear Bearing

d. Install mainshaft and main drive gear assemblies (figs. 13 and 30). Place mainshaft and gears in position in housing, meshing second speed and third speed gears with countershaft second and third speed gears to position assembly. Drive mainshaft rear bearing over shaft and into rear transmission housing bore with hammer and bearing replacer (41-R-2389-905) (fig. 33). Install main drive gear assembly into case, making sure end of mainshaft enters roller bearing. Install snap ring on front bearing. Install main drive gear bearing cover using a new gasket, and secure with four lock washers and cap screws. Install snap ring on rear main bearing, then install mainshaft rear bearing cover using a new gasket, securing with four lock washers and cap screws. Pull first speed gear (large rear mainshaft gear) back against case to lock transmission. Install washer and spacer and press companion flange on rear mainshaft. Install and tighten castle nut and secure with cotter pin.

e. Install bell housing, clutch pedal shaft, and bearing carrier (figs. 13 and 16). Place bell housing in position on six engine studs; install and tighten six lock washers and nuts. Holding yoke of clutch release mechanism in position (vertical), push long shaft through

Assembly



RA PD 353065

Figure 33 — Replacing Mainshaft Rear Bearing

right side of housing (facing front) and through yoke end. Insert Woodruff key in shaft slot and pull back into yoke. Push short shaft through left side of housing into yoke. Center yoke on clutch pilot shaft, insert and tighten yoke set screws on shaft. Slide clutch release carrier, bearing, and sleeve over shaft and against release yoke arms. Install lubricant pipe. Hook bearing carrier pull-back springs into cap screws of front bearing cover.

f. **Install shifting bar housing assembly.** Push first speed gear (large rear mainshaft gear) to rear of housing. Move shifting forks into position (fig. 27). Use a new gasket on transmission housing, and lower shifting bar assembly into position. Guide reverse fork arm down past first speed gear and into space in front of reverse idler gear on the left side of the case (fig. 15). Slowly lower fork into place in the sliding clutch and first speed gear fork slots (fig. 13). Inspect these installations closely, making sure they are correct. Install and tighten six lock washers and cap screws securing housing to transmission. The shifting bar slots will now be in position (fig. 27). Install a new gasket and the gearshift lever housing and assembly. Secure with four lock washers and cap screws.

24. TEST.

a. **Test transmission operation.** Fill transmission with proper grade and quantity of lubricant (see lubrication order) and give

rotary power test. Attach clutch pilot shaft to power source and test each shift speed, stopping unit between each shifting to avoid gear breakage. Any undue noise indicates faulty assembly, which must be checked step by step. If unit operates quietly and smoothly in all speed ranges, install in the vehicle. If a test unit is not available, a trial in the vehicle should be made to determine whether the rebuilt unit is satisfactory.

Section V

FITS AND TOLERANCES

25. DATA (MANUFACTURING DIMENSIONS OF NEW PARTS).

	INCHES	
	Maximum	Minimum
a. Mainshaft.		
Dia. over splines—drive end.....	2.245	2.243
Dia. at bearings—front	1.3782	1.3777
Dia. at bearings—rear.....	2.3626	2.3620
Number of splines.....	10	
Countershaft—front (dia. at bearings).....	1.7721	1.7716
Countershaft—rear (dia. at bearings).....	1.9687	1.9682
Third speed gear thrust washer thickness (front) {	0.328 0.323	or { 0.326 0.321
Third speed gear shaft dia.....	2.2505	2.2500
Mainshaft—out-of-true	Not over 0.001	
b. Clearance.		
Mainshaft and sliding gears—width.....	0.008	0.003
Shifting fork and sliding gear—width.....	0.025	0.009
Fourth speed gear bushing and sleeve.....	0.003	0.002
c. End play.		
Helical gears—new limits.....	0.010	0.006
d. Spring tension.		
Shifting bar lock spring.....	Free length third, fourth, reverse— 1½ in.; first and second (5549)— 1 ⁵ / ₃₂ in.	
Shifting bar lock spring.....	70 to 80 lb pressure at 1 in.	
Reverse latch spring.....	Free length 1½ in.	
Reverse latch spring pressure.....	10 to 12 lb at ¾ in.	

CHAPTER 4

PROPELLER SHAFTS AND UNIVERSAL JOINTS

Section I

DESCRIPTION AND DATA

26. DESCRIPTION AND OPERATION.

a. **Description** (fig. 34). There are four propeller shafts used on this vehicle. Each propeller shaft assembly consists of a tubular shaft with a non-slip joint at one end and a slip joint at the other. On each shaft a yoke is welded to one end of the tubular shaft and a splined shaft to the other end.

(1) Propeller shaft (A, fig. 34) is furnished with a flange yoke at the slip joint, which is bolted to the companion flange on the transmission, and an end yoke on the non-slip joint which attaches to the transfer case.

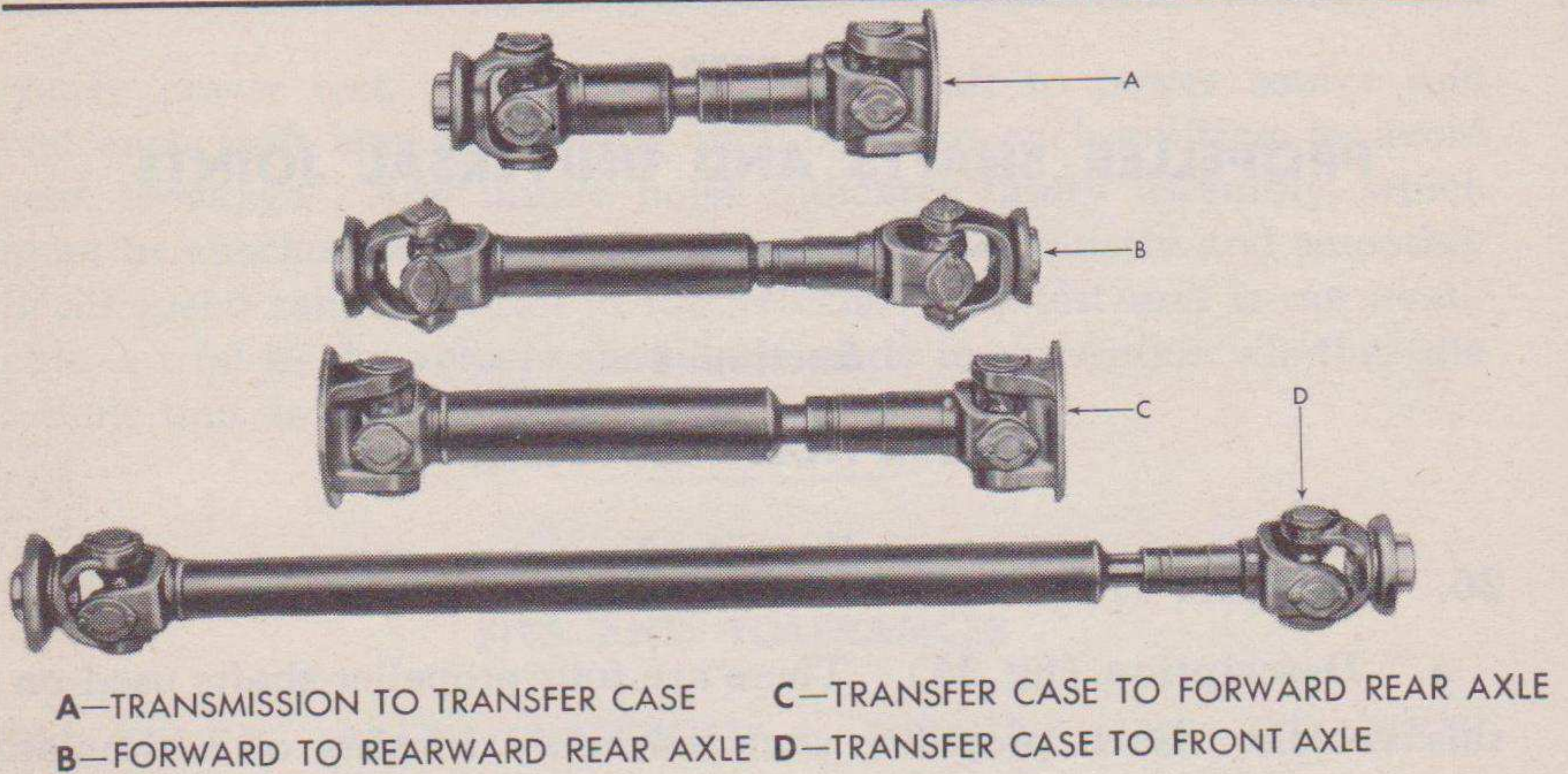
(2) Propeller shaft (B, fig. 34) is furnished with an end yoke at each end.

(3) Propeller shaft (C, fig. 34) is furnished with a flange yoke at each end. The flange yoke on the slip joint end is bolted to the brake disk which is mounted on the companion flange at the transfer case, while the flange yoke on the non-slip joint is bolted to the companion flange at the forward rear axle.

(4) Propeller shaft (D, fig. 34) is furnished with a yoke at each end; the one being attached to the transfer case, and the other to the front axle.

b. **Operation** (fig. 34). The propeller shaft (A) transmits power from the transmission to the transfer case. The shaft (C) transmits power from the transfer case to the forward rear axle. The shaft (B) transmits power from the forward rear axle to the rearward rear axle. The shaft (D) transmits power from the transfer case to the front axle.

(1) The slip joint permits variations in length between connecting units, caused by flexing of the springs while the truck is in motion.



RA PD 334514

Figure 34 — Propeller Shafts

27. PROPELLER SHAFT DATA.

	PRIME MOVER, GAS TANK CHASSIS, VAN White	PRIME MOVER Corbitt	BRIDGE ERECTION Brockway, White, Ward La France	CRANE AND FIRE CRASH Brockway
Make	Spicer	Blood	Spicer	Spicer
Transmission to transfer case.....	9000-1SF	6N-9346	9113-1SF	9113-1SF
Transfer case to front axle.....	9001-1SF	7N-9071	9114-1SF	9114-1SF
Transfer case to forward rear axle	9002-1SF	7N-9072	9115-1SF	9115-1SF
Interaxle	8215-1SF	6N-9073	8215-1SF	8215-1SF

Section II

DISASSEMBLY INTO SUBASSEMBLIES

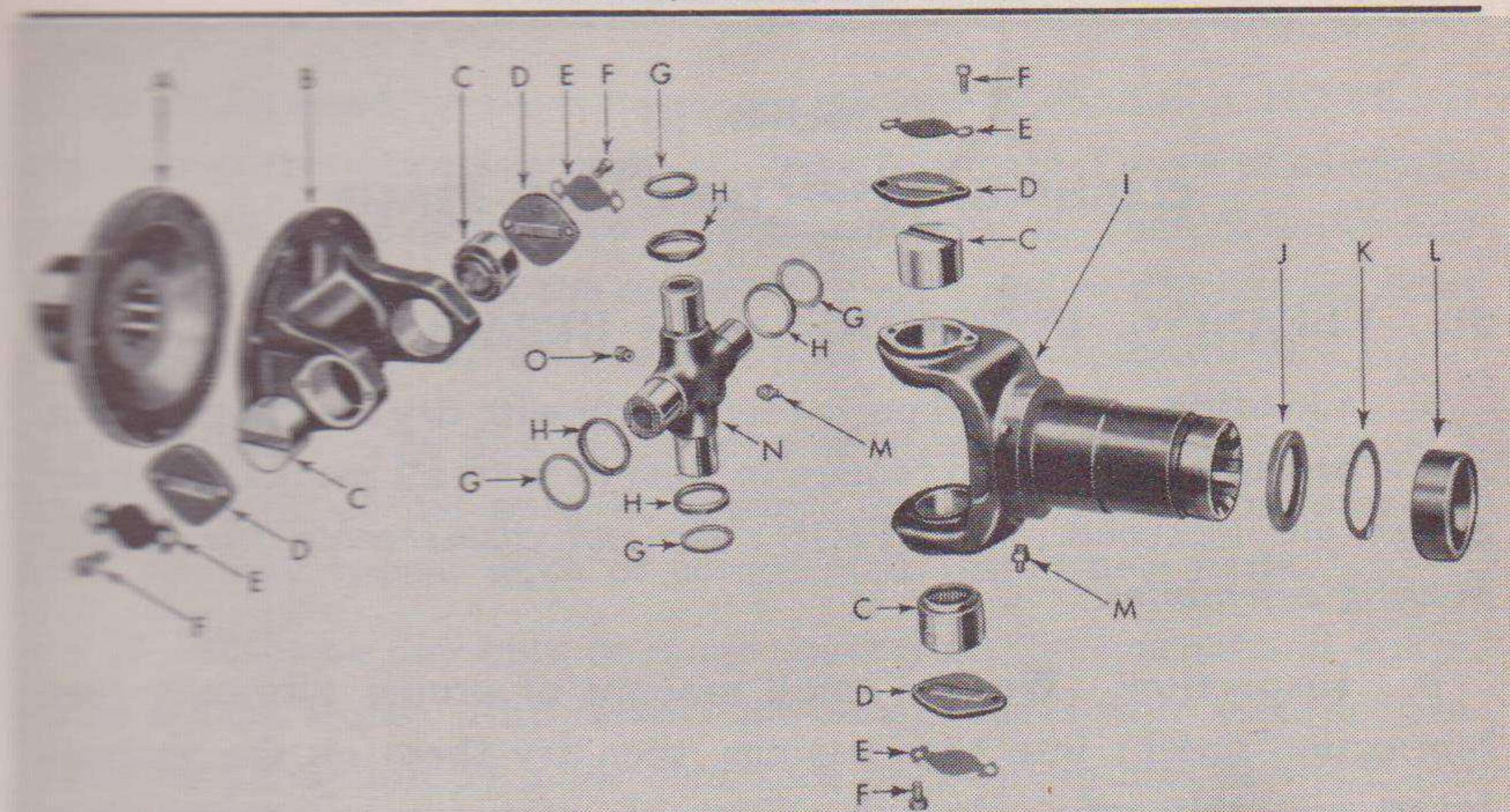
28. PRELIMINARY INSTRUCTIONS.

a. Remove propeller shafts. Refer to TM 9-813 for instructions on removing propeller shafts.

b. Cleaning. Remove all foreign matter from the exterior of the propeller shafts with a wire brush and a putty knife. Place the unit in a container of dry cleaning solvent and wash thoroughly. Wipe dry with clean cloths. Wrap all parts in clean paper or cloth as disassembly proceeds.

c. Construction (fig. 36). In each universal joint assembly there are four block plates, bearing caps, and bearing assemblies. A lock plate bearing cap and bearing assembly fit over each end of the journal. To disassemble the joint, all four lock plates, bearing caps, and bearing assemblies must be removed. The procedure in removing all lock plates, bearing caps, and bearing assemblies is identical.

Disassembly Into Subassemblies



A— COMPANION FLANGE
B— FLANGE YOKE
C— BEARING ASSEMBLY
D— BEARING CAP
E— LOCK PLATE

F— CAP SCREW
G— GASKET
H— RETAINER
I— SLIP JOINT YOKE
J— WASHER

K— STEEL WASHER
L— DUST CAP
M— FITTING
N— JOURNAL CROSS
O— RELIEF VALVE

RA PD 334515

Figure 35 — Universal Joint — Disassembled

29. DISASSEMBLY OF PROPELLER SHAFT.

a. Remove slip joint (fig. 35). Look for arrow marks on propeller shaft and slip joint yoke (fig. 36). If the marks are not easily seen, mark the shaft and slip joint yoke with a punch and hammer so that they can be reassembled in exactly the same relative position. Unscrew slip yoke dust cap (L, fig. 35) by hand. Withdraw shaft. Slip dust cap off the shaft. Lift the steel washer and the felt washer out of the cap.

b. Disassembly, universal joint. Straighten out lugs on lock plate with screwdriver. Remove two cap screws, on each end of flange yoke. Tap on end of bearing assembly until opposite bearing is forced out of yoke. Then turn assembly over and drive the first bearing back out of its lug by driving on the exposed end of the journal. NOTE: Use a soft, round drift with a flat face about $\frac{1}{32}$ inch smaller in diameter than the hole in the yoke, to prevent damaging the bearing.

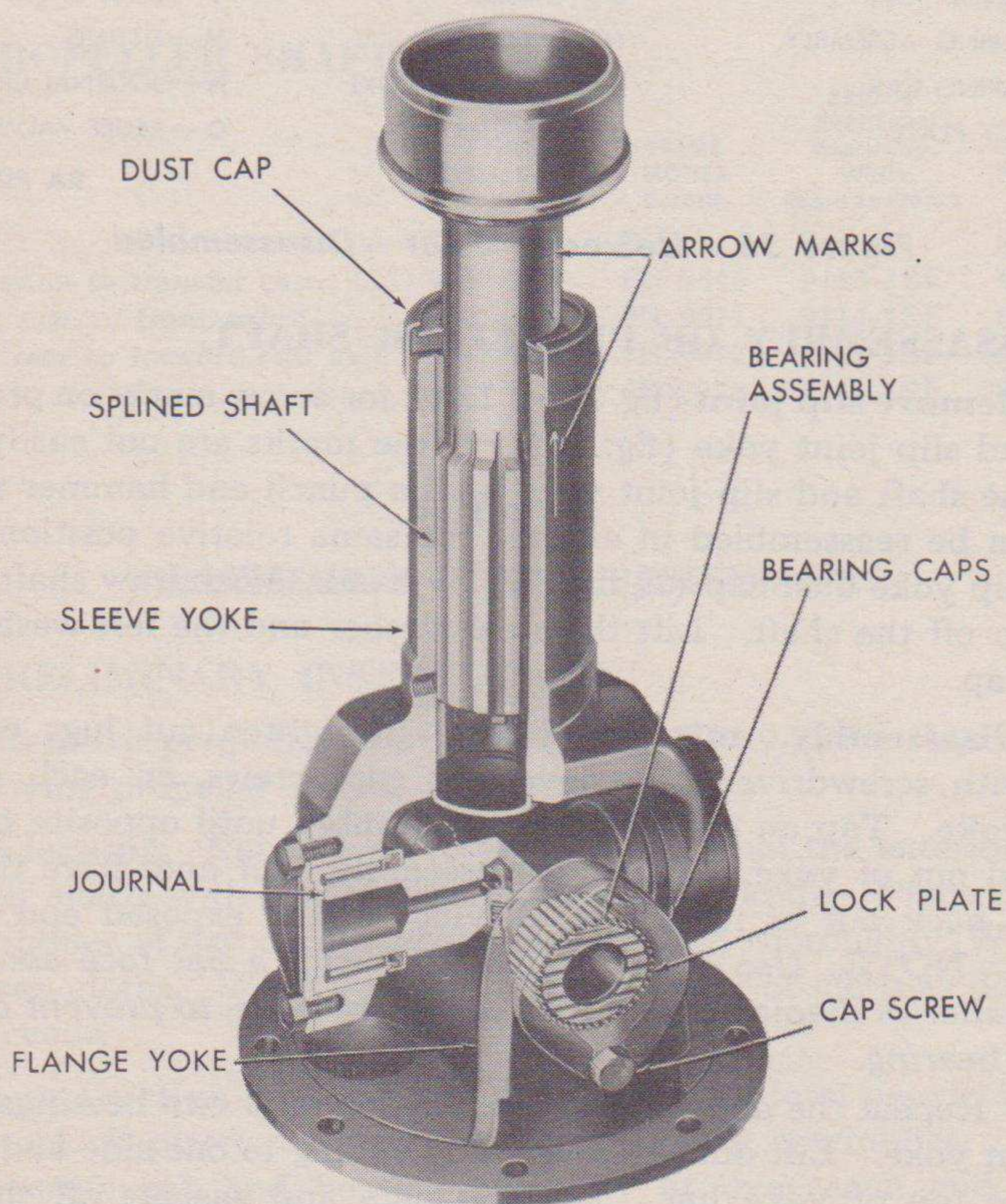
(1) Repeat the above operation for the other two bearings of the slip joint yoke. Lift out the journal by sliding to one side and tilting over the top of yoke lug. Tap retainers and gaskets off the four prongs of the journal. Pry the cork gasket out of each retainer with an awl. Remove release valve assembly and lubrication fitting from the journal.

Section III
CLEANING, INSPECTION, AND REPAIR

30. CLEANING, INSPECTION, AND REPAIR.

a. **Cleaning.** Wash all parts thoroughly with dry cleaning solvent. Allow bearing assembly to remain in solvent until all particles of hard grease are loosened. **CAUTION:** *Do not disassemble the needle bearing assemblies.*

b. **Inspection.** Work a small amount of proper lubricant (see lubrication order) into the bearings, then try them on the journal. Insert assembly into yoke. A slight side movement is permissible. Too much side movement indicated by backlash or jerky action re-



RA PD 334548

Figure 36 — Section Through Journal

Assembly and Test

quires replacement of parts necessary to remedy condition. **NOTE:** *If the ends of the journal cross do not have lubrication grooves as shown in figure 36, grind one groove to approximately $\frac{3}{32}$ inch in width and $\frac{1}{16}$ inch in depth across the diameter of each end of the journal cross to provide a means for lubricant to pass into needle bearings.*

c. **Repair.** The dust cap, steel washer, dust cap felt washer, and trunnion cork washer must be entirely free of any wear or compression. If they appear worn or compressed, install new parts.

(1) Remove any burrs or rough spots from the journal and yokes, using a hand stone. Also remove all burrs or nicks from yoke splines. Refer to paragraph 34 a for clearance between splines of shaft and yoke.

Section IV

ASSEMBLY AND TEST

31. PRELIMINARY INSTRUCTIONS.

a. **Clean and lubricate bearings and splines.** Make sure the universal joint bearings are clean and properly lubricated (see lubrication order). Make sure splines on spline shaft are lubricated. When inserting the spline of propeller shaft into the slip joint, be sure the arrows on propeller shaft (fig. 36) and slip joints are in line. Make sure oil passages in journal are clean and free from foreign matter.

32. ASSEMBLE PROPELLER SHAFT.

a. **Assemble universal joint (fig. 35).** Insert journal gasket into journal gasket retainer. Install relief valve and lubrication fitting in journal. Place a retainer assembly on each end of journal. Insert one trunnion of journal into bearing hole in lug of the yoke from the inside between the lugs, and tilt until journal trunnion will enter opposite hole in lug. Pack bearings and reservoir with lubricant specified in pertinent lubrication order. **NOTE:** *If a manufacturer's lubrication instruction plate is present, deface the plate. Lubrication will be performed only as instructed in War Department lubrication orders.* Insert bearings from outside of yoke, pressing them into place with an arbor press, or tapping with a soft drift. Install bearing cap; be sure the key on bearing cap lines up with slot in the

bearing. Install new lock plate. Install cap screws and tighten evenly. Bend up lugs on lock plate around flat side of cap screws. *NOTE: When assembled, if joint appears to bind, tap lugs lightly with a hammer. This will relieve any pressure of the bearing on the end of the journal.*

b. **Assemble slip joint.** Insert steel washer followed by a new cork washer in dust cap. Slip dust cap assembly over spline end of shaft with open end toward universal joint. Lubricate splines thoroughly. Insert splines of propeller shaft into slip joint so that arrows are in line (fig. 36), screw dust cap onto sleeve.

33. TEST.

a. **Procedure.** Fill propeller shaft journal and slip joint grease fittings with proper grade and quantity of lubricant (see lubrication order). Check the shaft for run-out. The shaft tube must not run-out to an indicator reading in excess of 0.020 inch, and neck of spline, 0.005 inch.

34. FITS AND TOLERANCES.

a. **Clearance.** Propeller shaft splines to yoke splines must have clearance of from 0.001 inch to 0.006 inch.

b. **Propeller shaft run-out (permissible).**

At tube	0.020 in.
At neck of spline	0.005 in.

CHAPTER 5
TRANSFER CASE

Section I
DESCRIPTION AND DATA

35. DESCRIPTION AND OPERATION.

a. **Description** (fig. 37). The transfer case is a 2-speed gear box, mounted behind the transmission between the frame side rails. The front and rear axles and winch are driven through this unit. A declutching device is provided for engaging and disengaging the front axle and the power take-off drive. The main drive gear, idler shaft rear gear, and driven shaft gear are the herringbone type. The mainshaft sliding gear and the idler shaft low speed gear are the spur type. The mainshaft, driven shaft, power take-off, and declutch shaft are mounted in tapered roller bearings. These bearings are adjusted by means of shims. The idler shaft is mounted on radial ball bearings and is not adjustable for wear. The speedometer drive gears are fully enclosed in a small housing on the forward end of the idler shaft and gear assembly and are lubricated from the transfer case.

b. **Operation** (fig. 37). High and low speed ranges in the transfer case, the engagement and disengagement of the front axle, and the power take-off, are controlled by three separate shift levers in the cab.

36. DATA.

Make Timken-Wisconsin

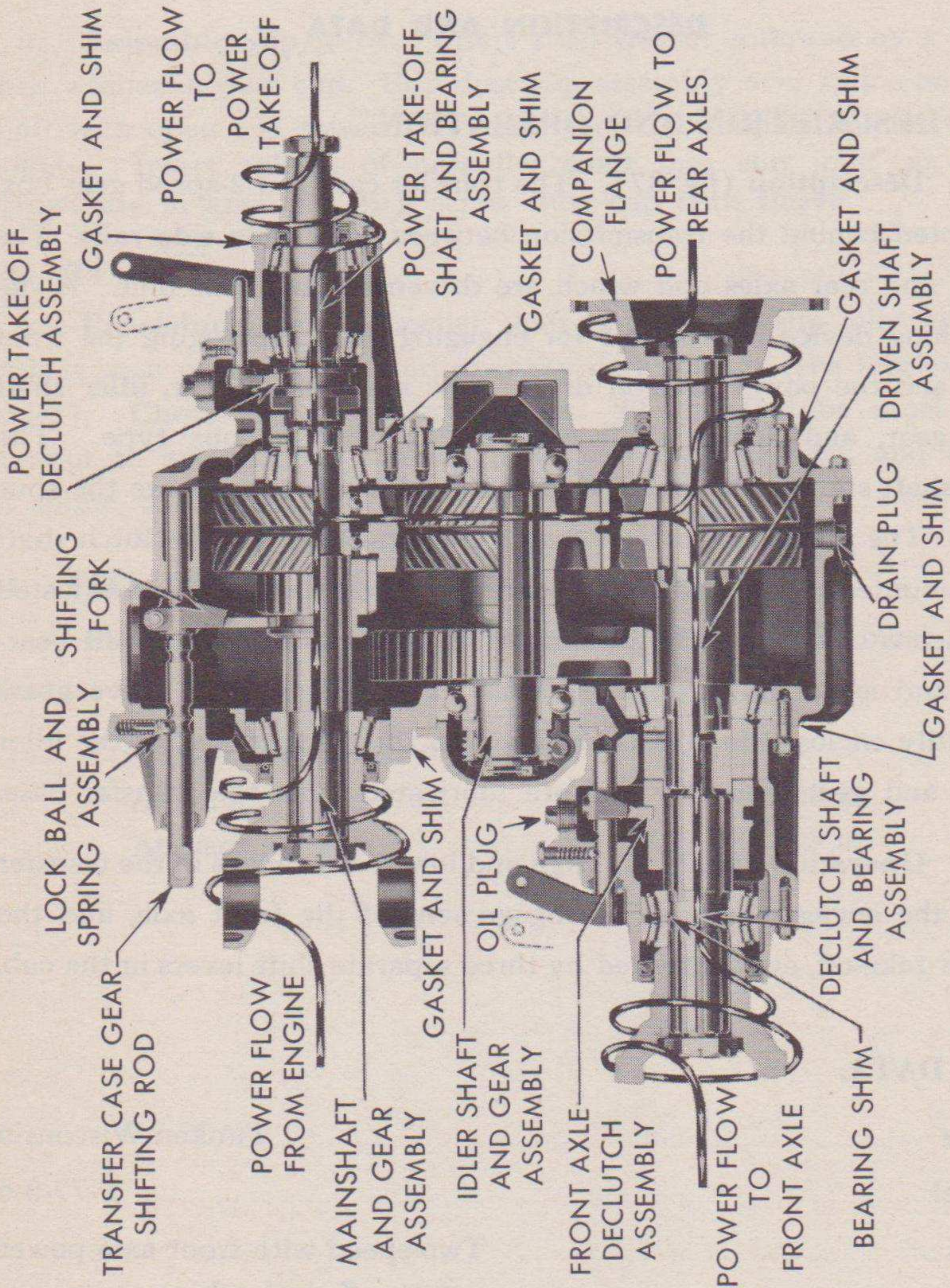
Model T-77-3-6

Type Two-speed with front axle power
take-off declutching units

Gear ratios:

High speed 1.00 to 1

Low speed 2.55 to 1



RA PD 353066

Figure 37 — Transfer Case Showing Power Flow — Sectional View

Disassembly Into Subassemblies

Bearings:

Drive gear (front)	SKF 1209
Drive gear (rear)	SKF 1209
Mainshaft cup (front)	Timken 59412
Mainshaft cone (front)	Timken 59200
Mainshaft cup (rear)	Timken 3732
Mainshaft cone (rear)	Timken 3782
Idler shaft (front)	New Dep. 1311
Idler shaft (rear)	New Dep. 1409
Driven shaft cup (front)	Timken 33472
Driven shaft cone (front)	Timken 33225
Driven shaft cup (rear)	Timken 59412
Driven shaft cone (rear)	Timken 59200
Declutching shaft cup	Timken 382A
Declutching shaft cone	Timken 385A
Power take-off shaft cup (front and rear)	Timken 332
Power take-off shaft cone (front and rear)	Timken 342S

Bearing adjustment method:

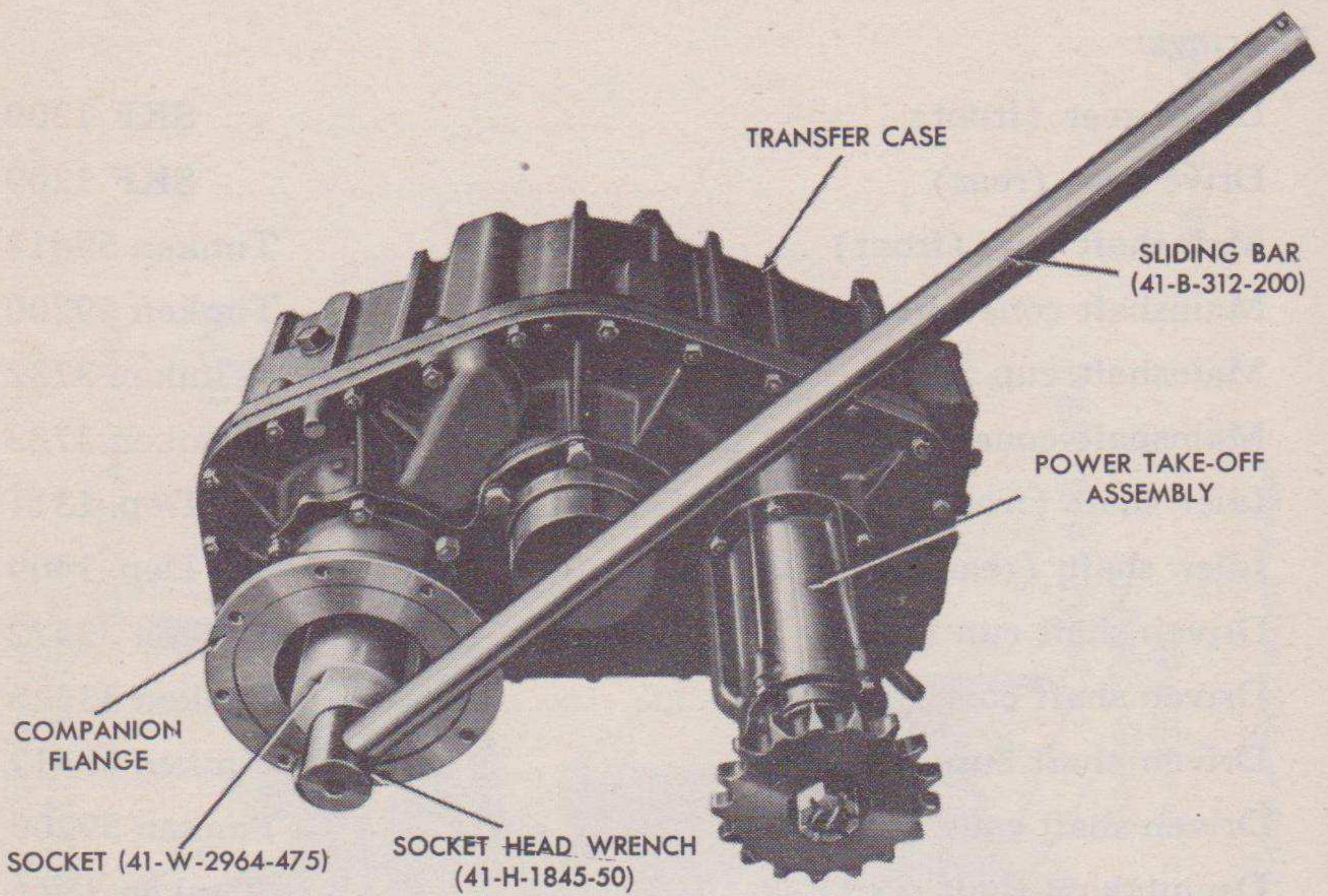
Main drive shaft	Shims between transfer case cover and power take-off declutch housing
Driven shaft	Shims under rear bearing cap
Idler shaft	None, ball-bearing type front bearing spacing
Front axle declutch shaft	Spacer shims between bearings
Power take-off declutch shaft	Shims under rear bearing power take-off cap

Section II

DISASSEMBLY INTO SUBASSEMBLIES

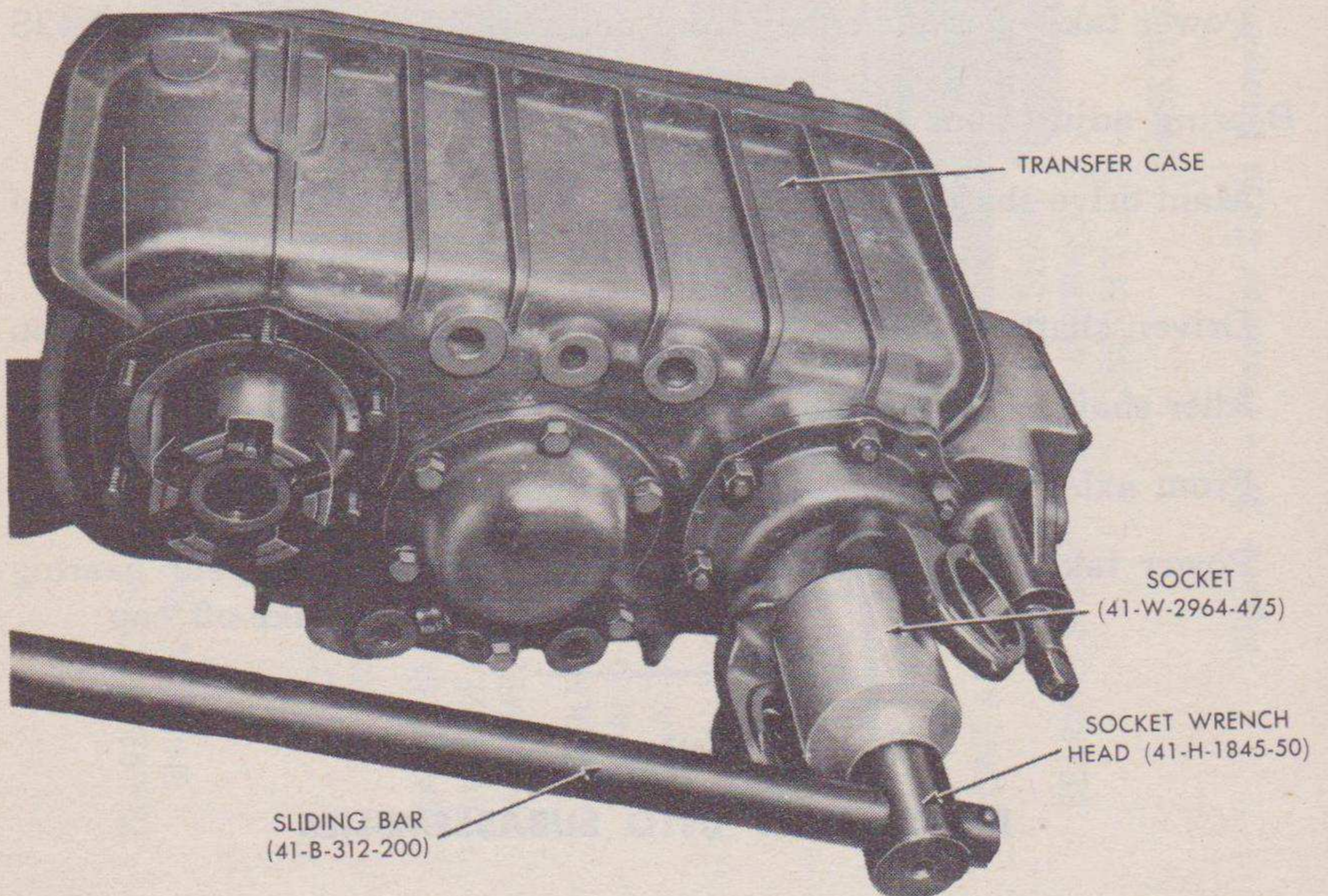
37. PRELIMINARY INSTRUCTIONS.

a. Remove transfer case. Refer to TM 9-813 for instructions on removing transfer case.



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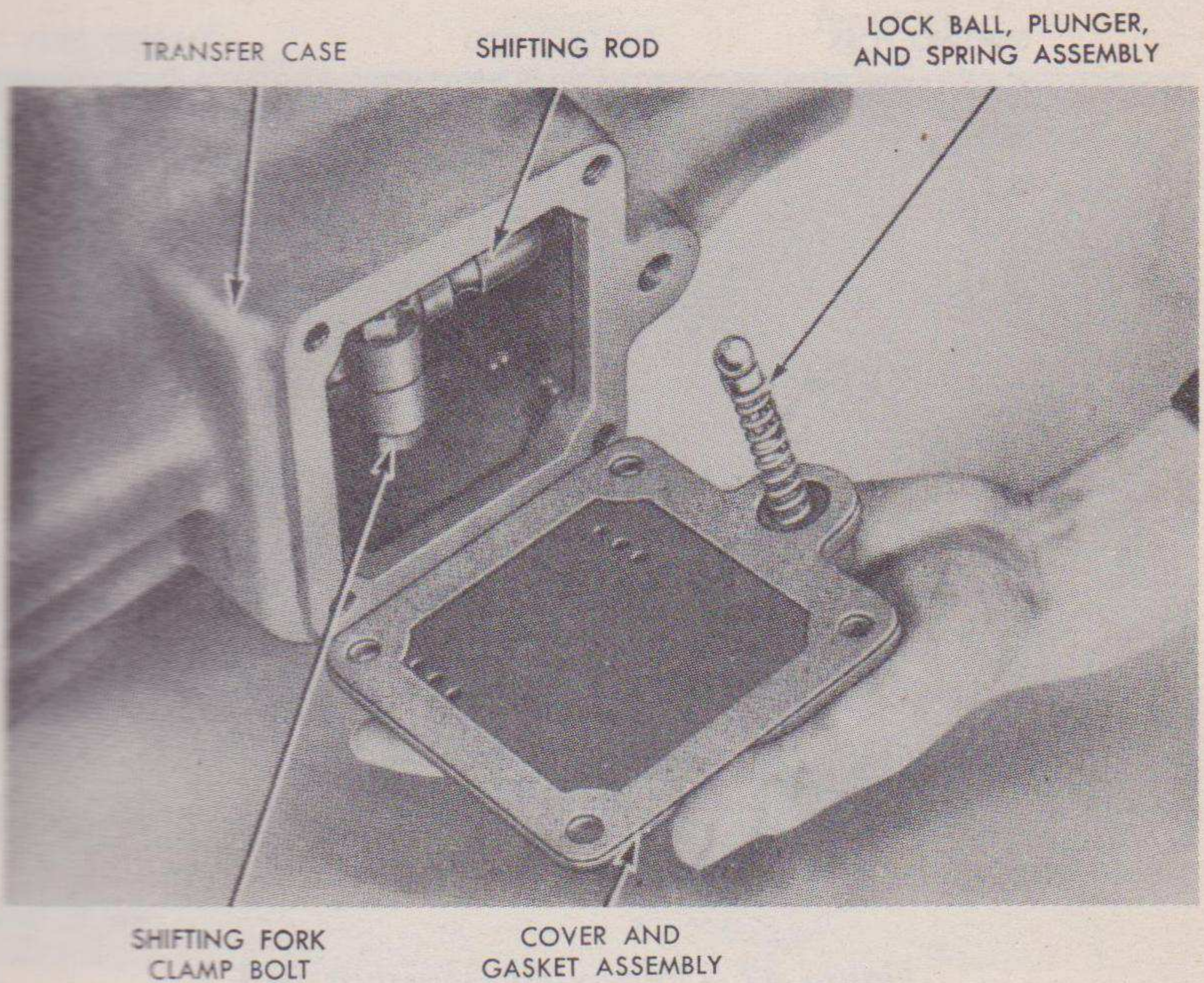
Figure 38 — Removing Driven Shaft Nut



RA PD 353068

Figure 39 — Removing Mainshaft Nut

Disassembly Into Subassemblies



RA PD 353069

Figure 40 — Removing Gearshift Rod Cover

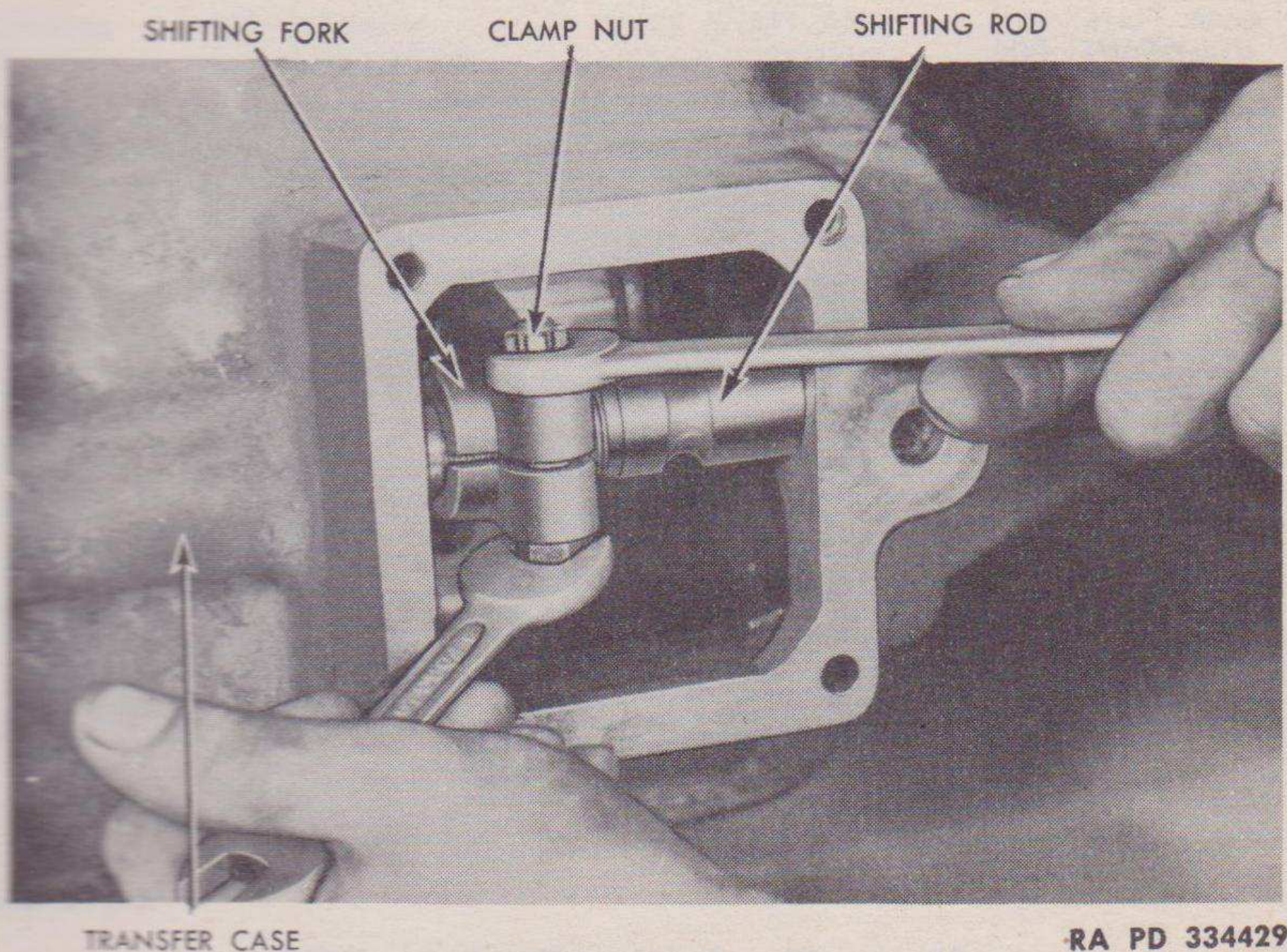
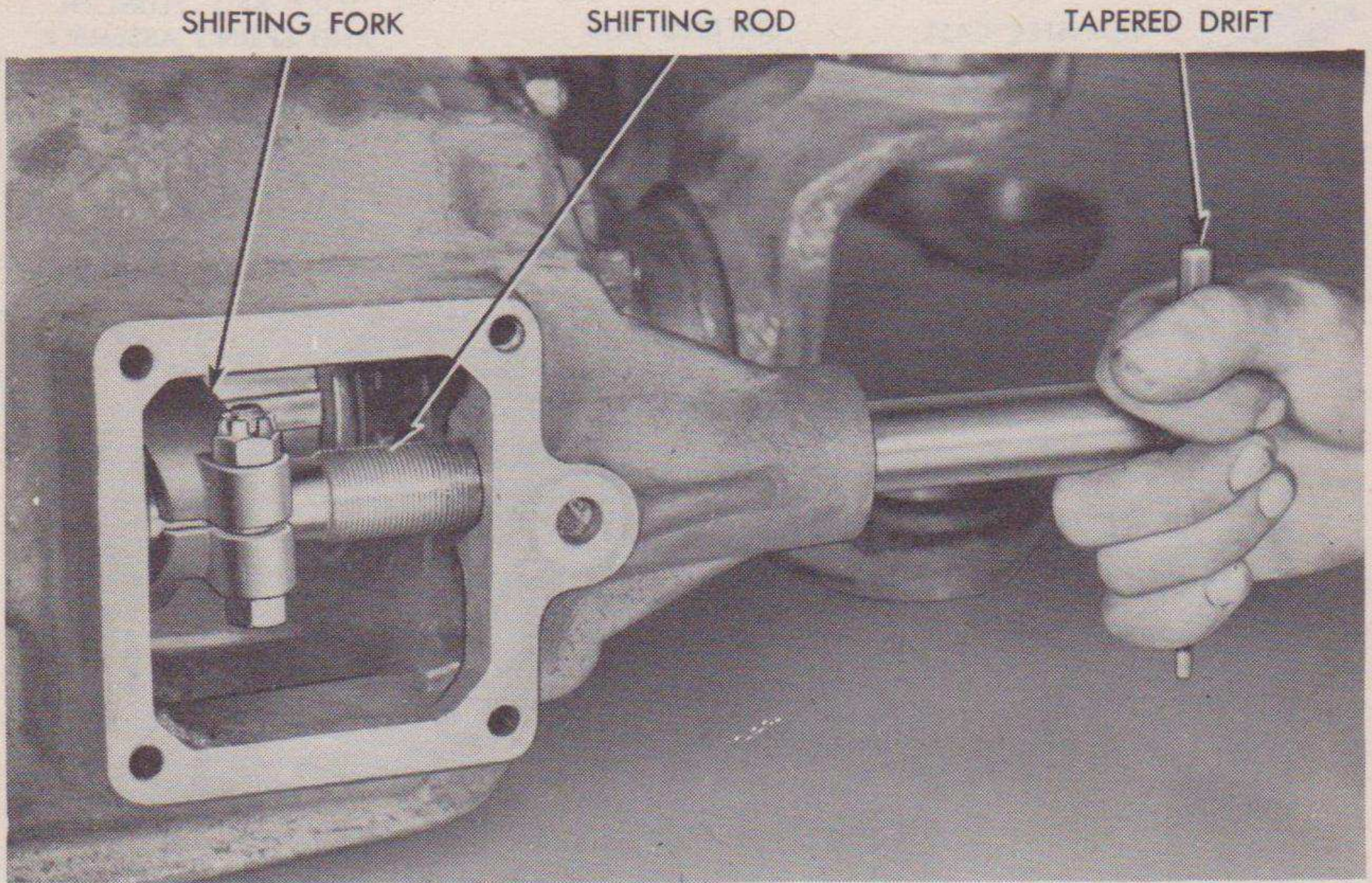
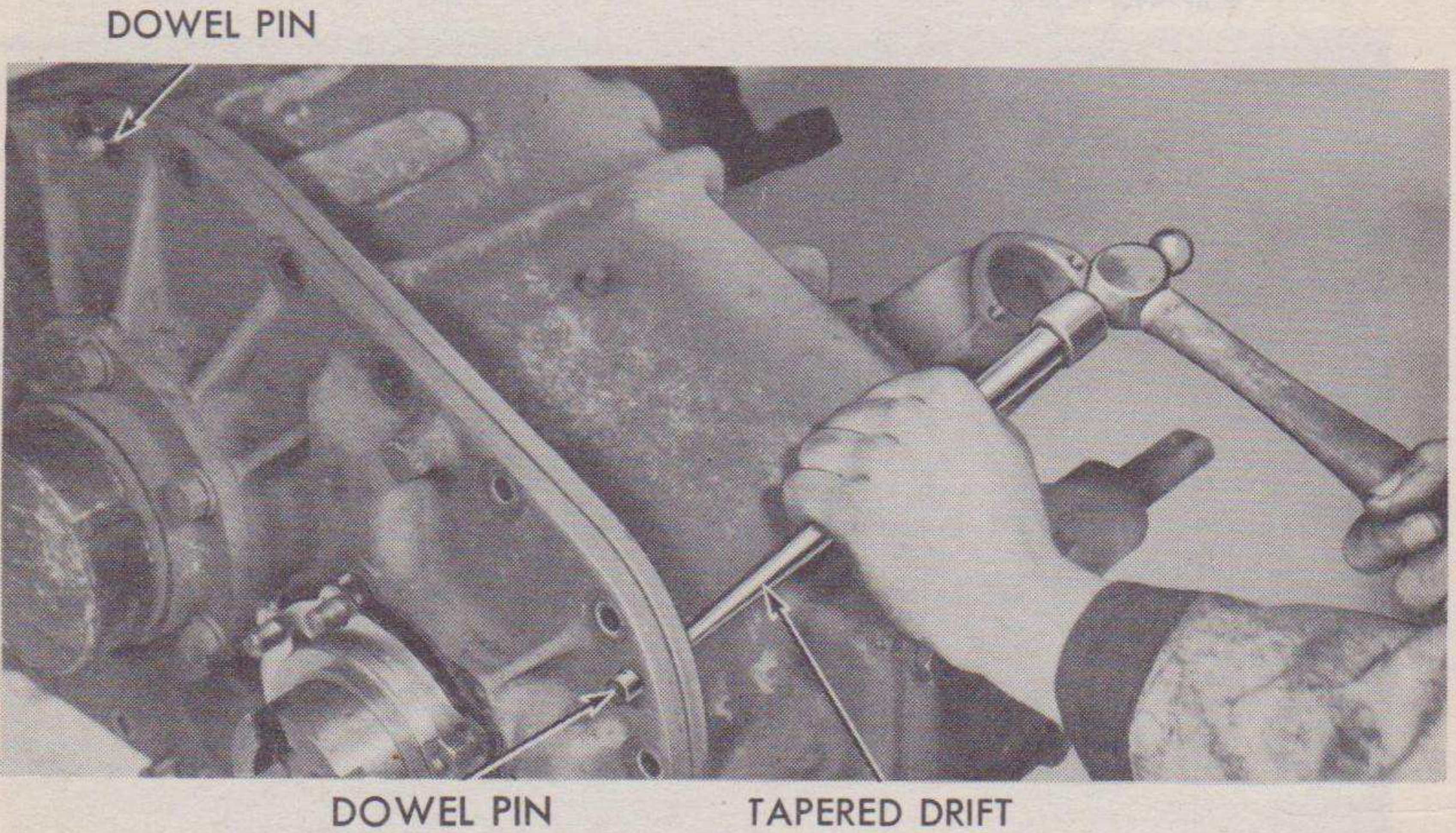


Figure 41 — Loosening Shifting Fork Clamp Nut



RA PD 349790

Figure 42 — Removing Gearshift Rod



RA PD 334431

Figure 43 — Driving Out Dowel Pins

Disassembly Into Subassemblies

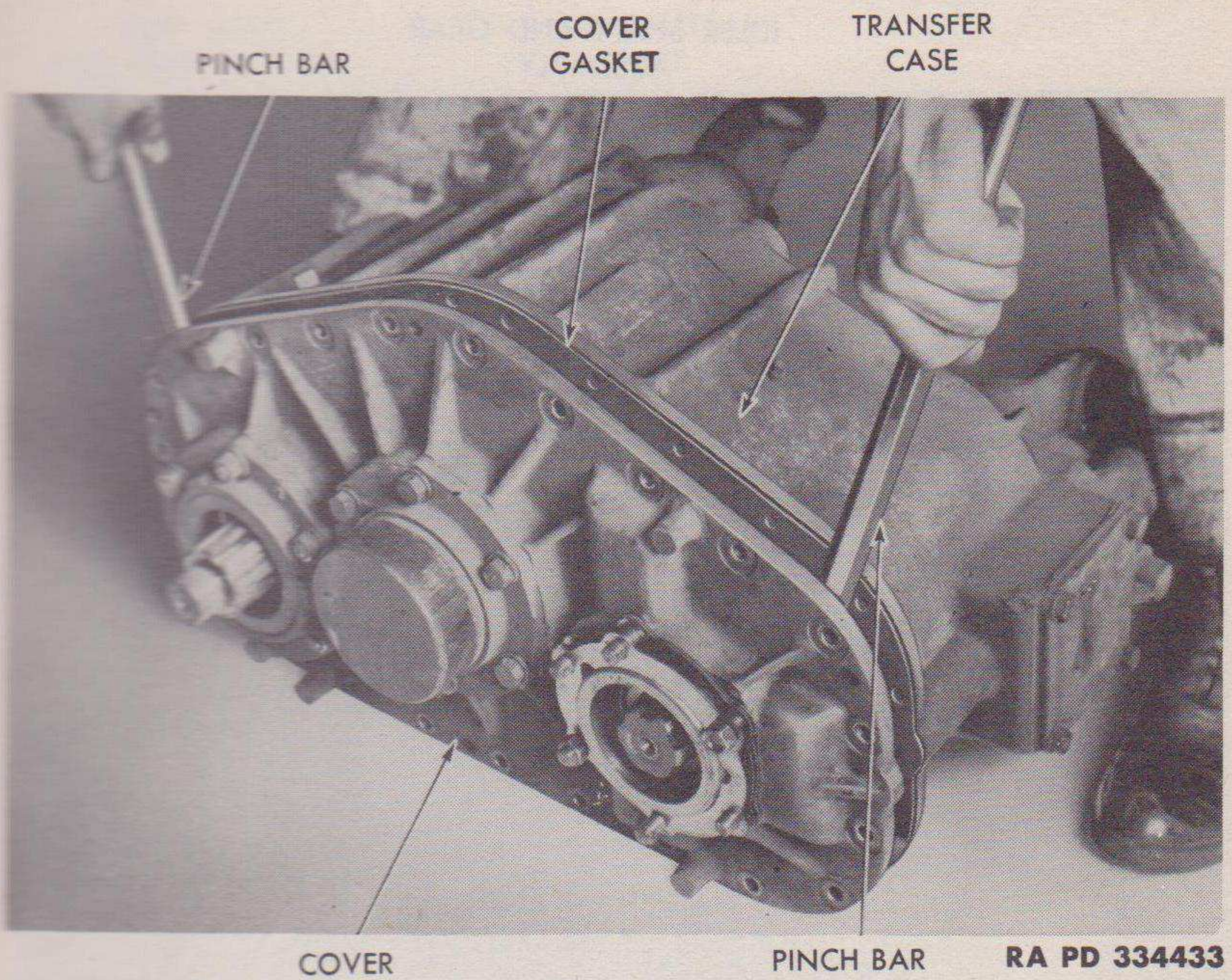


Figure 44 — Removing Transfer Case Cover

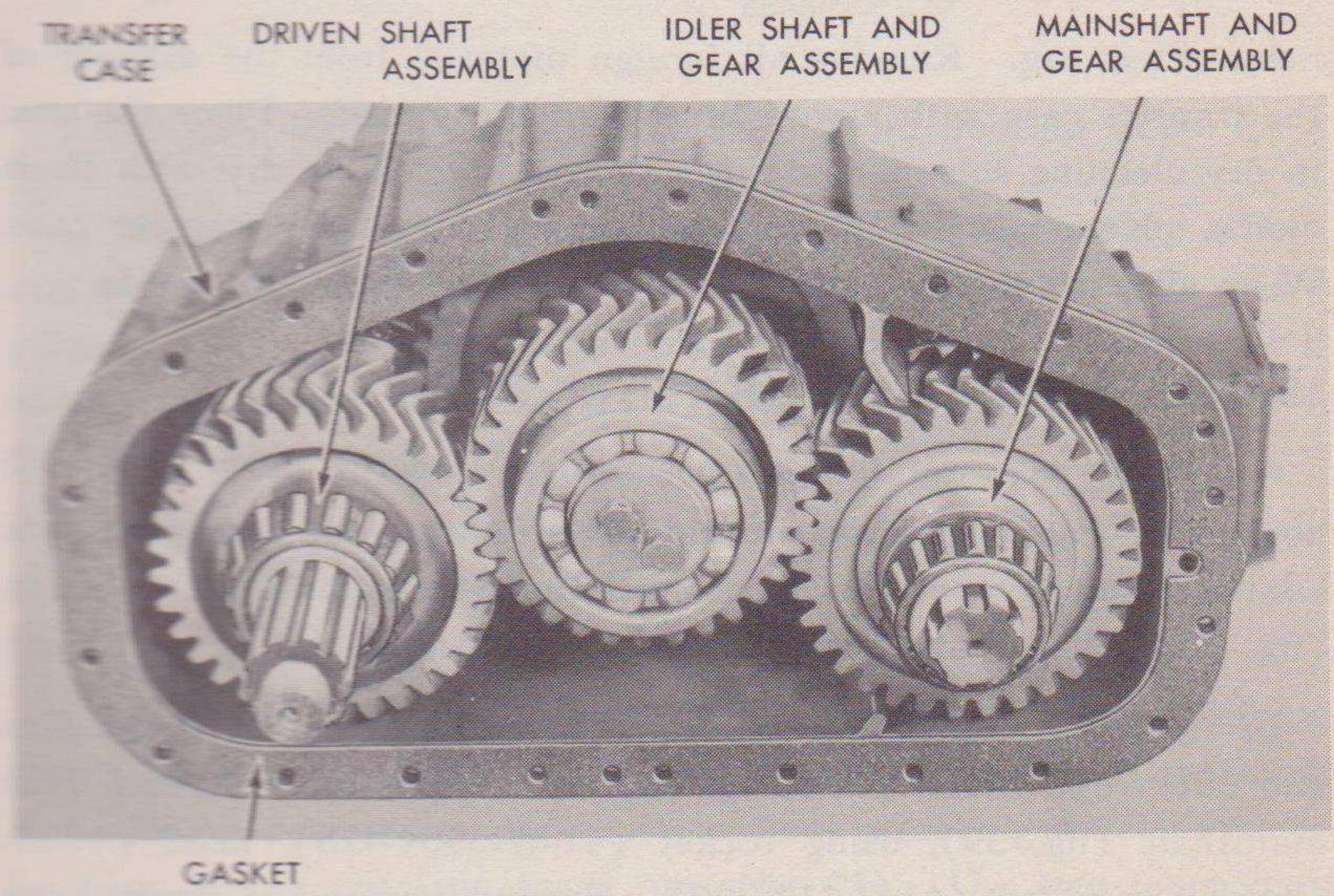


Figure 45 — Transfer Case and Gears With Cover Removed



RA PD 334435

Figure 46 — Removing Mainshaft and Gear Assembly

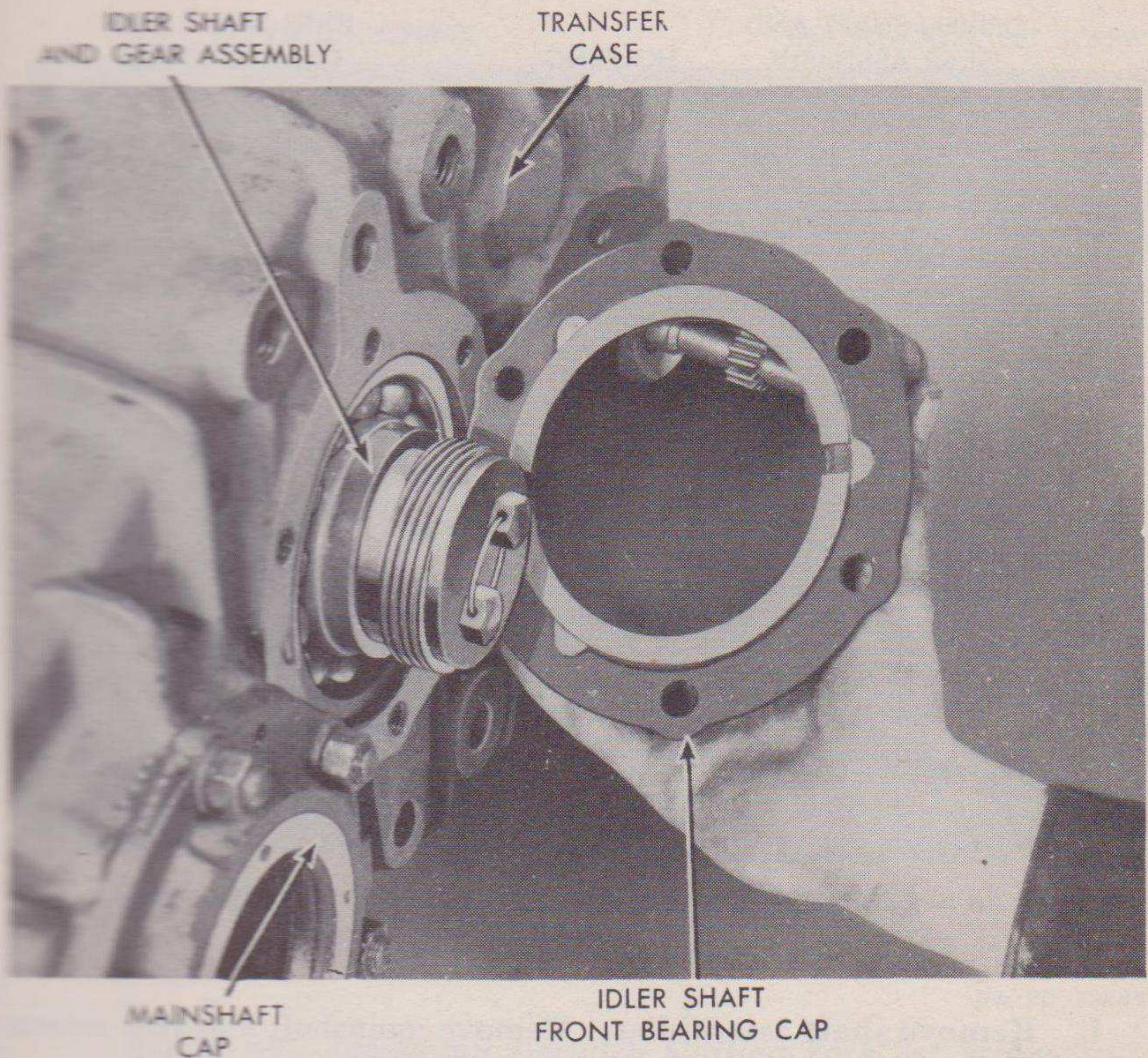
b. **Cleaning.** Remove all foreign material from the exterior of the transfer case with a wire brush and putty knife. Place the unit in dry cleaning solvent and wash thoroughly. Wipe dry with clean cloths. Keep all dirt or foreign material from the transfer case. Wrap all parts in clean paper or cloth as disassembly proceeds.

38. DISASSEMBLY OF TRANSFER CASE.

a. **Remove power take-off assembly.** Unscrew drain plug from bottom of case and drain lubricant. Remove six nuts and lock washers, and remove power take-off assembly, gasket, and shims (fig. 38). Tag the shims to insure correct assembly.

b. **Remove companion flange and yokes.** Remove cotter pins and nuts from driven shaft (fig. 38), from declutch shaft, and from mainshaft (fig. 39), using socket (41-W-2964-475), head (41-H-1845-50) and bar (41-B-312-200). Remove companion flange from driven shaft. Remove yokes from declutch shaft and mainshaft.

Disassembly Into Subassemblies



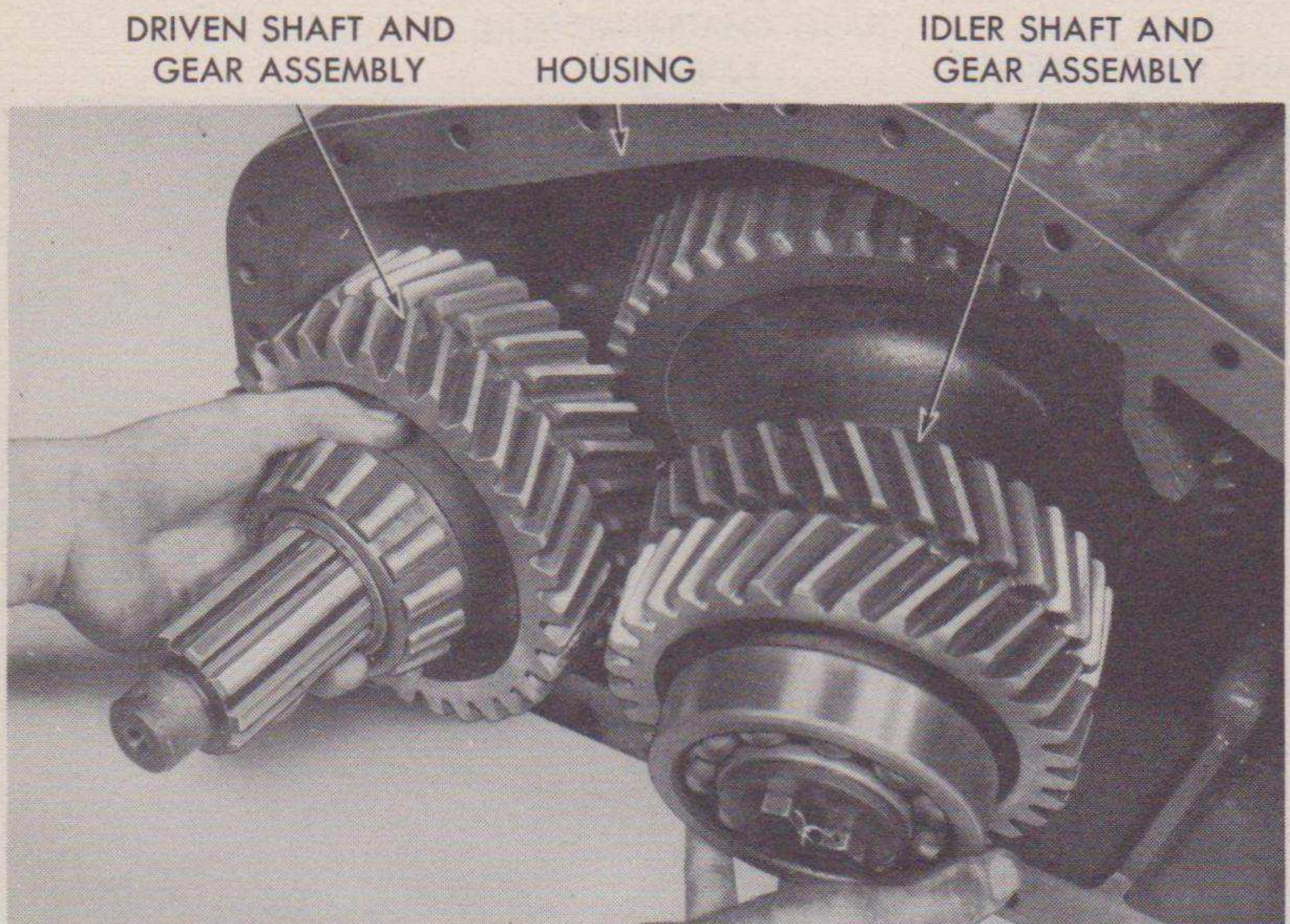
RA PD 353070

Figure 47 – Removing Idler Shaft Front Bearing Cap

e. **Remove gearshift shaft assembly.** Remove four cap screws and lock washers and lift off gearshift cover with two gaskets and a plate (fig. 40). Remove cotter pin and loosen nut on clamp bolt in shifting fork (fig. 41). Turn out gearshift rod and remove shifting fork (fig. 42).

d. **Remove front axle declutch assembly** (fig. 37). Remove six declutch carrier attaching nuts and lock washers. Remove the declutch carrier and gasket.

e. **Remove transfer case cover.** Remove power take-off driving clutch set screw and pull off driving clutch. Remove oil retaining ring. Remove cap screws and lock washers attaching cover to transfer case. Drive out four dowel pins (fig. 43). Use two pinch bars (fig. 44) and remove transfer case cover. **CAUTION: Do not tilt or "cock" the cover or parts will be damaged.**



RA PD 334440

Figure 48 — Removing Driven Shaft and Gear and Idler Shaft and Gear Assemblies

f. **Remove shaft assemblies.** Remove mainshaft and gear assembly (fig. 46). Remove six cap screws and lock washers, and remove idler shaft front bearing cap (fig. 47). Drive out driven shaft and gear and idler shaft and gear assemblies by tapping each one alternately with a soft hammer from the front end until front bearings have cleared front bearing bores of transfer case (fig. 48).

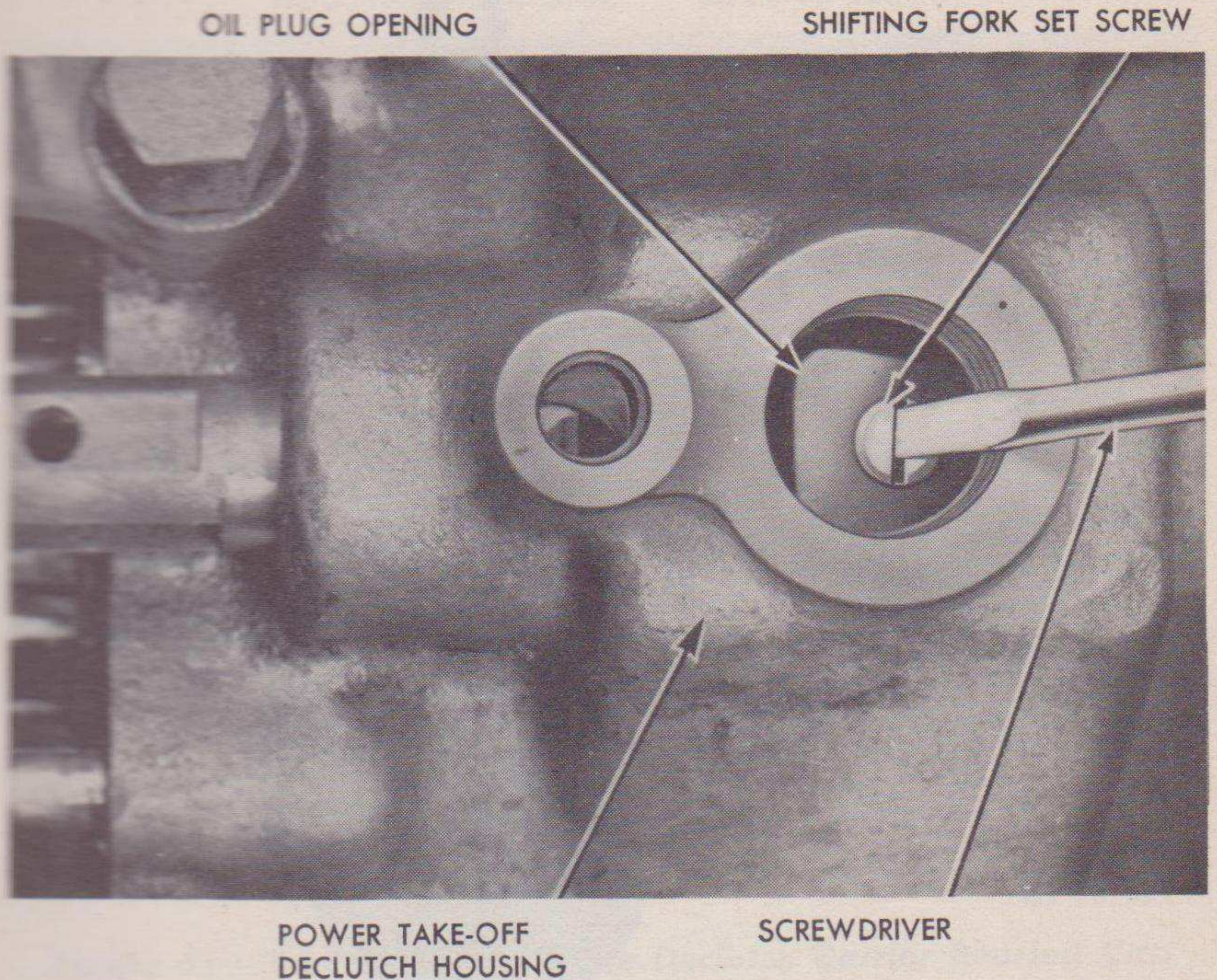
Section III

DISASSEMBLY, CLEANING, INSPECTION, REPAIR, AND ASSEMBLY OF SUBASSEMBLIES

39. POWER TAKE-OFF DECLUTCH ASSEMBLY.

a. Disassembly.

(1) **REMOVE SHIFTING ROD.** Remove the shifting rod lock ball retainer screws, washer, spring, and ball (fig. 52). Turn assembly so that hole is downward, to permit ball to fall out. Disconnect shifting rod from declutch lever. Remove oil plug from housing. Remove shifting fork set screw (fig. 49), then remove shifting rod and sliding clutch gear.



RA PD 334443

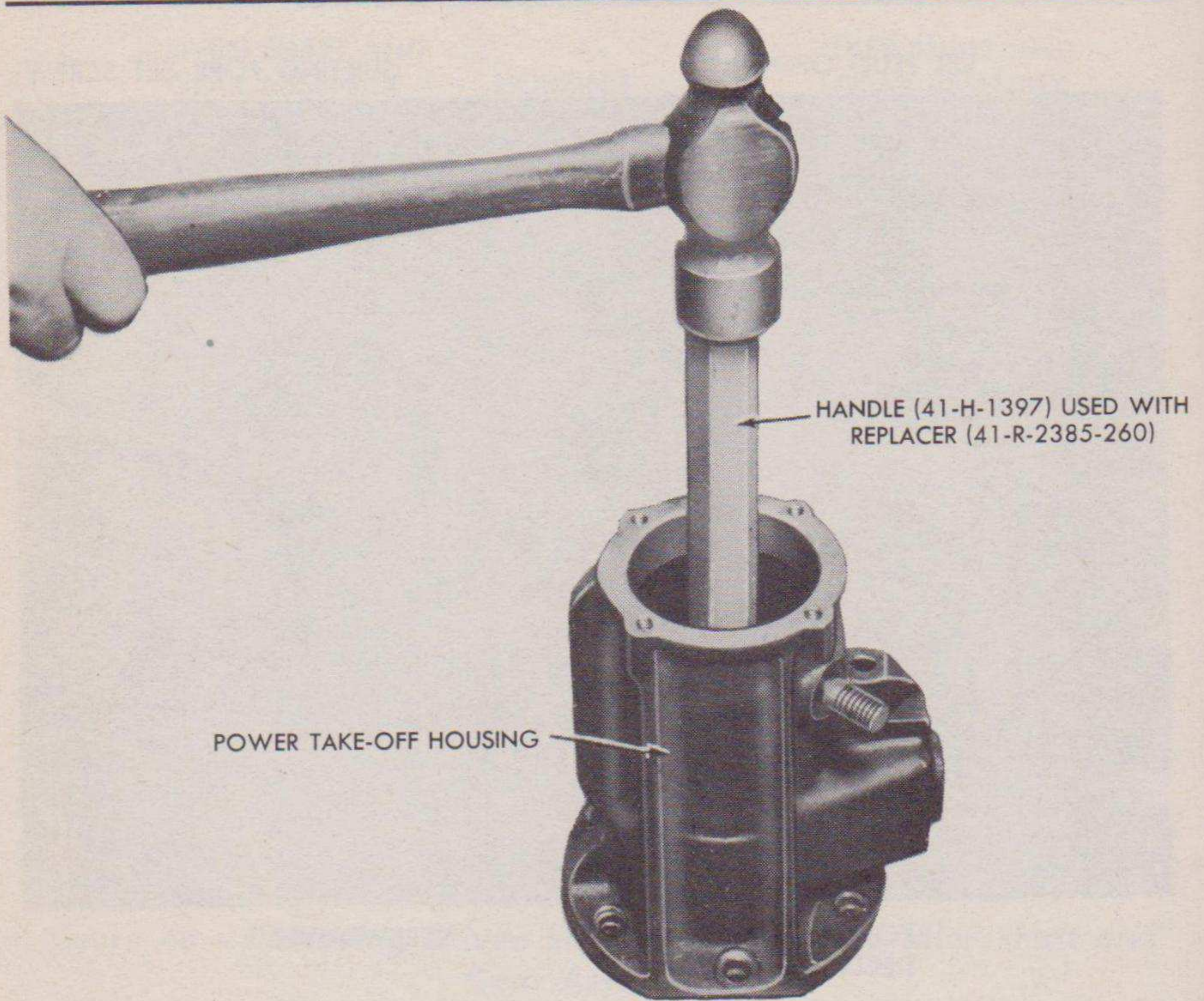
Figure 49 — Loosening Declutch Shifting Fork Set Screw

(2) REMOVE POWER TAKE-OFF DECLUTCH SHAFT. Remove the four cap screws and lock washers which attach the bearing cap to housing. Lift off the cap, gasket, and shim. Remove oil seal from cap. With the power take-off housing clamped in a vise, use a soft drift and drive on the forward end of the shaft, to remove shaft with bearings from housing. Lift shifting fork out of housing. Drive front bearing cup out of housing. Remove bearing cones from shaft with arbor press.

b. **Cleaning, inspection, and repair.** Wash all parts thoroughly with dry cleaning solvent and dry thoroughly. Check bearings carefully for damage. Check power take-off shaft for damage or wear. Inspect shifter rod for burs and wear. Inspect spring for tension. Refer to paragraph 47 for clearances of new parts. Repair consists of replacing unserviceable parts with serviceable parts.

c. **Assembly.**

(1) POSITION OF PARTS IN ASSEMBLY. Refer to figure 37 for position of assembled parts.



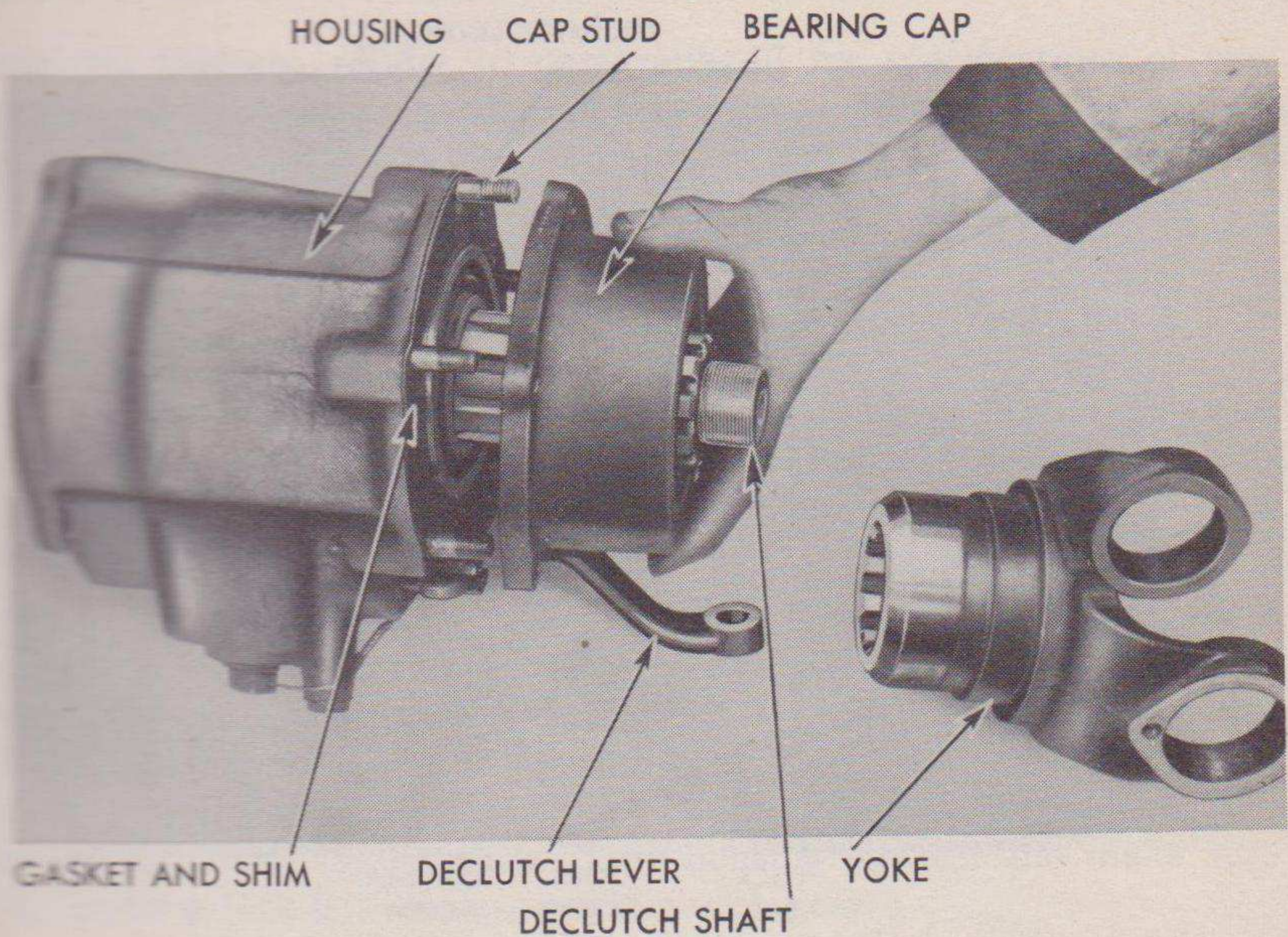
RA PD 349654

Figure 50 — Driving Front Bearing Cup Into Power Take-off Housing

(2) **INSTALL DECLUTCH SHAFT BEARING CONES, CUPS, AND OIL SEALS.** Drive the forward bearing cup into its recess in the power take-off housing (fig. 50). Make sure cup “bottoms” in housing. Use replacer (41-R-2385-260) with handle (41-H-1397). Insert a new oil seal into rear bearing cap. Press the bearing cones to seat against the shoulders on the shaft.

(3) **INSTALL POWER TAKE-OFF DECLUTCH SHAFT.** Turn housing so that oil plug hole is facing downward. Insert the shifting fork, with set screw started in position, into housing. The boss on the fork must face rear of the assembly. Place the sliding clutch gear on splines of the shaft with shifter fork groove toward rear. Slide the shaft and clutch into housing. Install rear bearing cup. Turn the housing upward and make sure the fork inside cage fits into deep groove of the sliding clutch gear.

(4) **INSTALL SHIFTING ROD.** Slide shifting rod into the power take-off housing and through the shifting fork. Line up shifting rod so that depression in the rod is directly under set screw hole in the



RA PD 353071

Figure 51 — Removing Front Axle Declutch Carrier Bearing Cap

fork (fig. 52). Insert a screwdriver through the oil plug opening and tighten the set screw (fig. 49). Connect the lever to the shifting rod (fig. 51).

(5) **INSTALL POWER TAKE-OFF REAR BEARING CAP.** Install the cap with new gasket and proper shims on the housing with lock washers and cap screws. Tighten screws alternately, testing end play in shaft during tightening operation. Refer to step (7) below.

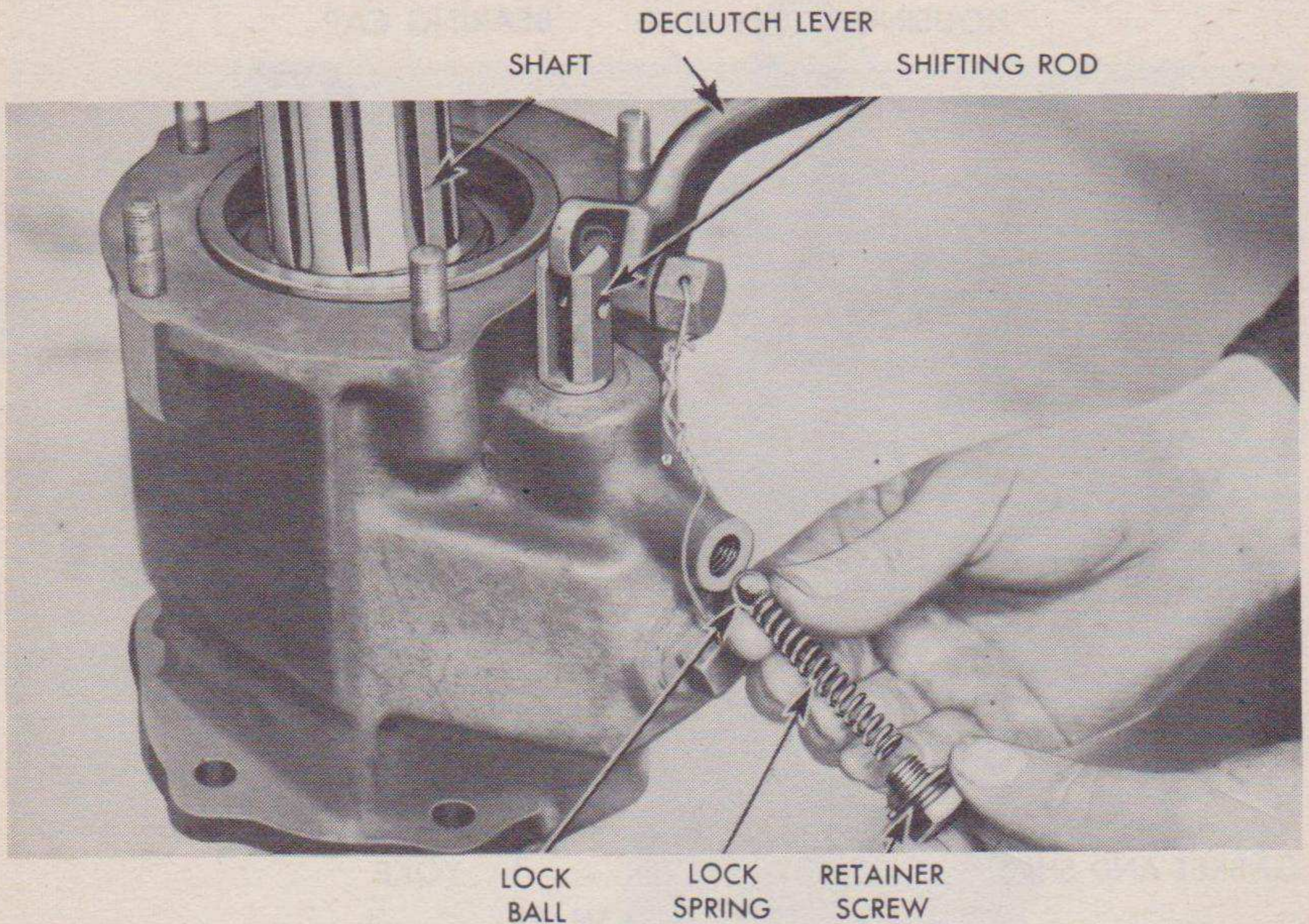
(6) **INSTALL LOCK BALL ASSEMBLY AND OIL PLUG.** Drop ball and spring into position in the power take-off cage. Place washer on ball spring screw, and insert screw, then turn down tightly.

(7) **TEST OPERATION OF ASSEMBLY.** Turn shaft to see if bearing adjustment is necessary. Bearings must be adjusted to from 0.003- to 0.005-inch maximum end play. Decreasing shim thickness decreases end play. Increasing shim thickness increases end play.

40. FRONT AXLE DECLUTCHING ASSEMBLY (fig. 37).

a. Disassembly.

(1) **REMOVE DECLUTCH CARRIER BEARING CAP (fig. 51).** Remove the carrier cap nuts and lock washers. Pull cap off shaft by hand with forward bearing cone. Lift off cap gasket.



RA PD 353072

Figure 52 — Removing Front Axle Declutch Shifting Rod Retainer Screw, Spring, and Ball

(2) **REMOVE DECLUTCH SHIFTING ROD.** Remove the shift lever retaining screw, washer, spring, and lock ball (fig. 52). Remove oil filler plug. Insert a screwdriver through the oil filler plug hole and loosen the shifting fork set screw (fig. 49). Disconnect shifting rod from declutch lever. Pull shifting rod from housing.

(3) **REMOVE DECLUTCH SHAFT FROM HOUSING.** With soft hammer, drive on rear end of declutch shaft and remove from carrier. Remove sliding clutch gear and shifting fork from housing. Press bearing and spacer off shaft if shaft or bearing is defective.

(4) **DISASSEMBLE DECLUTCH CARRIER BEARING CAP.** Place bearing cap in a vise. Remove and discard oil seal. If forward bearing cup or cone is defective, remove cup for cap.

(5) **REMOVE SHIFTING ROD PACKING AND RETAINER FROM HOUSING.** Place the housing in a vise. Using a screwdriver, pry out packing and packing retainer from housing.

b. Cleaning, inspection, and repair. Wash all parts thoroughly with dry cleaning solvent and dry thoroughly. Check bearings carefully for damage. Check declutch shifting shaft for damage and wear. Inspect shifting rod for burrs and wear. Use a new oil seal and shift-

ing rod packing. Refer to paragraph 47 for specifications of new parts. Check shifting rod spring for tension. Repair consists of substituting serviceable parts for unserviceable parts.

c. Assembly.

(1) POSITION OF PARTS IN ASSEMBLY. Refer to figure 37 for position of assembled parts.

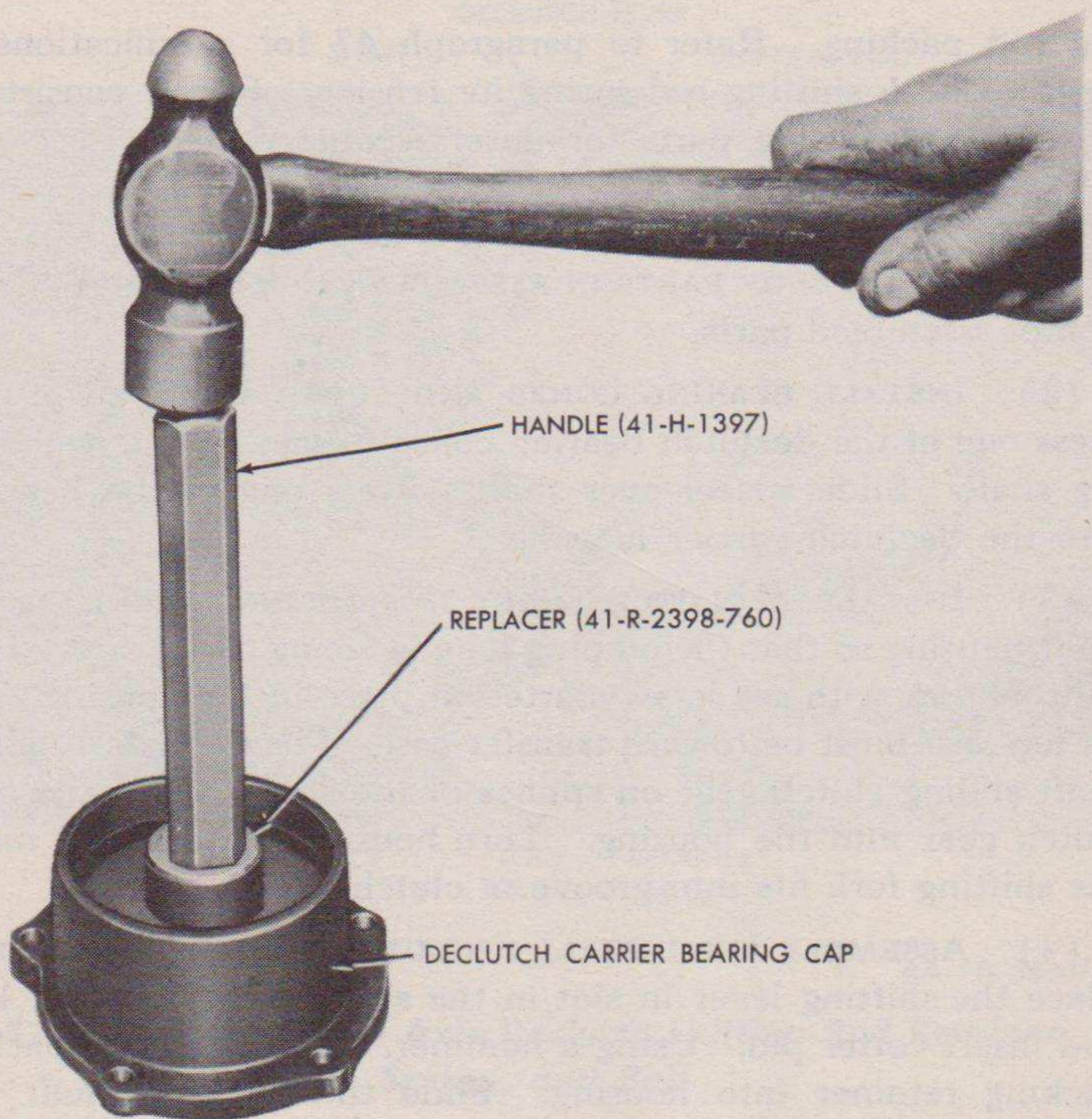
(2) INSTALL BEARING CONES AND CUPS. Using an arbor press, press one of the declutch bearing cones to seat on the declutch shifting shaft. Slide spacer over shaft. Press one of the bearing cups into the declutch carrier housing.

(3) INSTALL DECLUTCH SHAFT IN HOUSING. Turn the declutch shaft housing so that the oil plug hole is facing downward. Insert the shifting fork with set screw started in place in the housing. The boss on the fork must be toward transfer case. Place the declutch shifting shaft sliding clutch gear on splines of the shaft. Slide the shaft and clutch gear into the housing. Turn housing upward and make sure the shifting fork fits into groove in clutch gear.

(4) ASSEMBLE AND INSTALL DECLUTCH SHIFTING ROD IN HOUSING. Place the shifting lever in slot in the shifting rod. Install lever pin and insert cotter pin. Using a hammer, tap shifting rod packing and packing retainer into housing. Slide the declutch shaft into the housing and through the shifting rod. Line up the rod so that depression in rod is directly under set screw hole in the fork. Insert a screwdriver through oil plug hole and tighten set screw in the shifting fork (fig. 49). Install the shifting lever cap screw to attach lever to housing.

(5) INSTALL DECLUTCH HOUSING BEARING CAP (fig. 51). Install bearing cup in cap (fig. 53) using replacer (41-R-2398-760) and handle (41-H-1397). Install cap gasket over studs. Slide housing cap over shaft onto housing studs. Install lock washers and tighten nuts fingertight. Install bearing shim over shaft. Press second bearing cone over shaft. Install the universal joint yoke. Install the declutch shaft nut and cotter pin, making sure nut seats against yoke and that yoke is against forward bearing. Tighten cap to housing nuts. Adjust shaft bearings, step (6) below. Remove yoke, install oil seal flush with face of cap, and install yoke.

(6) TEST BEARING ADJUSTMENT (fig. 37). Turn shaft to see if bearing adjustment is necessary. Shaft must turn easily with no perceptible end or side play. Increasing thickness of bearing shim increases bearing play; conversely, decreasing bearing shim thickness decreases play. After properly adjusting bearings, perform remaining operations in step (5) above.



RA PD 353073

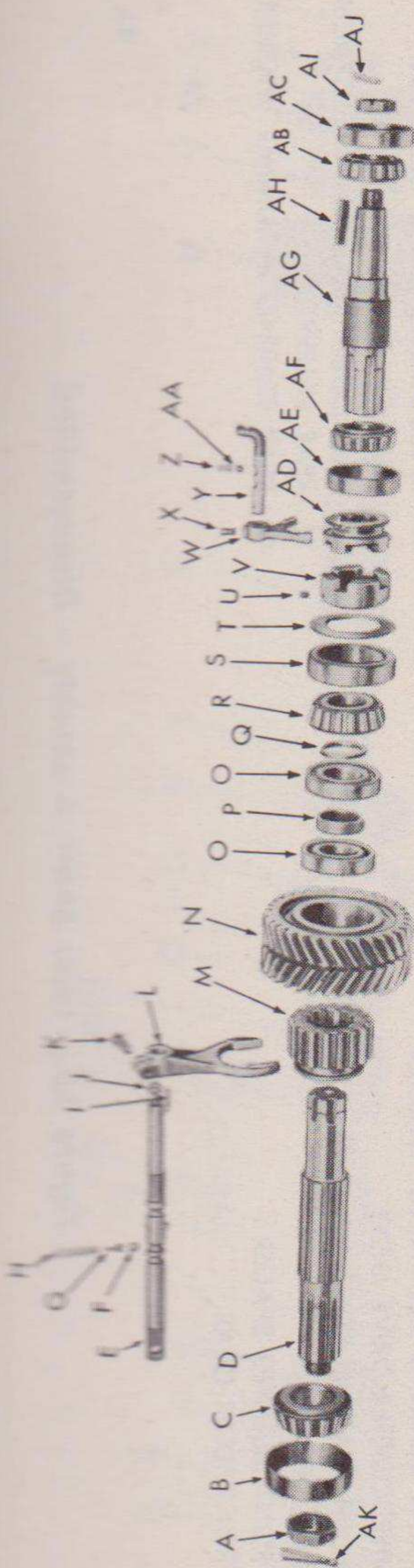
Figure 53 — Installing Bearing Cup in Front Axle Declutch Assembly Cap

(7) INSTALL DECLUTCH SHIFTING ROD RETAINER SCREW, SPRING, AND BALL (fig. 52). Drop the lock ball and spring into position in the declutch shaft housing. Place washer on the screw and insert screw in place in housing.

41. MAINSHAFT ASSEMBLY (fig. 54).

a. **Disassembly (fig. 54).** Press off front bearing cone from mainshaft. Remove sliding gear from mainshaft. Remove set screw in driving clutch gear. Press off the driving clutch gear; oil dam, rear bearing cup and cone, rear bearing spacer, and direct drive gear with two bearings with spacer between from mainshaft.

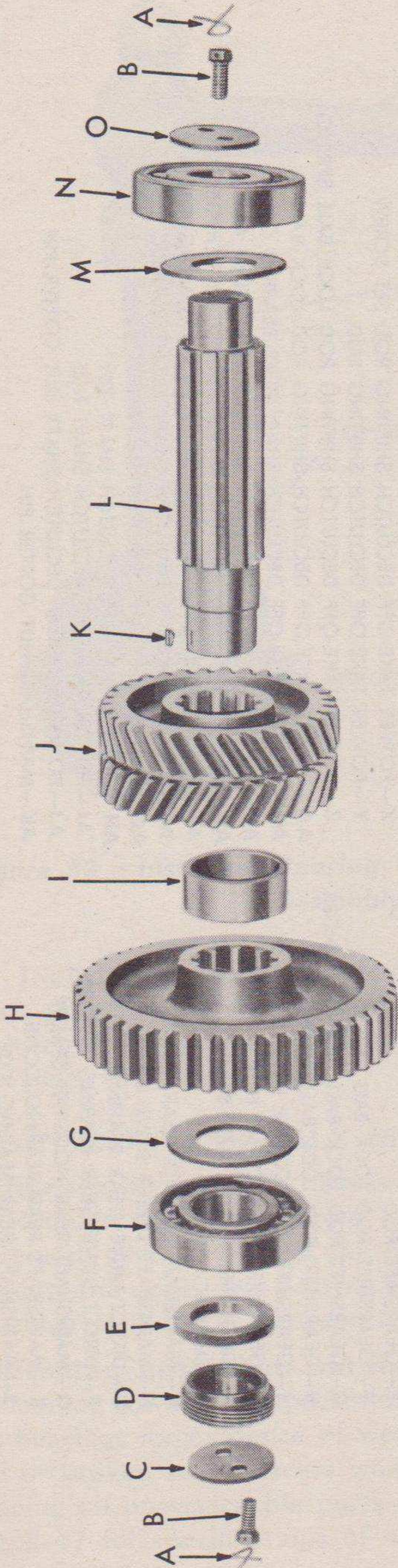
b. **Cleaning, inspection, and repair.** Wash all parts thoroughly in dry cleaning solvent. Inspect shaft for wear, burs, and rough spots. Inspect bearings for evidence of wear or damage. Inspect gears for cracked or broken teeth, excess wear, or roughness. Repair consists of replacing all unserviceable parts with serviceable parts. Refer to paragraph 47 for specifications of new parts.



- A—MAINSHAFT NUT
- B—MAINSHAFT FRONT BEARING CUP
- C—MAINSHAFT FRONT BEARING CONE
- D—MAINSHAFT
- E—GEARSHIFT ROD
- F—GEARSHIFT ROD LOCK BALL
- G—GEARSHIFT ROD LOCK BALL SPRING PLUNGER
- H—GEARSHIFT ROD LOCK BALL SPRING
- I—GEARSHIFT FORK COTTER PIN
- J—GEARSHIFT FORK CLAMP NUT
- K—GEARSHIFT FORK CLAMP BOLT
- L—SHIFTING FORK
- M—MAINSHAFT SLIDING GEAR
- N—MAINSHAFT DIRECT DRIVE GEAR
- O—DIRECT DRIVE GEAR BEARING
- P—DIRECT DRIVE GEAR BEARING SPACER
- Q—MAINSHAFT REAR HOUSING SPACER
- R—MAINSHAFT REAR BEARING CONE
- S—MAINSHAFT REAR BEARING CUP
- T—MAINSHAFT REAR BEARING OIL DAM
- U—MAINSHAFT DRIVING CLUTCH GEAR SET SCREW
- V—MAINSHAFT DRIVING CLUTCH GEAR
- W—POWER TAKE-OFF DECLUTCH SHIFTING ROD FORK
- X—POWER TAKE-OFF DECLUTCH SHIFTING ROD SET SCREW
- Y—POWER TAKE-OFF DECLUTCH SHIFTING ROD
- Z—POWER TAKE-OFF DECLUTCH SHIFTING ROD LOCK BALL SPRING
- AA—POWER TAKE-OFF DECLUTCH SHIFTING ROD LOCK BALL
- AB—POWER TAKE-OFF DECLUTCH SHAFT REAR BEARING CONE
- AC—POWER TAKE-OFF DECLUTCH SHAFT REAR BEARING CUP
- AD—POWER TAKE-OFF DECLUTCH SHAFT SLIDING CLUTCH GEAR
- AE—POWER TAKE-OFF DECLUTCH SHAFT FRONT BEARING CUP
- AF—POWER TAKE-OFF DECLUTCH SHAFT FRONT BEARING CONE
- AG—POWER TAKE-OFF DECLUTCH SHAFT
- AH—POWER TAKE-OFF DECLUTCH SHAFT KEY
- AI—POWER TAKE-OFF DECLUTCH SHAFT NUT
- AJ—POWER TAKE-OFF DECLUTCH SHAFT NUT COTTER PIN
- AK—MAINSHAFT-NUT COTTER PIN

RA PD 353074

Figure 54 — Mainshaft and Power Take-off Declutch Shaft Assemblies — Disassembled

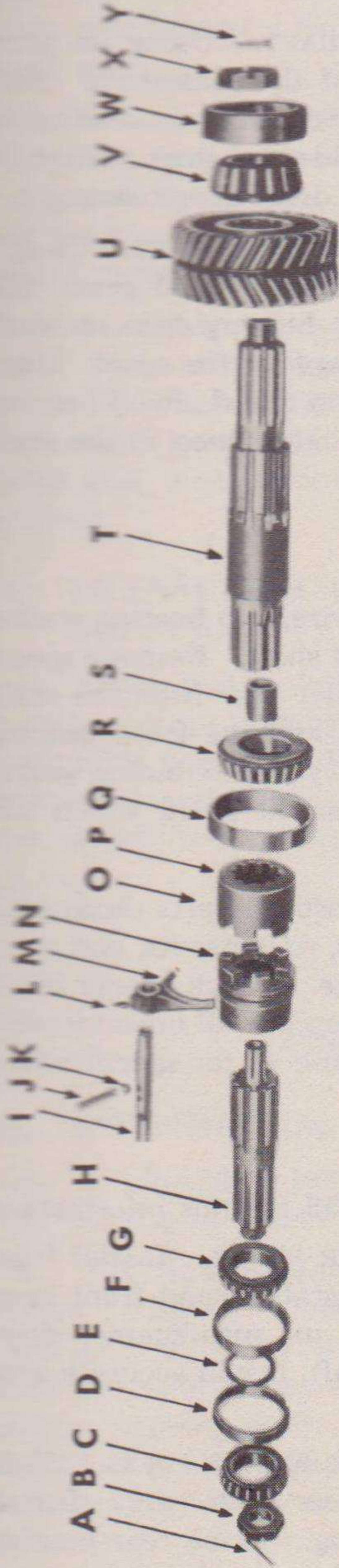


- A—BEARING WASHER SCREW LOCK WIRE
- B—BEARING WASHER SCREW
- C—FRONT BEARING RETAINING WASHER
- D—SPEEDOMETER DRIVE GEAR
- E—FRONT BEARING SPACER
- F—FRONT BEARING
- G—FRONT BEARING SPACER
- H—FRONT IDLER GEAR

- I—IDLER GEAR SPACER
- J—REAR IDLER GEAR
- K—SPEEDOMETER DRIVE GEAR KEY
- L—IDLER SHAFT
- M—IDLER SHAFT REAR BEARING SPACER
- N—REAR BEARING
- O—REAR BEARING RETAINING WASHER

RA PD 353075

Figure 55 — Idler Shaft Assembly — Disassembled



- A—DECLUTCH SHAFT COTTER PIN
- B—DECLUTCH SHAFT NUT
- C—DECLUTCH SHAFT FRONT BEARING CONE
- D—DECLUTCH SHAFT BEARING CUP
- E—DECLUTCH SHAFT BEARING SHIM
- F—DECLUTCH SHAFT REAR BEARING CUP
- G—DECLUTCH SHAFT REAR BEARING CONE
- H—DECLUTCH SHAFT
- I—DECLUTCH SHIFTING ROD
- J—DECLUTCH SHIFTING ROD LOCK BALL SPRING
- K—DECLUTCH SHIFTING ROD LOCK BALL
- L—DECLUTCH SHIFTING ROD FORK SET SCREW
- M—DECLUTCH SHIFTING ROD FORK
- N—DECLUTCH SHAFT SLIDING CLUTCH GEAR
- O—DRIVEN SHAFT DRIVING CLUTCH GEAR SET SCREW
- P—DRIVEN SHAFT DRIVING CLUTCH GEAR
- Q—DRIVEN SHAFT FRONT BEARING CUP
- R—DRIVEN SHAFT FRONT BEARING CONE
- S—DECLUTCH SHAFT PILOT BUSHING
- T—DRIVEN SHAFT
- U—DRIVEN GEAR
- V—DRIVEN SHAFT REAR BEARING CONE
- W—DRIVEN SHAFT REAR BEARING CUP
- X—DRIVEN SHAFT NUT
- Y—DRIVEN SHAFT NUT COTTER PIN

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Figure 56 — Driven and Front Axle Declutch Shaft Assemblies — Disassembled

c. Assembly.

(1) **POSITION OF ASSEMBLED PARTS.** Refer to figures 37 and 54 for this information.

(2) **ASSEMBLE SLIDING GEAR ON MAINSHAFT.** Using an arbor press, press the front bearing on front end of the mainshaft. Slide the sliding gear on shaft. Press the direct drive gear bearing on shaft. Press bearing to seat against the shoulder on shaft. Slide the spacer on shaft, then press on the rear direct drive gear bearing.

(3) **ASSEMBLE THE DIRECT DRIVE GEAR ON MAINSHAFT.** Using a soft hammer, tap gear so bearings are flush with side of gear. Slip rear bearing spacer on the shaft. Press rear bearing cone on shaft. Slide rear bearing cup and oil dam on shaft against the cone. Using a soft hammer, drive the driving clutch gear on the shaft. Then line up the set screw hole in clutch gear with the indentation in the shaft. Install clutch set screw and tighten securely.

42. IDLER SHAFT ASSEMBLY.

a. Disassembly (fig. 55). Remove lock wire, two bearing washer screws, and retaining washer from front end of shaft. Remove speedometer drive gear and key. Press off front idler gear from the shaft, which will remove two front bearing spacers and the front bearing. Remove locking wire, two bearing washer screws, and retaining washer from rear end of shaft. Press rear idler gear off shaft, which will remove rear bearing spacer and rear bearing.

b. Cleaning, inspection, and repair. Wash all parts thoroughly in dry cleaning solvent. Inspect shaft for burs, rough spots, and wear. Inspect bearings and gears for wear or damage. Check spacer thicknesses (par. 47). Replace spacers, if worn. Replace all unserviceable parts with serviceable parts. Refer to paragraph 47 for specifications of new parts.

c. Assembly.

(1) **POSITION OF PARTS.** Refer to figure 55 for this information.

(2) **PRESS FRONT IDLER GEAR ONTO IDLER SHAFT.** Install front bearing spacer, press on front bearing, then install second front bearing spacer. Insert key in keyway and press on speedometer drive gear. Position retaining washer on end of shaft, fasten securely with two screws, and lock with lock wire.

(3) **REVERSE POSITION OF ASSEMBLY ON ARBOR PRESS.** Slide idler gear spacer onto shaft, then press on rear idler gear. Install rear bearing spacer, then press on rear bearing. Place rear bearing retaining washer on end of shaft, fasten securely with two screws, and lock with lock wire.

43. DRIVEN SHAFT ASSEMBLY.

a. **Disassembly** (fig. 56). Press off rear bearing cone and driven gear. Reverse the position of shaft in the press. Remove driving clutch gear set screw from clutch gear, and press off front bearing and clutch gear.

b. **Cleaning, inspection, and repair.** Wash all parts thoroughly in dry cleaning solvent. Inspect shaft and pilot bushing for burs, rough spots, and wear. Inspect bearings for wear or damage. Inspect gear for wear or damage. Replace all unserviceable parts with serviceable parts. Refer to paragraph 47 for specifications of new parts.

c. **Assembly.** Refer to figures 56 and 37 for position of assembled parts. Press driven gear on shaft, then press on rear bearing cone. Reverse position of shaft in press, and press on front bearing cone. Slide clutch gear onto front end of shaft. Line up set screw hole in clutch gear with indentation in shaft. Insert set screw and tighten securely.

44. TRANSFER CASE, COVER, CAPS, AND DECLUTCH HOUSINGS.

a. Clean and inspect these parts for damage and wear. Check diameters of all bearing bores. Replace worn or damaged parts with serviceable parts. In the transfer case cover, install the rear mainshaft bearing cup and the driven shaft rear bearing cup. In transfer case, install front mainshaft bearing cup and front driven shaft bearing cup.

Section IV

ASSEMBLY, TEST, AND DATA

45. ASSEMBLY (fig. 37).

a. **Preliminary instructions.** Lubricate all subassemblies with a light coating of prescribed lubricant (see lubrication order).

b. **Position mainshaft, idler shaft, and driven shaft assemblies in case.** Position driven shaft assembly in case, then carefully position idler shaft assembly in case, being careful to avoid gear tooth injury when meshing driven and rear idler gears. Use a soft-faced hammer, and tap ends of shafts alternately until front bearing of idler shaft is in correct position (fig. 37). Carefully position mainshaft and gear assembly in case, being careful to mesh rear idler gear with direct drive gear of the mainshaft.

c. **Install transfer case cover.** Place a new gasket on transfer case. Place transfer case cover in position and, using a soft hammer,

CHAPTER 14
HOIST POWER TAKE-OFF

Section I

DESCRIPTION AND DATA

139. DESCRIPTION AND OPERATION.

a. The bridge erection vehicle is equipped with power take-off units, mounted to each side of the transmission. The left unit transfers power from the transmission to the winch, and the right unit transfers power to the hydraulic pump for the rear unloading derrick. The right unit differs from the left to the extent that the adapter gear and shaft assembly (as shown in figure 162, parts A, B, C, D, E, F, and G) is not included as part of this unit. The crane vehicle is equipped with the left power take-off unit only, which transfers power to the front mounted winch controlling the raising and lowering of the crane.

140. DATA.

Make	Heil
Model	B-356, B-357
Bearings	
Drive shaft (front) (ball)	N.D. 1207
Drive shaft (rear) (ball)	N.D. E207
Intermediate gear (straight roller)	Hyatt 94328
Double idler gear (straight roller)	Hyatt 94532
Adapter idler gear (straight roller)	Hyatt 94328

Section II

DISASSEMBLY INTO SUBASSEMBLIES

141. PRELIMINARY INSTRUCTIONS.

a. **Remove power take-off.** Refer to TM 9-813 for instructions in removing power take-off.

b. **Cleaning.** Remove all foreign material from the exterior of the power take-off with a wire brush and putty knife. Place the unit in a container of dry cleaning solvent and wash thoroughly. Dry with a clean cloth. *NOTE: As disassembly proceeds, clean all parts and wrap in paper or cloth.*

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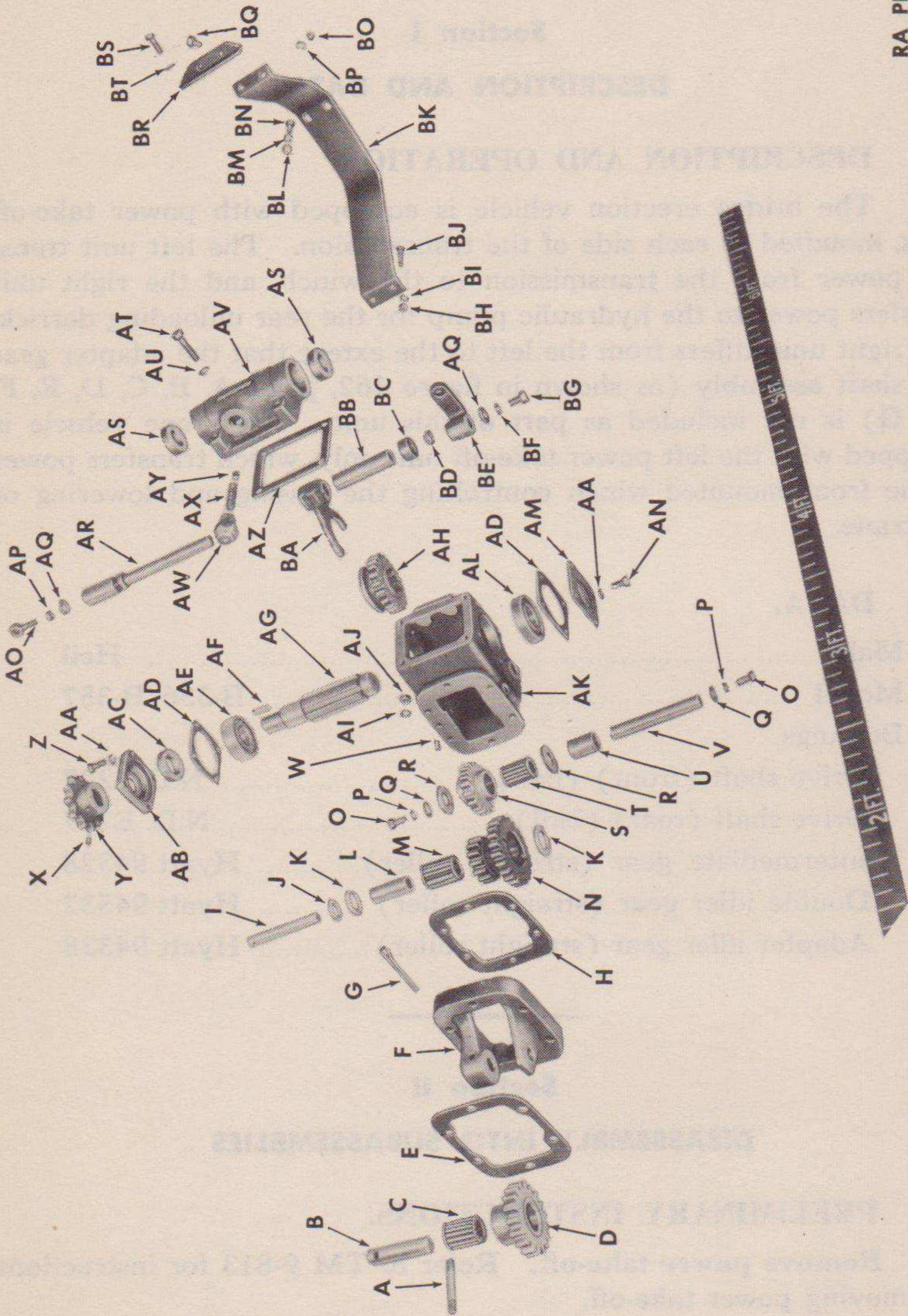


Figure 162 — Power Take-off (Left Unit) — Disassembled

Disassembly Into Subassemblies

- | | | |
|---|---|--|
| A — ADAPTER STUD | AA — DRIVE SHAFT REAR BEARING COVER SCREW LOCK WASHER | BA — SHIFTER YOKE |
| B — ADAPTER IDLER GEAR SHAFT | AB — DRIVE SHAFT REAR BEARING COVER | BB — SHIFTER SHAFT SLEEVE |
| C — ADAPTER IDLER GEAR ROLLER BEARING | AC — DRIVE SHAFT REAR BEARING SEAL | BC — SHIFTER SHAFT SLEEVE SPACER COLLAR |
| D — ADAPTER IDLER GEAR | AD — DRIVE SHAFT BEARING COVER GASKET | BD — SHIFTER SHAFT SLEEVE SPACER PACKING RING |
| E — ADAPTER TO TRANSMISSION GASKET | AE — DRIVE SHAFT REAR BEARING | BE — SHIFTER SHAFT ARM |
| F — ADAPTER HOUSING | AF — DRIVE SHAFT SPROCKET KEY | BF — SHIFTER ARM RETAINING SCREW LOCK WASHER |
| G — ADAPTER IDLER GEAR SHAFT COTTER PIN | AG — DRIVE SHAFT | BG — SHIFTER ARM RETAINING SCREW |
| H — POWER TAKE-OFF TO ADAPTER GASKET | AH — DRIVE SHAFT SLIDING GEAR | BH — POWER TAKE-OFF STRAP CONNECTING NUT |
| I — DOUBLE IDLER GEAR SHAFT | AI — TRANSMISSION ADAPTER STUD LOCK WASHER | BI — POWER TAKE-OFF CONNECTING LOCK WASHER |
| J — DOUBLE IDLER GEAR SLEEVE WASHER | AJ — TRANSMISSION ADAPTER STUD NUT | BJ — POWER TAKE-OFF STRAP CONNECTING BOLT |
| K — DOUBLE IDLER GEAR BEARING SPACER WASHER | AK — WINCH POWER TAKE-OFF HOUSING | BK — POWER TAKE-OFF STRAP |
| L — DOUBLE IDLER GEAR BEARING SLEEVE | AL — DRIVE SHAFT FORWARD BEARING | BL — POWER TAKE-OFF HOUSING FLAT WASHER |
| M — DOUBLE IDLER GEAR ROLLER BEARING | AM — DRIVE SHAFT FORWARD BEARING COVER PLATE | BM — POWER TAKE-OFF HOUSING LOCK WASHER |
| N — DOUBLE IDLER GEAR | AN — DRIVE SHAFT COVER PLATE SCREW | BN — POWER TAKE-OFF HOUSING CAP SCREW |
| O — INTERMEDIATE GEAR RETAINING SCREW | AO — SHIFTER SHAFT EYE BOLT | BO — POWER TAKE-OFF STRAP BRACKET CONNECTING NUT |
| P — INTERMEDIATE GEAR RETAINING SCREW LOCK WASHER | AP — SHIFTER SHAFT EYE BOLT LOCK NUT | BP — POWER TAKE-OFF STRAP BRACKET CONNECTING LOCK WASHER |
| Q — INTERMEDIATE GEAR RETAINING SCREW FLAT WASHER | AQ — SHIFTER SHAFT FLAT WASHER | BQ — POWER TAKE-OFF STRAP ANGLE CONNECTING BOLT |
| R — INTERMEDIATE GEAR BEARING WASHER | AR — SHIFTER SHAFT | BR — BINDING STRAP ANGLE |
| S — INTERMEDIATE GEAR | AS — SHIFTER COVER SEAL | BS — ANGLE CAP SCREW |
| T — INTERMEDIATE GEAR ROLLER BEARING | AT — SHIFTER COVER CAP SCREW | BT — ANGLE LOCK WASHER |
| U — INTERMEDIATE GEAR SPACER SLEEVE | AU — SHIFTER COVER CAP SCREW LOCK WASHER | |
| V — INTERMEDIATE GEAR SHAFT | AV — SHIFTER COVER | |
| W — DOUBLE IDLER GEAR SHAFT SOCKET TYPE SET SCREW | AW — SHIFTER YOKE LOCK SPRING CAP | |
| X — DRIVE SHAFT SPROCKET SOCKET TYPE SET SCREW | AX — SHIFTER YOKE LOCK SPRING | |
| Y — DRIVE SHAFT SPROCKET | AY — SHIFTER YOKE LOCK BALL | |
| Z — DRIVE SHAFT REAR BEARING COVER SCREW | AZ — SHIFTER COVER ASSEMBLY GASKET | |

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Legend for Figure 162

142. DISASSEMBLY OF POWER TAKE-OFF (LEFT UNIT)
(fig. 162).

a. **Remove gaskets.** Remove any gasket which adheres to the mounting surfaces. *NOTE: If replacement gaskets are not available, do not destroy these gaskets. Their thickness determines the backlash of the gears.*

b. **Remove shifter yoke assembly.** Remove four cap screws (AT) and lock washers from shifter cover (AV). Remove shifter yoke assembly.

c. **Remove double idler shaft and gear.** Remove the set screw from the double idler gear shaft (I) and tap the shaft from the housing (AK) with a small drift. Remove sleeve and spacer washers. Remove the double idler gear (N), gear roller bearing (M), and bearing sleeve (L) from the housing.

d. **Remove intermediate gear, shaft, and bearing.** Remove retaining screws (O) and lock washers (P) from each end of the intermediate gear shaft (V). Tap the shaft from the housing with a drift. Remove the intermediate gear roller bearing (T), spacer sleeve (U), bearing washers (R), and the gear from the housing.

e. **Remove drive shaft.** Remove four cap screws and lock washers and remove drive shaft front bearing cover plate (AM). Remove four cap screws and lock washers and remove drive shaft rear bearing cover (AB). Tap the drive shaft from the bearings and housing with a drift. Tap out and remove drive shaft rear bearing (AE) and front bearing (AL) from the housing. Lift out drive shaft sliding gear (AH).

f. **Remove shifter shaft assembly.** Remove shifter shaft retaining screw and washers and pull shifter arm (BE) from shifter shaft (AR). Remove the shifter yoke poppet spring cap (AW) and remove the spring and poppet ball from the shifter cover (AV). Push the shifter shaft from the housing, being careful not to damage the oil seals. Remove shifter shaft sleeve (BB) and sleeve spacer collar (BC) from housing.

g. **Remove adapter gear and shaft.** Remove large cotter pin (G) from adapter housing and tap out adapter idler gear shaft (B). Remove adapter idler gear (D) and roller bearing (C).

Section III**ASSEMBLY****143. PRELIMINARY INSTRUCTIONS.**

a. **Clean all units thoroughly and check all parts.** Wash all parts thoroughly. Remove all traces of dirt or metal from inside

Assembly

housings. After coating all gears and bearings with a light oil, rotate or slide on mating shafts to prove free operation.

144. ASSEMBLE POWER TAKE-OFF (fig. 162).

a. Install adapter gear assembly. Place gear roller bearing (C) inside adapter idler gear (D) and hold between arms of adapter housing (F). Tap adapter idler gear shaft (B) through arms and bearing, alining hole in housing and shaft. Install and secure large cotter pin (G).

b. Install shifter bar assembly. Place shifter shaft sleeve (BB) and sleeve spacer collar (BC) in shifter cover. Push shifter shaft (AR) through assembly, being careful not to damage oil seals. Install lock ball, spring, and cap (AY, AX, AW). Place shifter arm in position on shifter shaft and secure shifter shaft with washers and cap screws (BF, BG).

c. Install drive shaft assembly. Place drive shaft sliding gear (AH) in housing. Push drive shaft (AG) through sliding gear and install front bearing (AL) and rear bearing (AE) on drive shaft and tap into housing bores. Install front bearing cover plate and gasket (AM, AD) and secure with four lock washers and cap screws. Install rear bearing cover (AB) and rear bearing seal (AC) and secure with four lock washers and cap screws.

d. Install double idler shaft and gear. Place bearing sleeve (L) inside roller bearing (M) and both inside double idler gear (N). Place gear in position in winch power take-off housing (AK) and push shaft (I) through housing and sleeve while assembling sleeve washer and spacer washers in position on shaft.

e. Install intermediate gear, shaft and bearing. Place spacer sleeve (U) in roller bearing (T) and both inside intermediate gear (S). Place assembly in position in housing and push shaft (V) through housing and sleeve. Install spacer washers (P, Q, R) and secure shaft at each end with washers and cap screw (O).

CHAPTER 15
SPECIAL TOOLS

145. PURPOSE.

a. The following list of special tools contains only those special tools necessary to perform the operations described in this manual. A complete list of special tools available for all maintenance operations on the 6-ton, 6 x 6 truck is contained in ORD 5 SNL G-27, section 1.

b. The following list of special tools is for information only. It is not to be used as a basis for requisition.

146. LIST OF SPECIAL TOOLS.

Name	Federal Stock Number	Mfg. Tool No.
BAR, socket wrench, sliding, length (approx) 22 in.	41-B-312-200	MTM-M3-16L
HANDLE, remover and replacer, length overall 8 ¹ / ₈ in., size 3/4 in.....	41-H-1397	TEC-4-223
HEAD, socket wrench, sliding bar, male, 1 in. square drive (Formerly 41-H-1779-50).....	41-H-1845-50	MTM-M3-16E
REMOVER, bearing race, differential side and main drive gear (Formerly 41-R-2374-25)....	41-R-2369-50	KM-J-1708
REMOVER AND REPLACER, bushing and oil seal, steering gear	41-R-2377-275	TEC-2-745
REPLACER, spigot bearing, drive pinion aux, spline shaft	41-R-2398-760	MAS-17-302
REPLACER, bearing cone, bevel pinion gear.....	41-R-2384-115	MAS-17-605
REPLACER, bearing cone, countershaft, rear, transmission	41-R-2384-128	MAS-13-310
REPLACER, bearing cones, differential side, right and left hand.....	41-R-2384-165	MAS-17-604
REPLACER, bearing cup, power take-off.....	41-R-2385-260	MAS-13-504
REPLACER, gear, crankshaft timing.....	41-R-2389-905	MAS-13-604
REPLACER, oil seal, differential housing.....	41-R-2392-425	TEC-6-422
WRENCH, socket, transfer case output shaft locknut, 1-in. square drive, 2 ¹ / ₈ -in. hexagon opening	41-W-2964-475	
WRENCH, socket (detachable), 1-in. square drive, 6-point opening, 2 ³ / ₈ in.....	41-W-3058-450	MTM-M3-16H
WRENCH, tubular, pronged, single-end, handled, OD 2 ³ / ₄ in., wall thickness 5/16 in., two prongs	41-W-3739-925	SEV-1-315
WRENCH, wheel bearing nut, double-end, octagon opening, 4 ⁷ / ₁₆ in. x 4 ¹⁵ / ₁₆ in. (Formerly 41-W-3825-70)	41-W-3825-72	TD-3256-C-3
WRENCH, tubular, pronged, single-end, with two threaded handles, OD 3 ¹ / ₄ in., two prongs	41-W-3739-975	TEC-6-215

APPENDIX

Section I

REFERENCES

147. PUBLICATIONS INDEXES. The following publications indexes should be consulted frequently for latest changes or revisions of references given in this section and for new publications relating to material covered in this manual:

- a. Ordnance Supply Catalog Index.....ASF Cat ORD 2
- b. Ordnance Major Items and Combinations, and Pertinent Publications SB 9-1
- c. List and Index of War Department Publications FM 21-6
- d. List of War Department Films, Film Strips and Recognition Film Slides FM 21-7
- e. Military Training Aids FM 21-8

148. STANDARD NOMENCLATURE LISTS.

a. Vehicular.

- Truck, 6-ton, 6 x 6, bridge erecting (White Model 666), tank, gasoline, 2,500 gallon
ASF Cat ORD (*) SNL G-690
- Truck, 6-ton, 6 x 6 (Brockway and Ward La France), bridge erecting, w/winch, chassis, w/quickway crane, w/winch
ASF Cat ORD (*) SNL G-547
- Truck, 6-ton, 6 x 6, prime mover, w/ or w/o winch (Corbitt 50SD6)
ASF Cat ORD (*) SNL G-512
- Truck, 6-ton, 6 x 6, prime mover, w/winch, 2,000-gal. gas tank, chassis, van, 1942-43-44 (White Model 666).... ASF Cat ORD (*) SNL G-514

b. Maintenance.

- Antifriction bearings and related items
ASF Cat ORD 5 SNL H-12
- Cleaning, preserving, and lubricating materials, recoil fluids, special oils, and miscellaneous related items..... ASF Cat ORD 5 SNL K-1
- Elements, oil filter..... ASF Cat ORD 5 SNL K-4

(*) See ASF Catalog Ord 2 Index for published pamphlets of the Ordnance Supply Catalog.

Lubricating equipment, accessories, and related dispensers	ASF Cat ORD 5	SNL K-3
Miscellaneous hardware	ASF Cat ORD 5	SNL H-2
Soldering, brazing, and welding materials, gases, and related items.....	ASF Cat ORD 5	SNL K-2
Standard hardware	ASF Cat ORD 5	SNL H-1
Tires, tubes, tire valves, and patches, etc.	ASF Cat ORD 5	SNL H-14
Tool-sets (special), motor vehicles	ASF Cat ORD 6	SNL G-27 (Section 1)
Tool-sets (common), specialists' and organizational	ASF Cat ORD 6	SNL G-27 (Section 2)

149. EXPLANATORY PUBLICATIONS.

a. Fundamental principles.

Automotive Brakes	TM 10-565
Automotive Electricity	TM 10-580
Basic Maintenance Manual	TM 37-250
Care and Maintenance of Ball Bearings.....	TM 37-265
Chassis, Body, and Trailer Units	TM 10-560
Cooling Systems: Vehicles and Powered Ground Equipment	TM 9-2858
Driver's Manual	TM 21-305
Driver Selection and Training	TM 21-300
Electrical Fundamentals	TM 1-455
Military Motor Vehicles	AR 850-15
Motor Vehicle Inspection and Preventive Maintenance Service	TM 37-2810
Ordnance Service in the Field	FM 9-5
Precautions in Handling Gasoline	AR 850-20
Standard Military Motor Vehicles	TM 9-2800
Storage Batteries—Lead-acid Type	TM 9-2857

b. Vehicular operation.

6-ton, 6 x 6, Truck (White, Corbitt, Brockway and Ward La France)	TM 9-813
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c. Maintenance and repair.

Cleaning, Preserving, Lubricating, and Welding Materials and Similar Items Issued by the Ordnance Department	TM 9-850
Maintenance and Care of Pneumatic Tires and Rubber Treads	TM 31-200

Appendix

Ordnance Maintenance: Carburetors (Zenith)	TM 9-1826C
Ordnance Maintenance: Electrical Equipment (Delco-Remy)	TM 9-1825A
Ordnance Maintenance: Fire Extinguishers	TM 9-1799
Ordnance Maintenance: Fuel Pumps	TM 9-1828A
Ordnance Maintenance: Hercules Engines	TM 9-1832A
Ordnance Maintenance: Power Brake Systems (Bendix-Westinghouse)	TM 9-1827A
Ordnance Maintenance: Speedometers, Tach- ometers, and Recorders	TM 9-1829A
d. Protection of materiel.	
Camouflage	FM 5-20
Camouflage of Vehicles	FM 5-20B
Chemical Decontamination Company	FM 3-70
Chemical Decontamination, Materials, and Equipment	TM 3-220
Decontamination of Armored Force Vehicles..	FM 17-59
Defense Against Chemical Attack	FM 21-40
Explosives and Demolitions	FM 5-25
Military Chemistry and Chemical Agents.....	TM 3-215
Preparation of Ordnance Materiel for Deep Water Fording	TM 9-2853
e. Storage and shipment.	
Ordnance Company, Depot	FM 9-25
Ordnance Packaging and Shipping (Posts, Camps, and Stations)	TM 9-2854
Ordnance Storage and Shipment Chart, Group G—Major Items	SB 9-OSSC-G
Preparation of Unboxed Ordnance Materiel for Shipment	SB 9-4
Protection of Ordnance Materiel in Open Storage	SB 9-47
Registration of Motor Vehicles	AR 850-10
Rules Governing the Loading of Mechanized and Motorized Army Equipment, Also Major Caliber Guns, for the United States Army and Navy, on Open Top Equipment, Published by Operations and Maintenance Department of Association of American Railroads.	
Storage of Motor Vehicle Equipment.....	AR 850-18

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