SECTION 4-C
SYNCRO-MESH TRANSMISSION AND UNIVERSAL JOINT

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SERVICE BULLETIN REFERENCE

Bulletin No.	Page No.	SUBJECT

4-17 TRANSMISSION TYPES AND MOUNTING

In *1948 Models*, Syncro-Mesh transmissions are used as standard equipment, with Dynaflow Drive available as optional equipment on Series 70 only. In *1949 Models*, Syncro-Mesh transmissions are used as standard equipment in Series 40-50, with Dynaflow Drive available as optional equipment on Series 50. Dynaflow Drive is standard equipment in 1949 Series 70, and Syncro-Mesh is not available in this series.

The Syncro-Mesh transmission used in 1948 Series 70 is larger and of a different design than the transmission used in Series 40-50. In both transmissions, gears are synchronized when shifting into second and third speeds only.

In all series the Syncro-Mesh transmission is solidly bolted to the rear face of flywheel upper housing, with a heavy paper gasket between, to form a unit assembly with the engine. The transmission main drive gear extends through the clutch driven plate into a single-row-ball pilot bearing seated in the rear end of engine crankshaft. The outer race of main drive gear bearing projects from transmission case to seat in a counterbore in flywheel housing, thus serving as a pilot to center the transmission with engine crankshaft.

The transmission, as well as rear end of engine, is carried on a channel-shaped support or cross member which is bolted to the frame "X" member. The transmission is cushioned on a rubber mounting pad which is bolted to the rear bearing retainer and to the top of transmission support. Driving thrust is taken by a rubber thrust pad located between the rear flange of transmission support and a thrust plate attached to rear bearing retainer by the torque ball retainer bolts. Shims, as required, are placed between the transmission support and the thrust pad to fill any fore and aft space existing at this point when engine and transmission mounting pads are in normal position. See figure 4-60.

4-18 SERIES 40-50 TRANSMISSION—DESCRIPTION

The transmission main drive gear is supported by a ball bearing seated in front wall of transmission case. The ball bearing, which is shielded on rearward side, is pressed against a shoulder on main drive gear and held in place

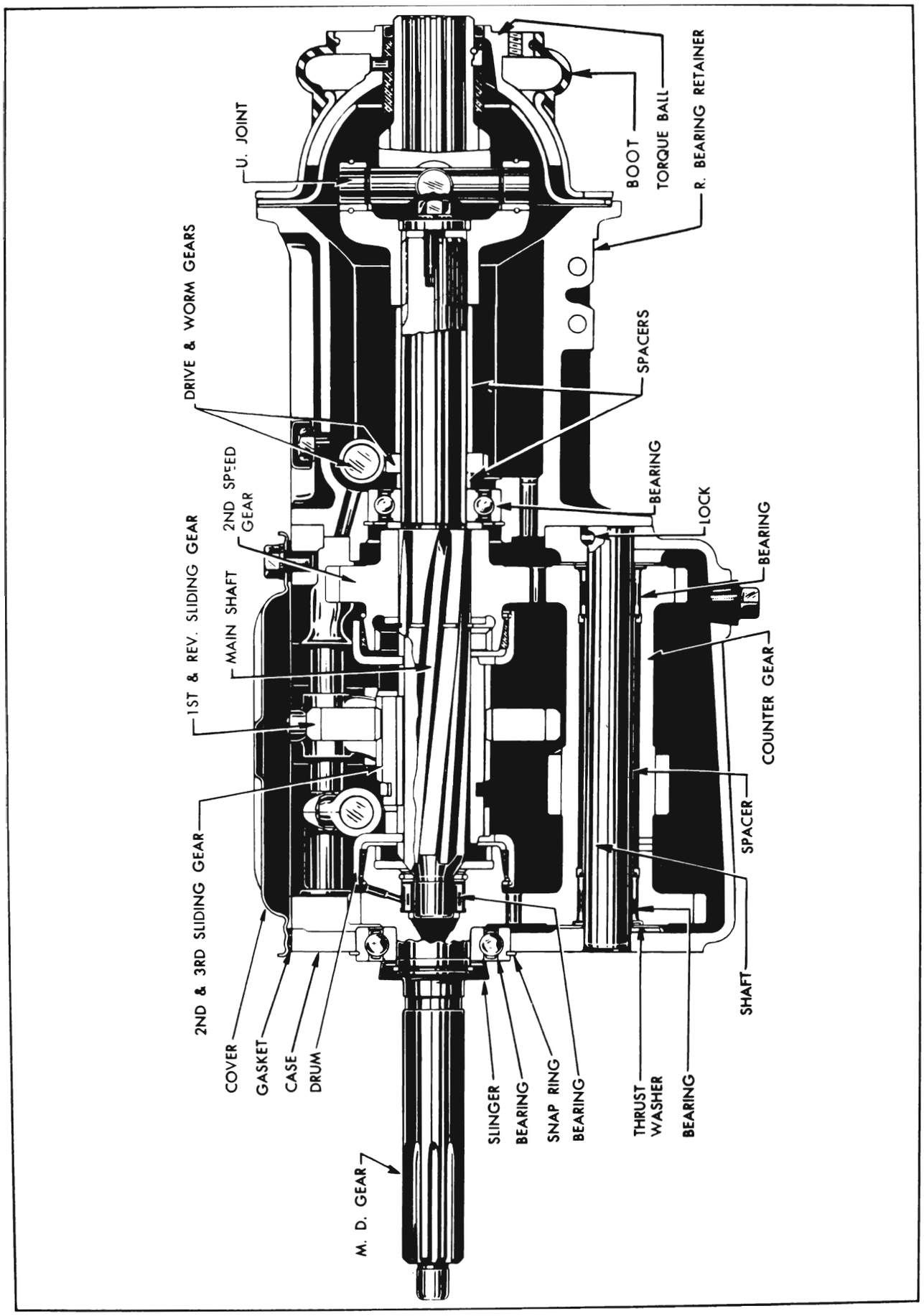


Figure 4-20—Transmission Assembly—1949 Series 40-50

by an oil slinger, washer, and retainer (snap ring). The outer race of bearing is grooved for a snap ring which fits between transmission case and flywheel housing to hold bearing and main drive gear in place. See figure 4-20.

The front end of transmission main shaft is piloted in the bored rear end of main drive gear by a bearing consisting of 14 small steel rollers, which are retained in drive gear by a washer and snap ring. The main shaft is also supported by the transmission rear bearing which seats in transmission rear bearing retainer. The outer race of rear bearing is held in position by a shoulder in bearing retainer and a lock (snap ring) which engages a groove in retainer. The inner race of bearing is clamped against the main shaft thrust washer by a short spacer, speedometer worm gear, long spacer and universal joint. See figure 4-20.

The transmission counter gear is supported by two roller bearings on a shaft which is held stationary in transmission case by a steel ball seated in recesses in case and rear end of shaft. A tubular spacer and two thrust washers are located between the roller bearings, and a retaining washer is located at outer end of each bearing to hold the rollers in position. End thrust is taken by a bronze thrust washer at each end of counter gear. A hole in hub of counter gear permits lubricant to reach bearings and thrust washers. See figure 4-20.

The reverse idler gear is provided with two bronze bushings and is supported on a shaft which is held stationary by a grooved pin lock driven into holes in transmission case and rear end of shaft. End thrust is taken by a bronze thrust washer at each end of idler gear. Lubricant is fed to thrust washers and bushings through passages in transmission case and a groove cut through the bore of idler gear.

The second speed gear is mounted on the main shaft between two thrust washers and a snap ring, which hold it in position to mesh with the counter gear. It is free to rotate on the main shaft except when engaged by the second and third speed sliding sleeve during second speed operation. The sliding sleeve is splined to the main shaft to transmit drive when sleeve is engaged with either the main drive gear (third speed) or the second speed gear. The sliding sleeve carries the first and reverse sliding gear on splines so that it also transmits drive to the main shaft in first speed and reverse. See figure 4-20. The sliding sleeve and sliding gear are actuated by the gear shift

Figure 4-21—Synchronizing Drum—Series 40-50

mechanism later described in paragraph 4-21.

When the transmission is shifted into second or third speed, the sliding sleeve and the gear it engages are synchronized in speed through the action of a synchronizing drum. Each drum is a steel stamping having a bronze insert machined to match a conical surface on the gear, to which drum is loosely attached by a wire retainer. See figure 4-21. Synchronization is obtained when the beveled cam surfaces of the

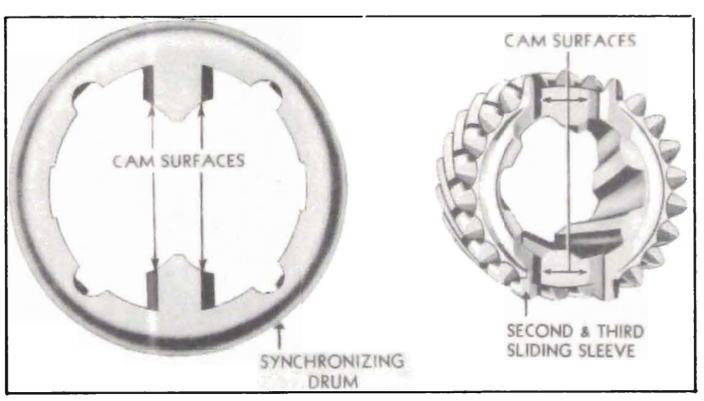


Figure 4-22—Cam Surfaces on Drum and Sleeve—Series 40-50

two slots in sliding sleeve come in contact with the beveled cam surfaces on the two fingers of synchronizing drum. See figure 4-22. This contact of cam surfaces presses the drum against the gear so that gear is brought to the same speed as the sliding sleeve, and the slight angular motion imparted permits the teeth of sliding sleeve and gear to mesh quietly and easily.

The universal joint and torque ball of Series 40, 50, and 70 are almost identical; therefore these are described together in paragraph 4-20.

4-19 1948 SERIES 70 TRANSMISSION—DESCRIPTION

The transmission main drive gear is supported by a ball bearing seated in front wall of transmission case. The ball bearing, which is shielded on rearward side, is pressed against a

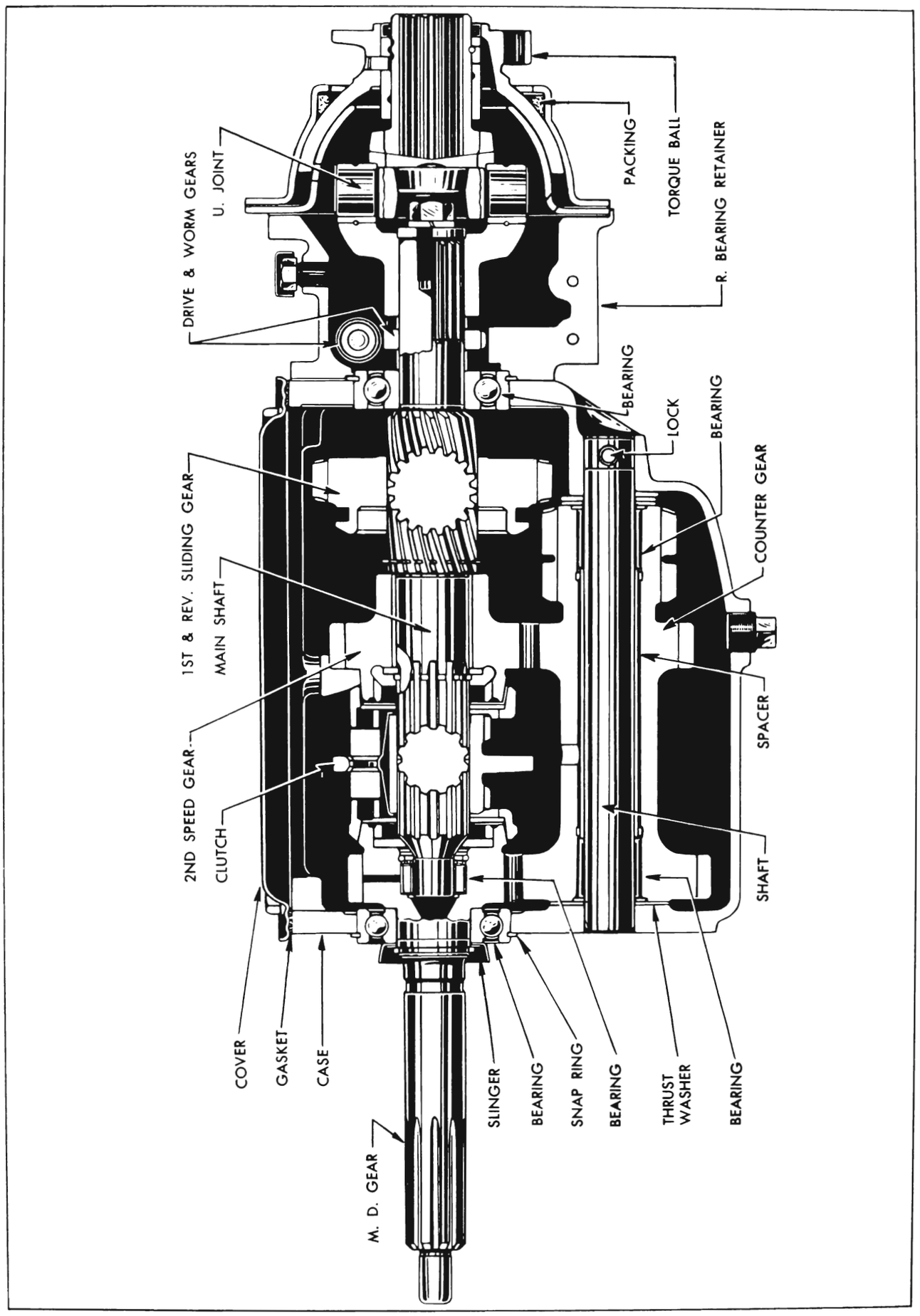


Figure 4-23—Transmission Assembly—1948 Series 70

shoulder on main drive gear and held in place by an oil slinger, washer, and retainer (snap ring). The outer race of bearing is grooved for a snap ring which fits between transmission case and flywheel housing to hold bearing and main drive gear in place.

The front end of transmission main shaft is piloted in the bored rear end of main drive gear by a bearing consisting of 14 small rollers which are retained in drive gear by a washer and snap ring. The main shaft is also supported by the transmission rear bearing which seats in the rear wall of transmission case. The outer race of rear bearing is grooved for a snap ring which fits between transmission case and the rear bearing retainer. The inner race of bearing is clamped against a shoulder on main shaft by spacers, speedometer worm gear, and universal joint. See figure 4-23.

The transmission counter gear is supported by two roller bearings on a shaft which is held stationary in transmission case by a grooved pin lock driven into holes in case and rear end of shaft. A tubular spacer and two thrust washers are located around the shaft between the roller bearings and a retaining washer is located at outer end of each bearing to hold rollers in position. End thrust is taken by a bronze thrust washer at each end of counter gear, with rear washer backed by a steel thrust washer. A hole in hub of gear permits lubricant to reach bearings and thrust washers. See figure 4-23 and 4-24.

The reverse idler gear is provided with two bronze bushings and is supported on a shaft which is held stationary by a grooved pin lock driven into holes in transmission case and front end of shaft. End thrust is taken by a bronze thrust washer as each end of idler gear. A hole in hub of gear permits lubricant to reach bushings and thrust washers. See figure 4-24.

The second speed gear is provided with a bronze bushing and is mounted on the main shaft in position to mesh with the counter gear. It is held in position between a shoulder on main shaft and a thrust washer retained by a snap ring. The gear is free to rotate on the main shaft except when engaged by the gear synchronizing clutch during second speed operation.

The gear synchronizing clutch is splined to the main shaft to transmit drive when clutch is

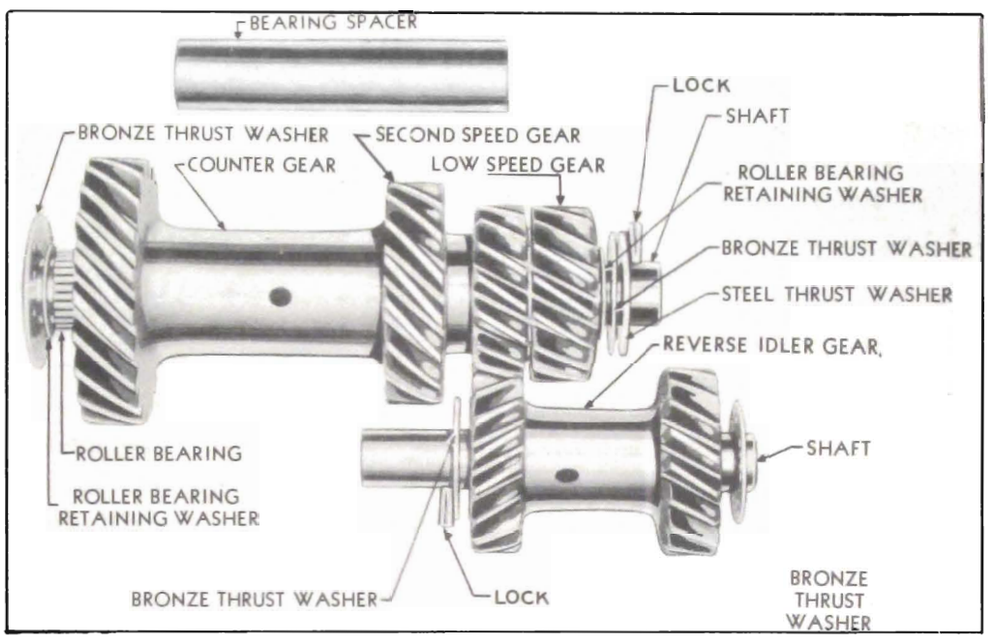


Figure 4-24—Counter Gear and Reverse Idler Gear—1948 Series 70

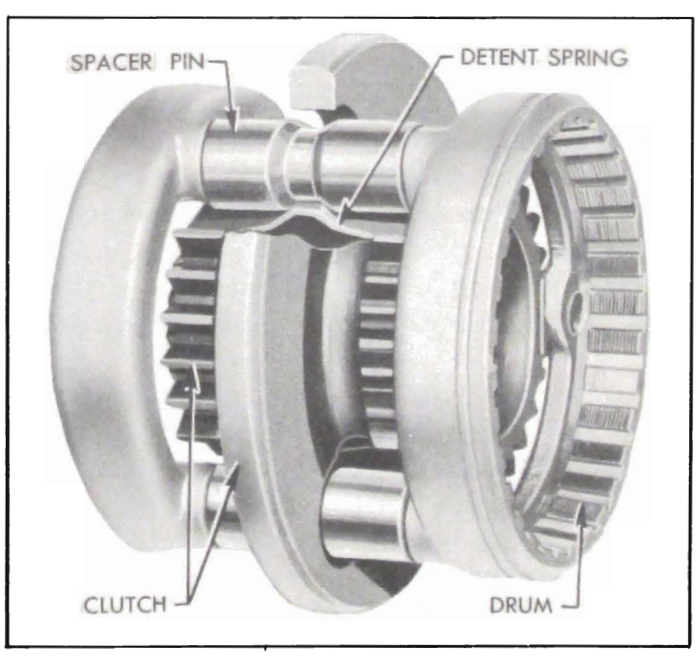


Figure 4-25—Gear Synchronizing Clutch—1948 Series 70

engaged with either the main drive gear (third speed) or the second speed gear. The clutch assembly includes synchronizing drums and detent springs which act to synchronize the speed of the clutch with the gear it engages during a shift into second or third speed. The drums are joined together by three spacer pins which are notched to engage three detent springs which support the synchronizing parts on the clutch. See figure 4-25. As the clutch moves toward the gear, the detent springs press the drum into contact with the gear, thereby equalizing speed of clutch and gear, after which the detent springs compress and disengage notches in the spacer pins to permit the clutch to engage the gear quietly and easily.

The first and reverse sliding gear is splined to the main shaft, to rear of second speed gear, so that it can be moved forward to engage the counter gear for first speed or rearward to engage reverse idler for reverse. Its forward movement is limited by a snap ring retainer installed in a groove in main shaft. See figure 4-23.

The gear synchronizing clutch and the first and reverse sliding gear are actuated by the gear shift mechanism described in paragraph 4-21.

4-20 UNIVERSAL JOINT AND TORQUE BALL

The universal joint is splined to the rear end of transmission main shaft and retained by a heavy steel washer and bolt. It is entirely enclosed by the transmission rear bearing retainer and by the torque ball and retainers which are attached to rear end of the bearing retainer.

The universal joint yokes are provided with hardened and ground steel bushings, held by retainer rings, which provide bearings for the hardened and ground pins of the universal joint cross. The rear yoke is splined internally to engage the propeller shaft, and is ground externally to provide a bearing in a bronze bushing in the torque ball. See figure 4-20 and 4-23.

The torque ball is supported between an inner and outer retainer which are centrally located and bolted to the transmission rear bearing retainer. The retainers are copper plated and the bearing surfaces of the torque ball are also plated to prevent scoring during break-in. *On 1948 Models,* the outer retainer carries a packing backed by a cup shaped spring washer to provide an oil seal. *On 1949 Series 50-70,* a synthetic rubber boot extends from rear end of outer retainer to the flange of torque ball to provide an oil seal; the packing and spring washer are not used in the retainer. The torque ball is flanged for attachment to the torque tube. An oil seal installed in torque ball at rear end of bronze bushing prevents leakage of oil between transmission and torque tube. See figure 4-20 and 4-23.

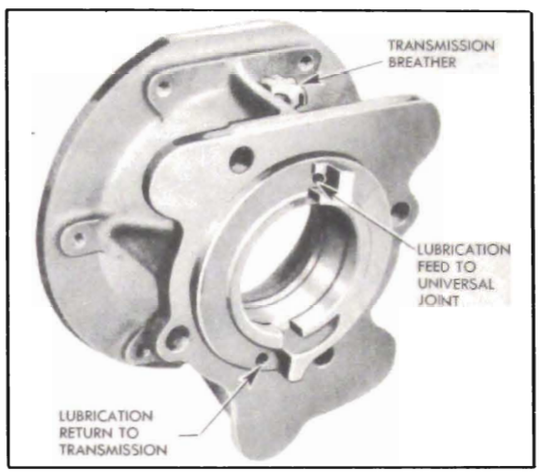


Figure 4-26—Rear Bearing Retainer—Series 40-50

The universal joint, torque ball, and speedometer drive gears are automatically lubricated from the transmission. *On Series 40-50,* oil enters the rear bearing retainer through an oil hole at top of retainer. *On Series 70,* oil enters bearing retainer through a groove in top of first and reverse shifter yoke shaft. Oil returns to transmission case through holes at bottom of bearing retainer. A breather or air vent is installed in upper side of the rear bearing retainer to prevent a build up of pressure, due to heat, that would force transmission lubricant out past gaskets and oil seals. See figure 4-26.

4-21 TRANSMISSION SHIFT MECHANISM

a. Shift Mechanism in Transmission

The first and reverse sliding gear is moved forward or rearward from the neutral position by a shifter yoke mounted on a shaft supported in left side of transmission case. The second and third speed sliding sleeve (Series 40-50) and the gear synchronizing clutch (Series 70) are similarly actuated by a yoke and shaft on right side of case. Each shifter yoke shaft is notched for engagement by one of two shifter levers mounted on a selector shaft which is supported in transmission case at right angle to yoke shaft. The levers are located on selector

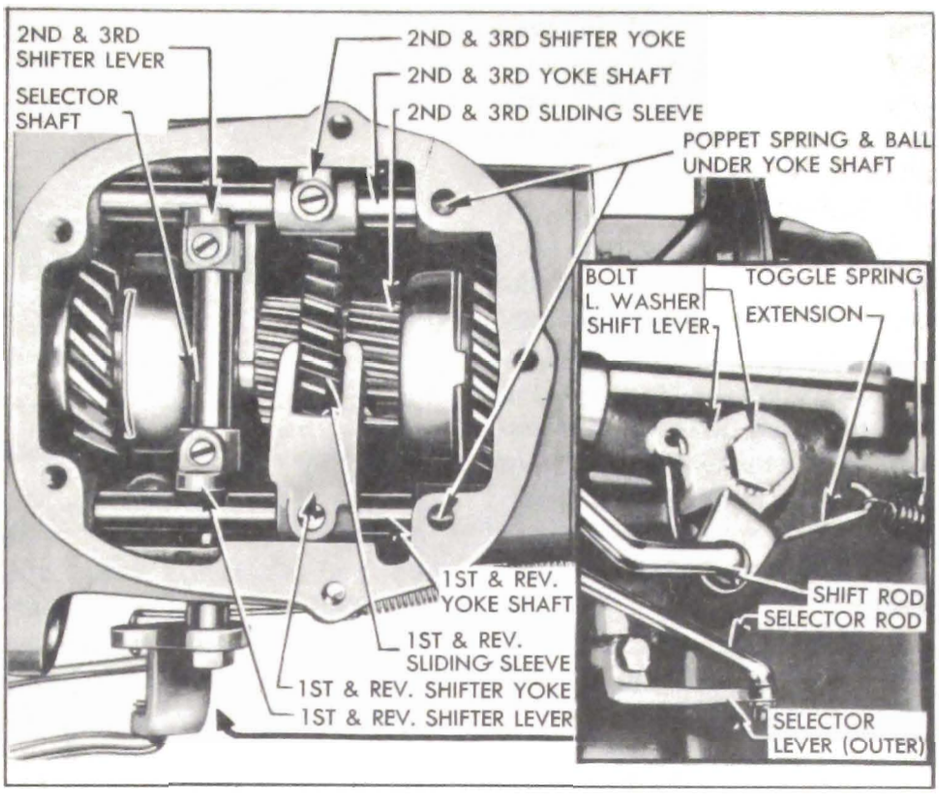


Figure 4-27—Shift Mechanism in Transmission—Series 40-50

shaft so that only one lever at a time can engage its yoke shaft. See figure 4-27 and 4-28.

Engagement of a shifter lever with its yoke shaft, to select a gear shift, is obtained by moving selector shaft to right or left as required. This transverse movement of selector shaft is made by a selector lever and shaft which engages a groove in selector shaft on *Series 40-50*, and a notch in first and reverse shifter yoke on *Series 70*. The selector lever shaft extends through transmission case and has a lever on its outer end which is actuated by a selector rod connected to the selector control mechanism in steering column. See figure 4-27 and 4-28.

Forward or rearward movement of the selected shifter yoke shaft, to complete the gear shift, is obtained by rotating the selector

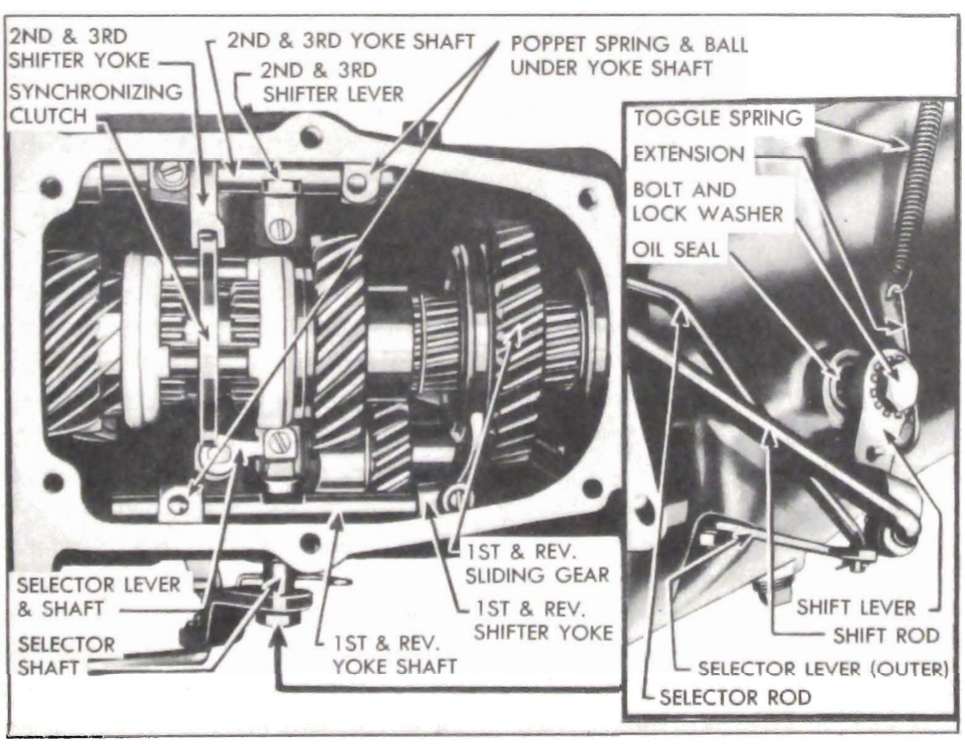


Figure 4-28—Shift Mechanism in Transmission—1948 Series 70

shaft. This movement is made by a shift lever mounted on outer left end of shaft and actuated by a shift rod connected to the gear shift control mechanism in steering column.. A toggle spring and extension attached to shift lever aids in moving the sliding parts. See figure 4-27 and 4-28. A spring loaded poppet ball, housed in a recess in transmission case under each yoke shaft, engages one of three recesses in shaft to hold the shaft in desired position.

A seal pressed into a recess in transmission case prevents leakage of oil around the extended left end of selector shaft. A welsh plug closes the opening in case at right end of shaft. A cork seal, spring washer, and plain washer prevents leakage of oil around the selector lever shaft. See figure 4-31.

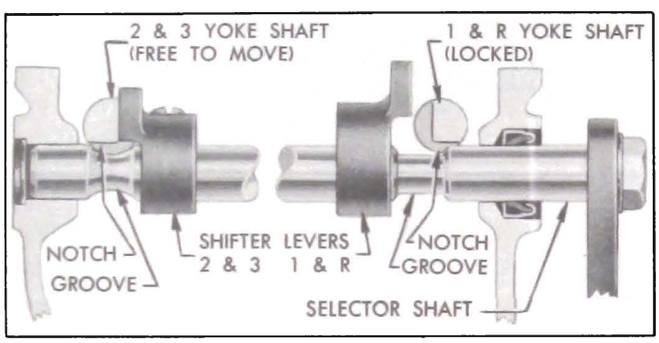


Figure 4-29—Transmission Interlock—Series 40-50

An interlock arrangement permits movement of one shifter yoke and shaft only when the opposite yoke shaft is locked in neutral position. *On Series 40-50,* the full diameter of selector shaft engages a notch in one yoke shaft to lock it while the opposite yoke shaft is free to move through a groove in the selector shaft. See figure 4-29. *On Series 70,* the selector shaft pushes an interlock pin up into a notch in the first and reverse shifter yoke shaft to lock it when selector shaft moves to the right. When the selector shaft moves to the left, the interlock pin drops into a groove in selector shaft, thereby unlocking the yoke shaft. A grooved collar mounted on right end of selector shaft and a notch in the second and third shifter yoke shaft provide the locking device for that yoke shaft. See figure 4-30.

b. Selector Control Mechanism

The gear shift control lever on steering gear column and the linkage which connects it to the selector shaft in transmission controls the selection of either first and reverse or second and third speed gear shifts. Upward movement of control lever causes selector shaft to move

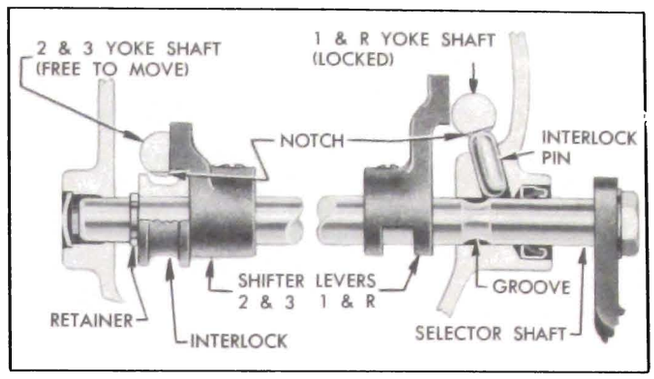


Figure 4-30—Transmission Interlock—1948 Series 70

to the left and engage the first and reverse shifter lever with the first and reverse shifter yoke shaft, ready for a shift into first or reverse. Downward movement of control lever similarly causes engagement of the opposite (second and third) shifter lever with the second and third shifter yoke shaft, ready for a shift into second or third speed. See figure 4-31.

The gear shift control lever pivots on a ball joint formed in outer end of the control lever housing. A spherical shoulder on the lever seats in a similarly shaped fabricated rubber bearing which is supported between the housing nut and a stamped steel bearing seat. The ball shaped inner end of control lever seats in a socket formed in the upper end of the selector control rod, which is located inside the steering gear column jacket. The end of control lever is firmly held in the rod socket by a spring loaded plunger. See figure 4-31.

The upper end of selector control rod is supported in a bearing machined in the control lever housing. The lower end of control rod is connected by a pin to the selector control lever which is supported on a bracket welded to lower end of the column jacket. The selector control lever is connected to the outer selector lever on transmission by the lower selector rod, which has a trunnion at the forward end for adjustment. The trunnion pin seats in a rubber insulator in the selector control lever to prevent noise at this connection. See figure 4-31.

A return spring connected between the column jacket and upper end of selector control lever operates to pull the gear shift control lever downward. An anti-rattle spring connected between the dash and a clip on lower selector rod also assists in pulling the control lever downward. In the neutral position, therefore, the control lever is always in position for a shift into second or third speed and must be raised for a shift into first or reverse.

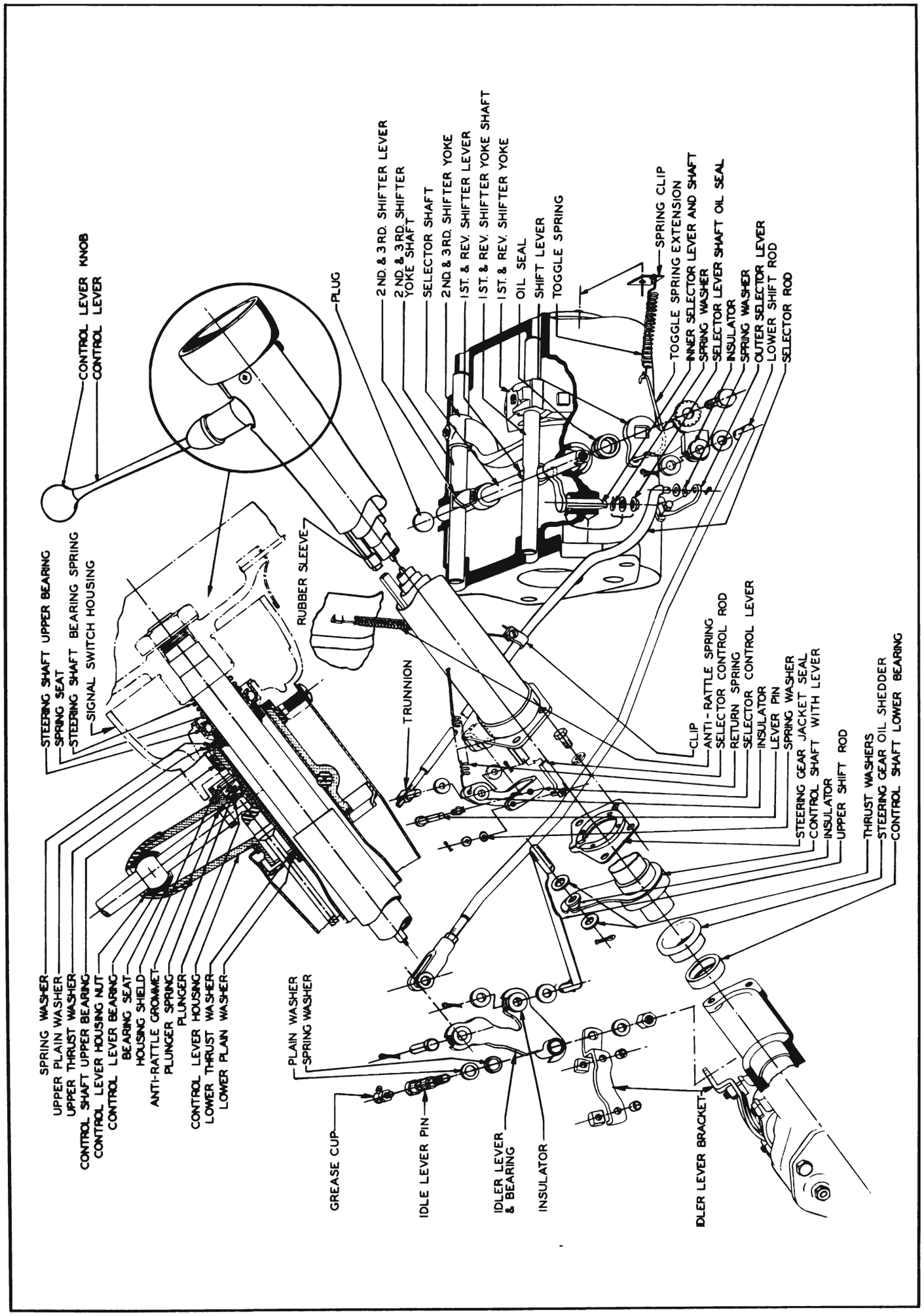


Figure 4-31—Transmission Shift Mechanism—Series 40-50

c. Gear Shift Control Mechanism

Shifting into gear after selection has taken place (see paragraph b. above), or shifting out of gear, is controlled by the shift control lever on steering gear column, the control shaft inside the column, and the linkage which connects the control shaft to the shift lever on selector shaft in transmission. Forward movement of control lever causes rotation of the selector shaft to produce a shift into reverse or second speed, depending on the selection. Rearward movement of control lever similarly produces a shift into first or third speed. See figure 4-31.

The housing in which the shift control lever is mounted is a slip fit over the upper end of the tubular control shaft, which encircles the steering shaft. The control shaft is slotted in two places to key to the lever housing, which is held tight on shaft by a clamp screw. The upper end of housing and shaft assembly is supported in a metal and fabric bearing seated in the signal switch housing. Upward thrust of the assembly is taken by a fabric thrust washer, plain washer, and spring washer placed between the lever housing and switch housing. Downward thrust is taken by a fabric thrust washer and a plain washer placed between lever housing and a plate welded into the column jacket. See figure 4-31.

The lower end of control shaft is reduced in diameter and is supported by a metal and fabric bearing seated in the steering gear housing. An oil shedder is pressed into steering gear housing over the bearing and the shedder is covered by a cup welded to the control shaft, to form a seal against entrance of dirt and water.

A lever welded to control shaft is connected by a short upper shift rod to the idler lever mounted on a bracket attached to steering gear housing. The idler lever is bushed and carried on a shouldered pin attached to bracket by a nut and washer. The pin is drilled and fitted with a grease cup for lubrication. A long lower shift rod, provided with an adjustable clevis, connects the idler lever to the shift lever on selector shaft in transmission.Rubber insulators seated in the levers prevent noise at the connection with both ends of both shift rods. See figure 4-31.

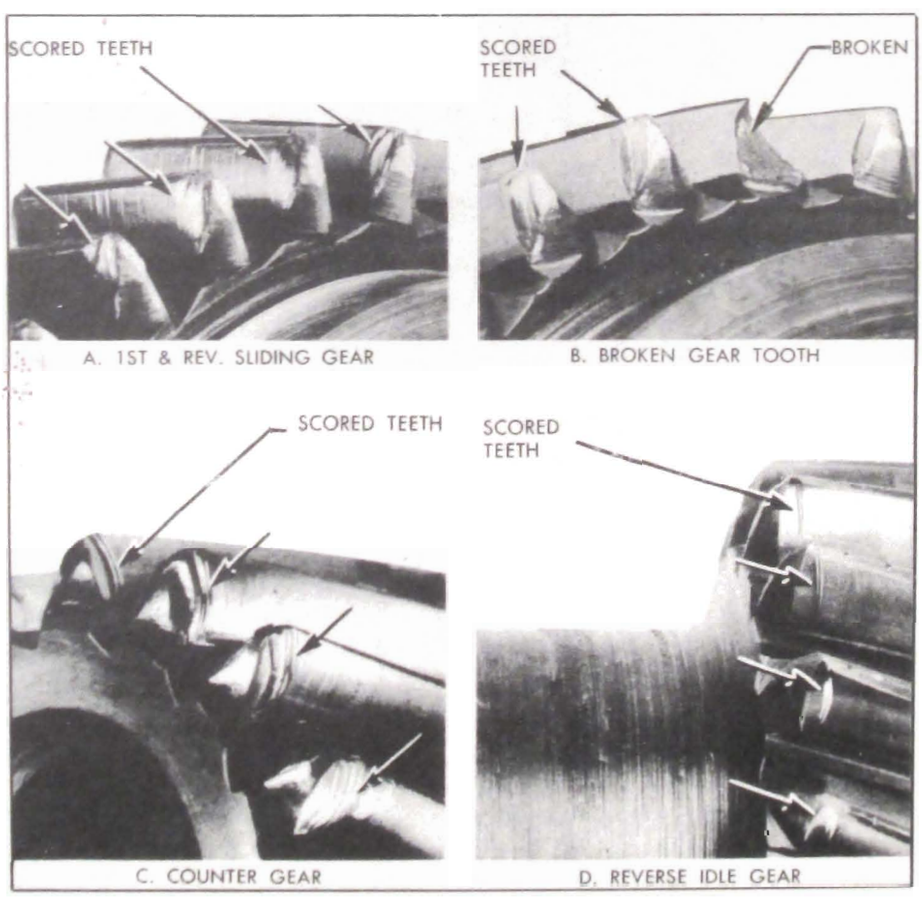


Figure 4-32—Gear Teeth Damaged by Improper Gear Shifting

4-22 SERVICE RECOMMENDATIONS

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

The type of damage resulting from failure to obtain full engagement is shown in figure 4-32. The conditions illustrated were produced on *new gears* intentionally shifted improperly a few times to determine what damage would result.

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

4-23 TROUBLE DIAGNOSIS

a. Hard Shifting and Block-Out

Hard shifting may be caused either by conditions in shift control mechanism in steering column or by conditions in transmission assembly. Disconnect lower shift rod at idler lever to determine which unit is at fault.

Conditions in shift control mechanism which may cause hard shifting are: (1) Control shaft upper or lower bearing scored or distorted. (2) Control lever housing upper thrust washer broken or improperly installed in signal switch housing. (3) Selector control rod bent or rubber sleeves binding against jacket.

Conditions in transmission assembly which may cause hard shifting are: (1) If there is excessive resistance at start of shift, shifter yoke shaft poppet spring probably too stiff. (2) Shifter yoke shaft may be bent. (2) Selector shaft bent, or binding in oil seal may cause hard shifting or hard selection.

Block-out of second or third gear may be caused by scored synchronizing drums or the cones on gears. *In Series 40-50,* rough cam surfaces on ends of sliding sleeve or on synchronizing drums will also cause block-out.

b. Low and Reverse Gear Clash

Transmission gears can be made to clash by shifting into low or reverse gear too quickly after clutch pedal is depressed, even though clutch is in perfect working order. This is because inertia of clutch driven plate causes the plate to spin until it is stopped by friction of transmission and transmission lubricant.

Series 70 driven plates are larger in diameter and heavier than Series 40-50 plates, therefore, Series 70 plates have more inertia and will spin for a greater length of time after clutch is disengaged. With warm transmission lubricant and low friction transmission bearings, a reasonable amount of spin is to be expected. The spin does not occur when shifting quickly into second or high gear because the synchronizing unit stops the driven plate.

To eliminate gear clash, sufficient time *MUST* be allowed before shifting into low after 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 driven plate facings.

If gear clash continues after allowing proper time for clutch driven plate to stop, check clutch pedal lash and adjust to specified limits. See paragraph 4-7. In exceptional cases of driven plate spinning, clutch pedal lash should be *maintained* at ½". Make sure that idle speed of engine when hot is 450 RPM. A faster idle aggravates driven plate spinning.

Conditions within the transmission which may cause gear clash are: (1) Faulty synchronizing drums or cone surfaces; (2) Excessive main shaft end play; (3) *On Series 70,* weak or broken detent springs in gear synchronizing clutch. Gear clash also may be caused by a dragging clutch plate.

c. Noise in Neutral

With car standing, engine running, and transmission in neutral, the transmission parts in operation are: main drive gear and bearing, counter gear and bearings, reverse idler gear, second speed gear, main shaft pilot bearing. Disengaging clutch will stop movement of all these parts. By disengaging and engaging clutch it can be determined whether 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 transmission for correction of gear noise determine by test which gears are noisy under load, so that these can be thoroughly inspected when removed.

e. Gear Rattle During Acceleration

Improperly calibrated clutch driven plate, faulty crankshaft balancer, or scored rear axle gears may cause rattle in transmission in third speed, on acceleration. Rattles occuring 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 normally fast shift may be caused by improper clutch release. Check clutch pedal lash and adjust. See paragraph 4-7.

Abnormal noise during normally fast shift, when clutch release is satisfactory, may be caused by damage to pointing on engaging side of teeth on counter gear, reverse idler gear or first and reverse sliding gear. Noise when disengaging both first and reverse, indicates that fault is with sliding gear only. Noise when disengaging reverse only indicates reverse idler gear at fault. Noise when disengaging first speed only indicates counter gear 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 gear shift control mechanism as described in paragraph 4-25. Make certain that poppet balls have full engagement in notches in shifter yoke shaft in all speed positions and neutral. Also make certain that toggle spring extension is not distorted so that it contacts the selector shaft. If these items do not correct gear jump-out, remove transmission for examination of parts.

Gear jumping out of third speed may be caused by misalignment between the flywheel housing and crankshaft. See paragraph 2-33 for alignment correction procedure.

Gear jumping out of third speed may be caused by excessive run-out of front face of transmission case. See paragraph 4-32 (sub-par. g.) for checking procedure.

Gear jump-out in any transmission speed position may be caused by loose fit of bearings or bushings involved, weak poppet springs, loose fit of sliding sleeve (Series 40-50) or synchronizing clutch (Series 70) on main shaft, loose fit of sliding gear on sliding sleeve (Series 40-50) or on main shaft (Series 70), worn teeth on mating gears. All items should be carefully inspected.

On Series 70, jumping out of second speed may be caused by gear synchronizing clutch being installed with wrong end toward second speed gear. See figure 4-58.

h. Transmission Lubricant Passing to Rear Axle

Transmission lubricant may pass into rear axle assembly as a result of

(1) Scored universal joint or bushing.

(2) Clearance of more than .006" between universal joint and bushing in torque ball.

(3) Worn oil seal in torque ball.

(4) Loose torque ball adjustment.

(5) Excessive run-out of front end of propeller shaft.

4-24 SPEEDOMETER GEARS AND CABLE

The speedometer worm gear(driving gear) is mounted on transmission main shaft and held in place by the universal joint and spacers. The same worm gear is used in all series for all rear axle gear ratios. In changing axle ratios it is only necessary to change the driven gear.

The speedometer driven gear is furnished only as an assembly consisting of sleeve, shaft, retaining washer and gear. See figure 4-33. The number of teeth and a part number are stamped on the side of gear; however, the part number is that of the gear only and is not the number of the driven gear assembly as listed in the Master Parts List.

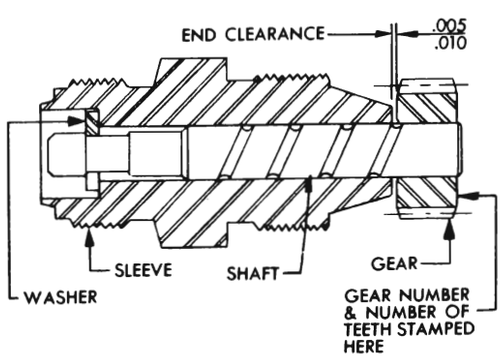


Figure 4-33—Speedometer Driven Gear Assembly

To insure proper mating of drive and driven gears as well as correct speedometer Readings when making a replacement, it is very necessary to install the driven gear assembly specified in the Master Parts List for the particular car model and rear axle ratio. The axle ratio is indicated by numbers stamped on the underside of axle housing.

The driven gear sleeve is threaded into the transmission rear bearing retainer and the speedometer cable is attached to the sleeve by a threaded sleeve on cable casing. The speedometer gears and driven gear shaft are lubricated from the transmission. The speedometer cable is lubricated at time of installation of casing and normally requires no further application of lubricant.

The speedometer cable casing must never be kinked sharply. The casing is marked with paint to designate retaining clip location. It is important to locate the cable casing so that retaining clip is in center of painted mark, to avoid kinking which will cause binding and whipping of cable and result in noise.

Replacement and lubrication of speedometer cables is covered in paragraph 10-68.

4-25 ADJUSTMENT OF TRANSMISSION SHIFT CONTROLS

a. Selector Control

The following steps are required to insure that the shifter levers in transmission make full engagement with the shifter yoke shafts as selected. See figure 4-31.

1. Shift transmission to neutral and disconnect selector rod from selector control lever.
2. Inspect rubber insulator in selector control lever and replace insulator if worn. Make sure that lever return spring is strong enough to pull selector control lever up so that the gear shift control lever is held all the way down.
3. Move selector rod back and forth to make sure that selector shaft in transmission moves freely. A bind at this point will prevent return spring from automatically dropping shift control lever to second speed side on shift from first to second speed.
4. Hold selector rod to the rear as far as possible and adjust trunnion until trunnion pin is centered in hole in selector control lever insulator.
5. Connect trunnion to selector control lever with a fiber washer on each side of insulator and lock with cotter pin.

b. Gear Shift Control

The following steps are required to insure that gears are fully engaged on all shifts. See figure 4-31.

1. Shift transmission into second speed and disconnect lower shift rod from the shift idler lever.
2. Inspect for wear and lost motion in rubber insulators located in control shaft lever, idler lever, and shift lever on selector shaft; replace any worn insulators. If idler lever has excessive play on idler lever pin; replace worn parts.
3. While pulling forward on lower shift rod to insure full engagement in second speed, adjust clevis on shift rod so that when clevis is connected to idler lever a clearance of 1/8" exists between the shift control lever housing and the edge of opening in steering gear column jacket.
4. With lower shift rod connected to idler lever and lock nut tightened against clevis, shift into third speed. A clearance of approximately 1/8" should exist between control lever housing and column jacket. Make certain that specified clearance exists between control lever housing and column jacket in all speed positions.

4-26 REPLACEMENT OF SHIFT CONTROL PARTS

The gear shift control lever, bearing, and bearing seat may be removed by unscrewing the control lever housing nut. Unscrew knob from lever to remove housing nut. A rubber anti-rattle grommet fits into a groove in the inner end of control lever. When installing a new bearing on control lever, the large diameter of bearing must be toward the lever knob. Before installing control lever, coat inner end and socket in selector rod with Lubriplate. During installation of lever be careful to draw housing nut tight so that shoulder in nut will seat against flange of bearing seat and lock the seat in place.

The control shaft upper bearing and control lever housing upper thrust washer may be replaced by removing the signal switch housing. The procedure for replacement of these parts is given in paragraph 7-7.

Replacement of selector rod, control shaft, and lower bearing requires removal of steering column jacket. The steering gear should be removed, or at least moved down from instrument panel to provide proper working space and avoid damaging interior of body. Replace-

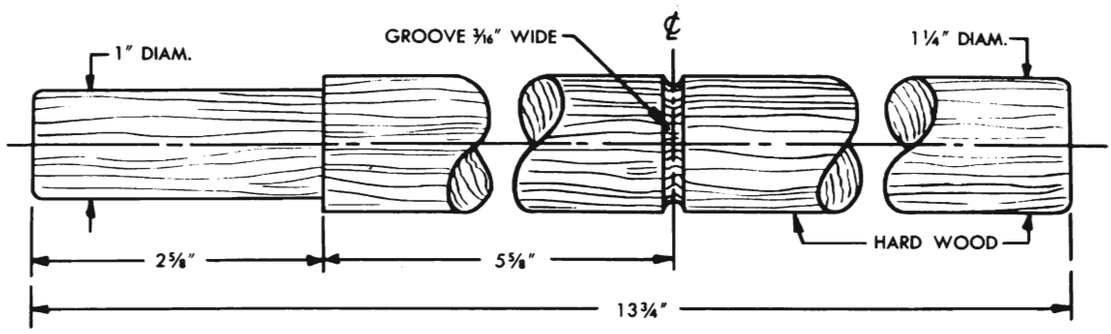


Figure 4-34—Club for Adjusting Torque Ball

ment of these parts is covered in paragraphs 7-9 and 7-10 covering disassembly and assembly of steering gear.

4-27 SPECIAL TOOLS AND FIXTURES

Special tools and fixtures are required for the adjustment and repair procedures which follow. Tools identified by tool numbers in text and illustrations are available through Kent-Moore Organizations, Inc., Detroit, Michigan. Tools and fixtures identified by name only are to be made locally from the following instructions:

a. Torque Ball Retainer Guide Pins

The guide pins shown in figure 4-40 will aid in assembling torque ball and retainers. They may be made from 3/8"-16 bolts with heads cut off to give 1/2" of thread and 1" of shank, with screwdriver slots cut in end of shank.

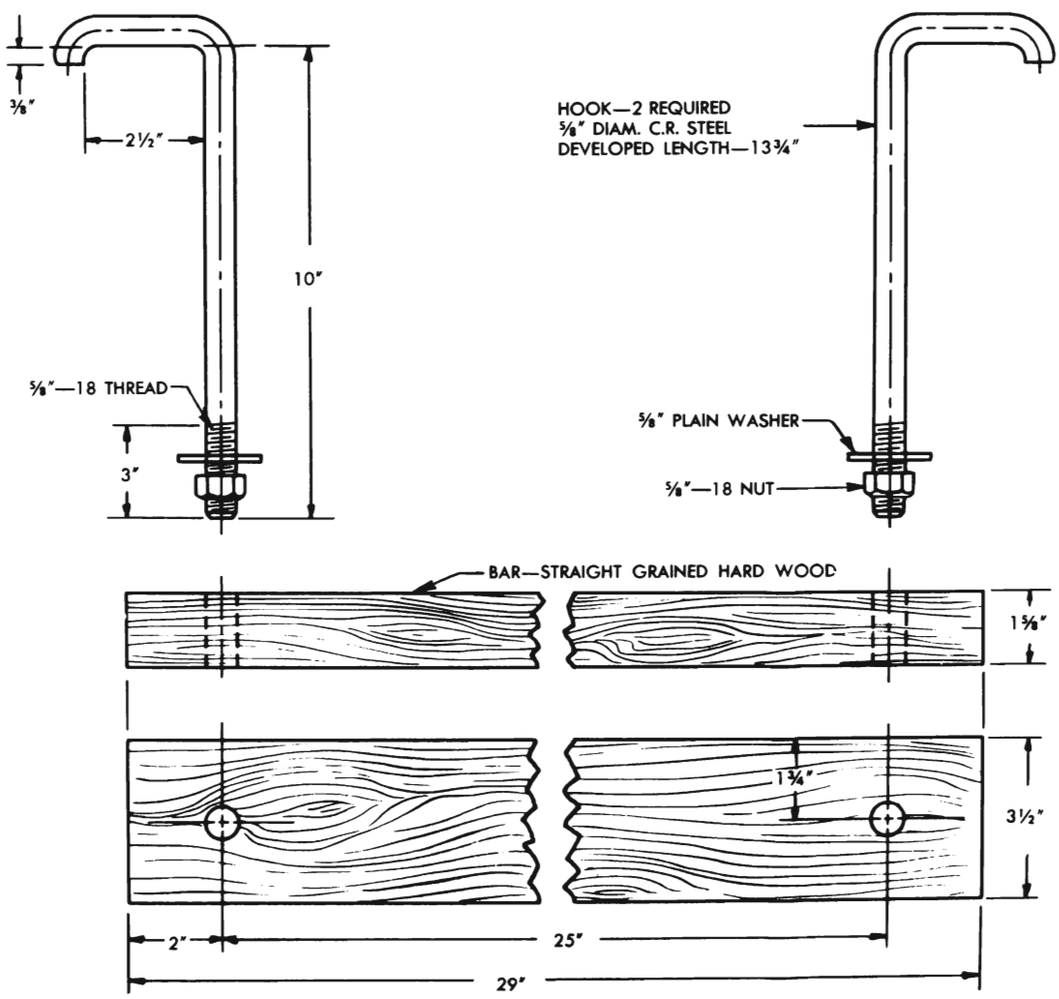


Figure 4-35—Engine Support Bar and Hooks

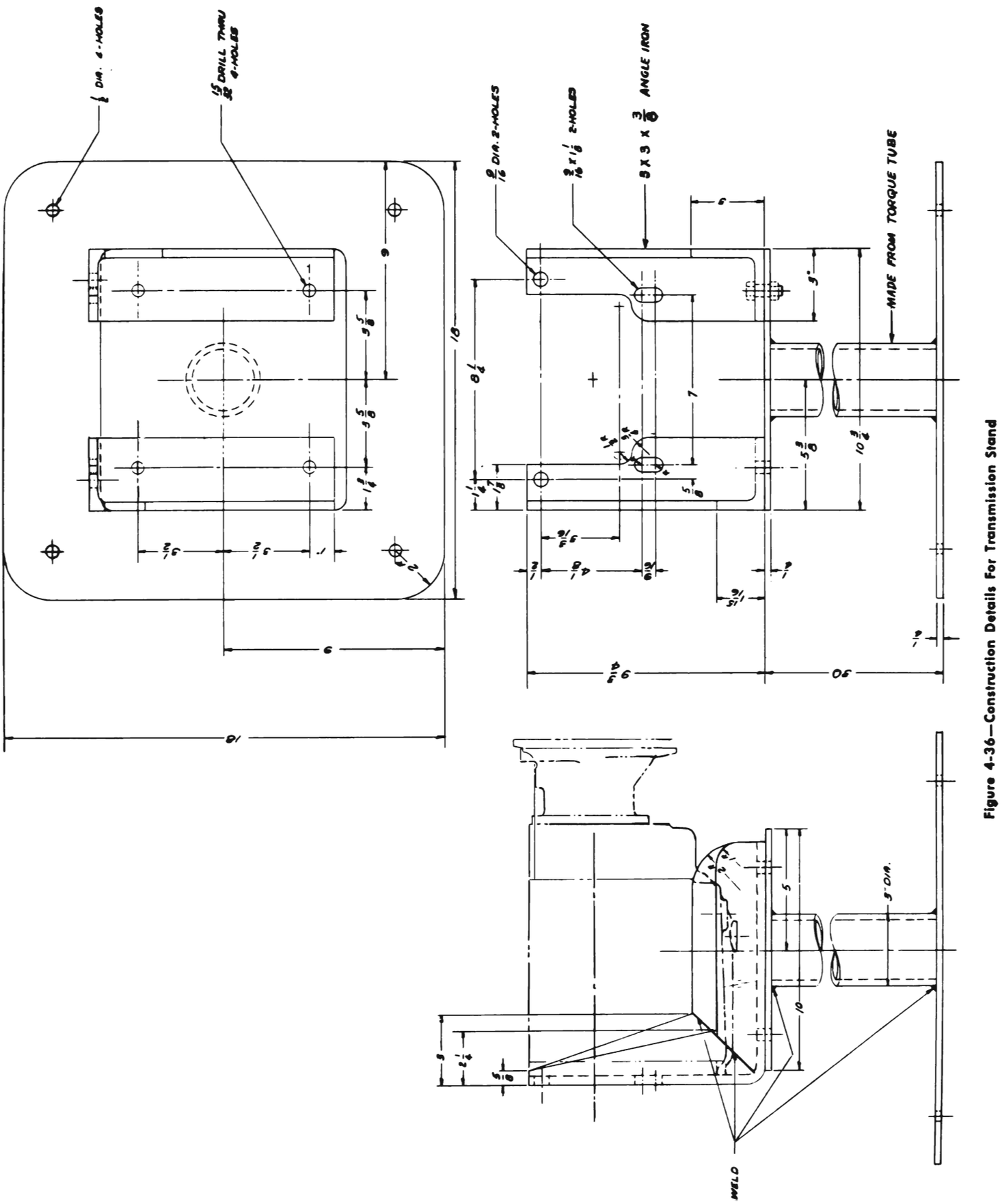


Figure 4-36—Construction Details For Transmission Stand

b. Hardwood Club for Adjusting Torque Ball

The club illustrated in figure 4-41 is made to dimensions shown in figure 4-34. A spring scale of at least 25 pounds capacity is used with the club to measure torque ball drag.

c. Engine Support Bar and Hooks

The rear end of engine must be firmly supported before removal of transmission. The use of a jack or blocks is dangerous because of possibility of slipping and letting engine fall. The support bar and hooks illustrated in figure 4-43 are made to the dimensions given in figure 4-35.

d. Transmission Holding Fixture

Some form of fixture for securely holding the transmission during disassembly and assembly is essential. The transmission stand shown in figure 4-45 may be made locally from details given in figure 4-36. If a stand is not desired, the upper section may be mounted on a work bench.

4-28 ADJUSTMENT OF TORQUE BALL AND PACKING

Correct adjustment of the torque ball and proper installation of outer retainer packing (1948 Models) is very important. If torque ball is loose and has end play it will be noisy and will act as a pump to cause leakage of transmission lubricant. If torque ball is too tight, it will cause transmission misalignment, scoring of ball and retainers, and may cause breakage of bolts which attached torque ball to torque tube. An improperly fitted outer retainer packing on *1948 Models* will permit leakage of transmission lubricant.

a. Adjustment of Torque Ball

1. Disconnect rear axle assembly and move it back out of the way (par. 5-26).

2. On *1949 Series 50-70,* remove torque ball boot.

3. Disconnect thrust plate from the rubber thrust pad on transmission support, then remove thrust plate, gasket, torque ball retainers, and shims from rear bearing retainer. NOTE: *On Series 40-50, mark top edge of outer retainer before removal so that retainer can be reinstalled in original position.* The top edge of *Series 70* outer retainer is cut flat and marking is not necessary.

4. On *1948 Models,* remove packing and spring washer from outer retainer. The following adjustment of torque ball cannot be properly judged with packing in place.

5. Clean and inspect spherical surfaces of torque ball and both retainers. Inspect bushing and universal joint oil seal in torque ball. Inspect outer retainer packing (1948) or torque ball boot (1949). Replace parts which are excessively worn, damaged, or scored.

6. When installing a new universal joint oil seal in torque ball, place seal in position with the feather edge pointing into torque ball, then press seal squarely into place, using a flat piece of metal to avoid distorting seal. Press new seal *flush* with boss on flange of torque ball. NOTE: *Oil seal should be stored in neatsfoot oil to keep leather soft and pliable. Do not use seal having a hard, dry leather.*

7. Install guide pins in upper bolt in rear bearing retainer flange. See figure 4-39. Place one gasket or shim (having 3 notches in outer edge) and the inner retainer on guide pins, with oil drain hole and notch in edge of retainer straight down.

8. Lubricate leather oil seal and bearing surfaces of torque ball and retainers with transmission lubricant. Place torque ball in outer retainer so that "TOP" mark on ball and the marked or flat top edge of retainer are together. *On 1948 Models, packing must not be installed in retainer at this time.*

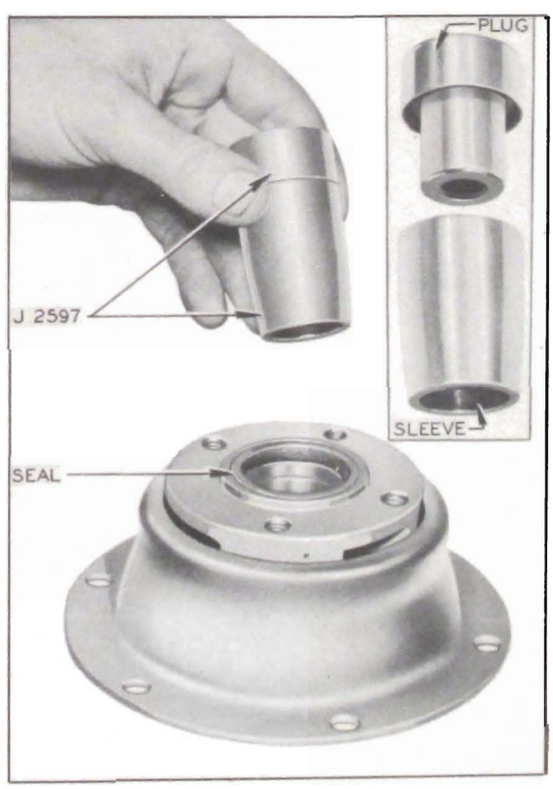


Figure 4-37—Torque Ball Installing Tool J597

9. Assemble sleeve and plug of Installing Tool J 2597 together (fig. 4-37), then push tool through *rear* side of oil seal until the leather edge is on the plug, at which time the sleeve will drop off the plug. See figure 4-38.

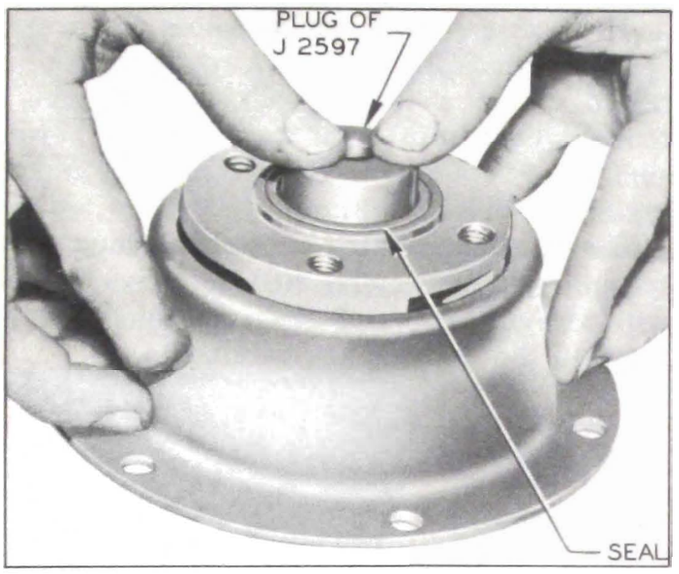


Figure 4-38—Pushing Installing Tool into Universal Joint Oil Seal

10. Install torque ball and outer retainer with "TOP" sides up, using shims of sufficient thickness to fill the space between flanges of inner and outer retainers. Hold plug of installing tool firmly against end of universal joint until oil seal has moved forward upon the universal joint, then remove the plug. See figure 4-39.

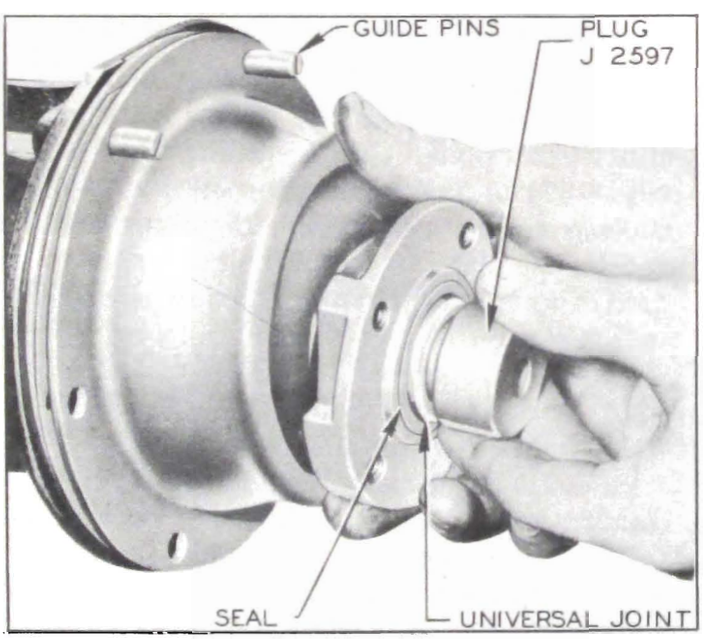


Figure 4-39—Installing Torque Ball and Retainer

11. Install thrust plate and all retainer attaching bolts, removing guide pins and placing the short bolts in these holes; *do not tighten bolts.* Thrust plate must be installed to prevent creeping or distortion of outer retainer.

12. Insert hardwood club (fig. 4-33) in universal joint and while moving torque ball up, down, and sideways tighten retainer bolts evenly. CAUTION: *It is absolutely necessary to continually move torque ball while tightening bolts in order to properly center the ball and retainers.* If torque ball binds as bolts are tightened, tap outer retainer lightly at several points, using rawhide or other soft mallet. This will usually relieve the binding condition.

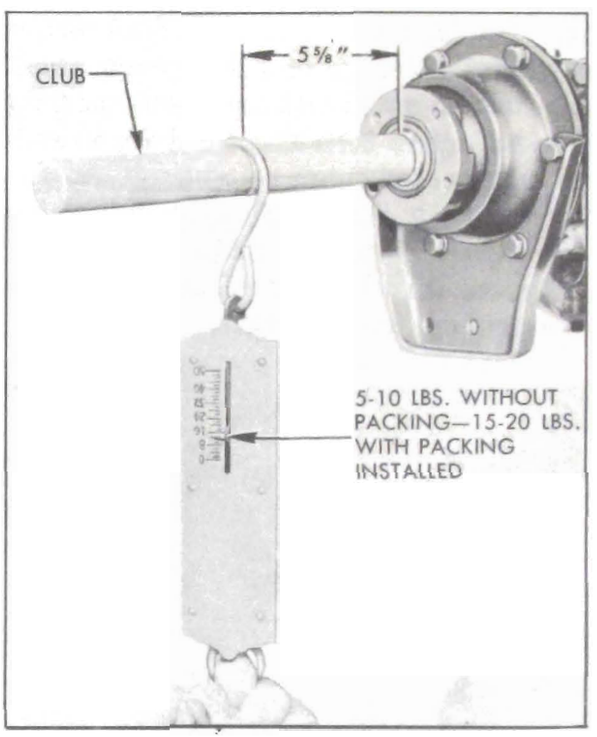


Figure 4-40—Checking Torque Ball Drag

13. Attach spring scale to club at groove located 5⅝" from end of universal joint and test pull required to move torque ball when all bolts are tight. See figure 4-40. A drag of 5 to 10 pounds should be obtained. If torque ball is too tight or too loose, loosen bolts and repeat the centering and tightening operation, then recheck drag with club and spring scale.

14. If torque ball is too tight after repeating the centering and tightening operation remove outer retainer and increase total thickness of shims; if ball is too loose, decrease total thickness of shims. Shims are furnished under Group 5.560 in four thicknesses, and are notched on outer edge for identification as follows:

Thickness	*Notches*
.000"-.006"	3
.009"-.011"	2
.011"-.003"	1
.013"-.015"	None

15. Always use Installing Tool J 2597 (fig. 4-37) when installing torque ball to avoid dam-

age to oil seal.

After changing shims always install ball and retainer with top sides up and use the centering, tightening, and checking procedure specified in steps 12 and 13 above.

Final adjustment must provide a drag of 5 to 10 pounds on club with a 5⅝" leverage. See figure 4-40.

16. *On 1948 models only,* install outer retainer packing as described in subparagraph *b*, below.

16*a*. *On 1949 Series 50-70,* install torque ball boot. Turn the large end back over small end, engage rib in small end in groove on flange of torque ball, then turn large end forward to engage rear end of outer retainer.

17. *On 1949 Series 50-70,* install shims between thrust plate and thrust pad (fig. 4-60) and tighten thrust pad stud nuts. Connect rear axle assembly (par. 5-27).

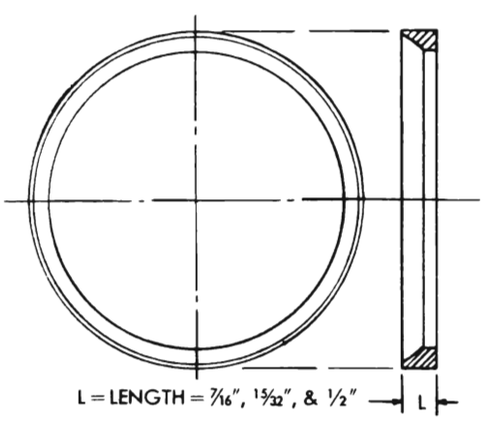


Figure 4-41—Outer Retainer Packings—1948 Models

b. Installation of Outer Retainer Packing—1948 Models Only

It is necessary to selectively fit packing of proper size to outer retainer in order to insure an oil-tight seal and avoid binding of torque ball.

Torque ball outer retainer packing listed under Group 5.560 is furnished for service in a package containing three packings of different sizes. See figure 4-41. When a packing is requisitioned, one of each size should be issued so that the mechanic can selectively fit packing in outer retainer. Packings not installed by mechanic may be returned to dealer's stock.

1. After proper adjustment of torque ball is obtained (subpar. *a*, above) remove outer retainer and torque ball. Do not lose or mix the shims selected during adjustment.

2. Place packing spring washer in outer retainer with edge standing away from end flange of retainer and with the gap at top side of retainer. Select one of the packings and install it in retainer so that it contacts the spring washer, then determine whether the thin edge of packing projects slightly beyond the spherical bearing surface of retainer. See figure 4-42 view A. If the thin edge of packing does not project beyond spherical surface of retainer as illustrated, select a longer packing until one is found whose thin edge *does project* beyond surface of retainer. Leave this packing and the spring washer in retainer.

The selected packing must be a snug fit in retainer, diametrically, since a loose packing will permit leakage of transmission lubricant between the packing and retainer.

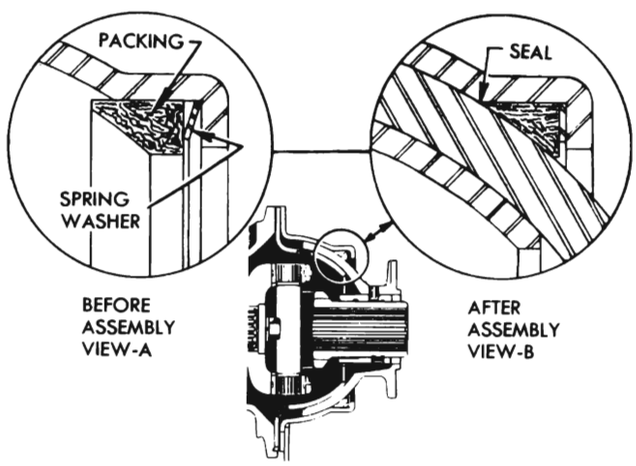


Figure 4-42—Selective Fit of Packing—1948 Models

3. Install selected shims, torque ball and retainer with top sides up, thrust plate gasket, and thrust plate. Use Installing Tool J 2597 (fig. 4-37) to avoid damaging oil seal when installing torque ball. When installing retainer and thrust plate attaching bolts be sure to use tightening and centering procedure specified in subparagraph a, above.

4. When torque ball is centered and bolts are tight, check torque ball drag with hardwood club and spring scale. See figure 4-40. The drag should be appreciably heavier than drag obtained during adjustment with packing removed; however, the drag must not be too great or cause a severe bind on torque ball. The torque ball should move smoothly and the drag should be 15 to 20 pounds on club with a 5⅝" leverage.

If the packing is properly selected and installed, the spring washer will be compressed almost flat. The washer forces packing against torque ball, which presses the thin edge of

packing against outer retainer to provide an oil-tight seal. See figure 4-42 view B.

5. If torque ball drag with the selected packing is not as described in the preceding step (4), it will be necessary to install a different size packing. If drag is excessive install a shorter packing. If drag is not heavy enough, or packing spring washer is not compressed almost flat, install a longer packing. After installing a different size packing be sure to use tightening and centering procedure and check for proper torque ball drag. Final drag must be 15 to 20 pounds with a 5⅝" leverage.

6. Install shims between thrust plate and thrust pad (fig. 4-60) and tighten thrust pad stud nuts. Connect rear axle assembly (par. 5-27).

4-29 REMOVAL OF TRANSMISSION—ALL SERIES

1. Disconnect rear axle assembly and move it back out of way (par. 5-26).

2. Drain transmission lubricant. Fill with clean gasoline or kerosene and run transmission in neutral for about 15 seconds. Drain cleaner.

3. Disconnect speedometer cable, lower shift rod, and lower selector rod. *On Series 40-50 only,* remove toggle spring and extension, remove shift lever and lock washer from selector shaft and remove outer selector lever, to provide clearance for removing transmission to

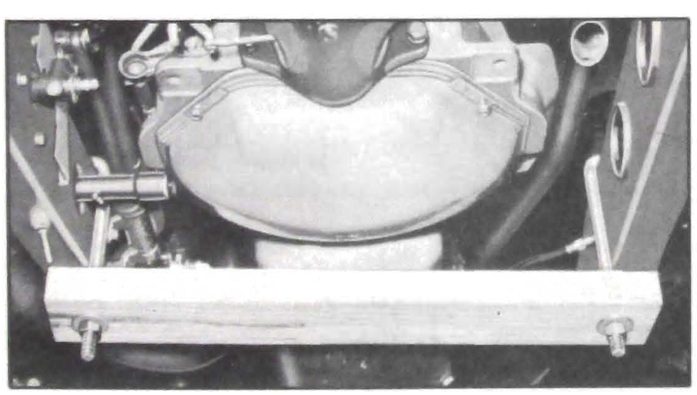


Figure 4-43—Supporting Rear End of Engine

flywheel housing bolts. *Hold shift lever* in neutral while removing attaching bolt, to avoid damaging shifter lever on shaft inside transmission.

4. Support rear end of engine by installing support bar (fig. 4-35) under rear end of lower crankcase. Place left side hook over frame between brake master cylinder and clutch release equalizer. Tighten nuts on both hooks evenly. See figure 4-43.

5. Disconnect rubber thrust pad from transmission support by removing three nuts and plate then lift out shims located between support and transmission thrust plate. Remove two bolts and plate which attach transmission mounting pad to the support then raise engine to relieve load on transmission support by tightening nuts on engine support bar hooks. Remove support from frame X member and remove thrust pad from thrust plate.

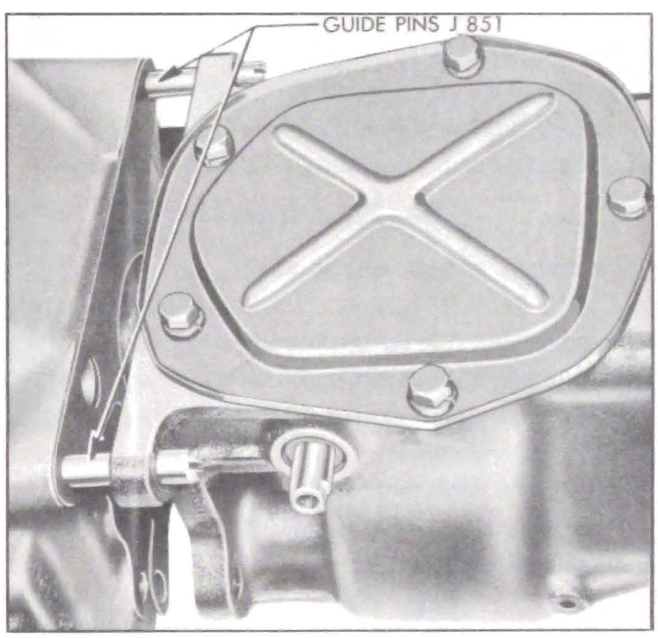


Figure 4-44—Transmission Guide Pins J851

6. Remove the two top transmission to flywheel housing bolts and install Guide Pins J 851 to support transmission. See figure 4-44. Remove lower bolts, then move transmission straight back and lower to floor. CAUTION: *If guide pins are not used and weight of transmission is allowed to rest on main drive gear in clutch driven plate hub, the driven plate will be damaged.*

4-30 DISASSEMBLY OF TRANSMISSION SERIES 40-50

1. Thoroughly clean all dirt from exterior of transmission to avoid getting dirt into bearings when transmission is opened. Remove

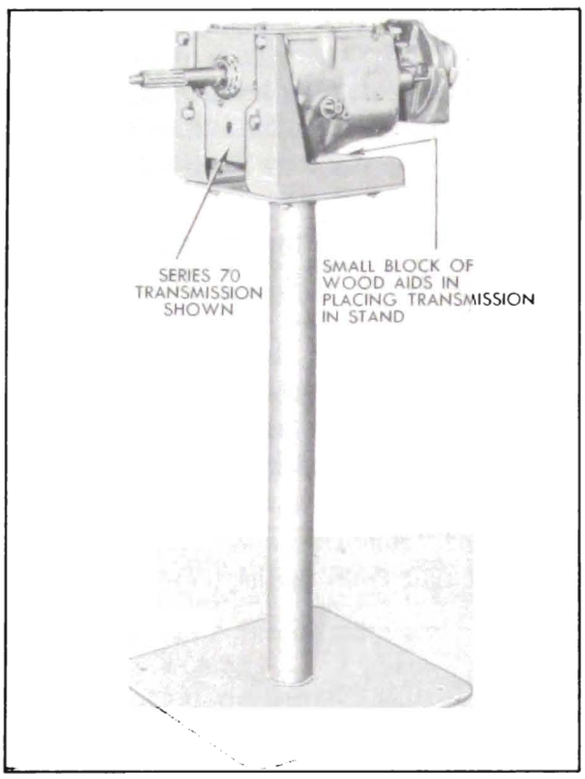


Figure 4-45—Transmission Supported in Stand

transmission cover and gasket.

2. Lock transmission in third speed to prevent sliding sleeve and sliding gear from dropping, then remove transmission rear bearing retainer, universal joint, torque ball, and main shaft as an assembly.

3. Remove the four set screws from shifter levers and shifter yokes, using Remover J 2895. See figure 4-46.

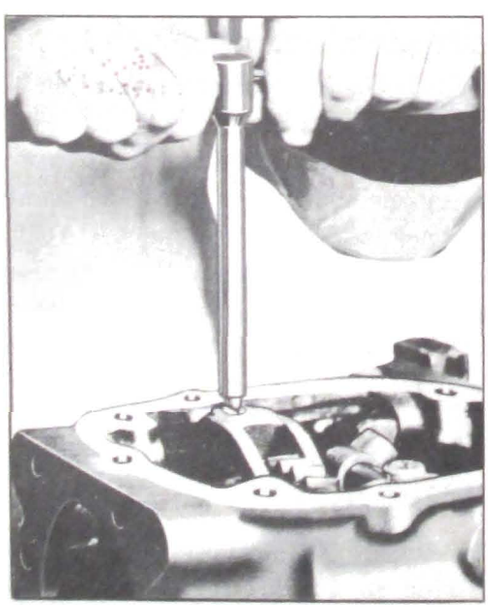


Figure 4-46—Removing Set Screw with Remover J2895

4. Drive selector shaft out through right side of transmission case, using babbitt hammer. Welsh plug in right side of case will be driven out by shaft. Do not let shifter levers drop into case.

5. Remove shifter yokes and shafts by pushing shafts out through front of transmission case, using care to prevent poppet balls from jumping out. The welsh plug in front end of case will be driven out by the second and third shifter yoke shaft. Remove poppet balls and springs. NOTE: *If poppet balls and springs are not to be replaced the shafts may be pushed to rear of case far enough to release the yokes while holding poppet balls in place.*

6. Remove sliding gear and the sliding sleeve, then remove the selector lever and shaft with spring washer, flat washer, and oil seal from transmission case.

7. Remove the counter gear shaft and lock ball by driving shaft out through *rear* end of transmission case, using Bearing Loader J 1334 and a babbitt hammer. Make sure that bearing loader follows the shaft closely so that counter gear bearings and thrust washers will be held in place. Allow counter gear to rest on bottom of case.

8. Remove the snap ring from main drive gear bearing and tap drive gear and bearing assembly toward rear of transmission case to remove it.

9. Carefully raise counter gear out of case so that bearing loader and counter gear bearings will not fall out. Remove all thrust washers.

10. Drive reverse idler gear shaft lock into the shaft, then remove shaft, idler gear, and thrust washers.

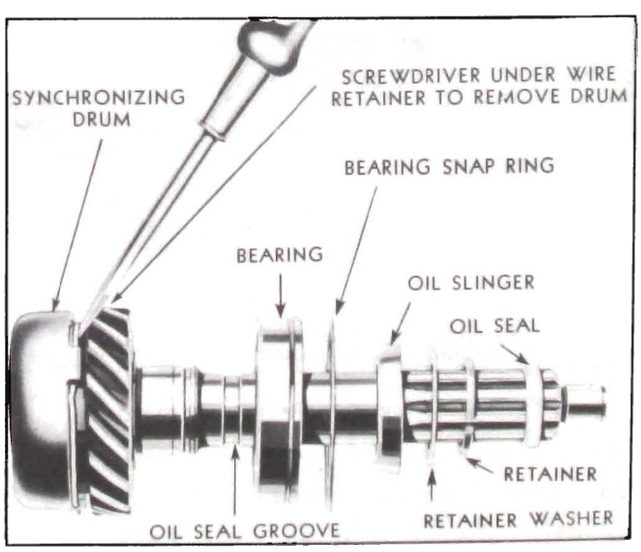


Figure 4-47—Disassembly of Main Drive Gear—Series 40-50

11. Disassemble main drive gear if any parts are to be replaced. Remove synchronizing drum by prying retainer over shoulder on gear, leaving retainer in drum. Remove oil seal, retainer (snap ring), washer, and oil slinger from drive gear, then remove bearing by jarring shaft on block of wood or lead. See figure 4-47. Remove main shaft pilot roller bearing by removing retainer (snap ring) and retainer washer.

NOTE: *If work to be done requires disassembly of rear bearing retainer, proceed with the following steps.*

12. Mount rear bearing retainer securely in a vise.

13. Remove second speed synchronizing drum by prying retainer over shoulder on second speed gear, leaving retainer in drum. Remove snap ring from main shaft using Remover J 1019 (shown in fig. 4-51), then remove thrust washer and second speed gear from main shaft.

14. Remove speedometer driven gear.

15. Mark the top edge of outer retainer so that it can be reinstalled in original position. Remove thrust plate and gasket, retainers, shims and torque ball from rear bearing retainer.

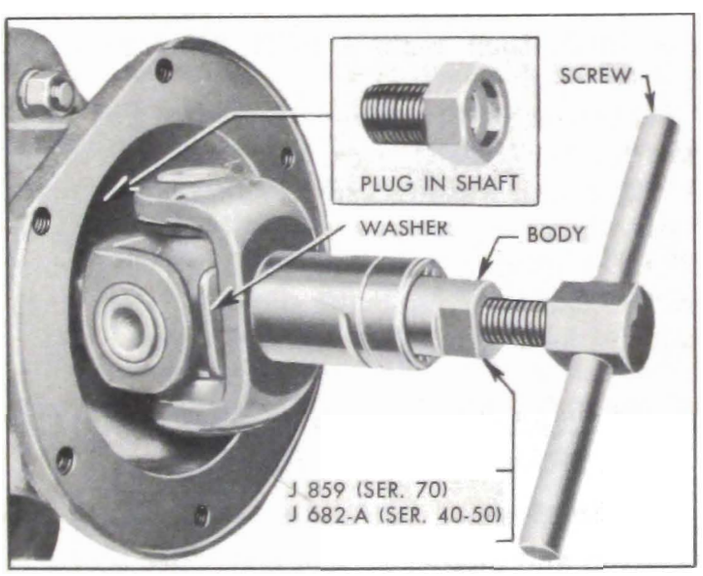


Figure 4-48—Removing Universal Joint with Puller J682-A

16. Remove retaining bolt and washer then pull universal joint from main shaft, using Puller J 682-A. To use the puller, install the pressure plug in transmission main shaft, insert puller body in universal joint rear yoke and install "C" washer in groove in puller body on front side of yoke, then turn screw handle clockwise. See figure 4-48. Remove universal joint spacer from main shaft.

17. Remove transmission rear bearing lock (snap ring), then remove main shaft and bearing from retainer by tapping rear end of shaft with babbitt hammer or hardwood block.

18. Remove speedometer worm gear, spacer, bearing and thrust washer from main shaft, using Puller J 1134 to remove worm gear and bearing. See figure 4-49.

4-31 DISASSEMBLY OF TRANSMISSION 1948 SERIES 70

1. Thoroughly clean all dirt from exterior of transmission to avoid getting dirt into bearings when transmission is opened.

2. Remove transmission cover and gasket, toggle spring, and spring extension.

3. Remove speedometer driven gear, thrust plate and gasket, torque ball, retainers and shims from rear bearing retainer. Installation of guide pins will aid in removal of torque ball and retainers.

4. Remove retaining bolt and washer, then pull universal joint from main shaft, using Puller J 859-A. To use puller, install the pressure plug in transmission main shaft, insert puller body in universal joint rear yoke and install "C" washer in groove in puller body on front side of yoke, then turn screw handle clockwise. See figure 4-48.

5. Remove universal joint spacer from main shaft, then remove rear bearing retainer and gasket from transmission case.

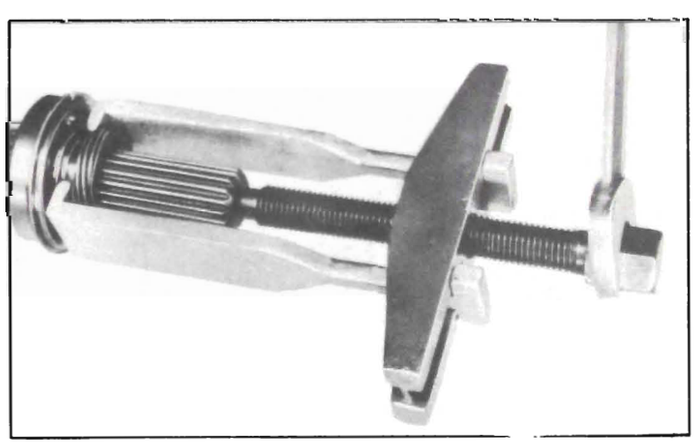


Figure 4-49—Removing Worm Gear with Puller J1134

6. Move main shaft back until rear bearing is clear of case. Remove snap ring from bearing, then pull bearing, spacer, and speedometer worm gear from shaft. using Puller J 1134. See figure 4-49.

7. Remove shifter yoke set screws, using Remover J 2895 (shown in fig. 4-46), then lift the main shaft and assembled parts out through top of transmission case. See figure 4-50.

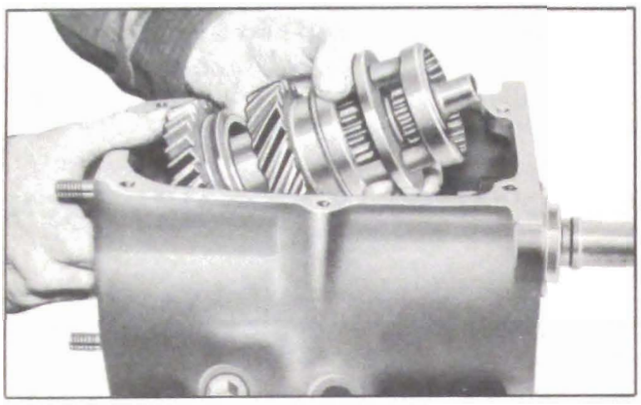


Figure 4-50—Removing Main Shaft Assembly

8. Remove synchronizing clutch and second speed sliding gear from main shaft. Remove snap ring, thrust washer, and second speed gear, using Remover J 1019 on snap ring. See figure 4-51.

Figure 4-51—Removing Snap Ring from Main Shaft

9. Remove shifter yokes and shafts, using care to prevent poppet balls from jumping out, then remove poppet ball and springs. Poppet balls are under rear end of short shaft and under front end of long shaft. Selector shaft must be moved so that interlock is clear of each shaft as it is removed.

10. Remove set screws from shifter levers on selector shaft. Remove second and third speed interlock retainer from groove in right end of selector shaft. Remove first and reverse interlock pin from case.

11. Remove shift lever and lock washer from left end of selector shaft, then drive shaft out through right side of transmission case, using babbit hammer. The welsh plug in right side of case will be driven out by shaft. Do not let shifter levers and interlock drop into case.

12. Remove selector lever and shaft, spring washer, flat washer and oil seal from transmission case.

13. Drive counter gear shaft lock into the shaft, then drive shaft out through rear end of transmission case, using Bearing Loader J 1001 and babbit hammer. Make sure that bearing loader follows the shaft closely so that counter gear bearings and thrust washers will be held in place. Allow counter gear to rest on bottom of case.

14. Remove the snap ring from main drive gear bearing and tap drive gear and bearing assembly toward rear of transmission case to remove it.

15. Carefully raise counter gear out of case so that bearing loader and counter gear bearings will not fall out. Remove all thrust washers.

16. Drive reverse idler gear shaft lock into the shaft, then remove shaft, idler gear and thrust washers.

17. Disassemble main drive gear if any parts are to be replaced. Remove oil seal, retainer (snap ring), washer, and oil slinger from drive gear, then remove bearing by jarring shaft on block of wood or lead. Remove main shaft pilot roller bearing by removing retainer (snap ring) and retainer washer.

4-32 CLEANING AND INSPECTION OF TRANSMISSION PARTS

a. Bearings

Clean and inspect all ball and roller bearings as described under Bearing Service (par. 1-13 & 1-14).

b. Cleaning Parts Other Than Bearings

Thoroughly clean all parts except bearings and rubber mountings in clean gasoline, kerosene, or other solvent and wipe dry with clean cloths.

c. Gears and Shafts

Carefully inspect teeth and other ground surfaces of all gears for wear, scoring, pitting, chips, nicks, and burrs. Do not confuse manu-

facturing cutter marks with scores or pits. Conical surfaces of gears where contacted by synchronizing drums must be smooth and free of burrs. Slight scores or burrs may be honed off with a fine stone, however, if any gear is chipped or excessively worn it should be replaced.

Inspect all shafts for wear or roughness on bearing surfaces. Check fit of gears on shafts upon which they are mounted. The sliding sleeve (Series 40-50) and synchronizing clutch (Series 70) must slide freely on splined section of main shaft, but without appreciable backlash.

d. Synchronizing Drums

The cam surfaces of synchronizing drums (Series 40-50) must be smooth. The conical surfaces of synchronizing drums, in all series, must be free of burrs or scores, and oil grooves must be clean. *Never polish this surface or change the angle.*

e. Selector Shaft, Shifter Yokes and Shafts, Toggle Spring Extension

Check selector shaft and shifter yoke shafts on a flat surface to see whether they are bent. A bent shaft will cause hard shifting, and should be replaced. If a shifter yoke is bent or has rough contact surfaces it will cause hard shifting and noise, therefore, it should be replaced. Replace poppet springs if distorted or of doubtful strength.

Check toggle spring extension to make sure it is not distorted. An improperly shaped extension will bear against the selector shaft and actually tend to pull transmission out of second speed. Figure 4-52 shows the correct shape for extension on all series. A bent extension should be reshaped to dimension shown, or replaced.

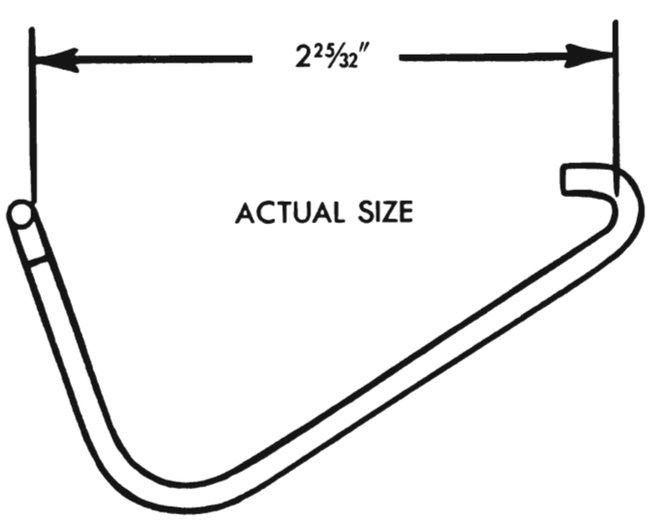


Figure 4-52—Toggle Spring Extension

f. Universal Joint and Torque Ball

Inspect universal joint for wear in bearings and for fit on main shaft and propeller shaft, and in torque ball bushing. Allowable play of spider pins in bushings is .002" to .004". Allowable backlash of rear yoke on propeller shaft splines is .0005" to .0045". The front yoke must be a tight fit, rotatively, on main shaft to prevent "snap" when alternating car movement between forward and reverse. The rear yoke of universal joint and bushing in torque ball must be free of scores and not worn excessively; clearance between these parts should be .004" to .006".

If torque ball and retainers are scored or pitted on bearing surfaces they should be replaced. If oil seal in torque ball is worn, remove old seal but do not install a new one at this time. Discard outer retainer packing (1948) or torque ball boot (1949) if worn or damaged.

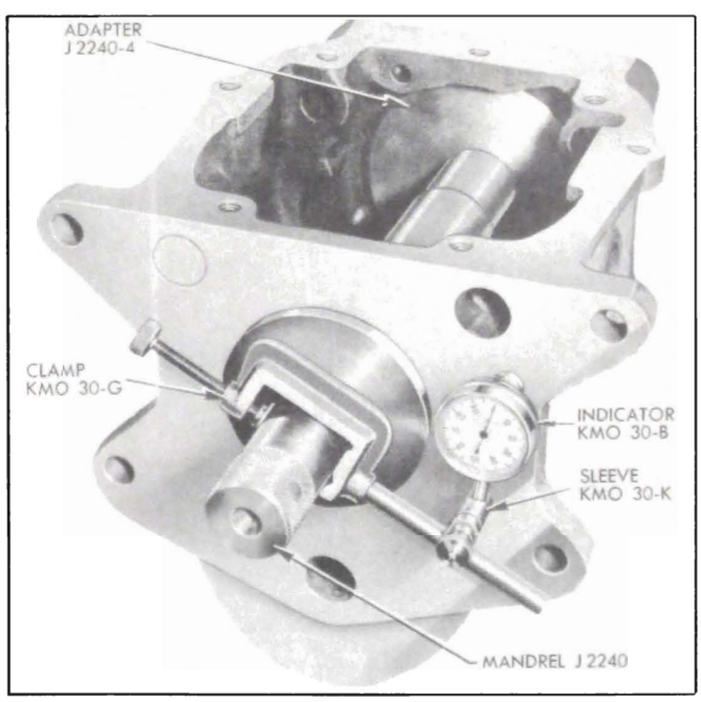


Figure 4-53—Checking Run-Out of Transmission Case—Series 40-50

g. Transmission Case

Inspect selector shaft oil seal in case. If worn, or there was evidence of oil leakage past the seal, remove it and install a new one. Coat outer surface of seal with white lead or other sealing compound and install seal with feather edge pointing inward.

If the transmission had been jumping out of third speed, the alignment of flywheel housing with engine crankshaft should be checked as described in paragraph 2-33, and front face of

transmission case should be checked for excessive run-out, as follows:

1. *In Series 40-50* transmission case, install Adapter J 2240-4 in rear opening in case, then install Mandrel J 2240 as shown in figure 4-53. *In Series 70,* install transmission rear bearing in case, then install Mandrel J 2240 as shown in figure 4-54.

2. Mount dial indicator on the mandrel as shown in figures 4-53 and 4-54 so that indicator stem bears against front face of transmission case 3" from center of mandrel.

3. Rotate mandrel while pressing it against case and note dial indicator reading. Total indicator reading should not exceed .003". If run-out exceeds .003", replace transmission case with one that checks within the allowable limit on run-out.

h. Transmission Mounting and Thrust Pad

Inspect mounting and thrust pads. Replace either part if rubber is broken or deteriorated.

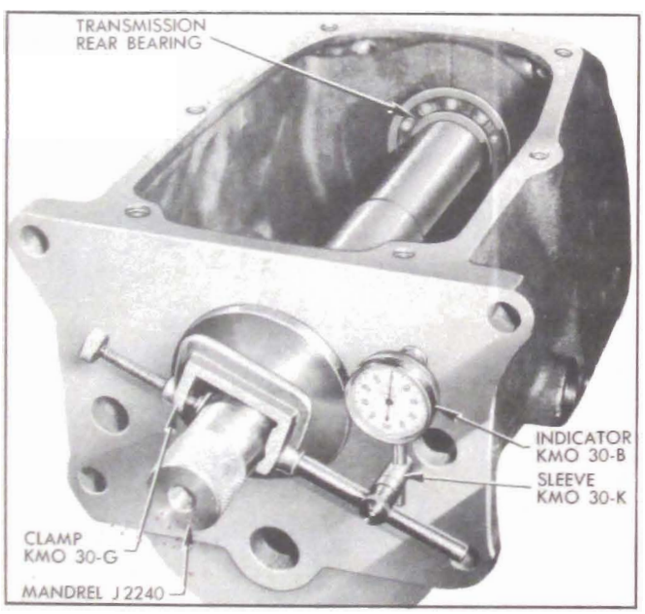


Figure 4-54—Checking Run-Out of Transmission Case—1948 Series 70

4-33 ASSEMBLY OF TRANSMISSION—ALL SERIES

To assemble the transmission, reverse the sequence of steps given for disassembly in paragraph 4-30 for *Series 40-50,* or 4-31 for *Series 70.* In addition, observe the following instructions that apply to assembly.

a. Condition of Parts

Make certain tnat all parts are absolutely clean and that gears and synchronizing drums are free of nicks or burrs. Use all new gaskets and oil seals or packings to insure against leakage of lubricants. Use all new snap rings, and retainers of snap ring type. Snap rings are frequently distorted during removal and are difficult to true up satisfactorily for further service.

b. Bearings

Observe instructions given under Bearing Service (par. 1-11) on proper installation of ball bearings. Coat bearings with clean transmission lubricant at time of installation, to insure initial lubrication.

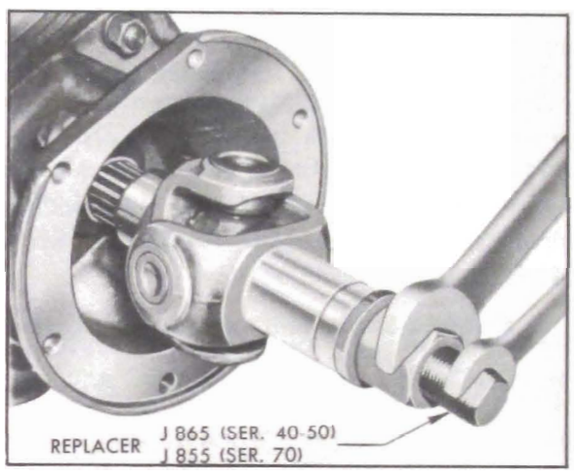


Figure 4-55—Installing Universal Joint with Replacer

c. Universal Joint and Torque Ball

When installing universal joint on main shaft, use Replacer J 865 for *Series 40-50* and Replacer J 855 for *Series 70.* See figure 4-55. When installing torque ball, retainers, packing, and oil seal follow instructions for installation and adjustment given in paragraph 4-28.

d. Main Drive Gear Bearing

Install main drive gear bearing with the shielded side toward gear teeth.

e. Reverse Idler Gear Shaft Lock

Always use a new lock and coat with white lead or other sealing compound before installation, to prevent oil leaks. *On Series 40-50,* drive lock into hole in shaft until outer end of lock is 25/32" below surface of boss on case. *On Series 70,* drive lock 1" below surface of boss on case.

f. Counter Gear Bearings, Thrust Washer, and Shaft

Use Bearing Loader J 1334 for Series 40-50 and Loader J 1001 for Series 70 when installing spacer, washer, and bearings in counter gear. See figure 4-56. Pack bearing rollers in white gasoline to hold them in place and make

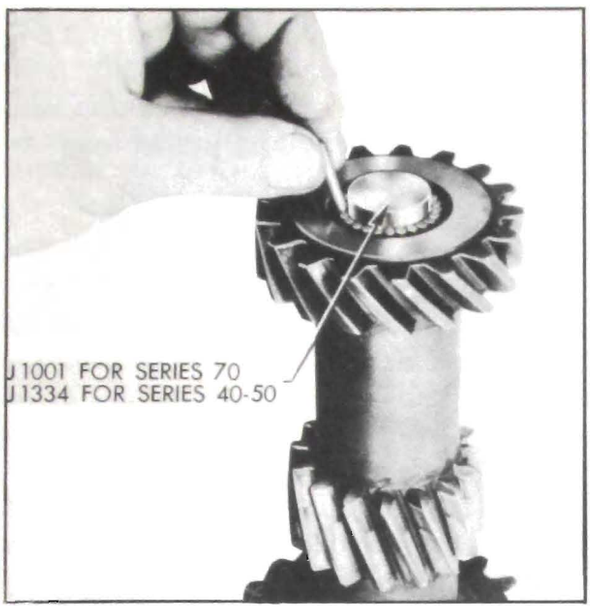


Figure 4-56—Installing Counter Gear Bearings with Loader

certain that all rollers are installed. *Series 40-50* has 25 rollers in each bearing and *Series 70* has 26 rollers. Leave loader in gear until it is pushed out by the counter gear shaft during installation.

Note that on *Series 70* an extra steel thrust washer is located between the rear bronze thrust washer and boss in transmission case. On all series, the counter gear shaft is installed through *rear end* of case. *On Series 40-50* install locking ball and drive rear end of shaft slightly below rear face of case so that rear bearing retainer may be tightened against the gasket. *On Series 70,* use a new counter gear shaft lock, coat it with white lead or other sealing compound, and drive it flush with surface of transmission case.

g. Main Shaft Snap Ring

On Series 70 only, install small wire spacer ring, Part No. 1309249, in groove in main shaft before installing snap ring which retains the second speed gear thrust washer. This spacer centers the snap ring so that it projects equally all around the shaft. Use Snap Ring Replacer J 1267 to install the snap ring on all series, to avoid distorting the ring. See figure 4-57.

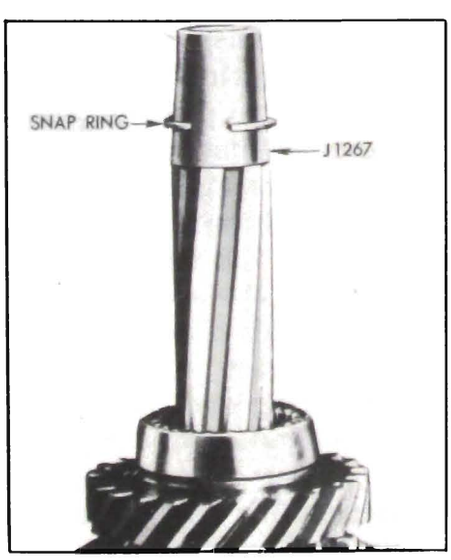


Figure 4-57—Snap Ring Replacer J1267

h. Selector Lever and Shaft, Washers and and Oil Seal

Place spring washer, flat washer, and oil seal on shaft in the order named, with crowned side of spring washer against the flat washer. Apply Lubriplate to shaft before installation of assembled parts in transmission case.

i. Selector Shaft and Shifter Levers

Coat oil seal with Lubriplate and install selector shaft through left side of transmission case to avoid damaging the oil seal. The long shifter lever goes on left side of case, and short shifter lever goes on right side. Install a new welsh plug in right side of case, sealing it with white lead or other compound. *On Series 40-50,* a welsh plug must also be installed in front side of case to seal opening for second and third shifter yoke shaft. Make certain that selector shaft slides freely after installation, otherwise hard selection of proper gear will result at control lever.

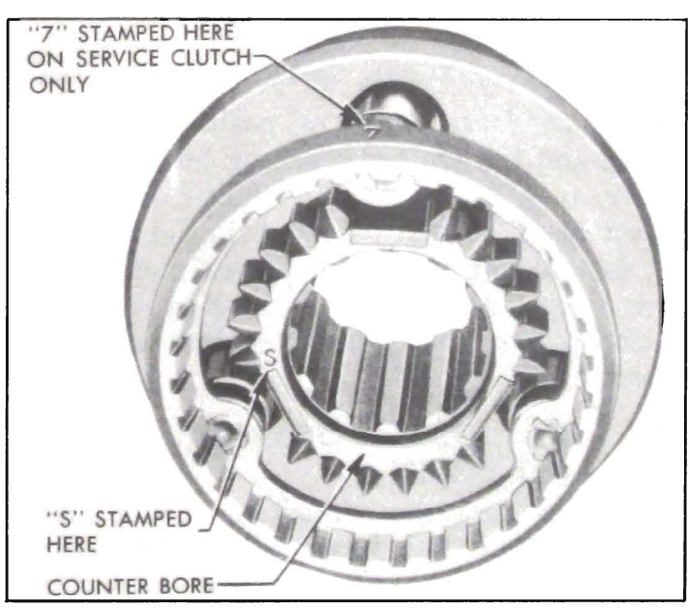


Figure 4-58—Counterbore and Marks on Second Speed End of Clutch—1948 Series 70

j. Gear Synchronizing Clutch—Series 70 Only

The synchronizing clutch must be installed with the counterbored end toward the second speed gear to insure full engagement of clutch with gear and avoid slipping out of second speed. The second speed end of clutch is stamped with a letter "S." Gear synchronizing clutches

furnished for service have a figure "7" (to indicate 7° angle) stamped on the second speed drum. Do not use replacement clutch having any other number stamped on drum. See figure 4-58.

k. Rear Bearing, Speedometer Worm Gear, and Spacers—Series 70

Use Universal Joint Replacer J 855 and a sleeve 1¼" inside diameter and 6" long to press the transmission rear bearing and the speedometer worm gear on main shaft. See figure 4-59. Be sure to place the wide spacer between bearing and worm gear and the narrow spacer between gear and universal joint.

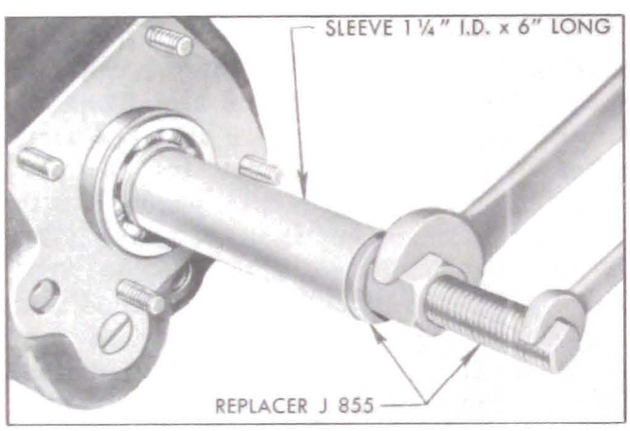


Figure 4-59—Installing Rear Bearing with Replacer J855 and Sleeve

l. Shift Lever, Toggle Spring and Extension

Hold shift lever in neutral position while installing and tightening attaching bolt and lock washer, to avoid damaging shifter levers on selector shaft. Install toggle spring and extension so that the extension passes underneath the selector shaft. Make sure that extension is not distorted so that it bears against the selector shaft.

4-34 INSTALLATION OF TRANSMISSION —ALL SERIES

1. Lightly coat the splines on end of main drive gear with Lubriplate for a distance of not more than 1". Do not apply an excess that will push off at driven plate hub and get on driven plate facings.

2. Make certain that front face of transmission case and face of flywheel housing are absolutely clean. Install Guide Pins J 851 in upper bolt holes in housing (fig. 4-44) and install a new transmission gasket. Make certain that spring washer is in place behind clutch release bearing support in housing.

3. Lift transmission into place and fully support it until the main drive gear bearing enters flywheel housing. *Clutch driven plate will be damaged if guide pins are not used and weight of transmission is allowed to rest on main drive gear in driven plate hub.*

4. Install lower transmission attaching bolts, then the upper bolts, and tighten all bolts evenly and securely. CAUTION: *If a gap exists between transmission case and flywheel housing do not tighten bolts as case may be broken. Remove transmission and check position of main drive gear bearing snap ring, which may have slipped out of place during installation.*

5. Install rubber thrust pad on thrust plate attached to torque ball. Install transmission support and attach transmission mounting pad to the support with bolt plate and self-locking nuts. Remove support bar from under the engine so that full weight rests on transmission mounting pad.

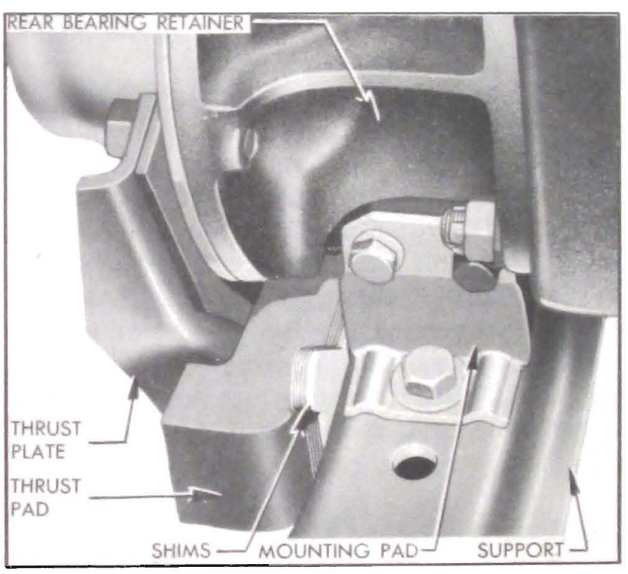


Figure 4-60—Transmission Mounting and Thrust Pads and Shims

6. With engine and transmission resting freely and normally on mountings, install sufficient shims between the thrust pad and transmission support to fill the existing space. Insert shims from above with tabs on right side, then install the bolt plate and three nuts which attach thrust pad to support. See figure 4-60.

7. Connect speedometer cable. *On Series 40-50*, install outer selector lever shift lever, toggle spring and extension. *Hold shift lever* in neutral while installing and tightening attaching bolt and lock washer to avoid damaging shifter levers on selector shaft. Install toggle spring and extension so that extension passes underneath selector shaft.

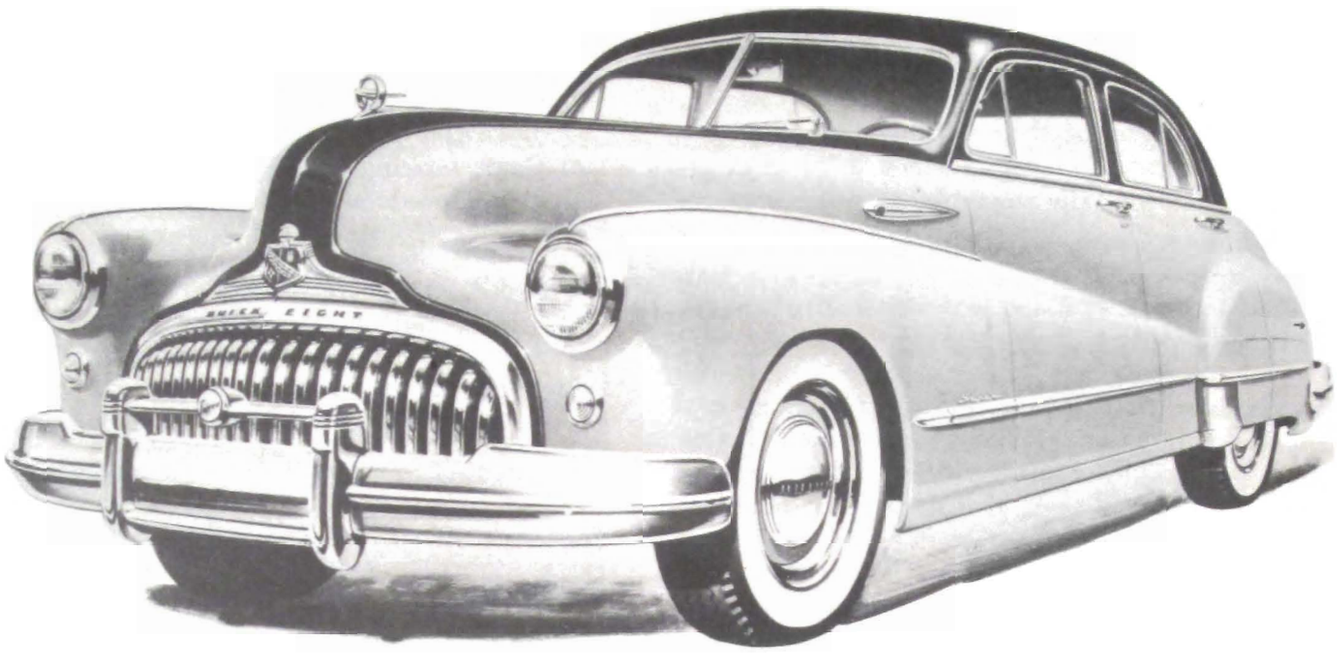
8. Connect lower shift rod and selector rod

to their levers and check adjustment as described in paragraph 4-25.

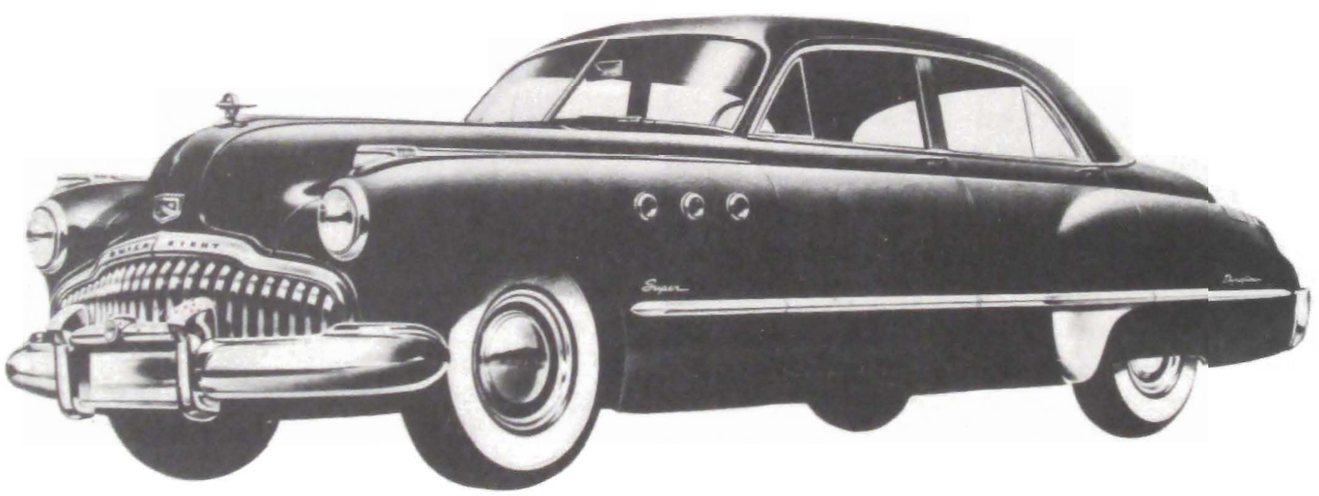
9. Place 7/8 pint of transmission lubricant in *Series 40-50*, or 1¼ pints of lubricant in *Series 70* transmission. In addition, inject ½ pint of transmission lubricant through universal joint yoke. See pargraph 1-1 for specified lubricant.

10. Install rear axle assembly as described in paragraph 5-27.

11. Road test car and check transmission for
    a. Proper shifting into all speeds.
    b. Correct synchronization when shifting into second and third speed.
    c. First and second speed slip-out, on drive and coast.
    d. Gear, bearing, or shifter yoke noises in all speeds and neutral.
    e. Rattles in shift control mechanism.



1948 Model 51



1949 Model 51