

TRANSMISSION AND UNIVERSAL JOINT ASSEMBLY

TRANSMISSION TYPES

All Series

Transmission on all series are of the synchronizing type in second and high gears. Main drive gear pilots in crankshaft on a ball bearing. Two sizes of transmissions are used — one for the Series 40-50, see Fig. 7-1 and 7-5, and the other for the Series 60-70-90, see Fig. 7-6. Transmissions are all supported at the rear by a mounting on the frame. Counter gears on all series are supported on cageless roller bearings.

Lubrication

Refer to Lubrication Chart.

Drain, flush and refill twice each year but in no event must this lubricant be used for more than 10,000 miles.

Alignment—All Series

The transmission main drive gear bearing at front of transmission on all series serves as a pilot to align transmission in flywheel housing. The front edge of the outer race of this bearing presses against clutch pilot tube spring ring in flywheel housing and holds clutch release bearing pilot support rigid.

The flywheel housing surface where outer race of front transmission bearing pilots should not be more than .005 indicator reading out of line with flywheel.

See "Flywheel Housing Alignment."

Gaskets—All Series

A heavy fibre gasket is used between transmission and flywheel housing.

Paper gaskets are used between the bearing retainer and case, between the bearing retainer and stationary member of the driving ball. A cork gasket is used between case and cover.

Several paper gaskets are used as adjusting shims between stationary members of driving ball assembly.

TRANSMISSION BEARINGS

All Series

Care should be used not to damage the bearings when disassembling or assembling the transmission. Steady, even pressure in a press or a puller should be used whenever it is necessary to remove a bearing. Driving on the bearings should always be avoided because it is liable to damage the bearing races.

BALL BEARING CLEANING

Care Before Cleaning

Very few bearings removed in service work are entirely free from dirt or foreign matter. In a majority of cases there is enough dirt present to affect the "feel" of the bearings.

After bearings have been removed, do not spin the bearings, *especially not with an air hose.*

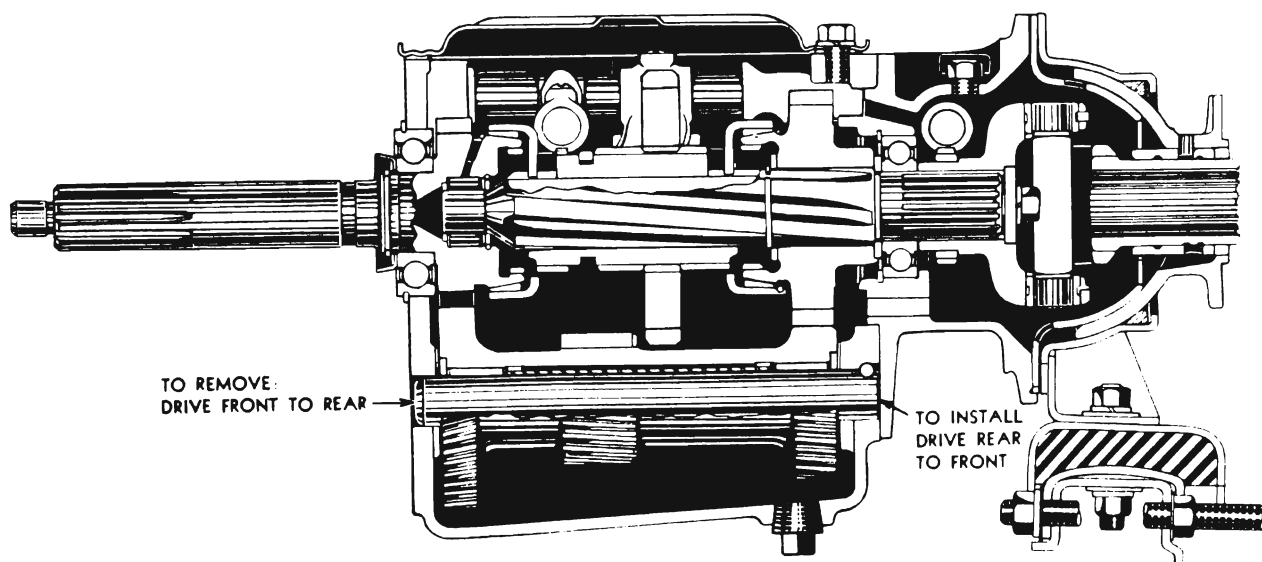


Fig. 7-1. Transmission—Series 40

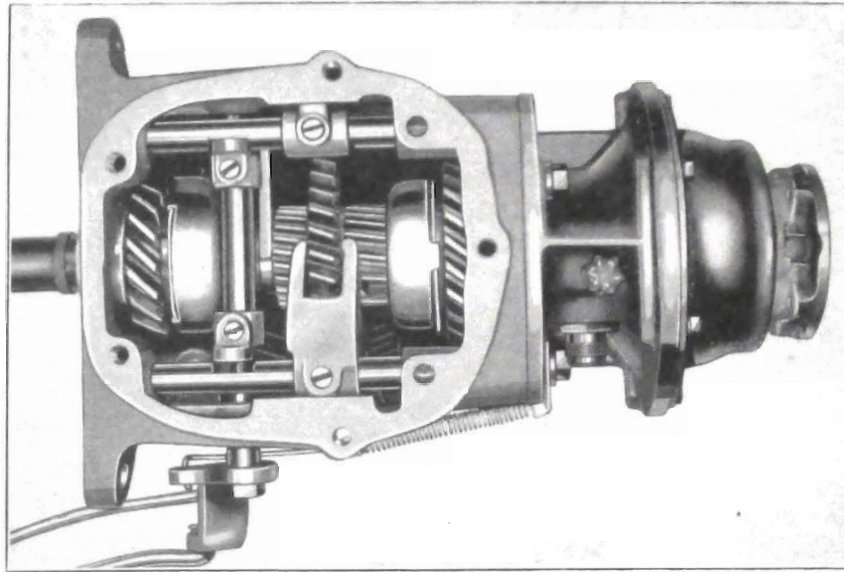


Fig. 7-2. Transmission—Series 40

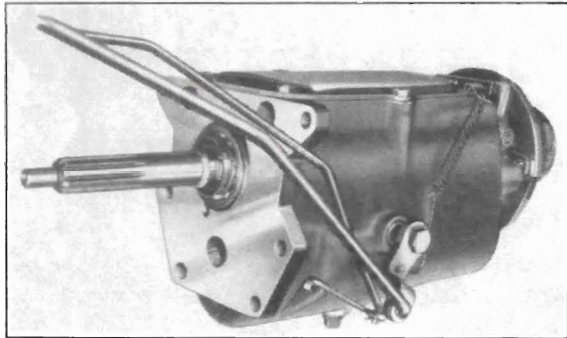


Fig. 7-3. Transmission Shift Controls—Series 60-70-90

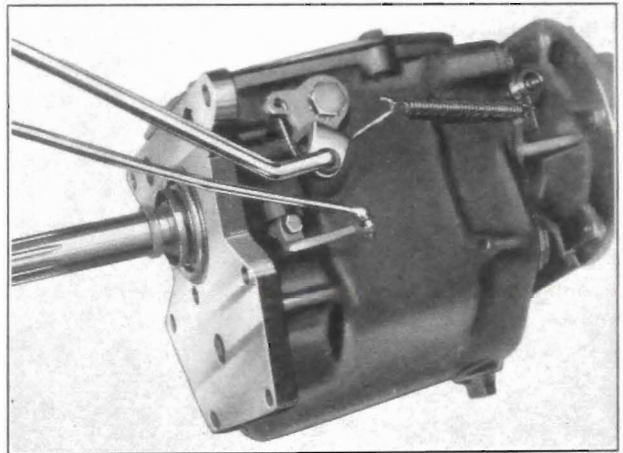


Fig. 7-4. Transmission Shift Controls—Series 40

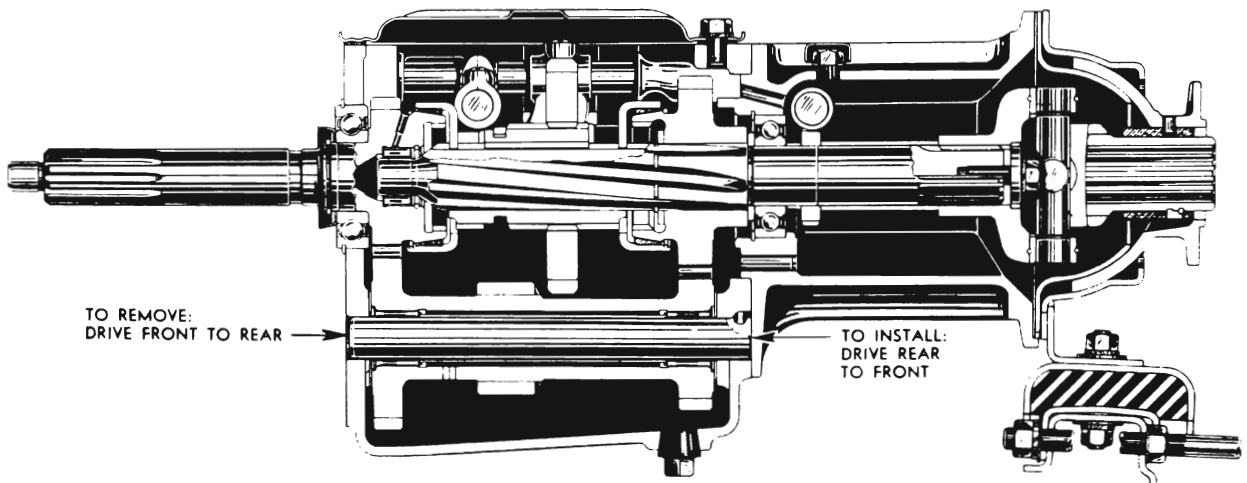


Fig. 7-5. Transmission—Series 50

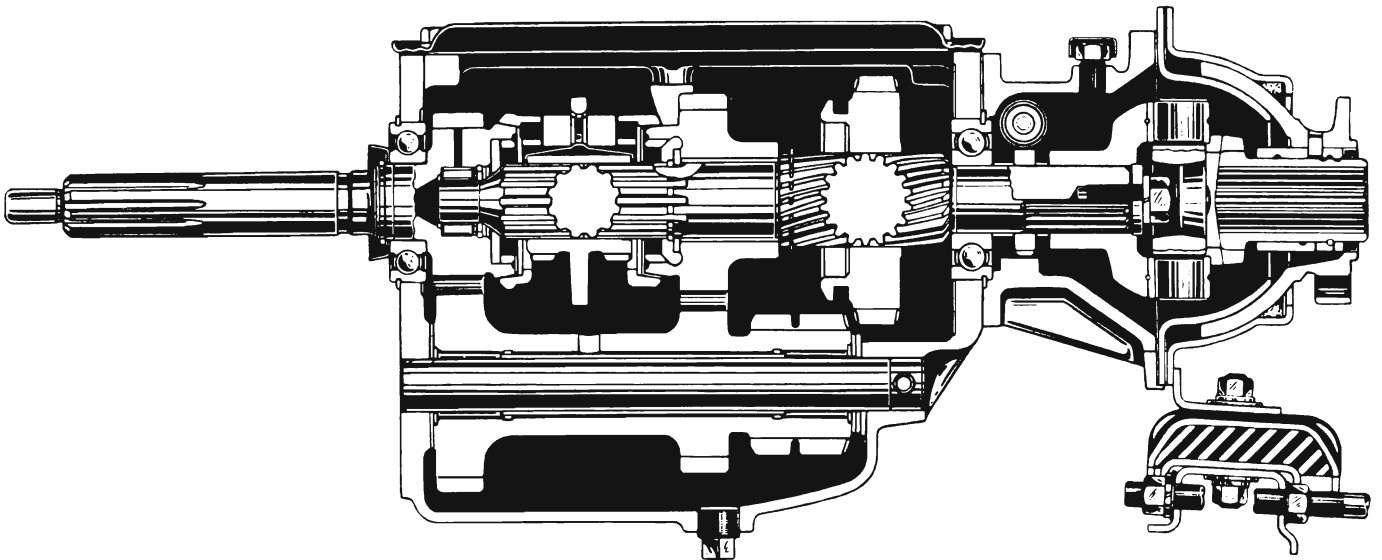


Fig. 7-6. Transmission—Series 60-70-90

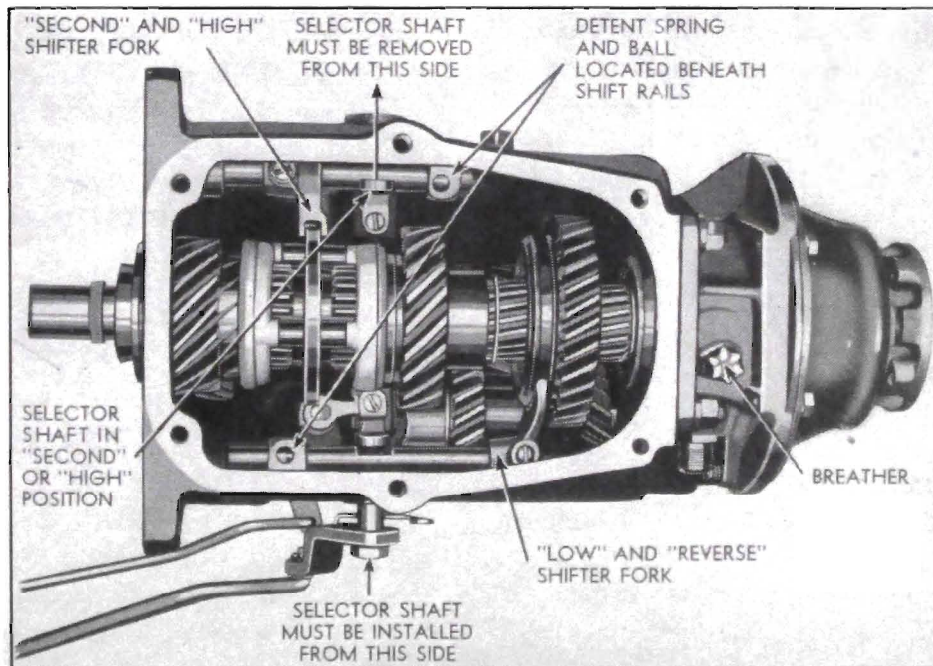


Fig. 7-7. Transmission—Series 60-70-90

Considerable damage can be done if bearings are spun at excessive speeds.

Do not lay bearings down on bench where filings and dirt are likely to get into the bearing with the old lubricant.

Wrap bearings in any dry, clean paper until they can be washed and re-lubricated, and then inspected as to fitness for reinstallation.

Bearings should be washed in clean gasoline or kerosene. The bearings may be strung on a wire and sloshed in the cleaning fluid to remove old oil or grease. Shielded type bearings should be held, while sloshing, with the shield side up to permit the dirt to drop out readily. Afterwards they may be rotated by hand in the fluid to complete the removal of old lubricant and dirt. Do not let bearings contact the bottom of container to prevent picking up any dirt that may have settled.

Blow out the bearings with clean, dry air. Let air run a while before turning it into the bearings, to eliminate fine dirt and moisture.

The air hose *must not* be directed so as to spin the bearing while cleaning, because a very high speed can be attained and considerable scratching and scoring will be done before the dirt is blown out. The correct method is to direct the air squarely into the open side or face of the bearing, while holding the inner race and slowly rotating the outer race by hand. Continue until all loose dirt is removed.

After the bearing is thoroughly cleaned, oil the bearing with clean new engine oil, rotating the bearing by hand to distribute the lubricant to all surfaces.

Inspection After Cleaning

Inspect bearing visually for cracks and defects or evidence of damage incurred during the removal.

Rotate the bearing slowly by hand with enough pressure on the races to force the balls into proper race contact.

If the bearing is smooth or only slightly rough after cleaning and oiling, it should be re-assembled.

Transmission bearings are built originally with end-play. Therefore, because they may feel quite loose does not necessarily indicate they are unsuitable for reassembly.

All Series

Front Transmission Bearing is a shielded type of ball bearing. Shielded side of bearing is toward inside of transmission. Inner race of bearing and an oil slinger are held on transmission main drive gear by a snap ring. Outer race of bearing is grooved for snap ring which fits between transmission case and flywheel housing and holds outer race in place. See Figs. 7-1, 7-5 and 7-6.

Rear Transmission Bearing is a ball bearing. Outer race is held in position in the rear bearing retainer by snap ring in the retainer on Series 40-50. Series 60-70-90 are held by a snap ring on the outer bearing race held in position when end plate is assembled to transmission case. Inner race is held on transmission main shaft by universal joint. See Figs. 7-1, 7-5 and 7-6.

Main Shaft Pilot Bearing used at front end of main shaft is a roller bearing. This bearing is composed of 14 rollers which keystone themselves in place when they are assembled in transmission main drive gear. Transmission main drive gear inside diameter serves as bearing outer race. Rollers are prevented from moving out of the gear by a thrust washer and a snap ring. The end of transmission main shaft acts as an inner race. See Figs. 7-1, 7-5 and 7-6.

SHIFT CONTROL

Shift control and the selection of the different ratios in the transmission is accomplished by a control assembly built in with the steering column and consists of a series of levers, shafts and rods, which all have a definite relation to each other and when properly assembled and adjusted will give easy and positive control of gear shifting. The assembly of the levers, shafts and rods are such that noises will be held to the minimum if proper servicing is carried out. See Fig. 7-8.

Control Lever

The **control lever bearing** in the **control lever housing nut** is a fabricated bushing, sup-

ported on the inner side by a bearing seat held in **control lever housing**. The outer side of bushing is supported by the **control lever housing nut**. **Control lever housing nut** should be drawn up tight so that shoulder in nut will seat and lock bearing seat to the housing assembly. Thus the bearing for the control lever is formed. The **control lever bearing** located on **control lever** must be assembled with the small outside diameter toward the housing end.

Control Shaft

The **control shaft** assembly is tubular and encircles the **steering tube**. The upper end of **control shaft** is key slotted in two places opposite each other to locate the **control lever housing**. The **control lever housing** is a slip fit over the **control shaft** and clamps to shaft by clamp screw. Upper end of the **control lever housing** forms the bearing for the **control shaft** and **control lever housing** assembly where it is located in metal and fabric bearing in the directional signal switch housing. The lower end of **control shaft** is reduced in diameter and is supported by the **control shaft lower bearing** located in the steering gear housing.

CAUTION

In assembling **control shaft** in either upper or lower bearings care must be used not to score fabric in bearing which would result in hard shifting of gears. If for any reason these bearings are removed, new ones should be installed, using Tool J-1585 for upper and J-1587 for lower replacement of bearing. Removal of the bearings can best be made by using Tool J-1583.

At the lower end of **control shaft** is located the **control shaft lower lever**. This lever is pressed over the **control shaft** and spot-welded for location, and is not adjustable.

To protect the lower **control shaft bearing** from dirt and water a **steering gear shedder** is pressed in steering gear housing after the bearing has been installed. This shedder is covered with a metal cup which is part of the **control shaft** assembly and forms the seal.

Care must be used in handling these parts to prevent damage to the seal.

The lower end thrust of the **control shaft**

assembly is taken on the **control lever housing**. In the upper end of the mast jacket is a plate welded in place to locate the lower thrust washers. There are two washers forming this thrust. A flat steel **lower plain washer** located next to plate in mast jacket, and a fabric **lower thrust washer** above the steel washer and next to the **control lever housing**.

The thrust at upper end is taken between the **control lever housing** and the directional signal switch housing. Three washers form this thrust bearing — a flat fabric, **upper thrust washer** located next to the **control lever housing**, a flat steel **upper plain washer** above the fabric washer, and a **spring washer** between the flat steel washer and the directional signal switch housing.

The upper thrust washers are installed in the signal switch housing before the O & S bearing is pressed into place and cannot be removed or installed without the removal of the bearing.

Selector Control Rod

The selection of either low or reverse, second or high gear shifting is controlled by a selector control rod located in the steering column jacket to the right of the shift control shaft and is operated by either raising or lowering the control lever when transmission gears are in neutral position. See Fig. 7-8.

The **selector control rod** has five rubber sleeves located at points where **selector control rod** may contact either **control shaft** or the steering column jacket, to reduce noise during movement of the selector assembly.

At the upper end of **selector control rod** is a socket provided for engagement of the inner ball end of the **control lever**. The lower part of socket is integral with the **selector control rod**. In the upper part of socket is a **plunger** held in place by the **plunger spring**, the outer coil of which locates in groove cut in the socket and retains the assembly as well as furnishing the tension necessary.

The lower end of **selector control rod** is provided with a pin which connects with **selector control lever**. This **selector control lever** is fastened to a bracket with a pin held in place by

a hair pin lock. The **selector control lever** is positioned to hold the **control lever** down in the second and high gear position by a **return spring** connected from the lever to the mast jacket.

The **selector rod** connecting outer **selector lever** of the transmission and the **selector control lever** is a one-piece assembly provided with a trunnion at the **selector control lever** end for making adjustment. The **selector rod** has a coil **return spring** located just ahead of the dash and fastened to the dash for support. This spring also serves to help locate **control lever** in second and high gear position.

Shift Rods

Two **shifter rods** are used on all series—one short, non-adjustable rod and one long rod provided with an adjustment at front end. These rods both connect to an idle lever supported by an **idler lever bracket** mounted on the steering gear. The lever is bushed and carried on a pin which requires lubrication. Pin fits into bracket against shoulder and is locked with nut and washer.

Adjustments

1. Shift transmission to neutral.
2. To adjust the **selector control lever**, move **selector rod** to rear as far as possible and adjust trunnion to fit in bushing in **selector control lever**.
3. Adjust **shift rod** at idle lever as follows: Locate transmission gears in second speed. Adjust clevis at **shifter rod** on **idler lever** so that **control lever housing** clears opening in mast jacket by $\frac{1}{8}$ ". This adjustment should give an approximate $\frac{1}{8}$ " clearance of **control lever housing** at mast jacket when **control lever** is in high gear position. *Clearance of control lever housing must be maintained at both upper and lower opening in mast jacket.*

Service Information

The **control lever** is provided with a **housing shield** which locates just inside the steering column jacket. At each end of seal a notch is

moulded in the rubber to identify the top for making correct assembly.

On the inner end of **control lever** an anti-rattle grommet prevents noise if **control lever** is shifted roughly.

When making assembly if the directional signal switch wires have been removed care must be used in replacing them. The wiring harness should be flattened to permit clearance of assembly in the mast jacket.

To get the rubber grommets, fabric and steel washers in their proper places when servicing a shift control, use the instruction in this manual.

Lubricate the **control lever** in **selector rod socket** and **selector rod pin** in **selector control lever** with "Lubriplate."

To remove or replace selector rod: The steering column jacket should be removed as clearance in assembly does not permit easy removal.

Fig. 7-8 shows the complete assembly of component parts in their relative positions.

1. Transmission **selector shaft** must be free in transmission and in transmission case seal. A bind at this point will prevent **return spring** from automatically dropping lever to second speed side as shift is made from low to second gear.

NOTE: Spring washer, plain washer and seal as shown directly below **inner selector lever** and **lever shaft** are assembled inside transmission case at upper end of shaft as line and bracket in drawing indicates.

2. **Selector shaft must be removed by driving same out of right side of transmission. Shaft must be installed from left side, otherwise oil seal around selector shaft will be ruined.**

Sealing **plug** on right side will be driven out by shaft and a sealing compound must be used when **plug** is replaced.

3. **Selector shaft and low and reverse shifter rail** on Series 40-50 must be removed before removing **inner selector lever and**

shaft. Selector shaft only need be removed on Series 60-70-90 to remove the selector lever and shaft.

4. **Selector shaft and shift rails** if bent will cause hard shifting. All rods are assembled with combinations of plain, spring, and insulating washers and should be replaced when making an assembly.
5. **Control lever knob screws on control lever** and must be removed when replacing the housing nut. **Control lever bearing** is formed with two different radii and must be assembled with small radius toward column bracket.
6. **Control lever** and movable parts of socket assembly should be lubricated with "Lubriplate" when lubrication appears necessary. All series have an **idler lever** connection at steering gear housing which requires lubrication at regular chassis lubrication periods or when shifting becomes difficult.
7. To remove transmission: **Outer selector lever** and outer **shift lever** (Series 40-50 only) must be removed before bolt holding the transmission to flywheel housing can be removed.
8. **Easy operation of shift assembly will depend entirely upon proper assembly and adjustment.**

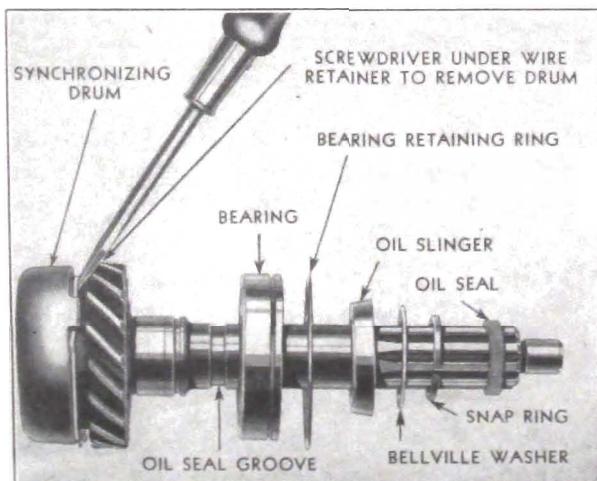


Fig. 7-9. Transmission Main Drive Gear

Transmission Main Drive Gear

All series have 10 spline $1\frac{1}{8}$ " shafts where clutch driven plates mount. Front end of main drive gears are supported by pilot bearing. See Fig. 7-9.

See "Main Drive Gear Pilot Bearing," Clutch Section.

See "Transmission Main Drive Gear Snap Ring."

Counter Gear

The counter gear has its three gears integral and is supported on a stationary countershaft by roller bearings. See Fig. 7-10. A metal spacer and hardened thrust washers are assembled between the two bearings to position rollers, on Series 40-50. Series 60-70-90 have spacer only. The counter gear end thrust is taken by bronze washers at each end. Hole is provided in hub of counter gear to provide lubricant for shaft, bearings and thrust washers.

Series 40-50 counter gear shaft is prevented from turning or moving forward by a ball lock at rear end of shaft. Case is machined to furnish slot for ball. See Figs. 7-1 and 7-5.

Series 60-70-90 counter gear shaft is prevented from turning or moving forward by a special grooved pin driven partly through case and into hole in counter gear shaft. See Fig. 7-6.

Reverse Idler Gear—All Series

The reverse idler gear is supported on a stationary shaft in bronze bushings and the thrust is taken by bronze thrust washers at each end of gear.

A special grooved pin is used to hold shaft in case.

Servicing Special Grooved Pins

When in locked position the outer end of pin is $\frac{5}{8}$ " to $\frac{3}{4}$ " past flush surface of transmission case boss. When in this position approximately half of length of pin is tight fit in case while other half extends into drilled hole in idler shaft.

Driving pin into case as far as it will go causes full length of pin to be in shaft and enables shaft to be removed. A new pin should always be used when assembling and sealed to prevent oil leaks.

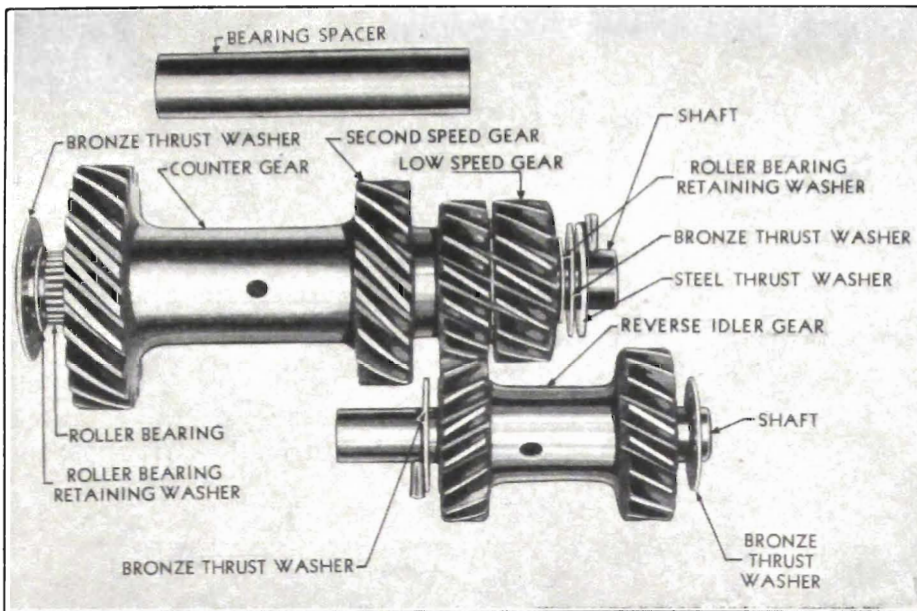


Fig. 7-10. Counter Gear—Series 60-70-90

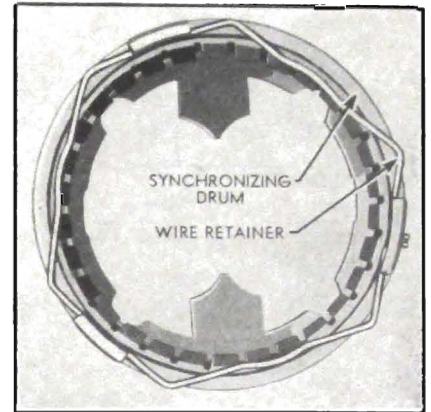


Fig. 7-11. Synchronizing Drum—Series 40-50

SYNCHRONIZING DRUMS

Drums on Series 40-50 have an 8° angle at both faces. Bronze drums must always be used at second speed gear contact. See Figs. 7-11 and 7-12. Series 60-70-90 drum assemblies are marked with letter "S" indicating second speed side of assembly and have a 7° angle. See Fig. 7-13.

NOTE: All service gears are marked with "8" for Series 40-50 and "7" for Series 60-70-90 and are not to be confused with past models.

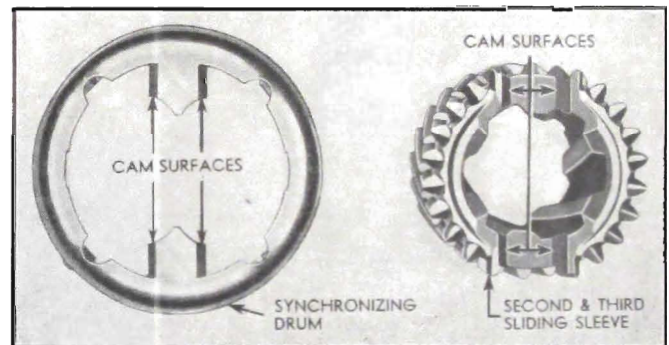


Fig. 7-12. Cam Surfaces—Series 40-50

Speedometer and Drive—All Series

The AC 120 pointer type speedometer is used on all series. All speedometers are equipped with 1000 mile trip odometer.

The sleeve and driven gear assembly is assembled to the transmission bearing retainer and the cable is attached by a threaded sleeve to driven gear assembly. See Fig. 7-14. Speedometer driving gear is pressed on front end of universal joint.

Speedometer outer cables should never be kinked sharply as this causes binding which results in noise.

Speedometer cables are marked with paint to designate clip location. It is important to locate

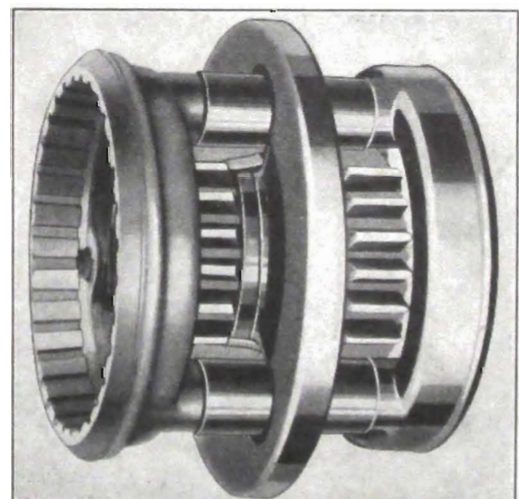


Fig. 7-13. Synchronizing Drums—Series 60-70-90

the cable so that clip is in center of painted mark to avoid kinking which will cause whipping of the shaft and result in noise.

In checking speedometers for accuracy consideration must be made for worn, under or over inflated tires, oversize tires, and the fact that the circumference increases appreciably with speed due to centrifugal force.

If axle ratio, tire size, driven gear, and driving gear are standard, the accuracy of speed

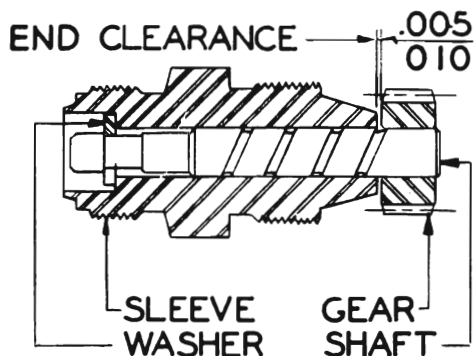


Fig. 7-14. Driven Gear Assembly

indicated by speedometer may be checked without removing speedometer from car. Use the following method:

1. Drive car at speed indicated on speedometer, which is desired to be checked.
2. Measure as accurately as possible the number of seconds required to travel one mile as measured by trip odometer.
3. Divide 3600 by number of seconds to travel one mile. Result will be actual speed of car.

When replacing the driven gear it is necessary to check the number which is stamped on the side of the gear, in reference to the models to which it is assigned.

The following table shows the number of teeth in both driving gear and driven gear for standard and optional ratio rear axle gears. Ratios are based on standard size tires. One driving gear used for all series. In changing axle ratios it is only necessary to change to the proper driven gear.

Series	Axle Ratio	No. Teeth in Driving Gear	No. Teeth in Driven Gear
40—118" W.B.	4.1	7	21
40—121" W.B.	4.4 Std.	7	22
	4.1 Opt.	7	21
50	4.4	7	22
60	3.9	7	19
70	4.1	7	20
90	4.55	7	21

UNIVERSAL AND BALL JOINT ASSEMBLY

All Series

The universal joint is entirely enclosed by the ball drive housing and bearing retainer and is lubricated automatically from the transmission.

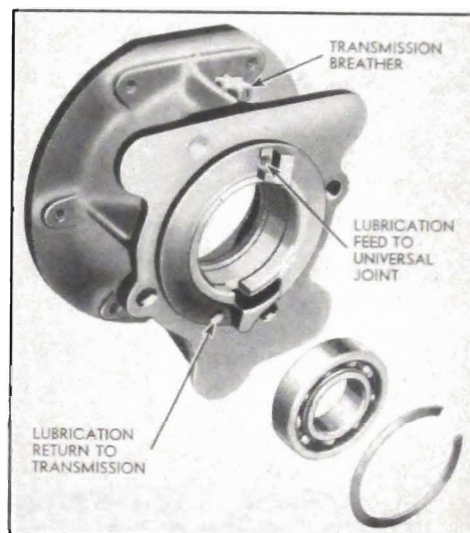


Fig. 7-15. Rear Bearing Retainer—Series 40

The hardened and ground steel cross is fitted with hardened and ground bushings to prevent wear on pins. The bushings are locked in place by dowel pins or retainer rings.

On the Series 40-50, lubricant enters through oil hole in top of retainer. See Fig. 7-16. On the Series 60-70-90, transmission oil is carried through a groove in top of first and reverse shift rail to retainer.

NOTE: In the Series 60-70 there is an oil seal just back of the universal joint bronze bushing. See Fig. 7-16. Use service tool J-1335 to prevent damage to oil seal when assembling. On Series 90 this seal is omitted at this position and torque ball bushing is so grooved as to permit oil to pass

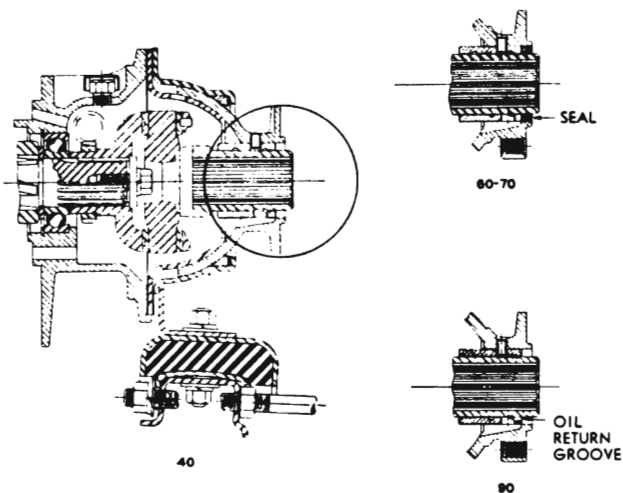


Fig. 7-16. Universal Joint and Driving Ball

through to lubricate bearing at steady rest, and the oil seal is placed back of this bearing.

All series permit oil to be drained back from torque ball to transmission. See Figs. 7-15, 7-17.

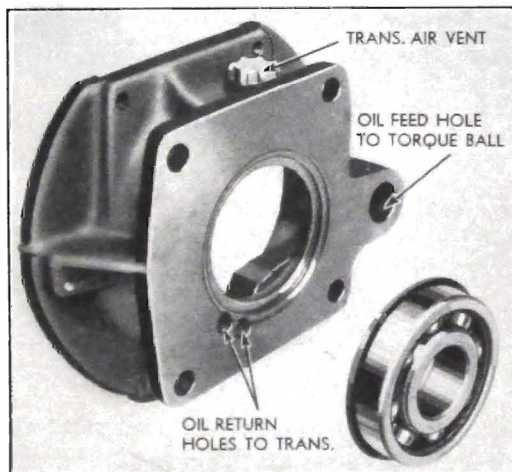


Fig. 7-17. Rear Bearing Retainer—Series 60-70-90

The driving ball is connected to the torque tube by means of a flange, and is supported between two copper plated stampings (inner and outer retainers) which are centrally located and bolted to the transmission rear bearing retainer. The ball is plated on both the inner and outer surfaces to prevent scoring during break-in. The driving ball is marked with the word "TOP" to insure correct assembly.

The outer retainer carries a cork oil seal and spring washer that maintains a constant pres-

sure on cork between the outer retainer and torque ball to prevent oil leak.

Spring washer is slightly cupped to afford tension and should be installed in retainer so that gap occurs between inside diameter of washer and edge of retainer.

In cases of leak, it is advisable to disconnect rear axle housing and remove shims between the inner and outer retainer until the ball is a snug fit between the retainers. **Make this adjustment with cork seal removed. The joint should be fitted so that it can be moved by hand, not using a bar in end of joint. Reinstall cork seal. If the ball has end-play it will act as a pump and the cork packing gland will not stop leak.**

Transmission Support Mounting

Transmission support mounting is a part of the engine mounting arrangement. The support should be adjusted so that no upward or side-wise tension is placed on transmission. (See "Engine Mounting" section.) The rod running from frame X-member to support mounting should be adjusted so that no tension is placed on rod.

Removal and Disassembly of Transmission

All Series

1. Drain lubricant. Fill with clean gasoline or kerosene and run transmission in neutral for about 15 seconds. Drain cleaner.
2. Remove transmission from car. First remove rear axle. Follow sequence for "Axle Removal," Axle section.

Remove rear transmission support and steady rest rod. Attach shims used at each

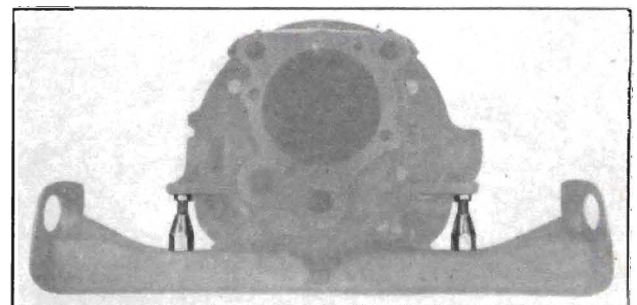


Fig. 7-18. Engine Jacks (Tool J-1580) in Position

end of transmission support to ends of support so that same number of shims will be used on each side when reassembled.

3. Support rear of engine, using engine jacks, Tool #J-1580. See Fig. 7-18. Place jacks each side of engine mounting, locating pilot end of jack in holes in flywheel housing and bottom of jack on frame cross member. Tighten jacks to relieve engine loads from mounting.
4. Remove transmission mounting bolts. On Series 40-50 first remove both selector and shift levers.
5. Insert Guide Pins J-851. Unless transmission guide pins are used, there is danger of damaging clutch hub. Remove both nuts holding transmission to rear engine mounting. Engine mounting bolt heads are located in notches in mounting to prevent turning and should be properly located when assembling.
6. Remove any strain on engine mounting bolts by either raising or lowering engine jacks.
7. Remove transmission.
8. Remove cover, shifter shafts, selector rails, forks, springs and balls.
9. Drive counter gear shaft out rear of transmission. Series 40-50 is retained in case by a ball. Series 60-70-90 is retained by a pin which must be driven in before shaft is removed.
10. Use service tool J-1334 for Series 40-50 and J-1001 for Series 60-70-90 to retain rollers in counter gear when removing shaft.

Remove the universal joint driving ball and end plate assembly from the back of the transmission.

Series 40-50

1. Main shaft and second speed gear will come out with end plate assembly.
2. If sliding sleeve and low speed gear are not to be removed the selector shaft and shift rails need not be removed.
3. Remove snap ring and thrust washer from front side of second speed gear and remove second speed gear.
4. Remove snap from front side of transmission rear bearing retainer and remove rear bearing retainer from shaft assembly.

Series 60

1. To disassemble main shaft through top of case, remove both shifter fork lock screws.
2. Move synchronizer drum assembly in high gear position.
3. Move main shaft assembly back until end of shaft is clear of pilot bearing.
4. Lift main shaft up and to the left until shifter fork clears collar on synchronizer and move fork to rear of case.
5. Hold main shaft up and move to right side to clear low and reverse shifter fork from gear. Move fork forward.
6. Remove synchronizer assembly.
7. Remove second speed gear snap ring, slide assembly forward and remove low speed gear stop ring. See Fig. 7-21.
8. Holding second speed and low and reverse gears, remove main shaft and bearing assembly through rear of case.

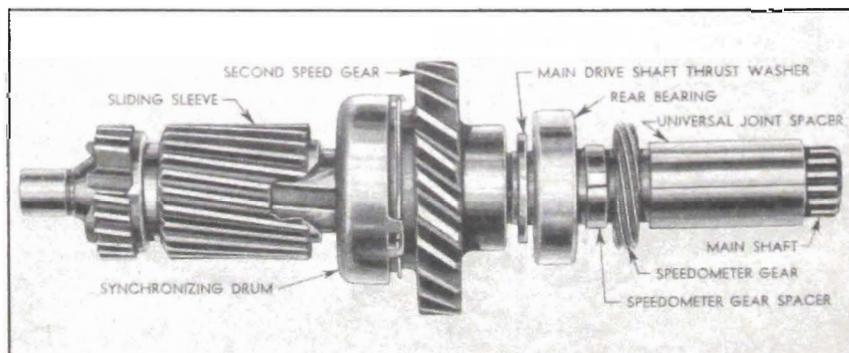


Fig. 7-19. Transmission Main Shaft Assembly—Series 50

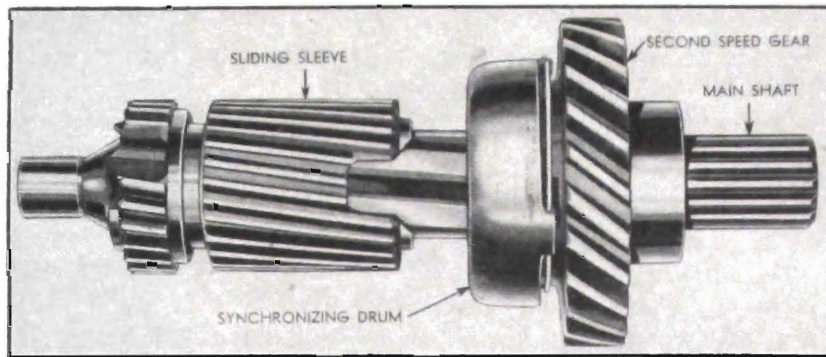


Fig. 7-20. Transmission Main Shaft Assembly—Series 40

9. Press off bearing.
10. Transmission main drive gear is removed through case. Counter gear shaft must be removed to allow counter gears to drop before front bearing will clear.

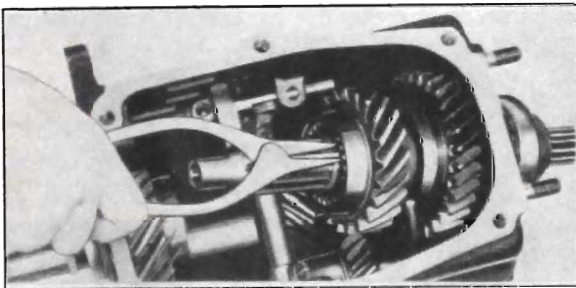


Fig. 7-21. Removal of Second Speed Gear

Assembly of Transmission—All Series

Follow the reverse order of Transmission Disassembly. In addition, the following instructions should be followed:

During assembly of the transmission, prevent scoring or bruising of any part. Nicks in gear teeth are certain to cause noise. Nicks in either bronze or steel cones prevent proper synchronization.

All dirt or foreign substance of any nature must be excluded from the transmission to pre-

vent abnormal wear of annular bearings, bronze bushings, and all synchronizing parts.

The teeth of all gears should show no pitting. Do not confuse manufacturing cutter marks with scores or pits. Bearings must be "free turning" and free from score marks on either raceways or rollers. The sliding sleeve on Series 40-50 main shaft and the synchronizing unit assembly of Series 60-70-90 must slide freely. The bronze cones must be free from scores and oil grooves clean.

If steel cones on any series show scoring or cutting, the synchronizing action will be too severe. This may result in "lock out" as gear shifting is attempted. The steel cones may be smoothed up with fine emery cloth and finished with polishing cloth, being careful not to change the cone angle. **Never polish or change the angle of the bronze cones.**

Make certain that shifter forks and selector shaft cams are securely fastened to shafts. Shifter forks that are bent or out-of-line with shifter shafts will not engage the sliding clutch flange with equal pressure on both sides and will produce hard shifting and noise.

Interlock bushing on Series 60-70-90 must be installed with the large diameter toward the transmission case and not toward shifter cam.

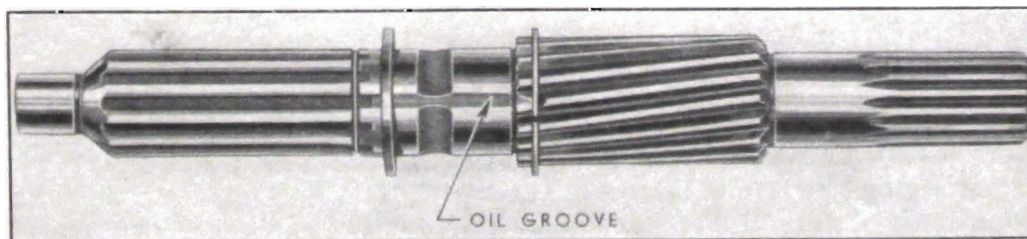


Fig. 7-22. Transmission Main Shaft—Series 60-70-90

If bushing is installed with large diameter against shifter cam no control of the interlocking of the second and high shift rail will result. A shift into low and reverse may lock the gears.

Transmission Snap Rings

Transmission overhaul will be more satisfactory if new snap rings are used to replace the snap rings removed. This practice eliminates time and care necessary to remove same without damage resulting in future failure. Therefore, a supply of the various rings should be carried in stock.

If new rings are not available, round up the used rings by springing the ring in a vise until it is round and gaps meet. Install snap rings, using tool J-1267, to avoid damage to rings.

TRANSMISSION SERVICE INFORMATION

(All Series)

Neutral Noise

In neutral position, engine running, car not moving, front transmission bearing, transmission main drive gear, counter gear, reverse idler, second speed gear and bearings of these parts are in operation. Disengaging clutch will stop movement of all transmission parts. By engaging and disengaging clutch it can be determined whether or not noise is normal.

Noise in neutral in the form of a constant regular click is usually caused by a nicked gear or bearing.

If necessary to disassemble transmission, check gears, bearings, and end-play of all parts operating in neutral.

Gear Noise

If noise is limited to any one or more transmission speeds, trace the gears under load and examine same for damage. Some gear noise is to be expected in all except high gear. Comparison with another car is the only means for determining whether or not noise is excessive.

Gear Clash when Shifting

Refer to Clutch section "Low and Reverse Gear Clash" if noise is in these gears.

Second gear and high gear clash is the result of: broken detent springs, improper amount of synchronizer end-play, poor synchronizing cone

surfaces or too much main shaft end-play or improper clutch release.

Gear Rattle During Acceleration

Rattles occurring in high gear on wide open throttle and between 40 and 60 M.P.H. are usually caused by improper clutch driven plate dampening. A new driven plate should be tried. See "Clutch Driven Plate" section. Improperly calibrated driven plates or scored axle gears may cause transmission rattle at lower speeds on part throttle. Engine torsional balancer should also be checked.

Noise when Shifting Out of Low or Reverse

Shifting out of low or reverse gear 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 normal shift may be caused by damage to pointing on engaging side of counter gear, reverse idler or low speed gear, or improper clutch release. If noise is abnormal when disengaging both low and reverse, it indicates that fault is with low speed gear only. Noise disengaging reverse only indicates reverse idler at fault. Noise when disengaging low only indicates counter gear at fault. **Tests must be made by disengaging gears while car is still in motion.**

Shifter Fork Noise

This noise is most likely to be apparent while driving in high because both shifter forks are being used to position the gears they control. If noise changes as shift lever is moved slightly but retained in high gear position, it indicates that noise is caused by high and second gear fork. Alignment and polishing of contacting surfaces will remedy noise.

Gear Jump-Out

Jump out of high gear is most likely to be caused by improperly adjusted engine mountings, misalignment of transmission with fly-wheel, excessive main shaft end-play, damaged or poor fit of sliding sleeve or synchronizing unit in transmission main drive gear.

Jump out of second gear may be caused by poor or damaged fit of sliding sleeve or synchro-

nizing unit in second speed gear, too loose fit of sliding sleeve or synchronizing unit on main shaft or excessive main shaft end-play.

Jump out of low or reverse may be caused by too loose fit of sliding sleeve and low speed gear on main shaft.

Loose fit of bearings or bushings involved may cause jump out in any gear. If transmission has jumped out of gear many times while under load, it may be necessary to replace the mating parts affected. This is because the gear teeth of the mating parts have become beveled.

Lack of sufficient tension on shifter shaft retainer springs may cause jump out of any gear.

Hard Shifting

Hard shifting at start of shift may be caused by too much tension on shifter shaft retaining springs.

Block out of high or second gear may be caused by scored synchronizing cones or drums. Rough cam surfaces on ends of sliding sleeve and on synchronizing drum cams will also cause block out.

Transmission Lubricant Passing to Rear Axle

Scored universal joint or bushing, gasket plugging return hole, more than .006" clearance between universal joint and bushing, loose adjustment of ball joint or run-out of front end of propeller shaft may cause transmission lubricant to pass to rear axle.

SPECIFICATIONS—TRANSMISSION AND UNIVERSAL JOINT

ITEMS	SERIES 40-A	SERIES 40-B	SERIES 50	SERIES 60	SERIES 70	SERIES 90
TRANSMISSION—Conventional						
Make	Own	Own	Own	Own	Own	Own
Type	Synchro-Mesh	Synchro-Mesh	Synchro-Mesh	Synchro-Mesh	Synchro-Mesh	Synchro-Mesh
Type of Gearing	All Helical	All Helical	All Helical	All Helical	All Helical	All Helical
Location	← Units with Engine →		← Units with Engine →		← Units with Engine →	
Number of Forward Speeds	Three	Three	Three	Three	Three	Three
Transmission Ratio—						
In High	Direct	Direct	Direct	Direct	Direct	Direct
In Intermediate	1.66 to 1	1.66 to 1	1.66 to 1	1.53 to 1	1.53 to 1	1.53 to 1
In Low	2.67 to 1	2.67 to 1	2.67 to 1	2.39 to 1	2.39 to 1	2.39 to 1
In Reverse	3.02 to 1	3.02 to 1	3.02 to 1	2.53 to 1	2.53 to 1	2.53 to 1
Total Gear Reduction (Engine to Rear Wheel)						
High Gear—						
With Regular Axle Ratio	4.083 to 1	4.445 to 1	4.445 to 1	3.923 to 1	4.083 to 1	4.555 to 1
With Optional Axle Ratio	—	4.083 to 1	—	—	—	—
Intermediate Gear—						
With Regular Axle Ratio	6.777 to 1	7.379 to 1	7.379 to 1	6.002 to 1	6.2469 to 1	6.9692 to 1
With Optional Axle Ratio	—	6.777 to 1	—	—	—	—
Low Gear—						
With Regular Axle Ratio	10.902 to 1	11.868 to 1	11.868 to 1	9.376 to 1	9.758 to 1	10.886 to 1
With Optional Axle Ratio	—	10.902 to 1	—	—	—	—
Reverse Gear—						
With Regular Axle Ratio	12.331 to 1	13.424 to 1	13.424 to 1	9.925 to 1	10.330 to 1	11.524 to 1
With Optional Axle Ratio	—	12.331 to 1	—	—	—	—
Transmission Oil Capacity	1¾#	1¾#	1¾#	2½#	2½#	2½#
Oil Grade Recommended—						
For Temp. Above Minus 10° F.	S.A.E. 90 E.P.	S.A.E. 90 E.P.	S.A.E. 90 E.P.	S.A.E. 90 E.P.	S.A.E. 90 E.P.	S.A.E. 90 E.P.
For Temp. Below Minus 10° F.	S.A.E. 80 E.P.	S.A.E. 80 E.P.	S.A.E. 80 E.P.	S.A.E. 80 E.P.	S.A.E. 80 E.P.	S.A.E. 80 E.P.
SPEEDOMETER GEARS						
Ratio—With 4.083 to 1 Axle Ratio						
Driving Worm	1315023	1315023	—	—	1315449	—
Driven Gear	1315027	1315027	—	—	1315447	—
Ratio—With 4.445 to 1 Axle Ratio						
Driving Worm	—	1315023	1315449	—	—	—
Driven Gear	—	1315011	1315011	—	—	—
Ratio—With 4.555 to 1 Axle Ratio						
Driving Worm	—	—	—	—	—	21 to 7
Driven Gear	—	—	—	—	—	1315449
Ratio—With 3.923 to 1 Axle Ratio						
Driving Worm	—	—	—	1315449	—	—
Driven Gear	—	—	—	1315447	—	—
Ratio—With 3.643 to 1 Axle Ratio						
Driving Worm	—	—	—	—	—	—
Driven Gear	—	—	—	—	—	—
Ratio—With 4.182 to 1 Axle Ratio						
Driving Worm	—	—	—	—	—	—
Driven Gear	—	—	—	—	—	—
UNIVERSAL JOINT						
Number of Joints Per Car	1	1	1	1	1	1
Make	Sag. or Spicer	Sag. or Spicer	Sag. or Spicer	Saginaw	Saginaw	Saginaw
Diameter of Pins	.684"-.685"	.684"-.685"	.684"-.685"	.872"-.873"	.872"-.873"	.872"-.873"
Number of Bearings	4	4	4	4	4	4
Bearings	← 1316574 or 266376 →			← 1316576 or 266379 →		
Type of Bearings	Bushing	Bushing	Bushing	Bushing	Bushing	Bushing
Torque Ball Material	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron	Malleable Iron
Torque Ball Diameter	4¾"	4¾"	4¾"	5"	5"	5"
Torque Ball Bushing	1312410	1312410	1312410	1312608	1312608	1314582
Lubrication	← From Transmission →		← From Transmission →		← From Transmission →	