SECTION 4-B

3-SPEED SYNCHROMESH TRANSMISSION

CONTENTS OF SECTION 4-B

NOTE: 3-Speed synchromesh transmission is standard equipment on Series 4000-4100-4300.

4–7 S-M TRANSMISSION SPECIFICATIONS

a. Bolt Tightening Specifications

Location	Size	Torque Ft. Lbs.
Side Cover Retaining Bolt (Use with 5/16 heavy lock washer)	5/16-18 x 7/8	15-18
Clutch Gear Bearing Retainer Bolt (Use with 5/16 internal tooth lock washer)	5/16-18 x 3/4	10-12
Transmission Rear Extension Retaining Bolt (Use with 7/16 external tooth lock washer)	7/16-14 x 1 1/8	40-45

b. Transmission Specifications

Type	3-Speed Manual Shift Synchromesh
Mounting	Unit with Engine
Lubricant	
Type	SAE 90 Transmission Multi-Purpose
Capacity	2 Pints
Type of Gearing	All Helical
Synchronization	2nd and 3rd Gears
Constant Mesh Gears	2nd Gear
Sliding Gears	1st and Reverse Gears
Gear Ratios	
1st	2.58 : 1
2nd	1.48 : 1
3rd	1.00 : 1
Reverse	2.58 : 1
Gear Shifting	Remote, on Steering Column

c. Speedometer Gears

Speedometer Driving Gear (on Mainshaft)	Press Fit
Driving Gear Teeth	
3.08 Ratio Rear Axle	8
3.23 Ratio Rear Axle	8
3.55 Ratio Rear Axle	8

	Tire Size		
	6.50 x 14	7.00 x 14	7.50 x 14
Driven Gear Teeth			
3.08 Ratio Rear Axle	20	21	23
3.23 Ratio Rear Axle	19	20	22
3.55 Ratio Rear Axle	19	20	21

4-8 S-M TRANSMISSION DESCRIPTION

The synchromesh transmission is solidly bolted to the rear face of the upper flywheel housing, forming a unit assembly with the engine. The clutch gear 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 clutch gear extends thru the clutch driven plate into an oil impregnated bronze bushing in the rear of the engine crankshaft. The rear of the clutch gear is supported by a ball bearing in the front of the transmission case. The inner race of the bearing is a press fit on the clutch gear shaft. The outer race is grooved for a snap ring that fits between the transmission case and the front bearing retainer to hold the bearing and clutch gear in place.

The front end of the mainshaft is piloted in a double set of roller bearings set into the hollow end of the clutch gear, while the rear end is supported by the transmission rear bearing and is a slip fit in the front end of the transmission rear extension. The outer race is grooved for a snap ring which retains the race in the rear extension. The inner race is a press fit on the mainshaft. The bearing is prevented from moving forward by the second speed gear thrust washer, and retained at the rear by a snap ring fitted into a groove on the mainshaft.

The countergear is carried on roller bearings at both ends, while thrust is taken on washers located between each end of the gear and the case.

A hole in the hub of the countergear permits lubricant to reach the bearings and thrust washers.

The reverse idler gear is carried on ball indented bronze bushings. Forward thrust of the gear is taken on a washer located between the front of the gear and the case, while rearward thrust is taken on a radial needle bearing and a washer located between the rear of the gear and the case. The reverse idler gear shaft is held in position by a pin passing thru the case into the rear end of the shaft.

The second gear is mounted on the main shaft in such a position that it is constantly in mesh with the countergear. The gear is free to rotate on the main shaft except when engaged by the synchronizing assembly during second speed operation.

The first-reverse sliding gear is splined to the second-third speed clutch 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 Shifting and Synchronization

1. Gear Shifting - Shifter forks extending thru the transmission side cover constitute the gear change mechanism. The forward lever moves the clutch sleeve forward or rearward to provide synchronized 2nd and 3rd speeds. The rear lever moves the sliding ring gear forward or rearward to engage the countergear for 1st and Reverse speeds. A shift interlock prevents both levers from moving at the same time. One lever must be in neutral position before the other will function.

2. Synchronization

Gear shift synchronization is provided in 2nd and 3rd speeds by a clutch sleeve with one synchronizing ring at each end. The front ring is positioned over the drive splines of the main drive gear. The rear ring is positioned over the splines of the second speed gear. 4 lugs on the rings fit into slots in their respective gears, causing the rings to rotate when the gear rotates. This arrangement allows the ring to slide on the gear. An energizing spring, positioned in a groove on the gear, provides resistance to this movement. As the clutch sleeve is slid forward or rearward, the beveled outer diameter of the ring contacts the beveled inner diameter of the clutch sleeve. The ring, which is rotating at the same speed as the gear, causes the sleeve to rotate at the same speed the gear is rotating. Further movement of the sleeve forces the lugs of the synchronizing ring over the energizing spring on the gear. This resistance to movement of the ring, causes a more positive contact between the sleeve and the ring. Thus, the sleeve and ring rotate at the same speed. Still further movement of the sleeve allows the internal drive splines of the sleeve to mesh with the external drive splines of the gear. This provides a positive engagement of the sleeve with the gear. Since the clutch sleeve is splined to the mainshaft, the gear is "locked" to the mainshaft.

c. Speedometer Gears

The speedometer driving gear is a press fit on the mainshaft. Normally, when changing rear axle ratios it is unnecessary to change the driving gear. However, with certain ratios, changing the driving gear becomes necessary. See Figure 4-20.

The driven gear and shaft is held in the rear extension by a fitting, lockplate, lock washer, and bolt. An "O" ring provides a seal between the driven gear assembly and the rear extension.

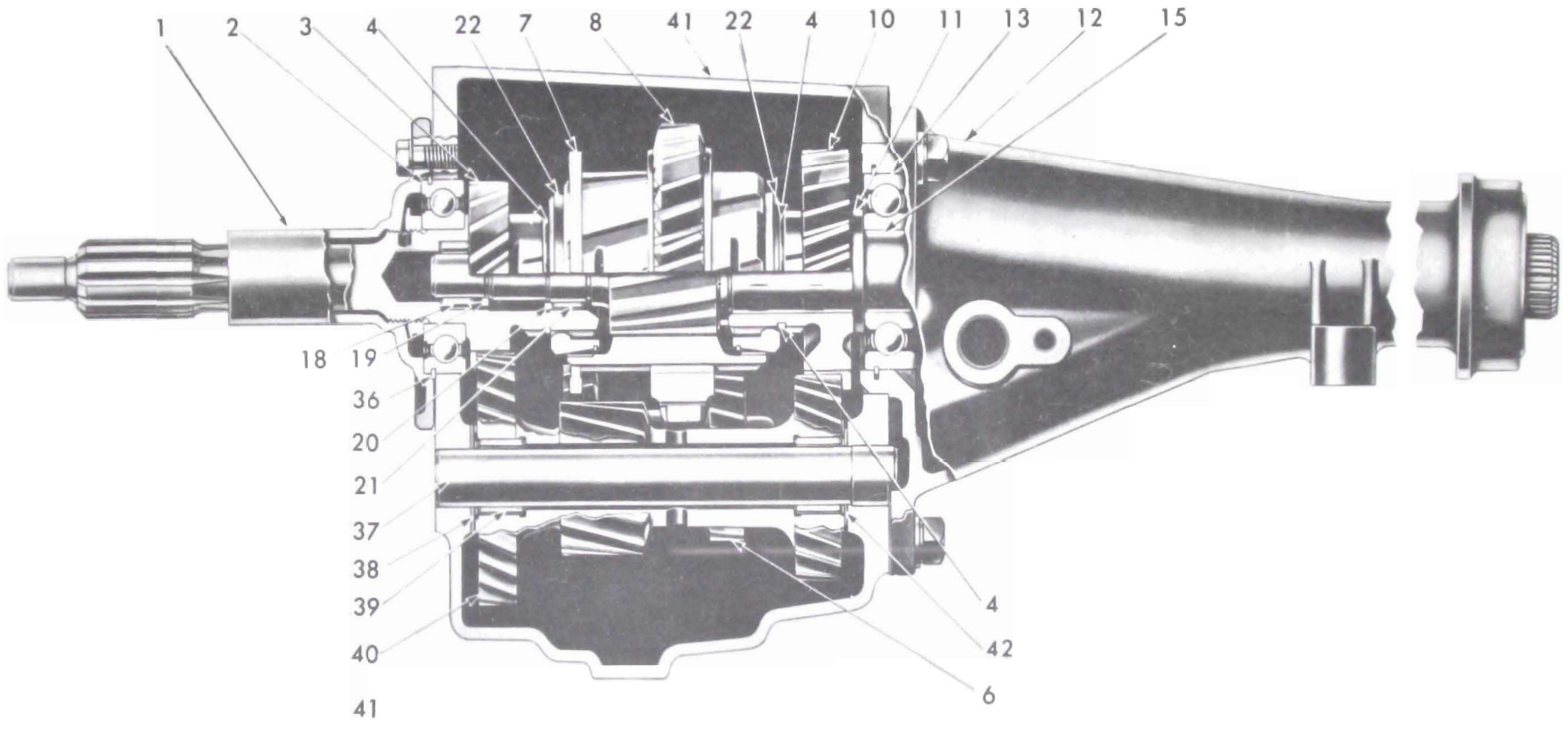

Figure 4-7—Transmission Cross-Section (Side View)

1. Clutch Gear Bearing Retainer
2. Clutch Gear Bearing
3. Clutch Gear
4. Energizing Spring
6. Reverse Idler Gear
7. Second and Third Speed Clutch
8. First and Reverse Sliding Gear
10. Second Speed Gear
11. Thrust Washer
12. Case Extension
13. Mainshaft Rear Bearing
15. Mainshaft
18. Front Pilot Bearing Rollers
19. Thrust Washer
20. Thrust Washer
21. Rear Pilot Bearing Rollers
22. Synchronizer Ring
36. Snap Ring
37. Countershaft
38. Thrust Washer
39. Roller Bearing
40. Countergear
41. Transmission Case
42. Roller Thrust Washer

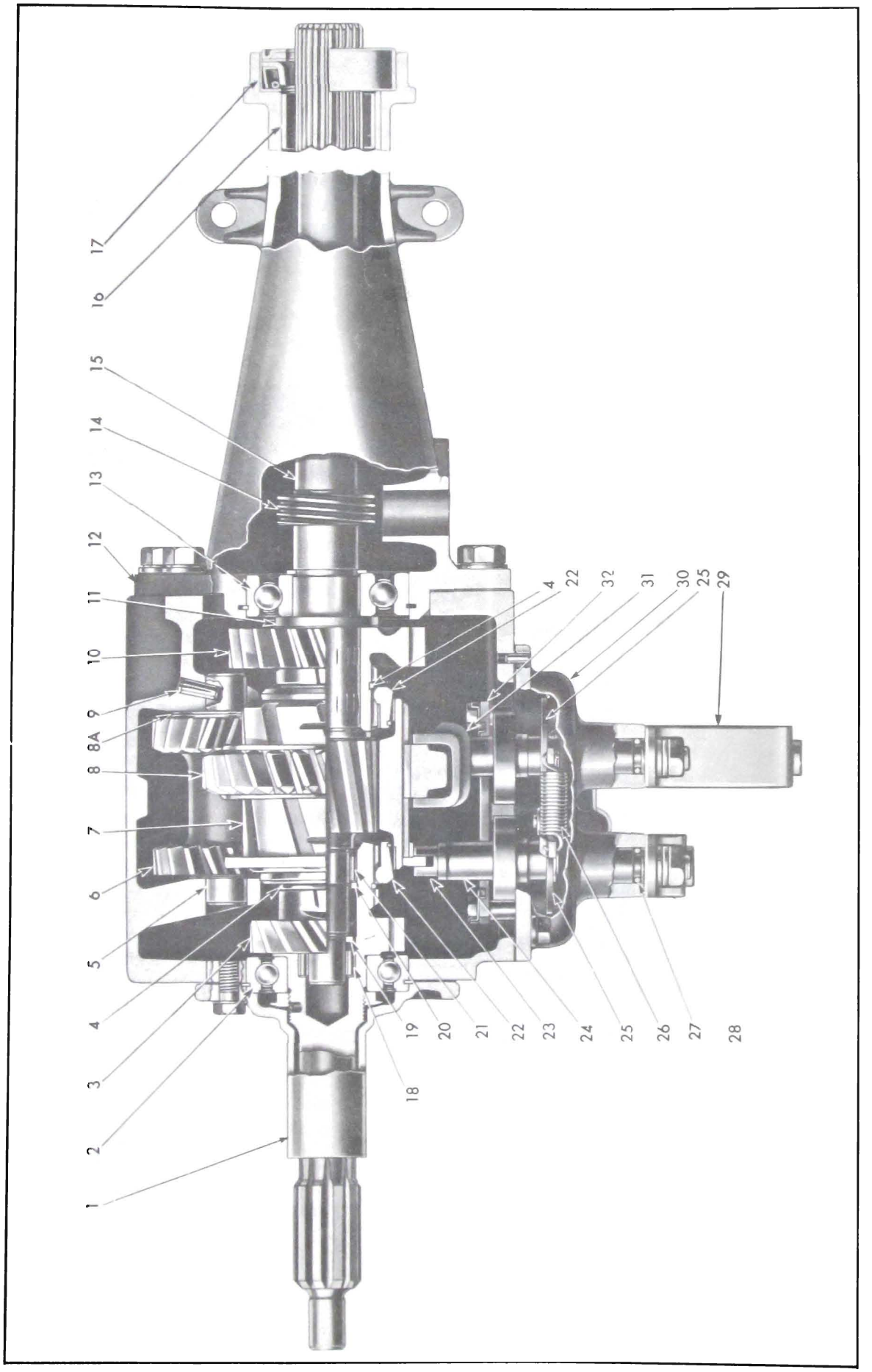

Figure 4-8—Transmission Cross Section (Top View)

1. Clutch Gear Bearing Retainer
2. Clutch Gear Bearing
3. Clutch Gear
4. Energizing Spring
5. Reverse Idler Shaft
6. Reverse Idler Gear
7. Second and Third Speed Clutch
8. First and Reverse Sliding Gear
8a. Thrust Bearing and Washer
9. Reverse Idler Shaft Pin
10. Second Speed Gear
11. Thrust Washer
12. Case Extension
13. Mainshaft Rear Bearing
14. Speedometer Drive Gear
15. Mainshaft
16. Bushing
17. Oil Seal
18. Front Pilot Bearing Rollers
19. Thrust Washer
20. Thrust Washer
21. Rear Pilot Bearing Rollers
22. Synchronizer Ring
23. Second and Third Shifter Fork
24. Second and Third Shifter Shaft
25. Detent Cam
26. Detent Cam Spring
27. "O" Ring Oil Seal
28. Second and Third Shifter Lever
29. First and Reverse Shifter Lever
30. Side Cover
31. First and Reverse Shifter Fork
32. Interlock Retainer

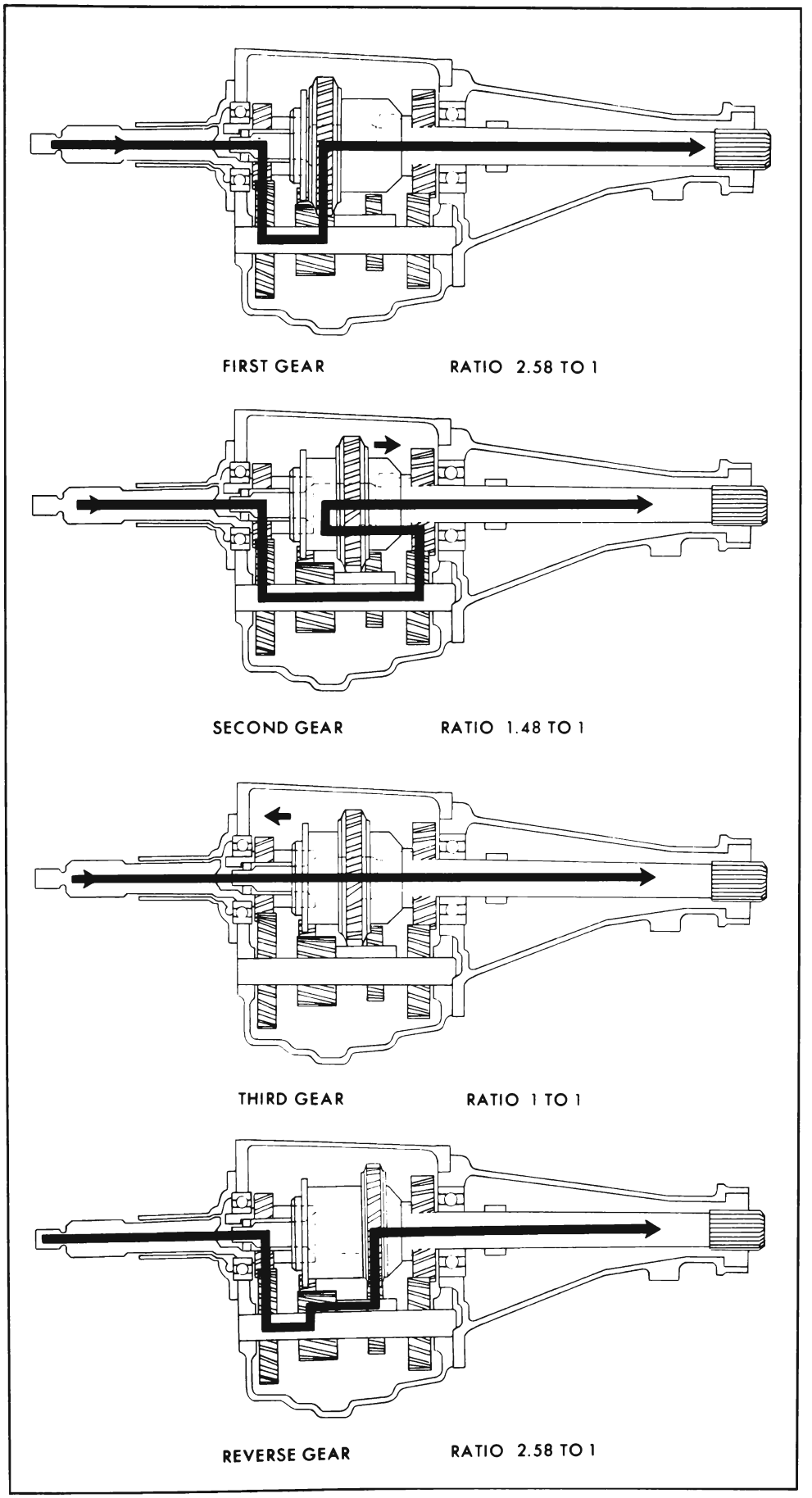

Figure 4-9—Transmission Power Flow

d. Power Flow Thru Transmission

1. First Gear - Mechanical Action - The shifter fork slides the ring gear into contact with the middle gear on the countergear. The countergear is in constant mesh with the main drive gear.

First Gear - Power Flow - Torque is imparted to the countergear by the main drive gear. It is then transferred to the ring gear on the clutch sleeve by the middle gear on the countergear. The ring gear is splined to the clutch sleeve which, in turn, is splined to the mainshaft.

2. Second Gear - Mechanical Action - The ring gear is moved back to the neutral position and the clutch sleeve is moved rearward to engage the front part of the second speed gear. The second speed gear is in constant mesh with the rear of the countergear.

Second Gear - Power Flow - Torque imparted to the countershaft by the main drive gear is transmitted to the second speed gear. The second speed gear, now splined to the clutch sleeve, transmits torque to the mainshaft thru the clutch sleeve.

3. 3rd or Direct Gear - Mechanical Action - The clutch sleeve is moved forward to engage the rear of the main drive gear. The ring gear remains in the neutral position. Thus the main drive gear is in contact with the mainshaft thru the clutch sleeve.

3rd or Direct Gear - Power Flow - Torque imparted to the main drive gear is applied directly to the mainshaft thru the clutch sleeve.

4. Reverse Gear - Mechanical Action - The shifter fork slides the ring gear rearward to engage the rear gear on the reverse idler

gear. The forward gear of the idler gear is always in constant mesh with the middle gear on the countergear. The clutch sleeve is in the neutral position.

Reverse Gear - Power Flow - Torque imparted to the main drive gear is applied to the countergear. The middle gear on the counter, being in mesh with the idler gear, transmits the torque to the idler gear. The idler gear, in turn, is in mesh with the ring gear and transmits torque to it and the clutch sleeve to which the ring gear is splined. The clutch sleeve then turns the mainshaft.

4-9 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. Slipping Or Jumping Out Of Gear

In any case of gear jump-out or slippage, first check the adjustment of the gear shift control mechanism as described in Section 4-A.

Gear jump-out in any reduction gear could be caused by damaged teeth on mating gears or improperly mated splines on the inside of first and reverse gear and/or external spline on second and third speed clutch sleeve. Also a loose fit of the bearings and bushings involved can cause this condition.

Gear jump-out in third or direct speed can be caused by the following conditions:

(1) Transmission loose in clutch housing.

(2) Damaged mainshaft pilot bearing.

(3) Clutch gear bearing retainer broken or loose.

(4) Misalignment of transmission.

(5) Does not fully engage. Check length of engagement pattern on clutching teeth. If less than 7/64", check for misadjusted shift linkage.

c. 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.

d. Noise in Neutral

With the car standing, engine running, and 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.

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. 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.

The clash does not occur when shifting quickly into second or high gear with the car standing still because the synchronizer stops the spinning parts.

Therefore, sufficient time must be allowed before shifting into first after the clutch pedal is depressed.

g. 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, check the lubricant level, and add any if necessary. Then determine by test which gears are noisy under load, so that these parts can be thoroughly inspected when removed.

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.

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.

4-10 REMOVAL AND INSTALLATION OF TRANSMISSION

a. Removal From Vehicle

1. Drain lubricant from transmission.

2. Disconnect the speedometer cable from speedometer driven gear fitting and disconnect shift control rods and equalizer from the shifter levers at the transmission.

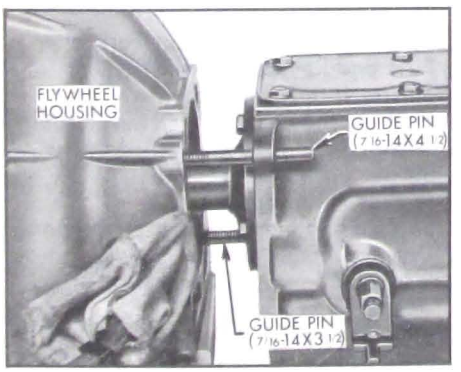

Figure 4-10—Transmission Removal

3. Remove propeller shaft as outlined in Group 6. Support rear of engine and remove transmission mounting block-to-support (cross member) bolts and washers. Remove support-to-frame bolts and washers and remove support.

4. Remove the 2 top transmission to clutch housing cap screws and insert 2 transmission guide pins, Tool J-1126, in these holes.

5. Remove the 2 lower transmission to clutch housing cap screws.

6. Slide the transmission straight back on guide pins until the clutch gear is free of splines in the clutch disc.

7. Remove transmission from under the body.

b. Installation in Vehicle

1. Install guide pin, Tool J-1126, in upper right transmission to clutch housing bolt hole for alignment and place transmission on guide pin. Rotate transmission as necessary and start clutch gear shaft into clutch disc and slide transmission forward.

2. Install the two lower transmission mounting bolts and lock washers and tighten securely. Remove guide pin and install upper mounting bolts and lock washers. Torque to 45-60 ft. lbs.

3. Position the transmission support under transmission mounting bracket. Install transmission support and support-to-mounting block bolts and washers.

4. Install propeller shaft as outlined in Group 6.

5. Install and adjust linkage as outlined in Group 4A.

6. Remove speedometer driven gear and add 1/2 pint of transmission lubricant to housing. Install speedometer driven gear.

7. Connect speedometer cable to driven gear and tighten securely.

8. Fill transmission with lubricant.

c. Transmission Alignment

If transmission slips out of high gear, particularly at 50 MPH and above, and all other probable causes outlined in paragraph 4-9 have been eliminated, the alignment of the engine crankshaft pilot, clutch housing bore, and the transmission should be checked.

A special tool, on which is mounted a dial indicator, is necessary to check the transmission rear bearing bore alignment. This tool may be made from a new or good used clutch gear which has a good bearing surface on the crankshaft pilot and front main bearing. The splines on the clutch gear shaft should be ground in so the shaft may be rotated in the clutch disc hub without interference when assembled in the car. Weld a piece of 1/4" rod, 8" long, in the mainshaft pilot bore. Assemble a good bearing on the shaft and secure it with a clutch gear bearing nut.

1. Remove the transmission from the car and completely disassemble.

2. Install the case extension on the case and tighten the extension-to-case bolts securely.

3. Install the special tool with the dial indicator in the transmission case, with the face of the indicator and the tracing finger to the rear of the transmission. Secure in place with a clutch gear bearing retainer.

4. Rotate the gear and make final adjustment of the indicator with the tracing finger to the rear of the case and in the center of the rear bearing bore in the case extension.

5. Assemble the transmission case to the clutch housing and tighten the four transmission mounting bolts securely.

6. Install transmission support and support-to-transmission mounting block bolts.

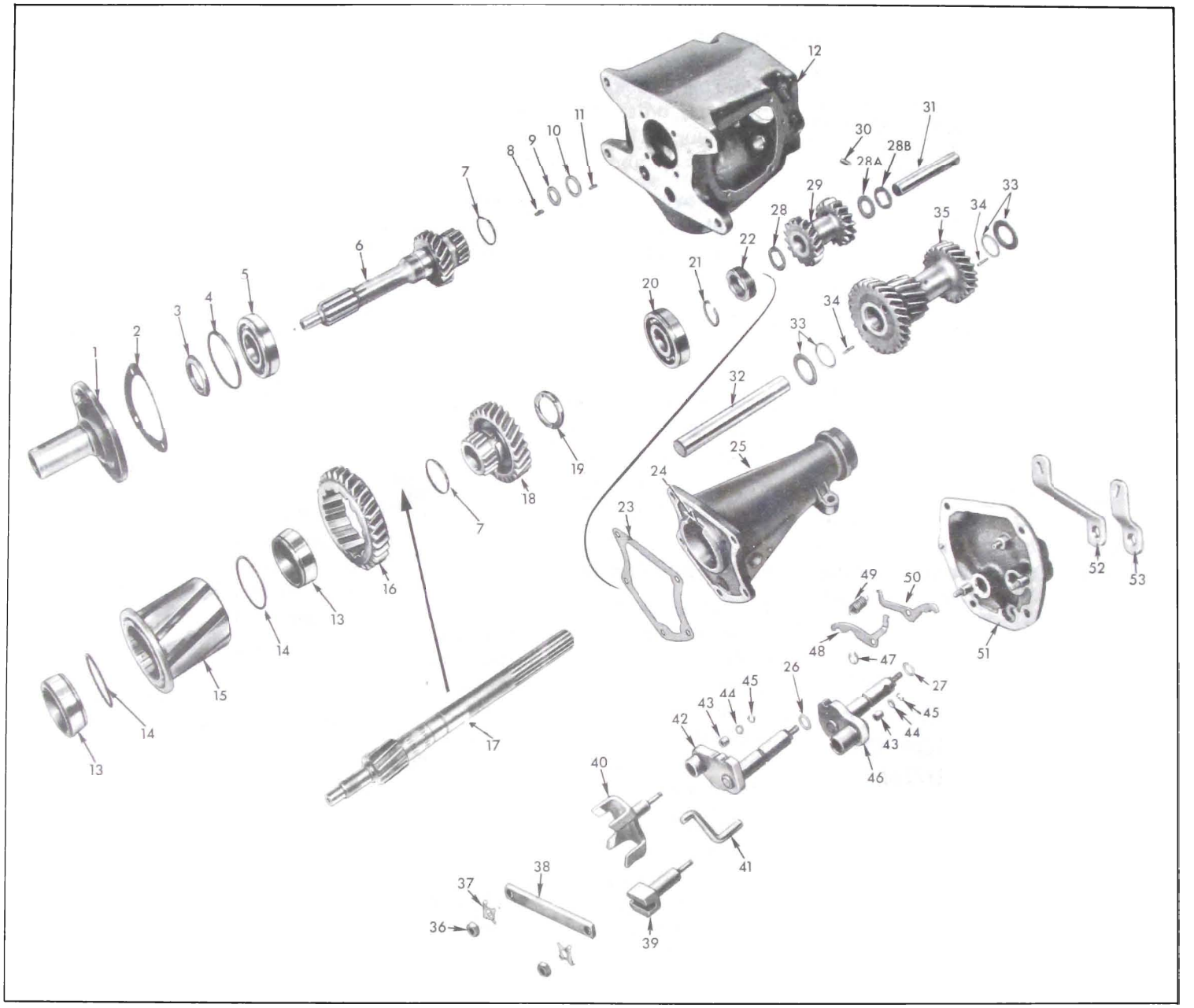

Figure 4-11—Exploded View of 3-Speed Synchromesh Transmission

1. Clutch Gear Bearing Retainer
2. Bearing Retainer Gasket
3. Bearing Nut and Oil Slinger
4. Bearing Snap Ring
5. Clutch Gear Bearing
6. Clutch Gear
7. Energizing Spring
8. Front Pilot Bearing Roller
9. Thrust Washer
10. Thrust Washer
11. Rear Pilot Bearing Rollers
12. Transmission Case
13. Synchronizer Ring
14. Snap Ring
15. Second and Third Speed Clutch
16. First and Reverse Sliding Gear
17. Mainshaft
18. Second Speed Gear
19. Thrust Washer
20. Mainshaft Rear Bearing
21. Snap Ring
22. Speedometer Drive Gear
23. Case Extension Gasket
24. Rear Bearing Snap Ring
25. Case Extension
26. First and Reverse Shifter Lever "O" Ring
27. Second and Third Shifter Lever "O" Ring
28. Thrust Washer
28a. Thrust Bearing
28b. Thrust Bearing Washer
29. Reverse Idler Gear
30. Reverse Idler Shaft Pin
31. Reverse Idler Shaft
32. Countershaft
33. Countergear and Roller Thrust Washers
34. Bearing Roller
35. Countergear
36. Shifter Interlock Retainer Stud Nut
37. Shifter Interlock Retainer Stud Nut Lock
38. Shifter Interlock Retainer
39. Second and Third Shifter Fork
40. First and Reverse Shifter Fork
41. Shifter Interlock Shaft
42. First and Reverse Shifter Lever (Inner)
43. Shifter Fork Spacer
44. Shifter Fork Washer
45. Shifter Fork Retainer
46. Second and Third Shifter Lever (Inner)
47. Detent Cam Retainer
48. First and Reverse Detent Cam
49. Detent Cam Spring
50. Second and Third Detent Cam
51. Side Cover
52. First and Reverse Shifter Lever (Outer)
53. Second and Third Shifter Lever (Outer)

7. Remove the jack or other support from under the engine and let the weight of the engine rest on the transmission mounting in the normal position.

8. With the dial indicator, check the readings of the rear bearing bore at the 12, 3, 6, and 9 o'clock positions.

9. Install temporary slotted shims between the transmission case and the clutch housing in the quantities and at the bolt locations as necessary to bring misalignment at the transmission rear bearing bore to a maximum of .010" indicator reading in either the horizontal or vertical plane.

10. After the position and quantity of shims has been determined and recorded, transmission case and extension may be removed.

NOTE: INSTALLATION OF A .002" SHIM BETWEEN THE TRANSMISSION CASE AND THE CLUTCH HOUSING AT TWO BOLT LOCATIONS OPPOSITE TO THE HIGH INDICATOR READING WILL CHANGE THE TRANSMISSION REAR BORE READING APPROXIMATELY .003" to .004".

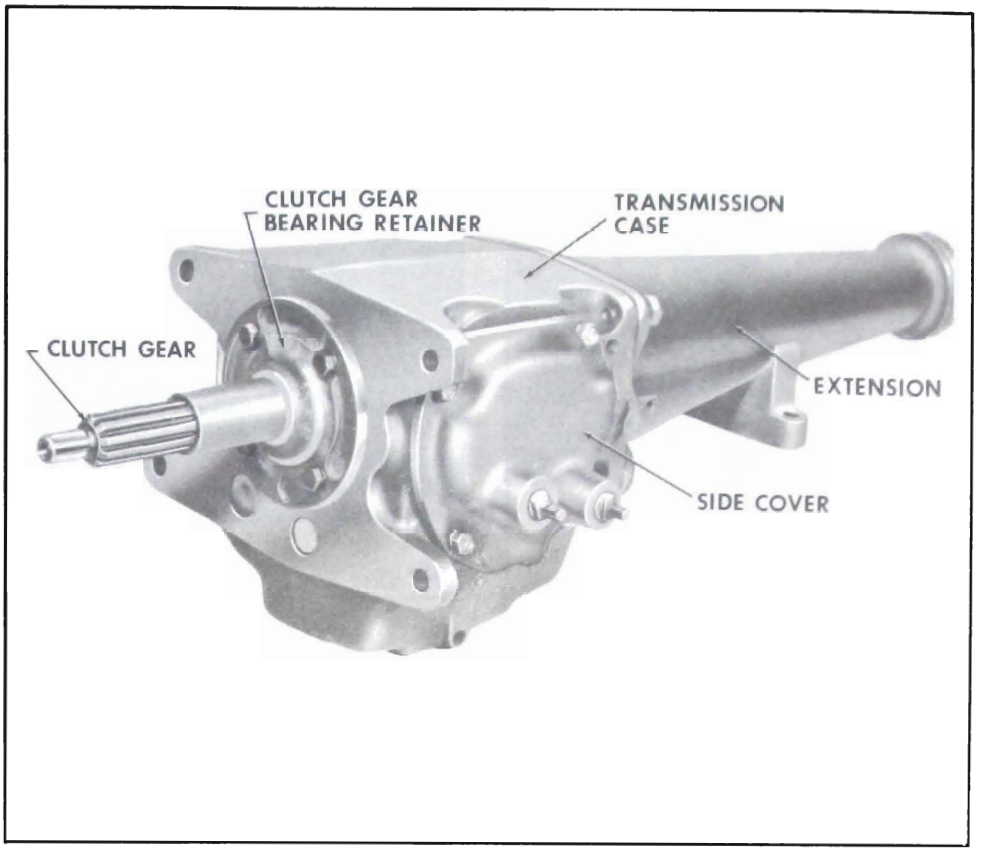

Figure 4-12—Transmission Identification

4-11 DISASSEMBLY OF TRANSMISSION

a. Major Disassembly

1. Remove the capscrews from the transmission side cover. Remove the side cover and gasket.

2. Remove extension-to-transmission case bolts and lock washers. Pull extension and mainshaft assembly from transmission case, leaving second and third speed clutch assembly and first-reverse ring gear in the case. Do not force the mainshaft. If necessary, rotate the second-third speed clutch slightly to aid removal. See Figure 4-13.

3. Slide the first-reverse ring gear off the clutch sleeve, and remove thru the side cover opening.

4. Remove the clutch assembly from the clutch gear and then remove thru the side cover opening.

5. Remove the pilot bearing rollers from clutch gear.

6. Remove the four clutch gear bearing retainer screws and washers. Remove retainer and gasket.

7. Using Tool J-5777, remove the countershaft. Leaving the tool in place, lower the countergear to the bottom of the case. See Figure 4-14.

NOTE: It is necessary to lower the countergear in order to provide clearance for clutch gear removal.

8. Remove clutch gear bearing snap ring. See Figure 4-15.

9. Tap the end of the clutch gear with a soft hammer, moving the bearing and gear assembly back into the case. Remove the assembly thru the rear of the case. See Figure 4-16.

10. Remove the countergear assembly thru the rear of the case.

11. Using a drift pin, drive the idler shaft lock pin into the shaft.

12. Drive the idler gear shaft out of the case, being careful not to turn the shaft. See Figure 4-17.

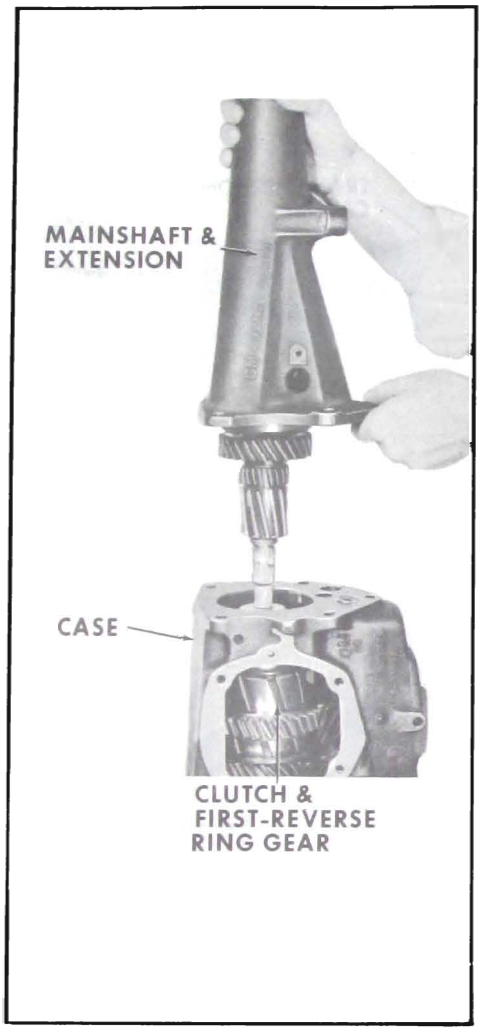

Figure 4-13—Mainshaft Removal

CAUTION: Do not allow the idler shaft to rotate causing the lock pin to drop down. Damage to the washers could result.

13. Carefully remove the idler gear, thrust washer, thrust bearing, and bearing washer.

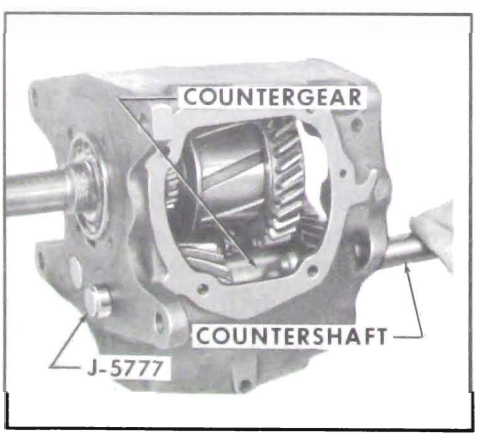

Figure 4-14—Removing Countershaft

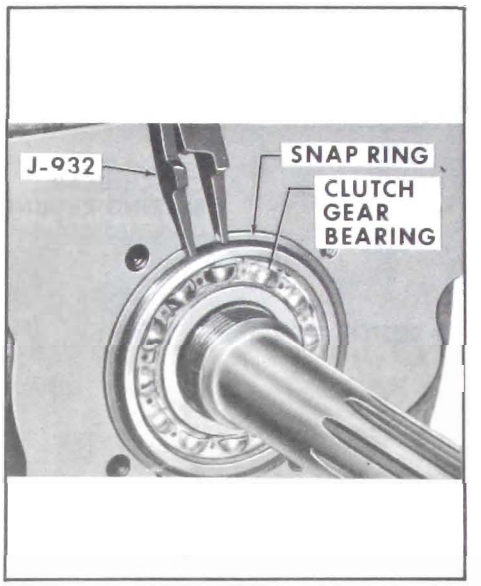

Figure 4-15—Clutch Gear Snap Ring Removal

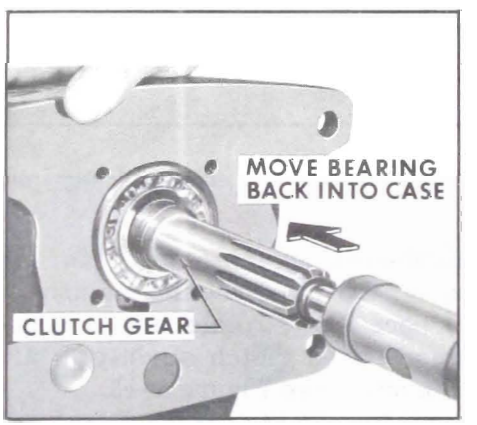

Figure 4-16—Clutch Gear Bearing Removal

14. To remove mainshaft from extension, expand the bearing snap ring and tap the rear of the mainshaft with a soft hammer. Remove the complete mainshaft assembly from the extension. See Figure 4-18.

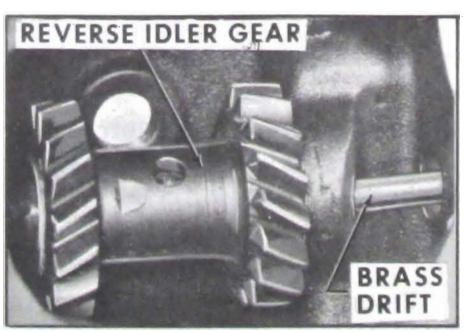

Figure 4-17—Idler Shaft Removal

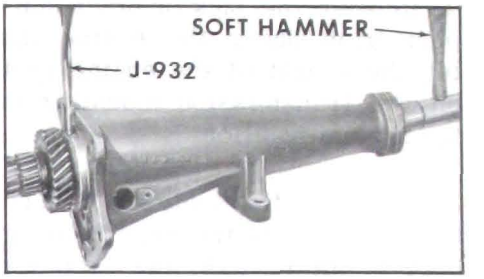

Figure 4-18—Mainshaft Removal

b. Mainshaft Repair

1. Remove speedometer drive gear with Tool J- See Figure 4-19.

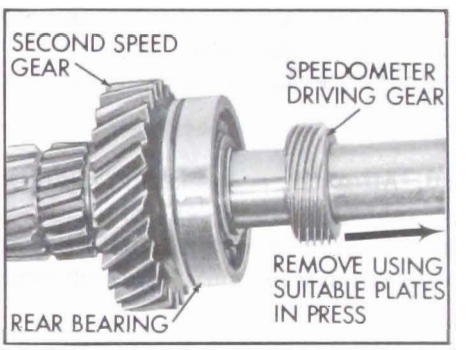

Figure 4-19—Removing Speedometer Driving Gear

2. Remove bearing to mainshaft snap ring. Press bearing off shaft.

3. Remove second speed gear thrust and second speed gear.

4. Inspect and replace worn or damaged parts.

5. Lubricate bore of second speed gear, and install on mainshaft.

6. Install bearing. Make sure the groove in O.D. of bearing is toward second speed gear.

7. Install correct size snap ring. Determine size by using ring that gives no more than .004" of end play between bearing and shaft.

8. Start speedometer drive gear on shaft with chamfered I.D. of gear toward bearing. Press gear on shaft until forward face of gear is 7/8" from face of bearing. See Figure 4-20.

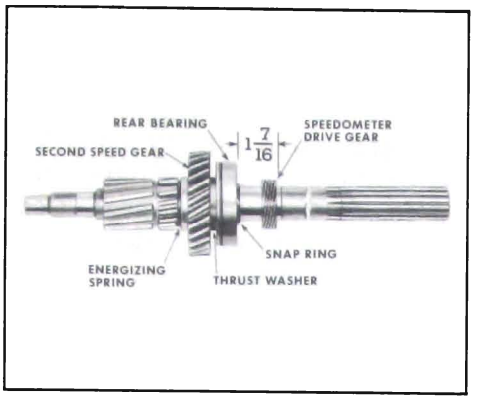

Figure 4-20—Mainshaft Identification

c. Clutch Gear Bearing Repair

1. Place the clutch gear in a vise with soft jaws, and remove the bearing retainer nut and oil slinger using Tool J-0933. See Figure 4-21.

2. Install gear and bearing in transmission case. Next, install snap ring on bearing.

3. Using a soft hammer, remove the bearing from the shaft by tapping the clutch gear shaft back into the case.

4. Remove the bearing from the case by tapping with a soft hammer.

5. After cleaning and inspecting all parts, replace any that are damaged or excessively worn.

6. Replace the bearing on the clutch gear shaft with the snap ring groove to the front.

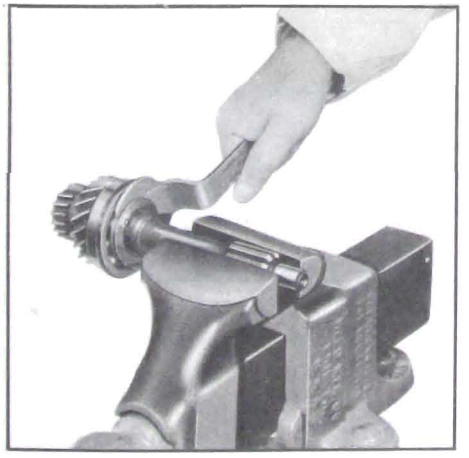

Figure 4-21—Removing Retainer Nut and Oil Slinger

7. Using Tool J-0933, install the bearing retaining nut and oil slinger. Tighten enough to permit free movement of the bearing. Lock in place by staking into hole with a center punch. Care must be taken not to damage the shaft threads.

d. Clutch Sleeve and Synchronizer Rings

1. Remove the first-reverse sliding gear from the clutch assembly.

2. Turn the synchronizer ring in the clutch sleeve until the ends of the synchronizer ring retainer can be seen thru the slot in the clutch sleeve.

3. Using Tool J-0932, expand the retainer into the counterbore in the clutch sleeve. This raises the retainer from the groove in the ring so that the ring may be easily slipped out. See Figure 4-22.

4. Check the synchronizing rings for wear or looseness in the clutch sleeve. If rings are damaged in any way, it will be necessary to replace the clutch sleeve and both synchronizer rings.

5. Place each synchronizer retainer in its respective ring. Check for any rocking or excessive looseness. Excessive rocking will not permit proper synchronization. Replace any worn or damaged parts.

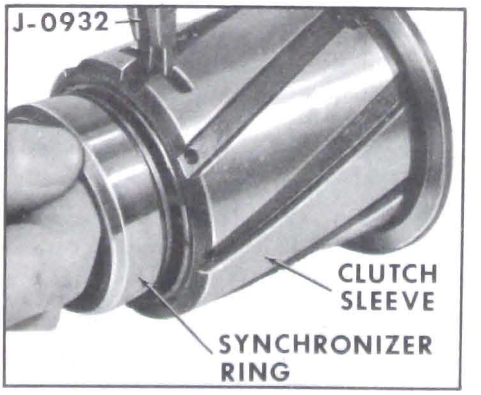

Figure 4-22—Removing Synchronizing Rings

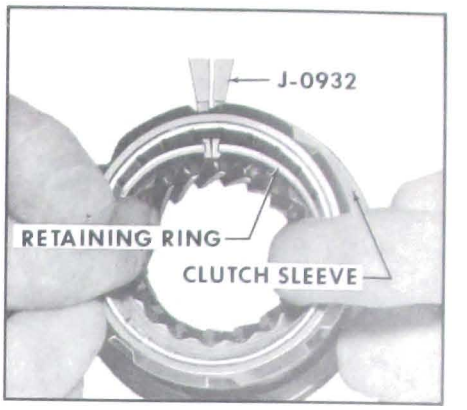

Figure 4-23—Installing Synchronizing Rings

6. Install the ring retainers in the counterbores in the ends of the clutch sleeve.

7. Insert Tool J-0932 in the opening in the clutch sleeve. Expand the retainer with the fingers just enough to catch the tips of the tool jaws. Then open the jaws of the tool enough to expand the retainer back into the counterbore and allow the ring to slip in the sleeve. Install both rings in this manner.

CAUTION: Make sure the retainers are seated in the groove all the way around the ring, so that the ring can turn freely. See Figure 4-23.

8. Install the first-reverse sliding gear on the clutch sleeve.

e. Synchronizer Engergizing Springs

1. It will be noticed upon examining these springs that one of the ends is slightly offset. Each spring must be assembled in its groove in the clutch gear and second speed gear. The offset or locking end must be between the third and fourth teeth in either bank of teeth. See Figure 4-24.

2. Under normal operation it should never be necessary to replace the energizing springs. However, should an energizing spring be removed for any reason, a new spring should be used for replacement.

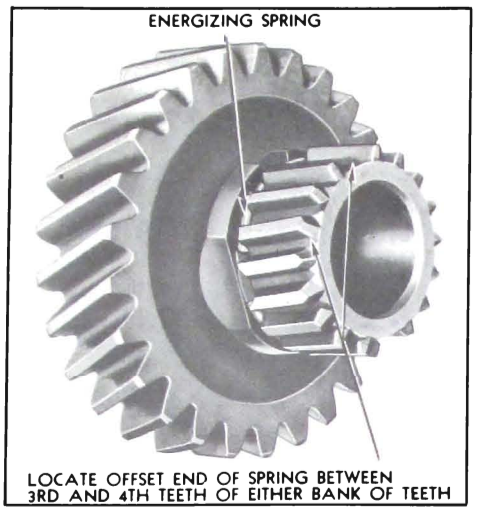

Figure 4-24—Energizing Ring Location

f. Side Cover Repair

1. Bend tabs on the shifter shaft nut retainers downward and remove nuts, nut retainers, and shifter shaft retainer.

2. Remove detent cam spring.

3. Remove cam retaining ring and cams.

4. Using a soft hammer, remove the shifter shaft and fork assemblies.

5. Remove interlock shaft.

6. Clean all parts and inspect for damage or excessive wear. Check the "O" rings at the ends of the shifter shafts for wear. Replace any parts required.

7. Install interlock shaft.

8. Lubricate the shifter shafts with transmission oil. Align the shaft of the 1st-Reverse shaft in the hole and tap in place with a soft hammer. Position interlock so as to clear shaft.

9. Repeat above procedure with the 2nd-3rd shifter shaft and fork assembly.

10. Install the detent cams with the 1st-Reverse cam on top of the 2nd-3rd detent cam. Retain with the special retaining ring.

11. Install detent cam spring.

12. Install shifter shaft retainer, nut retainers and nuts. Torque to 3-5 ft. lbs.

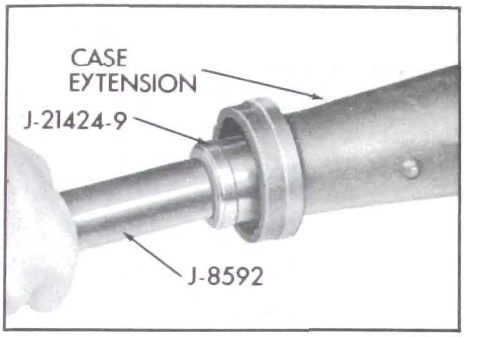

Figure 4-25—Installing Extension Bushing

g. Extension Bushing and Oil Seal

If bushing in rear of extension requires replacement, remove oil seal with the aid of a screwdriver. Using Remover J-21424-9 and Drive Handle J-8592, drive bushing back into the extension. Using the same tools, install a new bushing in the extension from the rear. Drive it in until the end of the bushing is slightly below counterbore for oil seal. Coat I.D. of bushing with transmission lubricant and install new oil seal using Tool J-8613.

4-12 TRANSMISSION ASSEMBLY

1. Coat reverse idler thrustwashers and the thrust bearing with grease and install as shown in Figure 4-26. Coat bushings with transmission lubricant.

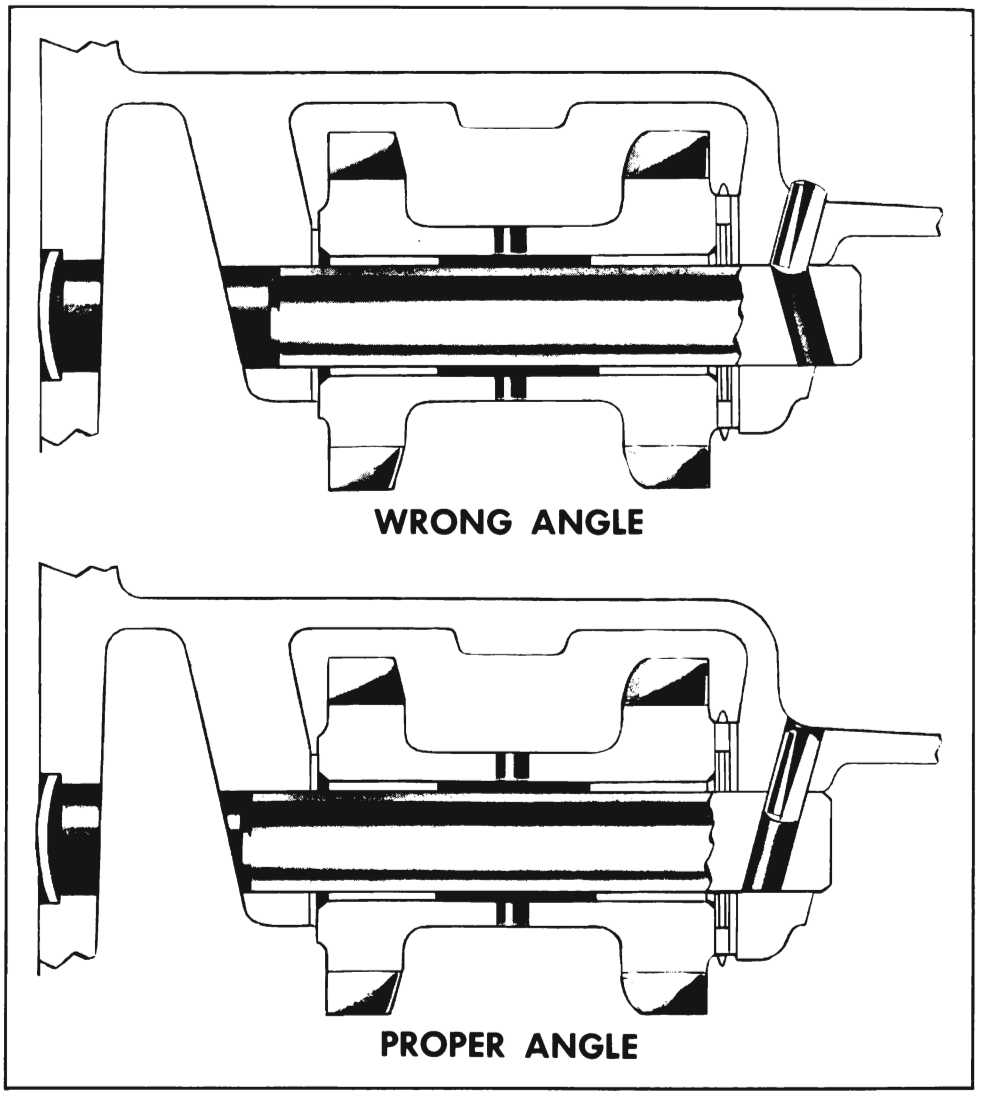

Figure 4-26—Reverse Idler Gear

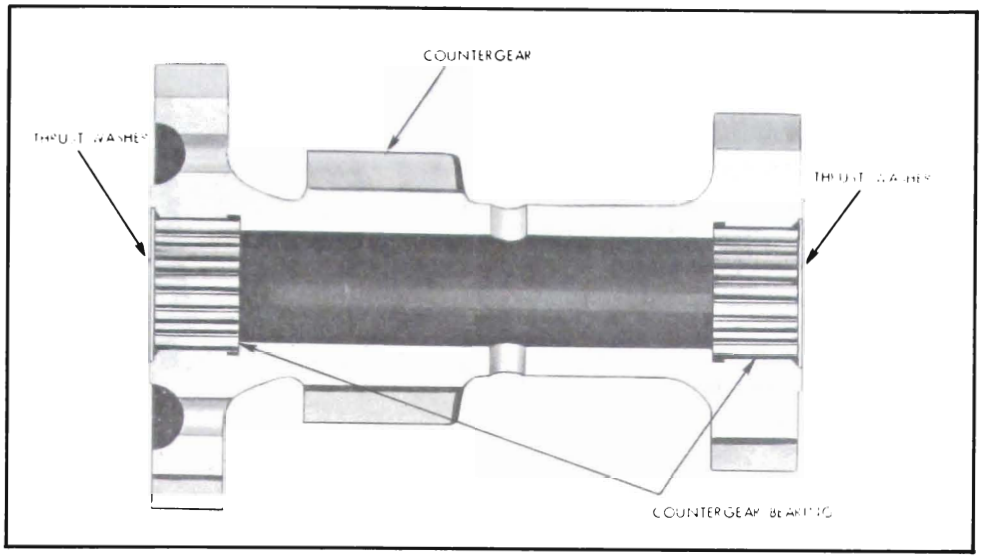

Figure 4-27—Countergear and Bearings

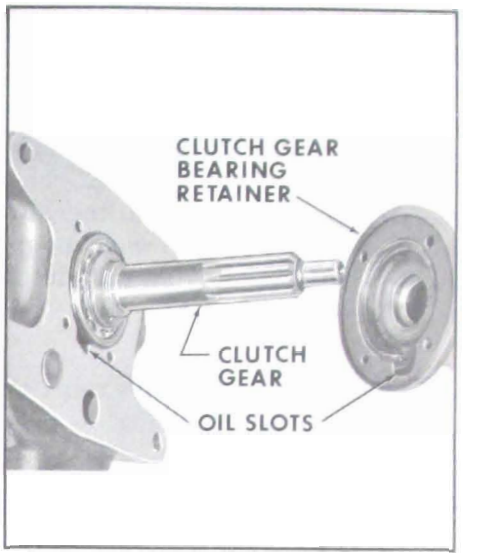

Figure 4-29—Clutch Gear Bearing Retainer Oil Slot

2. Place gear assembly in position in case with thrust bearing toward rear.

3. Install the idler shaft, making sure the lock pin hole in the shaft lines up with the hole in the case at the same angle. See Figure 4-26.

4. Coat a new idler shaft lock pin with Permatex No. 2 or its equivalent. Drive it in approximately 1/16" beyond flush with the case. Peen the hole slightly.

5. Install idler shaft expansion plug in case.

6. Place some cup grease in the roller bearing area on each end of countergear. Insert Tool J-5777 in countergear. Install 25 roller bearings in each end. Apply grease to bearing thrust washers; place one of each at each end of countergear. See Figure 4-27.

7. Insert countergear (with Tool J-5777) in transmission case and rest it on bottom of case.

8. Place some cup grease in the mainshaft pilot hole in the clutch gear and install the roller bearings. Install the larger group of 14 bearings and then the washer with the small I.D. Next install the washer with the large I.D. and then the group of 24 smaller roller bearings.

9. Insert clutch gear from inside case and using a soft drift, tap the outer race of the clutch gear bearing (back of gear) until the bearing locating ring groove is outside the front of the case. Drive the assembly straight to prevent damage. See Figure 4-28.

10. Install snap ring on bearing and tap clutch gear rearward until snap ring is firmly against case.

11. Install the clutch gear bearing retainer and gasket. Make sure the oil slot in the retainer lines up with the oil slot in the front face of the case. Do not allow the gasket to protrude beyond the edge of the retainer. See Figure 4-29.

12. Coat the retainer screws with Permatex No. 2 or equivalent and install in retainer, using the special shakeproof washers. Tighten to 12-15 ft. lbs. torque.

13. Lubricate and insert countershaft in rear of case. Align countergear with shaft and tap shaft thru, pushing Tool J-5777 out front of case. Be sure the flat on the end of countershaft is horizontal and to the bottom of the case. See Figure 4-30.

14. After shaft is aligned as described above and as shown in Figure 4-30, drive shaft into case until the flat on shaft is flush with case.

CAUTION: Flat on shaft must be horizontal and at bottom of case in order to allow the rear extension to fit properly.

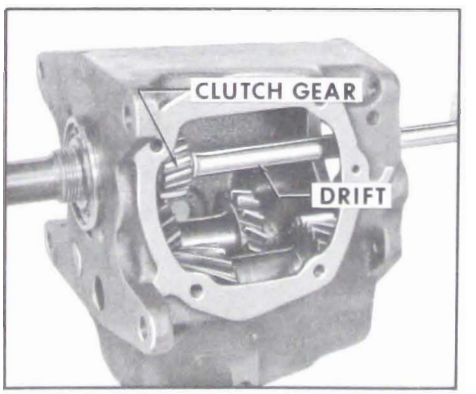

Figure 4-28—Clutch Gear Installation

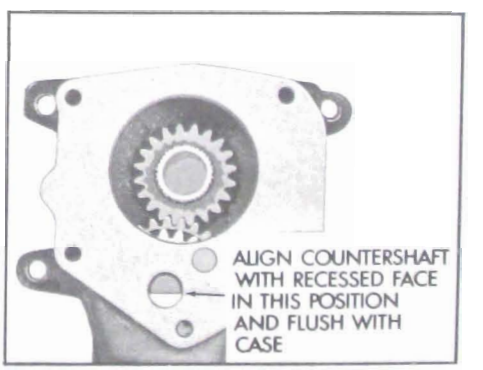

Figure 4-30—Countershaft Alignment

15. Assemble the first - reverse ring gear on the clutch sleeve. Insert this assembly into the side cover opening by tipping the front end of the unit into the opening first. Align the lug of the synchronizing ring with the slot in the clutch sleeve when positioning the assembly on the clutch gear. See Figure 4-31.

16. Install mainshaft in extension and secure with snap ring.

17. Install gasket on transmission case rear face.

18. Align lugs on synchronizer rings with slot in mainshaft so that the lugs slide in slots on gear. Be sure that the clutch gear roller bearings are still in position. Push the shaft into the clutch sleeve until the extension is tight against the case. See Figure 4-32. Install bolts and lock washers. Torque to

NOTE: Coat the lower extension bolt with Permatex No. 2 or equivalent before installation. Torque to 40-45 ft. lbs.

19. Place transmission gears in neutral and shift forks on side cover in neutral. Install cover to transmission using a new gasket. Coat screws with Permatex No. 2 or equivalent. Torque to 15-18 ft. lbs.

20. Attach control levers to studs on shifter forks. Torque to 10-15 ft. lbs.

21. Fill transmission with 2 pints of SAE 90 transmission lubricant.

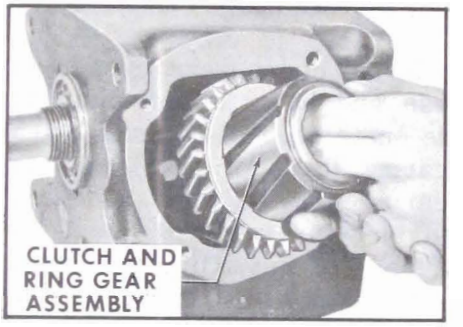

Figure 4-31—Installing Clutch and Ring Gear

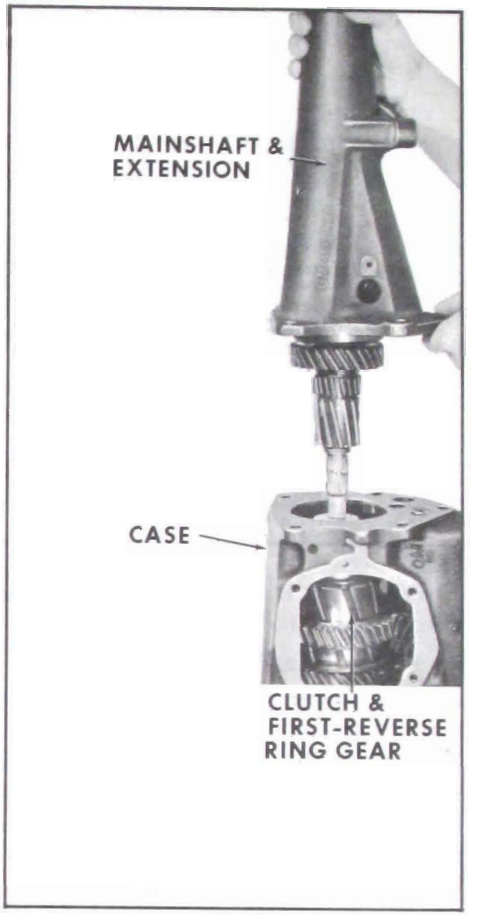

Figure 4-32—Mainshaft and Extension Installation

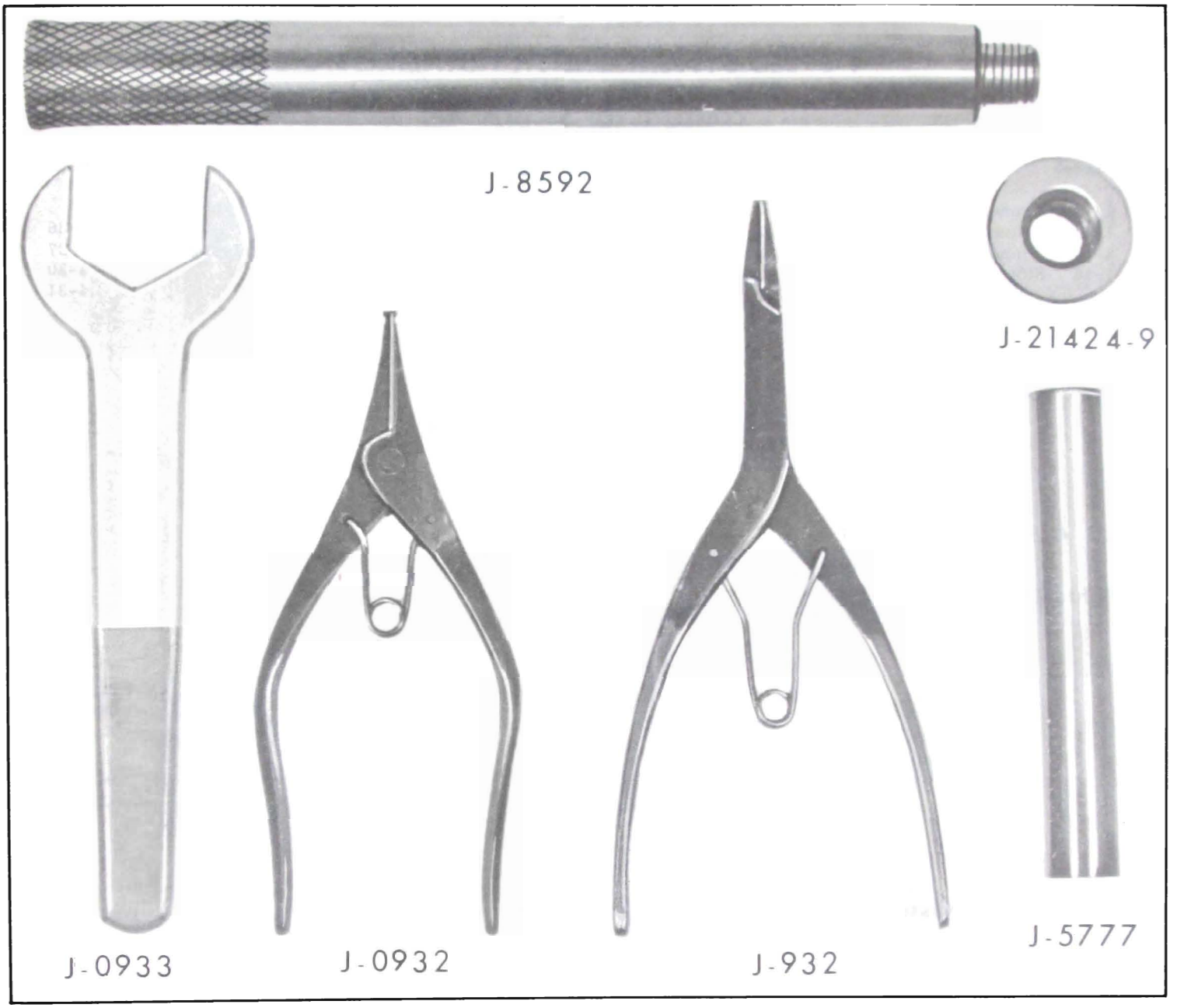

Figure 4-33—3-Speed - Synchromesh Tools