SECTION 4-D

3-SPEED SYNCHROMESH—4600

CONTENTS OF SECTION 4-D

4-21 TRANSMISSION SPECIFICATIONS

a. Tightening Specifications

Part	Location	Thread Size	Torque
Bolt	Extension Adapter to Case	Special	20-30
Bolt	Extension to Case (3 Upper Location)	1/2-13 x 1 5/8	35-45
Bolt	Extension to Case (2 Lower Location)	7/16-14 x 1 1/8	20-30
Bolt	Upper Flywheel Housing to Cylinder Block	7/16-14 x 1 3/4	45-60
Bolt	Lower Flywheel Housing to Cylinder Block	5/16-18 x 1/2	15-20
Screw	Lower Flywheel Housing to Upper Flywheel Housing	1/4-20 x 5/8	15-20
Nut	Shifter Lever to Shifter Shaft	5/16-18	10-15
Bolt	Control Housing to Case	5/16-18 x 7/8	15-20
Bolt	Main Drive Gear Bearing Retainer To Case	5/16-18 x 3/4	15-20

b. Transmission Specifications

Mounting	Unit with Engine
Oil Capacity	3 1/2 Pints
Type of Gearing	All Helical
Transmission Ratios	
In First	2.490 to 1
In Second	1.587 to 1
In Third	1 to 1
In Reverse	3.154 to 1

c. Speedometer Gears

Speedometer Worm on Main Shaft	Press Fit
Teeth on Worm (3.36 Ratio)	8
Teeth on Driven Gear	19
Teeth on Worm (3.23 Ratio)	9
Teeth on Driven Gear (3.23 Ratio with 7.60 x 15)	21
Teeth on Driven Gear (3.23 Ratio with 8.00 x 15)	20

4-22 S-M TRANSMISSION DESCRIPTION

The synchromesh transmission is solidly bolted to the rear face of the flywheel upper housing, to form a unit assembly with the engine. The transmission drive gear shaft extends the clutch driven plate into a bronze bushing seated in the rear end of the engine crankshaft. The front bearing retainer projects into a bore in the flywheel housing, serving as a pilot to center the transmission with the engine crankshaft.

a. Transmission Gears and Shafts

The transmission main drive gear is supported by a ball bearing which is a slip fit in the front wall of the transmission case. The ball bearing is shielded on the rear side by a slinger washer.

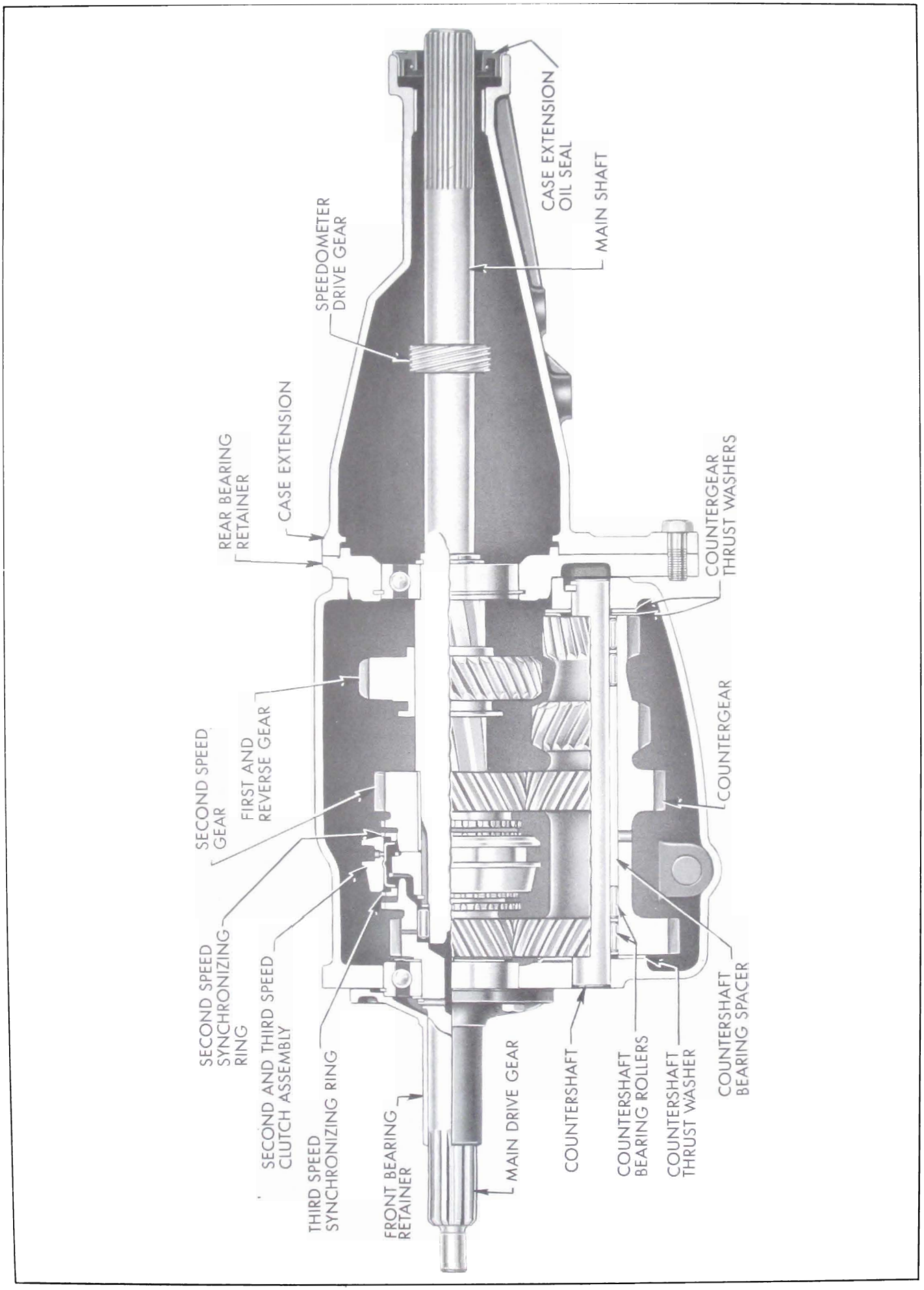

Figure 4-77—Cross Section of 4600 3-Speed Synchromesh Transmission

This washer is held tight against a shoulder on the drive gear by the bearing pressed against it. The bearing is prevented from moving away from the washer by a selective fit snap ring in a groove in the drive gear shaft. The outer race of the bearing is grooved for a snap ring which fits between the transmission case and the front bearing retainer to hold the bearing and main drive gear in place. See Figure 4-10.

The front end of the transmission main shaft is piloted in the bored rear end of the main drive gear by 14 loose rollers. The rear end of the main shaft is supported by the transmission rear bearing which is a slip fit in the rear wall of transmission case. The outer race of the rear bearing is grooved for a snap ring which fits between the transmission case and the rear bearing retainer. The inner race of the bearing is retained between a shoulder on the main shaft and a snap ring in a groove in the shaft.

The transmission countergear is supported by a set of 22 needle rollers on each end of the countershaft. The countershaft is held in position by its tight fit in the forward hole and by a lock plate between it and the reverse idler gear shaft. A tubular spacer separates the two sets of rollers and two washer-type spacers are located at the outer ends of each set to hold the rollers in position. End thrust is taken by a single thrust washer in the front and two thrust washers in the rear. A hole in the hub of the countergear permits lubricant to reach the bearings and thrust washers.

The reverse idler gear is provided with a bronze bushing and is supported on a shaft which is held stationary a a lock plate between it and the countershaft. End clearance of the gear permits lubricant to reach the bushing. The second speed gear is provided with a bronze bushing and is mounted on the mainshaft in such a position that it is constant mesh with the countergear. It is held in position between the front shoulder of the first-reverse gear splines and the hub of the synchronizer assembly. The gear is free to rotate on the mainshaft except when engaged by the synchronizing assembly during second speed operation. See Figure 4-77.

The first-reverse sliding gear is splined to the mainshaft to the rear of the second speed gear so that it can be moved forward to engage the countergear for first speed or rearward to engage the reverse idler for reverse.

b. Gear Shift and Synchronization

The synchronizing assembly and the first-reverse gear are actuated by the shift mechanism. The gear shift mechanism is described in Group 4A. The synchronizing assembly is splined to the mainshaft to transmit drive when the assembly is engaged with either the drive gear (third speed) or the second speed gear. The synchronizing assembly includes a hub, sleeve, shift plates, springs and blocking rings which act to synchronize the speed of the gear to be engaged with the speed of the hub during a shift into either second or third speed. As the sleeve moves toward the gear to be engaged, the shift plates press the blocking ring into contact with the gear, after which the springs allow the shift plates to slide out of the detent notches in the sleeve to permit the sleeve to engage the gear quietly and easily.

c. Speedometer Gears

The speedometer driving worm gear is held against a shoulder on the transmission mainshaft by forward pressure of the front companion flange. When changing rear axle ratios it is necessary to change the driven gear, and on some axle ratios it is necessary to change the driven worm gear. The speedometer driven gear assembly consists of a sleeve, a gear and shaft, an "O" ring sleeve seal, a sleeve retainer and bolt. The driven gear sleeve is a slip fit in the rear bearing retainer. The sleeve is held in place by a retainer which fits into a slot in the sleeve and is bolted to the rear bearing retainer. The gears are lubricated by splash from the transmission. The speedometer cable is attached to the sleeve by a threaded sleeve on the cable casing.

d. Front Companion Flange

The front companion flange is splined to the rear end of the transmission mainshaft and is retained by a heavy steel washer and bolt. The length of the front companion flange is such that it bottoms against the speedometer drive gear. An oil seal is located in the rear end of the rear bearing retainer with the seal lip contacting the companion flange.

e. Power Flow Through Transmission

1. In first speed, the first speed sliding gear is slid forward on the mainshaft splines so that it engages its corresponding gear on the countergear. See Figure 4-78 to follow the power flow.

2. In second speed, the clutch sleeve is slid rearward on the synchronizer hub so that it first synchronizes the speed of the second gear, then engages the projecting teeth on the second gear. See Figure 4-78.

3. In third speed, the clutch sleeve is slid forward on the synchronizer hub so that it first synchronizes the speed of the drive gear, then engages the projecting teeth on the drive gear. See Figure 4-78.

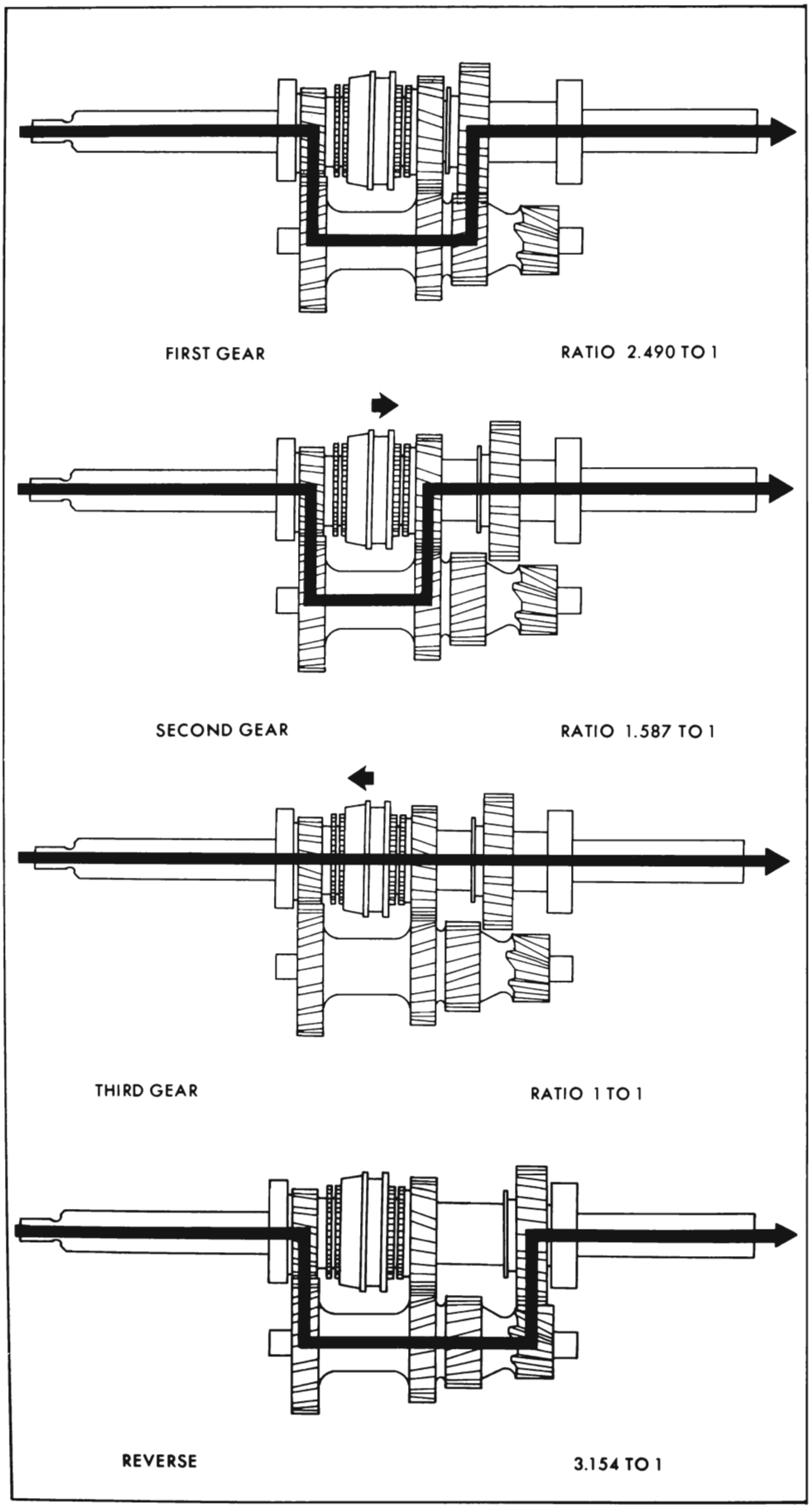

Figure 4-78—Transmission Power Flow

4. In reverse, the first-reverse gear is slid rearward on the mainshaft splines so that it engages the reverse idler, which is in constant mesh with a corresponding gear on the countergear. The idler gear reverses the direction of rotation of the complete drive train in the rear of the reverse idler.

f. S-M Transmission Shift Control Mechanism

Both shift levers are located on the left side of the transmission. The forward lever controls the second-third shift; the rear lever controls the first-reverse shift.

When the second-third shift lever is moved forward by the equalizer lever, a shift shaft with an integral notched cam is rotated to cause a shift fork to move rearward. This moves the clutch sleeve rearward to first synchronize the speed of the second gear and then to engage the projecting teeth on the second gear. When the second-third lever is moved rearward, the notched cam is rotated in the other direction and the clutch sleeve is moved forward to first synchronize the speed of the drive gear and then to engage the projecting teeth on the drive gear.

When the first-reverse lever is moved rearward, a shift shaft with an integral notched cam is rotated to cause a shift shoe to move forward. This moves the first-reverse gear forward to engage its corresponding part on the countergear. When the first-reverse lever is moved forward, the notched cam is rotated in the other direction and the first-reverse gear is moved rearward to engage the reverse idler gear.

When either shift lever is moved from the center or neutral position, an interlock mechanism located between the second-third shift cam and the first-reverse shift cam prevents the other shift

lever from being moved from its neutral position. This prevents the possibility of shifting into two gears at once, which would lock-up the transmission.

The interlock mechanism consists of an interlock sleeve, pin, spring and two balls. Each shift shaft cam has three grooves into which the interlock springs pushes the balls; these detents make a definite position for each shift. Each cam is lower in the center or neutral position and higher each side of the neutral position. When either cam is shifted out of the neutral position, the interlock sleeve is slid over so that is almost touches the other cam which is in the neutral position. The interlock sleeve therefore prevents this other cam from being shifted out of its neutral position unless the first cam is returned to neutral.

4-23 S-M TRANSMISSION TROUBLE DIAGNOSIS

a. Hard Shifting and Block-out

Hard shifting may be caused either by conditions in the shift control mechanism or by conditions in the transmission assembly. Disconnect the shift rods at the control shaft levers to determine which is at fault.

b. Low and Reverse Gear Clash

Transmission gears can be made to clash by shifting into first or reverse gear too quickly after the clutch pedal is depressed, even though clutch is in perfect working order. This is because inertia of the clutch driven plate, drive gear and countergear causes these parts to spin until stopped by friction of the transmission and transmission lubricant. With warm transmission lubricant and low friction transmission bearings, a reasonable amount of spin is to be expected. The clash does not occur when shifting quickly into second or high gear with the car standing still because the synchronizing unit stops the spinning parts.

To eliminate gear clash, sufficient time MUST be allowed before shifting into first after the pedal is depressed or else starts must be made in second gear. There is no objection to making starts in second gear on level ground since the clutch slippage under ordinary driving conditions is not sufficient to produce enough heat to damage the driven plate facings.

If gear clash continues after allowing proper time for the clutch driven plate parts to stop, check the clutch pedal lash and adjust to specified limits. See Section 4-B. Make sure that the idle speed is properly set. A faster idle aggravates driven plate spinning.

Conditions within the transmission which may cause gear clash are: (1) Faulty blocking rings or cone surfaces; (2) Excessive mainshaft end play; (3) Weak or broken detent springs in the synchronizing hub. Gear clash also may be caused by a dragging clutch plate.

c. Noise in Neutral

With the car standing, engine running, the transmission in neutral, the transmission parts in operation are; main drive gear and bearing, countergear and bearings, reverse idler gear, second speed gear. Disengaging the clutch will stop movement of all these parts. By disengaging and engaging the clutch it can be determined whether the noise originates in these transmission parts and whether the noise is normal. Noise in neutral in the form of a constant regular click is usually caused by a nicked gear or bearing.

d. Gear Noise

Some gear noise is to be expected in all except third speed. Comparison with another car is the only means of determining whether or not gear noise is excessive. Before removing the transmission for correction of gear noise, determine by test which gears are noisy under load, so that these parts can be thoroughly inspected when removed.

e. Gear Rattle During Acceleration

An improperly calibrated clutch driven plate, a faulty crankshaft balancer, or scored rear axle gears may cause rattle in the transmission in third speed on acceleration. Rattles occurring on wide open throttle between 40 and 60 MPH are usually caused by improper clutch driven plate dampening; a new driven plate should be installed if rattles are objectionable.

f. Noise When Shifting out of First or Reverse

Shifting out of first or reverse very slowly will usually result in some noise just as the gears disengage. This is normal because of the gear pointing necessary for easy engagement.

Abnormal noise during a normally fast shift may be caused by improper clutch release. Check clutch pedal lash and adjust. See Section 4-B.

Abnormal noise during a normally fast shift, when clutch release is satisfactory, may be caused by damage to the pointing on the engaging side of the teeth on the countergear, reverse idler gear.

or first-reverse sliding gear. Noise when disengaging both first and reverse indicates that the fault is with the sliding gear only. Noise when disengaging reverse only indicates that the reverse idler gear is at fault. Noise when disengaging first speed only indicates that the countergear is at fault. Tests must be made by disengaging gears while car is still in motion.

g. Gear Jump-Out

In any case of gear jump-out, first check the adjustment of the gear shift control mechanism as described in Group 4-A. Make certain that interlock balls have full engagement in the notches in the shift shaft cam through all speed positions including neutral.

Gear jump-out in third speed may be caused by misalignment between the flywheel housing hole and the crankshaft. Check bore and face run out. It must not exceed .005.

Gear jump-out in any transmission speed position may be caused by loose fit of the bearings or bushings involved, a weak interlock spring, loose fit of the synchronizing hub on the mainshaft, loose fit of the first-reverse gear on the mainshaft, worn teeth on mating gears. All items should be carefully inspected.

h. Scored or Broken Gear Teeth

Gear teeth will be seriously damaged and possibly broken by failure of the car operator to fully engage the gears on every shift before engaging the clutch and applying engine power.

Considerable damage to gears and bearings may result from running at abnormal speeds in reverse, first and second speed gears. This practice is also detrimental to the engine.

4-24 REMOVAL AND INSTALLATION OF SYNCHROMESH TRANSMISSION

a. Removal of Transmission

1. If transmission is to be disassembled, drain transmission lubricant. Fill with kerosene and run transmission in neutral about 15 seconds. Drain kerosene.

2. Mark front companion flange and propeller shaft so that these parts can be reassembled in the same relative position. Remove U-bolts attaching front companion flange to propeller shaft. Slide front propeller shaft rearward as far as possible for working clearance.

3. Disconnect shift linkage from transmission by first removing equalizer spring. Slide shift equalizer to full left position to disengage it from 2nd-3rd shift lever, then slide equalizer to right to remove from support pin. Remove transmission 1st-reverse shift lever from shift shaft. By disconnecting shift linkage in this way, shift linkage is not disturbed and should not require readjusting.

4. Disconnect speedometer cable from transmission.

5. Loosen all three exhaust pipe joints so that transmission and rear end of engine can be lowered.

6. Disconnect clutch push rod.

7. Remove two bolts attaching transmission mounting pad to transmission support. Leave mounting pad bolted to transmission.

8. Place a flat wood block on jack. Jack under engine pan until transmission mounting pad just clears transmission support.

9. Remove four bolts attaching transmission support to body members. Remove support, then lower jack so that transmission will clear underbody during removal.

10. Remove upper left transmission to flywheel housing bolt and install J-1126 guide pin; remove lower right bolt and install J-1126.

11. Remove the other two transmission to flywheel housing bolts. Slide transmission straight back until drive gear shaft is clear of flywheel housing. CAUTION: If weight of transmission is allowed to rest on main drive gear while drive gear splines are in clutch driven plate, driven plate may be damaged.

b. Installation of Transmission

1. Lightly coat splines on end of main drive gear with Lubriplate for a distance of about 1 inch. Do not apply an excess that will push off at driven plate hub and get on clutch facings. Fill groove in inner surface of throw-out bearing with wheel bearing grease.

2. Make certain that front face of transmission case and rear face of flywheel housing are absolutely clean. Install J-1126 guide pin in upper left flywheel housing hole; install guide pin in lower right hole.

3. Shift transmission into 3rd gear. Lift transmission into place on guide pins and slide straight forward, meanwhile fully supporting transmission. Rotate companion flange as required to engage drive gear with driven plate splines. CAUTION: If weight of transmission is allowed to rest on main drive gear shaft before shaft engages pilot bushing in flywheel, driven plate may be damaged.

4. Install two transmission to flywheel housing bolts; remove guide pins and install other two bolts. Tighten all four bolts securely.

5. Raise jack under engine pan so that transmission mounting pad will clear transmission support.

6. Install transmission support, leaving four nuts loose. Lower jack so that transmission rests on support.

7. Install two bolts attaching mounting pad to support, then tighten all six bolts securely.

8. Align exhaust system, if necessary, and tighten three joints.

9. Connect speedometer cable to transmission.

10. Install 1st-reverse shift lever on transmission shaft and tighten nut securely. Install shift equalizer by first sliding left end of equalizer over support pin, then engaging right end of equalizer with 2nd-3rd shift lever. Install equalizer spring.

11. Align mark on propeller shaft with mark on front companion flange. Install U-bolts and lock plates. If there is any doubt as to safety of lock plates, use new lock plates. Tighten nuts securely and bend up lock plate tabs. Make sure propeller shaft center bearing insulator is in position in support bracket.

12. Fill transmission with specified gear lubricant.

13. Connect clutch push rod.

14. Check adjustment of shift linkage. See Group 4-A. Check adjustment of clutch linkage.

15. Road test car, checking for proper shifting, correct synchronization, and quiet operation.

c. Transmission Side Cover Removal and Installation

NOTE: It is not necessary to remove transmission from vehicle for inspection or replacement of parts in transmission side cover assembly, but the side cover assembly itself must be removed from the transmission case.

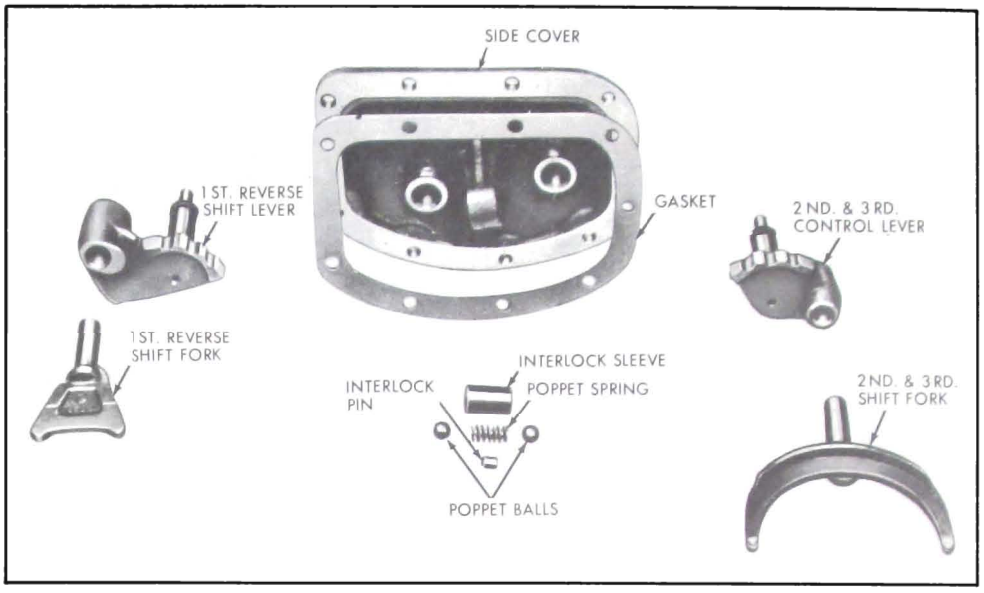

Figure 4-79—Transmission Side Cover

a. Removal

1. Remove drain plug at the bottom of transmission and drain lubricant.

2. Remove first-reverse, and second-third shift rods from levers.

3. Remove transmission side cover assembly from transmission case.

4. Remove the outer shifter lever nuts and lock washers and pull levers from shafts.

5. Carefully push the shifter shafts into cover, allowing the detent balls to fall free, then remove both shifter shafts. See Figure 4-79.

6. Remove interlock sleeve, interlock pin and poppet spring. See Figure 4-79.

7. Replace necessary parts.

b. Installation

1. Install interlock sleeve and one shifter shaft. Place steel detent into sleeve followed by poppet spring and interlock pin.

2. Start second shifter shaft into position and place second detent ball on poppet spring. Compress ball and spring with screwdriver and push the shifter shaft fully in. See Figure 4-79.

3. With transmission in neutral and shifter forks and levers in place, lower side cover into place. Install attaching bolts, using sealer in lower right bolt and tighten evenly.

4-25 DISASSEMBLY AND ASSEMBLY OF 3-SPEED SYNCHROMESH

a. Disassembly of 3-Speed Synchromesh Transmission

1. Remove transmission side cover assembly from transmission case. NOTE: If cover assembly is to be disassembled for inspection or replacement of worn parts, follow procedures 2 through 6, Section 4-31, paragraph c.

2. Remove front companion flange. Assemble Puller J-8614 as shown in Figure 4-80 and pull companion flange from mainshaft.

3. Remove case extension oil seal. See Figure 4-81.

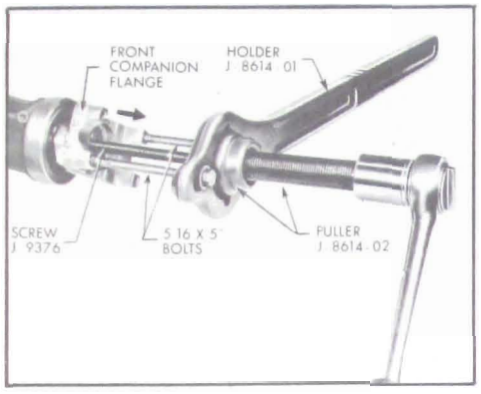

Figure 4-80—Removing Front Companion Flange

4. Remove five bolts attaching the case extension to the rear bearing retainer. Tap extension with a soft hammer in a rearward direction to start.

5. Remove speedometer gear with J-8760 as shown in Figure 4-82.

6. Remove rear bearing retainer to transmission case bolt. See Figure 4-83.

7. Move rear bearing retainer away from case approximately one-half inch, then remove welch plug in retainer using brass drift.

8. Rotate bearing retainer to expose countershaft and lock key. See Figure 4-84.

9. From front of transmission case, drive countershaft to rear, using countershaft bearing loader J-9573.

10. Drive countershaft all the way out and leave Tool J-9573 in the

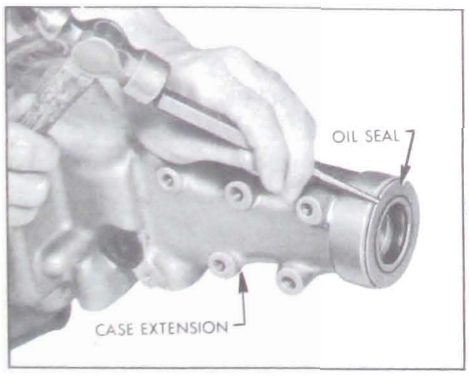

Figure 4-81—Extension Oil-Seal Removal

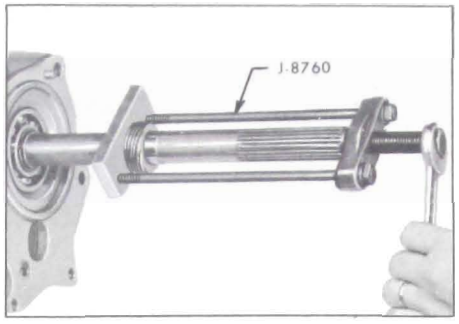

Figure 4-82—Removing Speedometer Gear

countergear to retain the needle roller bearings.

11. Drop countergear down in transmission case.

12. Carefully remove the entire mainshaft assembly.

13. Remove bearing spacing washer and 14 needle roller bearings from inside the main drive gear.

14. Remove four bolts from front bearing retainer and remove retainer and gasket. See Figure 4-85.

15. Remove main drive gear snap ring and washer from main drive gear, using Snap Ring Pliers J-5586. See Figure 4-85.

16. With a soft hammer, tap main drive gear down from front bearing as shown in Figure 4-86.

17. From inside case, tap out front bearing and snap ring. See Figure 4-87.

18. Using a small brass drift, drive reverse idler gear shaft to

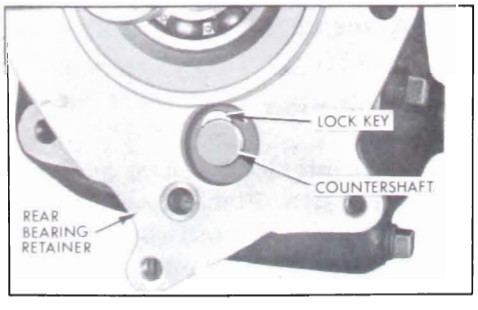

Figure 4-83—Removing Retainer to Case Bolt

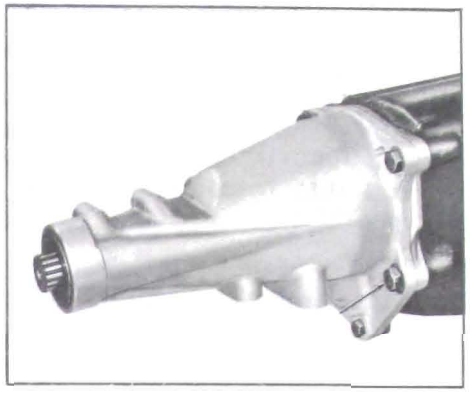

Figure 4-84—Rear Bearing Retainer Location

rear of case until lock key can be removed.

19. Remove lock key and, from rear of case, drive idler gear shaft into case.

20. Remove reverse idler gear and shaft from transmission case.

21. Remove countergear assembly and thrust washers from transmission case.

22. Remove Tool J-9753 from countergear and remove the 80 needle roller bearings, four bearing retaining washers and bearing spacer from inside the countergear.

23. Remove synchronizing ring from front side of 2nd and 3rd speed clutch sleeve. See Figure 4-88.

24. Remove clutch hub retaining snap ring from front end of mainshaft, using snap ring pliers as shown in Figure 4-88.

25. Remove 2nd and 3rd speed clutch sleeve and hub from mainshaft. See Figure 4-88.

26. Remove rear synchronizing ring and second speed gear from mainshaft. See Figure 4-88.

27. Remove 1st-reverse sliding gear from mainshaft. See Figure 4-88.

28. Spread rear bearing retainer snap ring and with a soft hammer, tap mainshaft out of retainer. See Figure 4-89.

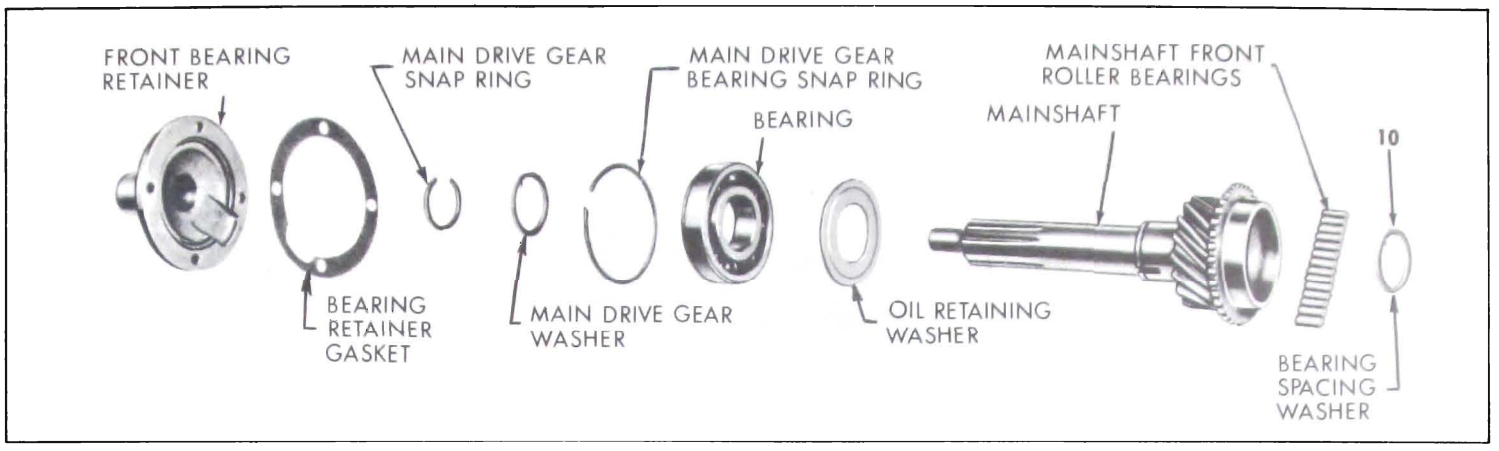

Figure 4-85—Main Drive Gear

29. Remove the mainshaft rear snap ring. See Figure 4-90.

30. Press rear bearing from mainshaft.

b. Cleaning and Inspection

Transmission Case

Wash the transmission case inside and out with a cleaning solvent and inspect for cracks. Inspect the front face which fits against the clutch housing for burrs and if any are present, dress them off with a fine cut mill file.

Front and Rear Bearings

1. Wash the front and rear bearings thoroughly in a cleaning solvent.

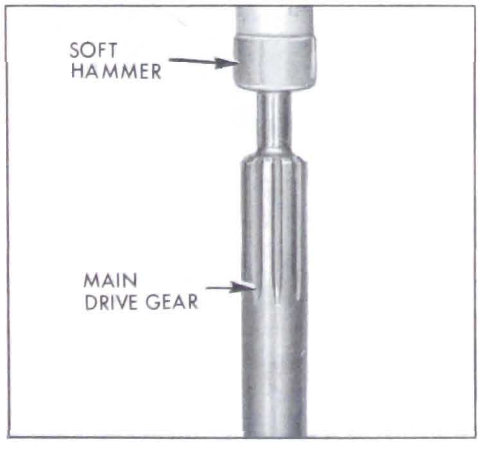

Figure 4-86—Removing Main Drive Gear

2. Blow out bearing with compressed air.

CAUTION: Do not allow the bearings to spin but turn them slowly by hand. Spinning bearings will damage the races and balls.

3. Make sure the bearings are clean, then lubricate them with light engine oil and check for roughness. Roughness may be determined by slowly turning the outer race by hand.

Bearings, Rollers and Spacers

All main drive gear and countergear bearing rollers should be inspected closely and replaced if they show wear. Inspect countershaft at the same time and replace as necessary. Replace all worn parts.

Gears

Inspect all gears and replace all that are worn or damaged.

c. Clutch Keys and Springs Replacement

1. Push the hub from the sliding sleeve. The keys will fall free and the springs may be easily removed.

2. Place the two springs in position (one on each side of hub), so a tanged end of each spring falls into the same keyway in the hub. Place the keys in position and, holding them in place, slide the hub into the sleeve as shown in Figure 4-91.

d. Transmission Assembly

Mainshaft Assembly

1. Using J-8853, press on the rear bearing with the snap ring groove toward the front of the transmission. See Figure 4-92. Firmly seat bearing against the shoulder on the mainshaft.

2. Install snap ring in groove in mainshaft behind rear bearing. See Figure 4-93.

NOTE: Always use a new snap ring when reassembling transmission and do not expand snap ring further than is necessary for assembly.

3. Install rear bearing retainer. Spread snap ring in rear bearing

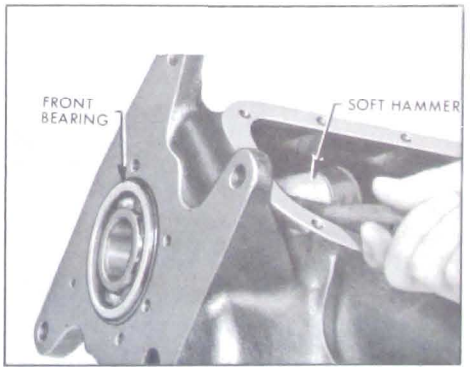

Figure 4-87—Removing Main Drive Gear Bearing

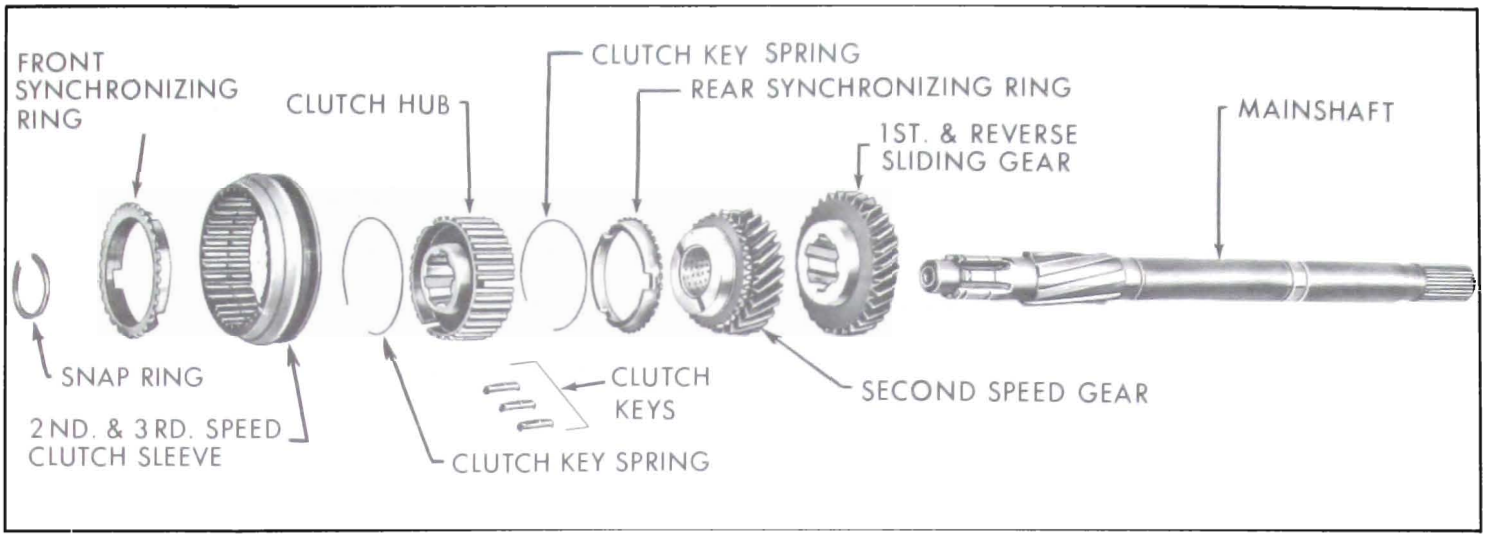

Figure 4-88—Mainshaft Assembly

retainer to allow snap ring to drop around rear bearing. Press on the end of mainshaft until snap ring engages groove in the rear bearing retainer.

4. Install 1st-reverse sliding gear on mainshaft. See Figure 4-94.

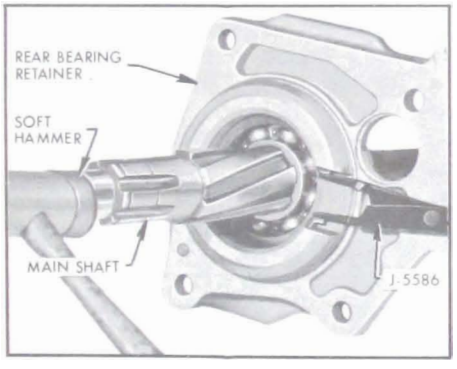

Figure 4-89—Spreading Rear Bearing Snap Ring

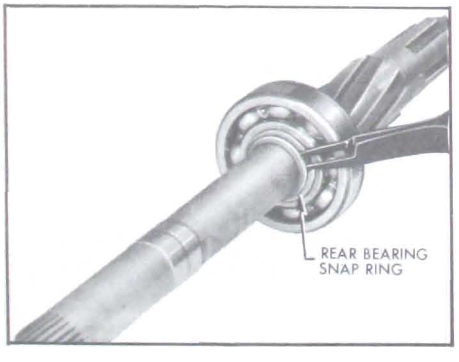

Figure 4-90—Removing Rear Bearing Snap Ring

5. Install second speed gear, hub forward, over front end of mainshaft. See Figure 4-95.

6. Install 2nd-3rd speed clutch sleeve on clutch hub as shown in Figure 4-96.

7. Place synchronizing ring on rear of sleeve and hub assembly,

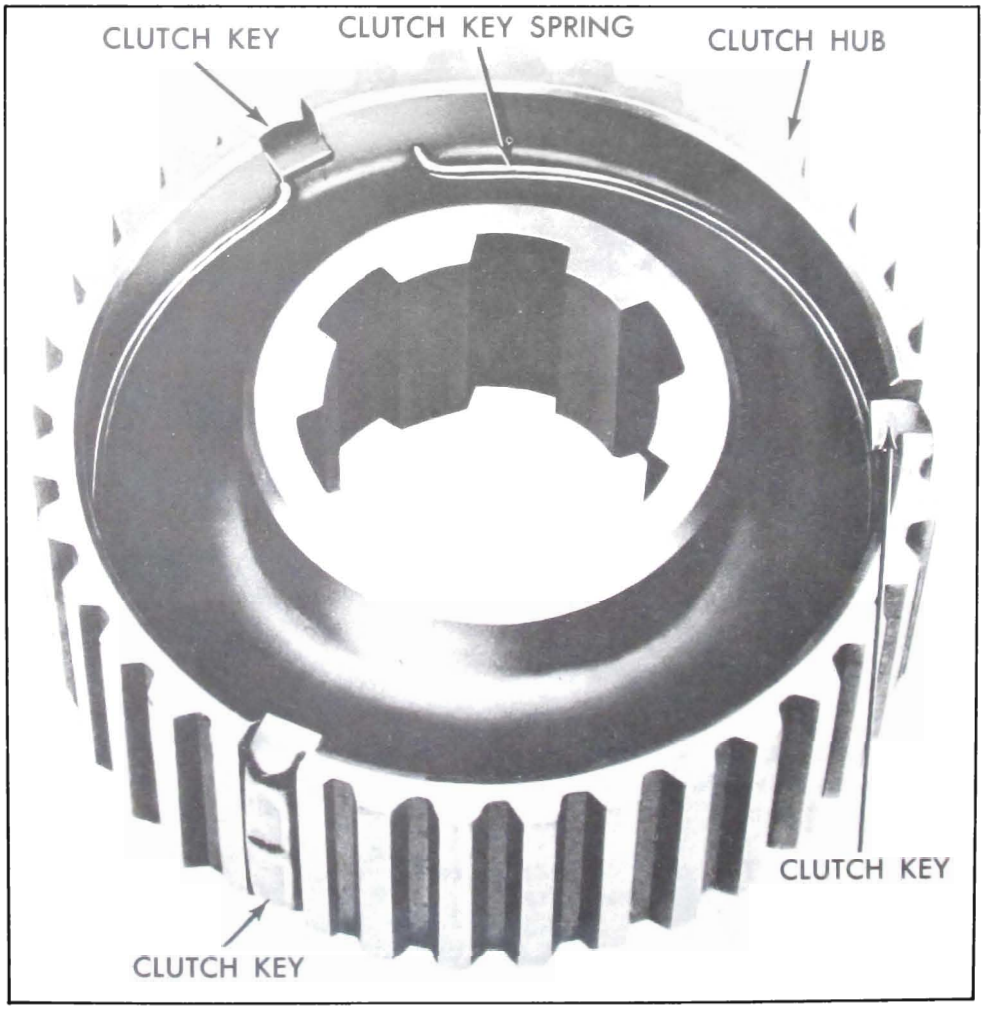

Figure 4-91—Clutch Hub Assembly

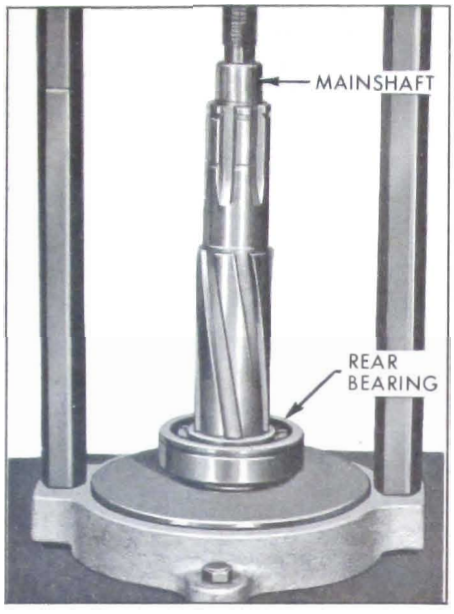

Figure 4-92—Installing Rear Bearing

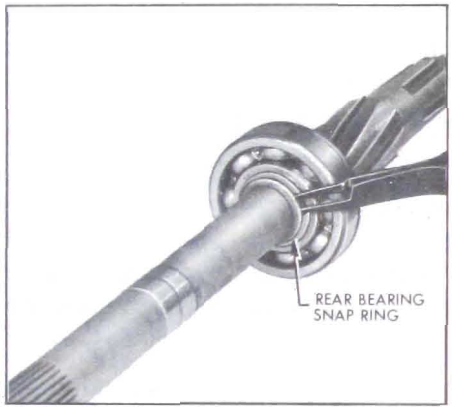

Figure 4-93—Installing Rear Bearing Snap Ring

making sure slots in ring are aligned with clutch keys.

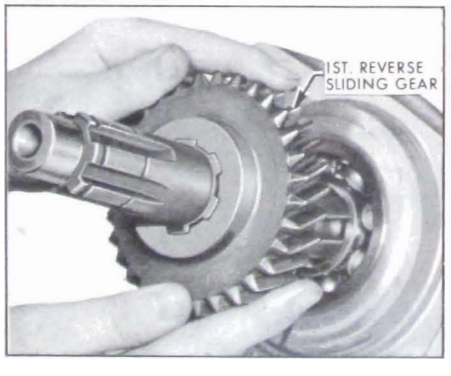

Figure 4-94—Installing 1st-Reverse Sliding Gear

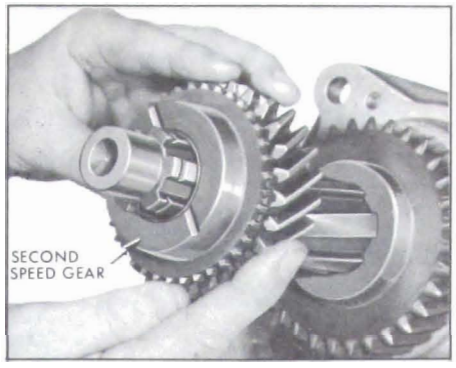

Figure 4-95—Installing Second Speed Gear

8. Install sleeve, hub, and synchronizing ring assembly on mainshaft. See Figure 4-96.

9. Secure clutch hub with retaining snap ring. See Figure 4-97.

10. Press speedometer drive gear onto mainshaft, using Press Plate J-8853. See Figure 4-98.

11. Position the speedometer gear 7-1/2" from the rear of the gear to the rear of mainshaft.

12. Countergear Assembly - Steps 12-18.

13. Install roller spacer in countergear.

14. Using heavy grease to retain the rollers, install 20 rollers in either end of the countergear, two .050" spacers, 20 more rollers, then one .050" spacer.

Install in the other end of coun-

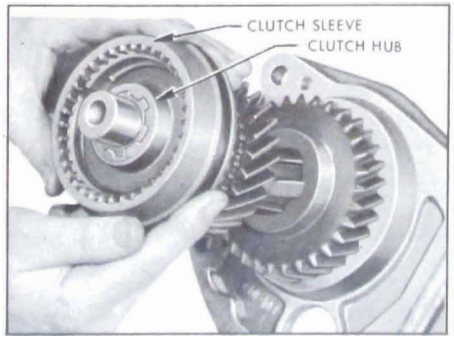

Figure 4-96—Installing 2nd & 3rd Speed Clutch Hub & Sleeve

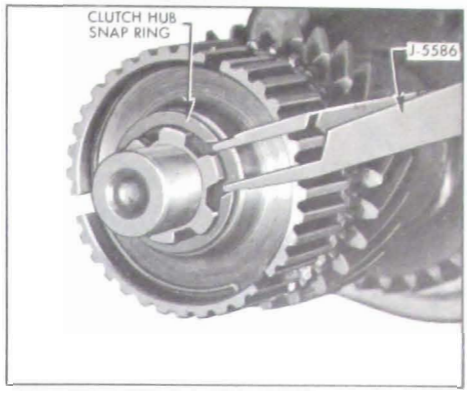

Figure 4-97—Clutch Hub Snap Ring

tergear, 20 more rollers and another .050" spacer. See Figure 4-99.

15. Place large bronze thrust washer at front end of countergear, tang facing out so that it will seat in groove at front of case. Retain with heavy grease.

16. Place smaller bronze thrust washer against rear of countergear, tangs facing gear and seated in grooves. Retain with grease.

17. Through rear of case, insert countergear assembly, large gear end toward front of case. Rest countergear assembly on bottom of case.

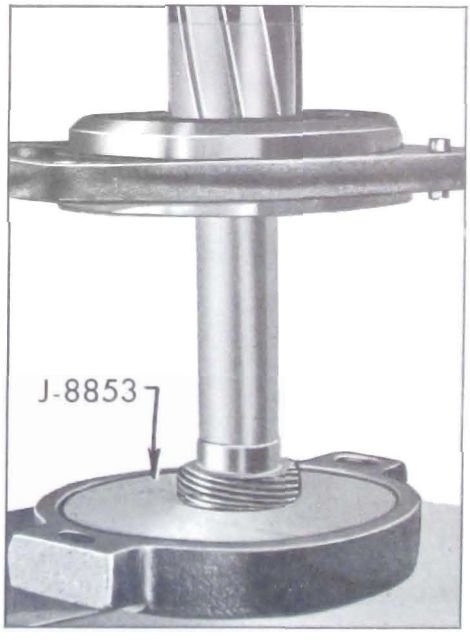

Figure 4-98—Speedometer Drive Gear

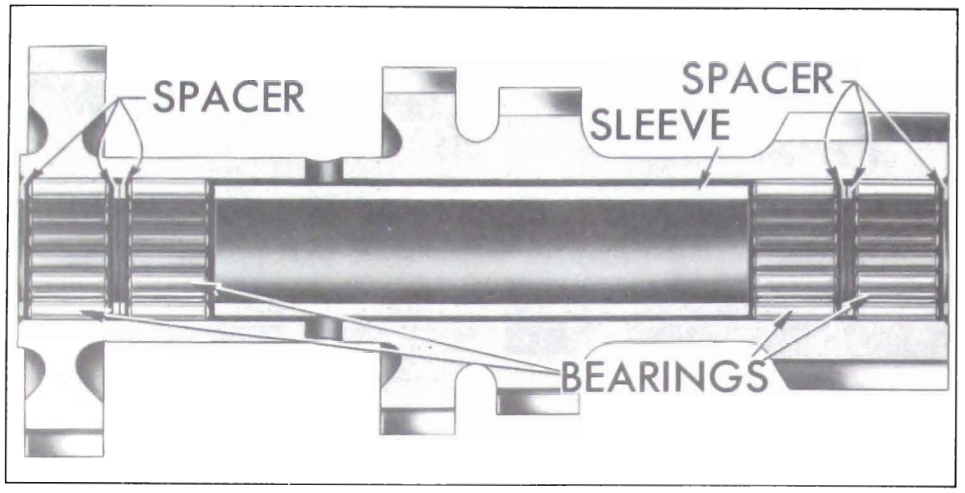

Figure 4-99—Countergear

18. Place steel thrust washer at rear of countergear between bronze thrust washer and case, positioning tang on steel thrust washer in groove in case.

19. Install oil retaining washer on main drive gear, depressed side up. See Figure 4-100.

20. Press bearing onto main drive gear (snap ring groove to front). See Figure 4-101.

21. From inside case, push main drive gear assembly through opening in front of case. Using a soft hammer, tap assembly from rear until bearing attains proper position for installation of snap ring.

22. Install snap ring in groove of bearing and tap front end of shaft until snap ring rests firmly against face of case.

23. Install main drive gear washer against bearing inner race. See Figure 4-102.

24. Secure main drive gear in place by installing main drive gear snap ring in groove provided in main drive gear. See Figure 4-103.

25. Install front bearing retainer and gasket, making certain oil groove in retainer is lined up with oil outlet hole in case.

Figure 4-100—Installing Oil Retaining Washer

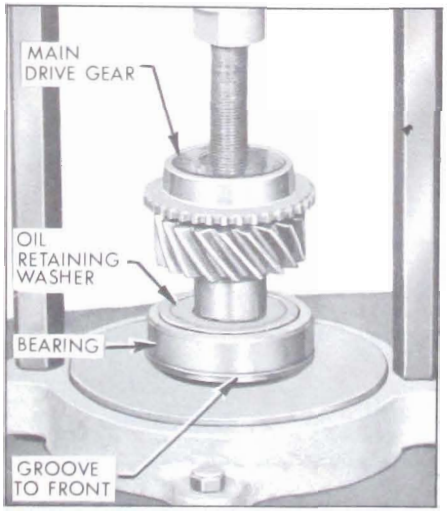

Figure 4-101—Installing Front Bearing

Figure 4-102—Main Drive Gear Washer Installation

26. Coat bore at rear end of main drive gear with heavy lubricant and insert the 14 needle roller bearings in bore.

27. Install bearing spacing washer. See Figure 4-104.

28. Position reverse idler gear in rear of case, chamfer on teeth toward front and, from rear, start idler gear shaft through case and gear.

29. Place lock key in notch at rear of idler gear shaft, then drive shaft into case until lock key seats against cutout in case and shaft is flush with rear of case.

30. Set transmission on its top side to assist in installing mainshaft assembly.

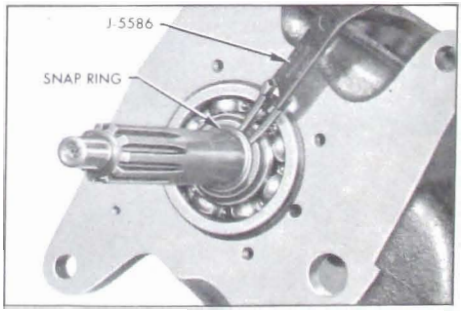

Figure 4-103—Installing Main Drive Gear Snap Ring

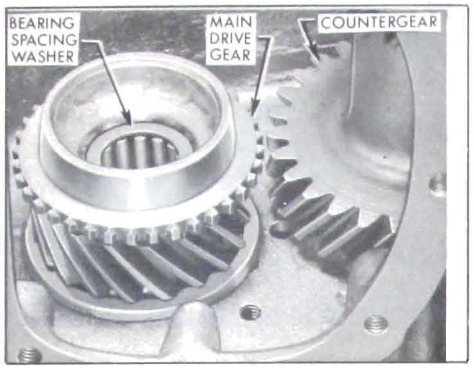

Figure 4-104—Installing Bearing Spacer

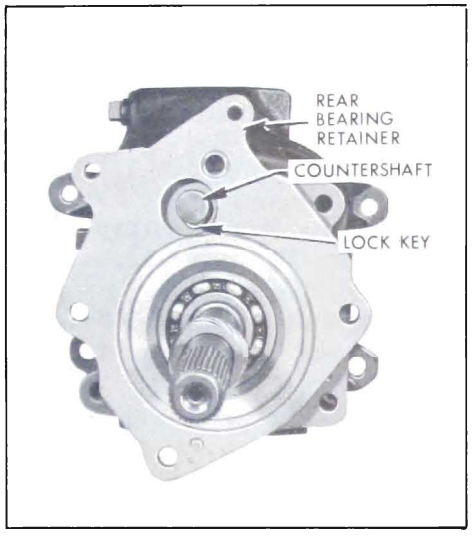

Figure 4-105—Rotating Rear Bearing Retainer

31. Using heavy grease, place gasket in position on front face of rear bearing retainer.

32. Lightly lubricate inner surface of front synchronizing ring and install on hub of main drive gear, positioning one clutch key slot so that it is visible from side opening in case.

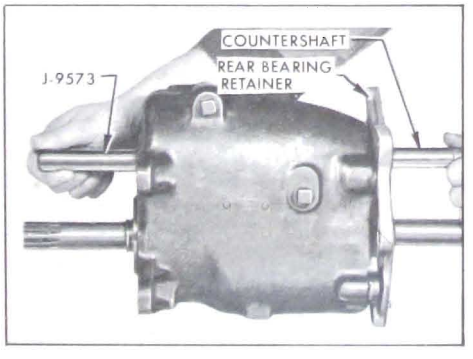

Figure 4-106—Removing J-9573

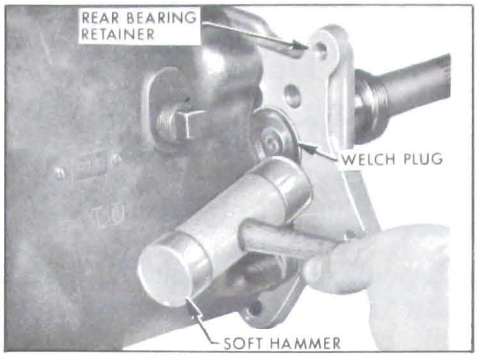

Figure 4-107—Installing Welch Plug

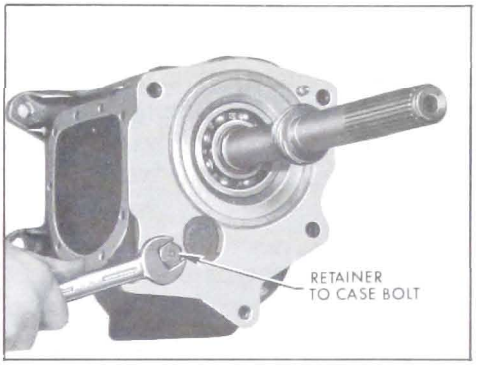

Figure 4-108—Retainer to Case Bolt

33. Carefully install mainshaft through opening in rear of case, making certain front end of mainshaft enters roller bearings at rear of main drive gear and clutch key slot of synchronizing ring lines up with clutch key.

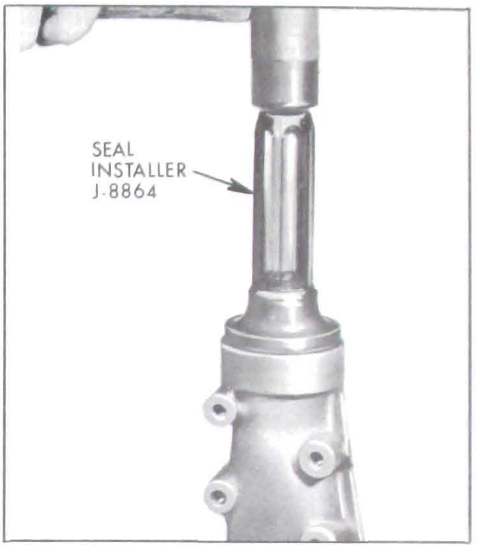

Figure 4-109—Installing Case Extension Oil Seal

NOTE: When installing mainshaft into transmission, allow approximately 1/2" clearance between transmission case and rear bearing retainer.

34. Turn transmission over so countergear shaft can be installed.

35. With rear bearing retainer rotated as shown in Figure 4-105, insert countershaft through exposed shaft opening in rear of case, making certain the shaft passes through both thrust washers before it enters countergear.

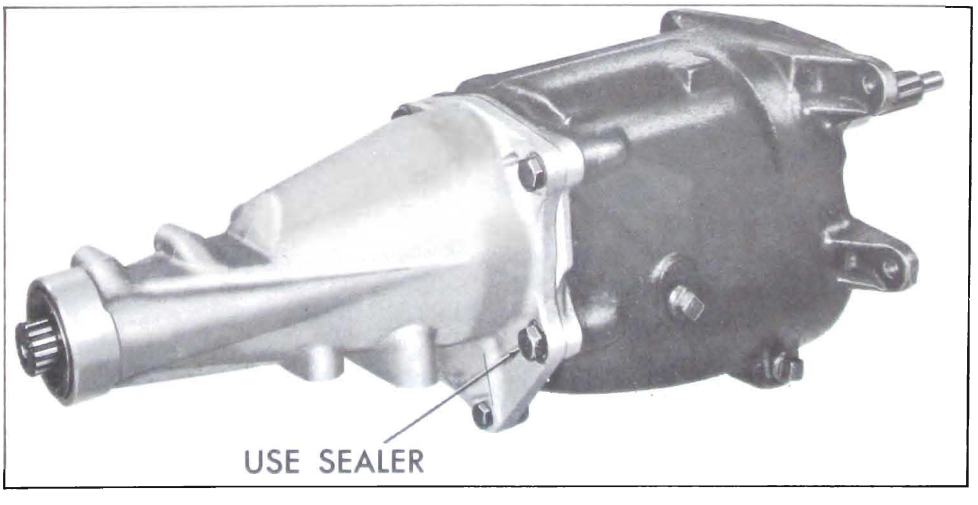

Figure 4-110—Sealing Case Extension Attaching Bolt

NOTE: Rotating main drive gear back and forth will help in aligning countergear thrust washer with shaft opening in case.

36. Slide countershaft through countergear, forcing Tool J-9573 out opening at front of case. See Figure 4-106.

37. Before countershaft is driven fully into place, install lock key (retain key is countershaft with heavy grease) in notch at rear of shaft, then drive shaft in until lock key seats against cutout in case.

38. Rotate rear bearing retainer as shown in Figure 4-107 and install welch plug.

39. Align rear bearing retainer with transmission case. With a soft hammer, tap end of mainshaft to seat rear bearing retainer with transmission case.

40. Install retainer to case bolt. See Figure 4-108.

41. Check both synchronizing rings through side opening in case to insure freedom of movement. Place clutch in neutral position.

42. With clutch in neutral, install shift rods. Lower transmission side cover into place. Install attaching bolts and tighten evenly to avoid side cover distortion. Use suitable sealer when installing the lower right bolt.

43. Install new oil seal in rear bearing retainer, using Seal Installer J-8864. See Figure 4-109. Lightly coat seal with gear lubricant.

44. Install three extension and retainer to case attaching bolts

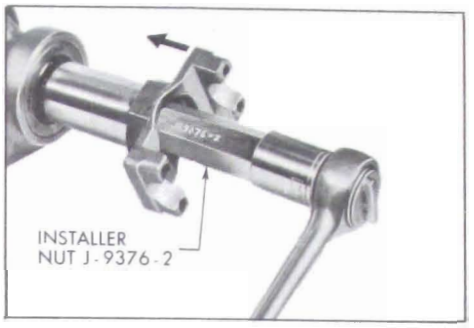

Figure 4-111—Installing Front Companion Flange

(torque to 35 to 45 ft. lbs.) and two extension to retainer attaching bolts (torque to 20 to 30 ft. lbs.). Use a suitable sealer on the lower right attaching bolt as viewed from rear. See Figure 4-110.

45. Install front companion flange. See Figure 4-111.