

# SECTION VI

## TRANSMISSION AND OVERDRIVE

### TRANSMISSION

#### Description

The function of the transmission is to transmit engine torque through the propeller shaft and differential to the rear wheels at the desired ratio and rotation. This is accomplished by use of a helical gear train in the transmission. The transmission has three speeds forward and one reverse.

The side cover supports two short shafts to which the external operating levers are attached. The levers are connected by link rods and relay levers to the steering column gearshift. The shifting forks are mounted on the inner ends of the shafts.

The engine torque is transmitted through a clutch shaft and helical main drive gear which meshes with the forward gear of the countershaft gear cluster. The helical forward center gear of the gear cluster is in constant mesh with the second speed gear, while the straight rear gear is in constant mesh with the reversing pinion. The mainshaft carries the second speed gear, the synchronizer assembly, and the low and reverse sliding gear.

The countershaft gear cluster is supported by the countershaft and four sets of roller bearings, each set having twenty rollers. The mainshaft is supported at the rear by a ball bearing, while the front end of the shaft is supported by fourteen bearing rollers in the end of the clutch shaft gear. The main drive gear is supported by a ball bearing. The second speed gear

and reverse idler pinion are supported by press fit steel backed ball indented bronze bushings.

Engine torque is transmitted to the propeller shaft through the splined universal joint flange attached with a slip fit to the transmission mainshaft. A babbit bearing in the rear of the rear housing supports the flange.

#### Disassembly

Remove the side cover retaining screws and lift the side cover and shift fork assembly from the case (see Fig. 1). To remove the rear housing, the housing, mainshaft, and gears must be removed as an assembly. But, before the assembly can be removed, the countershaft must be removed and the countershaft gear cluster lowered to the bottom of the case. Remove the rear housing retaining screws. Then move the housing rearward approximately one-half inch from the case. Rotate the housing to expose the end of the countershaft (see Fig. 2). The shaft is held in position by a

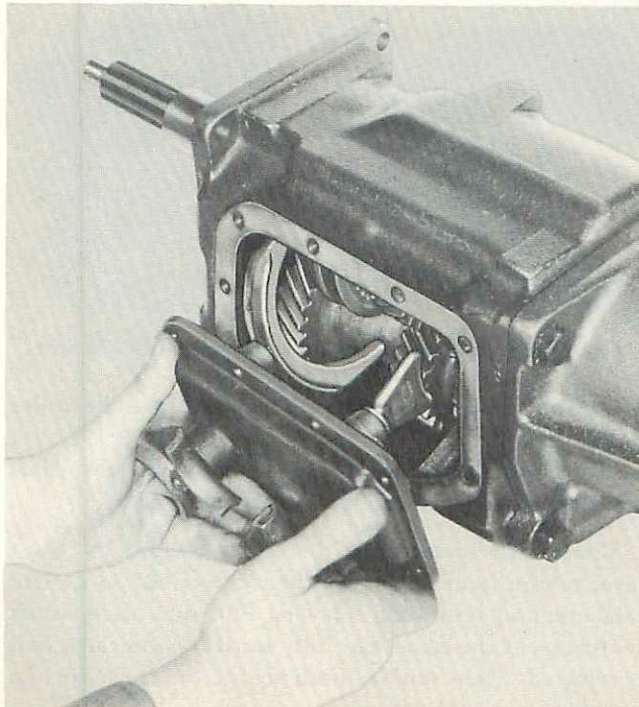


Figure 1—Removing the Transmission Cover

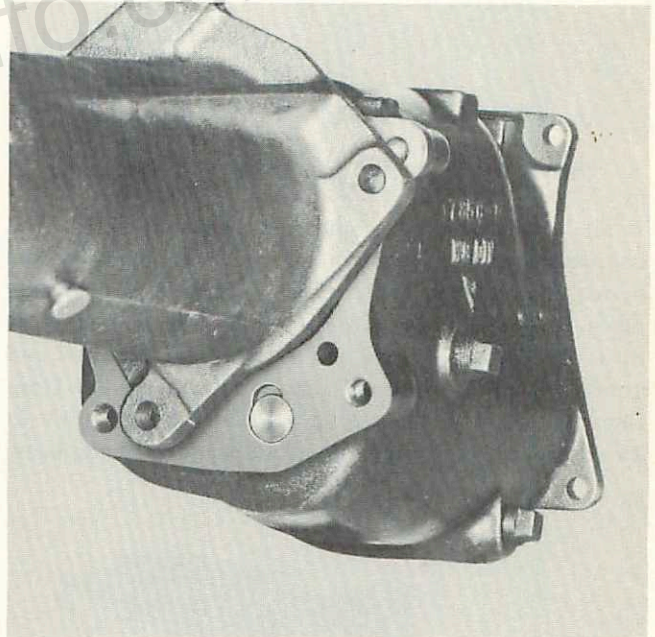


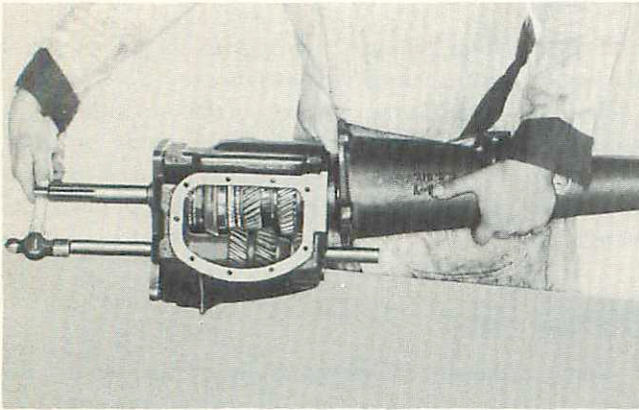
Figure 2—Rotate the Housing to Expose the End of the Countershaft

Woodruff key. Use a suitable drift and start the countershaft back out of the case far enough to permit removal of the key. Then, using the Countershaft Assembly Bar J-5589, drive the countershaft out of the case (see Fig. 3). The countershaft assembly with the assembly bar in place will drop to the bottom of the case. Raise the front end of the mainshaft assembly so that the synchronizer sleeve will pass over the counter-

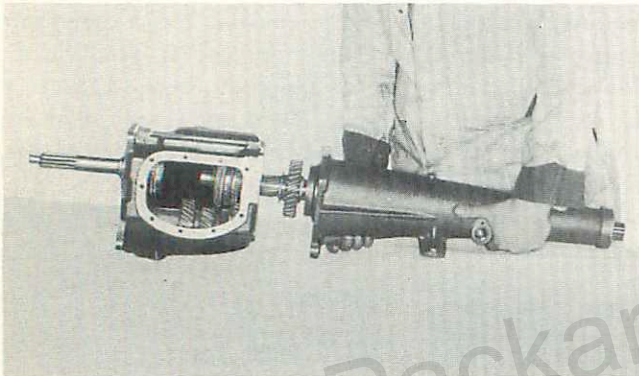


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shaft cluster gear, and remove the assembly from the case (see Fig. 4).

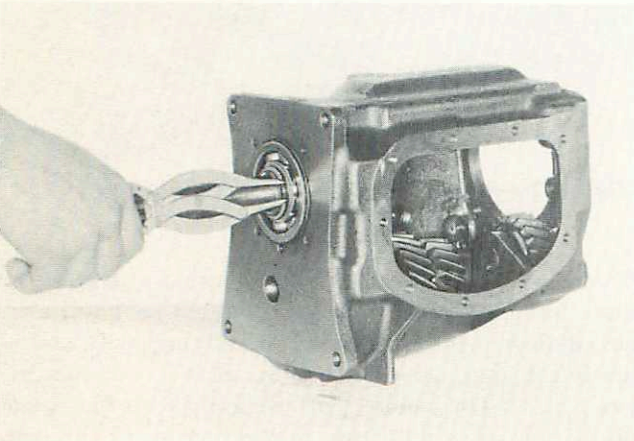


**Figure 3—Driving the Countershaft Out of the Case**



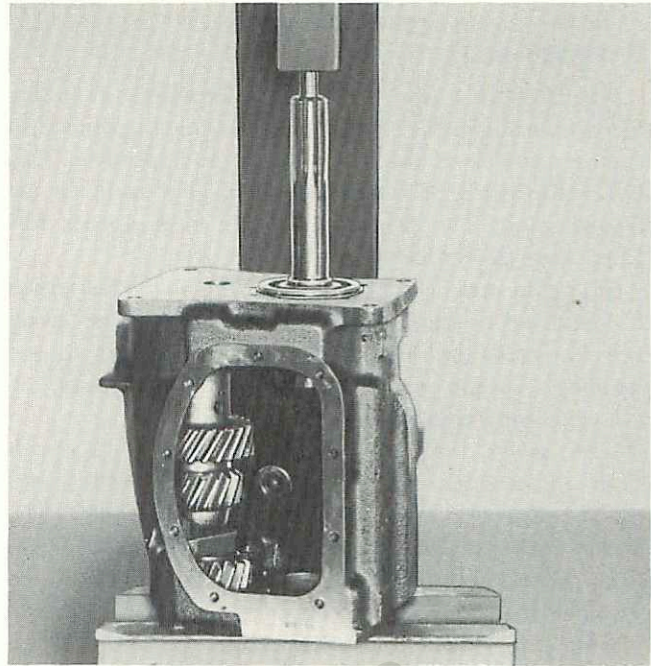
**Figure 4—Removing the Mainshaft Assembly**

The main drive gear must be removed before the countershaft assembly can be removed. Remove the mainshaft front bearing rollers from the bore of the main drive gear. Remove the main drive gear rear bearing retainer screws and remove the retainer and gasket. Remove the small snap ring and washer from the main drive gear (see Fig 5). Place the assembly in an arbor press and press the gear shaft out of the bear-



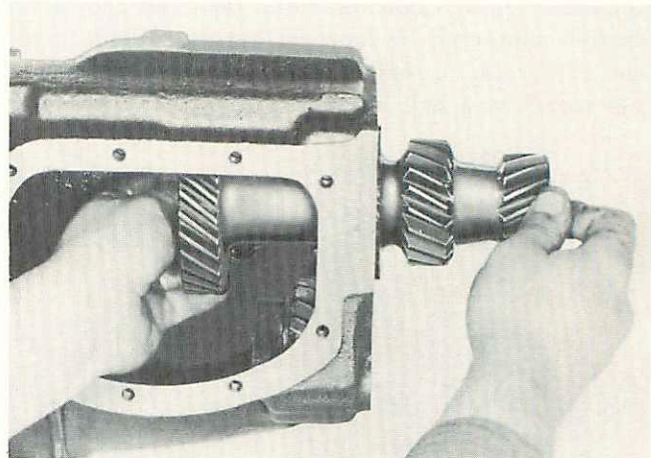
**Figure 5—Removing the Small Snap Ring**

ing (see Fig. 6). Then remove the large bearing snap ring and tap the bearing out of the case.



**Figure 6—Press the Gear Shaft Out of the Bearing**

Remove the countershaft gear cluster from the case (see Fig. 7). When removing the assembly, hold the



**Figure 7—Remove the Countershaft Gear Cluster**

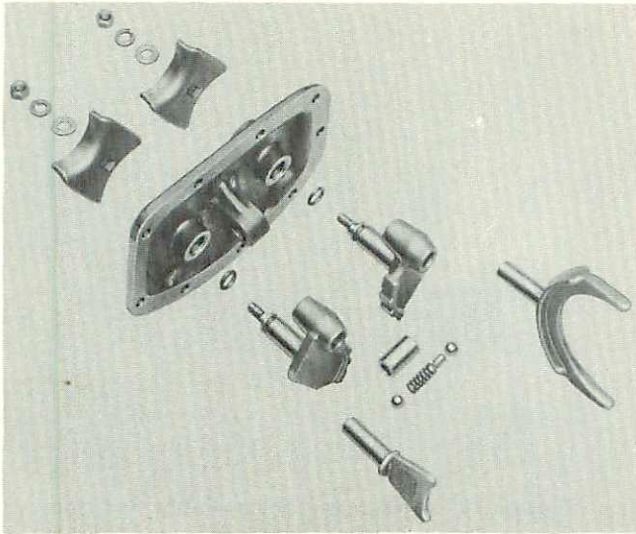
assembly bar in position to prevent spilling the roller bearings.

To remove the reverse idler pinion, tap the shaft rearward out of the case and remove the gear.

**Cover**—To disassemble the cover, remove the shaft lever retaining nuts, remove the lock washers and plain washers, and remove the levers. Pull one of the shift shafts out of the cover carefully until the interlock ball is released. Then remove both shafts, interlock spring, interlock pin, and the other interlock ball. Fig. 8 illustrates the parts of the side cover assembly.

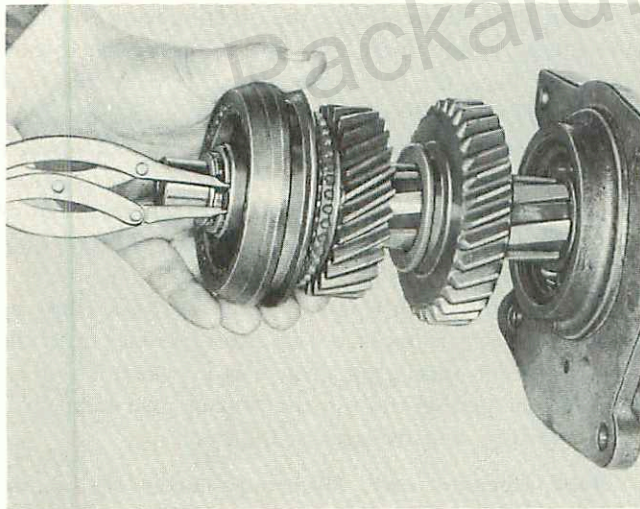


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**Figure 8—Exploded View of the Side Cover Assembly**

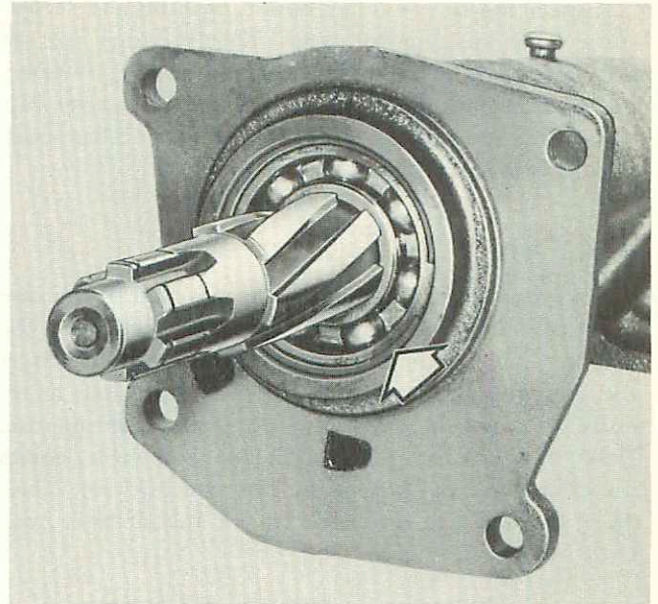
**Synchronizer and Mainshaft Gears**—Remove the front bearing spacer from the end of the mainshaft. Mark the synchronizer sleeve, gear, blocking rings, second speed gear, and the low and reverse sliding gear so that they can be reinstalled in their original positions. Remove the synchronizer gear retaining snap ring (see Fig. 9). Then slip the synchronizer assembly



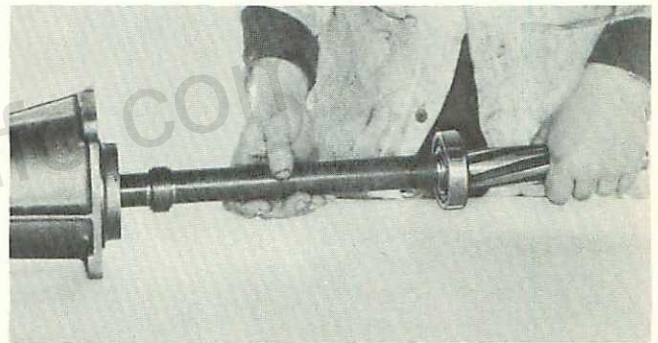
**Figure 9—Removing the Synchronizer Gear Retaining Snap Ring**

off the shaft. Remove the synchronizer blocking ring. Push the synchronizer gear out of the sleeve and remove the three shifter plates and the two synchronizer springs. Slip the second speed gear and the low and reverse sliding gear off the shaft.

**Rear Housing and Shaft**—Remove the bearing snap ring (see Fig. 10). Then tap the shaft and bearing assembly out of the housing (see Fig. 11). Remove the speedometer gear rear snap ring. Slip the gear rearward, remove the drive ball from the shaft, and slip



**Figure 10—Remove the Bearing Snap Ring**



**Figure 11—Removing the Bearing Assembly**

the gear off the shaft. Remove the other speedometer gear snap ring and the bearing snap ring. Press the shaft out of the bearing. Use Axle Shaft Oil Seal Remover J-943-B to remove the rear oil seal from the housing.

**Countershaft Cluster Gear Assembly**—Remove the thrust washers, slip the assembly bar out of the gear, and remove the roller bearings, bearing retainers, and tubular spacer.

## Inspection

Clean all of the transmission parts in cleaning solvent. If the bearings are in good condition and are to be used again, do not wash them or soak them in the solvent. Wipe them clean with a clean, lintless cloth. If the bearings are washed, dry them thoroughly with compressed air but do not allow the bearings to spin. Spinning the bearings will damage the race and balls.

Inspect all gears for wear, chipped teeth, scores, and pits. Inspect the countershaft, reverse idler pinion shaft, and mainshaft for wear or scores.



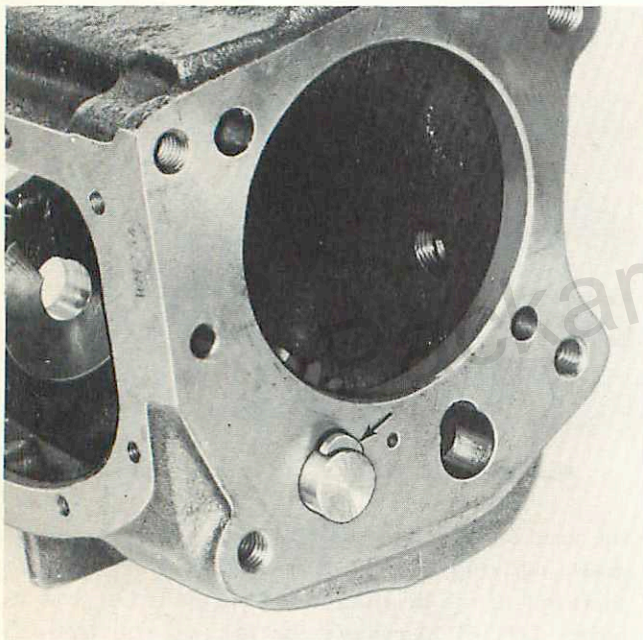
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Inspect the reverse idler pinion bushing and second speed gear bushing for wear. The bushings are not serviced separately. Therefore, if the bushing is worn, the gear and bushing must be replaced as an assembly.

Inspect the bearings for scores, roughness, flat spots, or looseness due to wear.

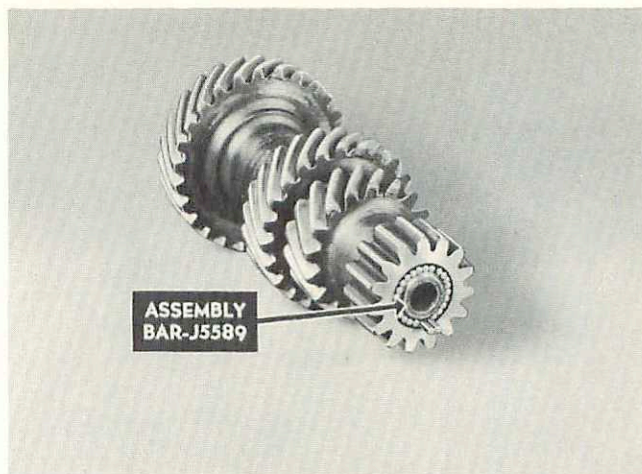
## Assembly

Place the reverse idler pinion in position in the case with the chamfered ends of the gear teeth and the smaller diameter shoulder to the front of the case. Start the shaft into the case and gear. Turn the shaft as required to align the keyway with the cutout in the case. Drive the shaft into the case. Before the keyway enters the case, place the key in the slot (see Fig. 12). Then drive the shaft in until the end of the shaft is flush with the case.



**Figure 12—Place the Key in the Slot**

**Countershaft Assembly**—Place the countershaft gear cluster in a horizontal position. Insert the Countershaft Assembly Bar J-5589 inside the gear cluster and slip the long tubular spacer over the bar to the approximate center of the cluster. Coat twenty of the bearing rollers with a stiff lubricant and install them in the cluster around the assembly bar (see Fig. 13). Install a bearing ring and, with a small screw driver or punch, push the bearing set toward the center of the gear against the spacer. Install another set of twenty bearing rollers around the shaft and install another bearing ring. Then carefully turn the gear cluster and repeat the same procedure for installing the bearing rollers at the other end. Be sure to install a bearing ring at both ends of each set of bearing rollers.



**Figure 13—Countershaft Assembly Bar and Rollers in Place**

Use a stiff lubricant to hold the thrust washers and place the washers on the ends of the cluster. The front (large) thrust washer should be placed so that the lug is up and faces the front when the assembly is installed. The rear washer should be placed against the cluster so the lugs engage the notches in the gear. Then place the assembly within the case and lay it on the bottom of the case. Slip the steel spacer between the case and the rear thrust washer with the tab up.

**Main Drive Gear**—Place the oil slinger on the main drive gear clutch shaft with the concave side toward the gear. Press the bearing in the shaft with the numbered side of the bearing toward the gear. Install the washer and retaining snap ring. The snap rings are available in six different sizes. Therefore, when installing a new snap ring or a new bearing, check the fit of the snap ring in the groove. Install the thickest ring that will seat properly in the groove.

Install the assembly from inside the case. Tap the main drive gear into place with a soft hammer until the bearing outer snap ring groove is exposed. Then install the snap ring and tap the bearing rearward until the snap ring is seated against the case.

**Rear Housing and Mainshaft**—Press the mainshaft into the bearing. Install the small snap ring. Install the front speedometer gear snap ring. Place the speedometer gear drive ball in the shaft and slip the speedometer gear into position over the ball and against the front snap ring. Install the rear snap ring.

Install the rear housing oil seal.

Make sure the mainshaft bearing rear snap ring is in the bore of the rear housing. Then insert the shaft assembly into the housing, tap into position, and install the front snap ring.

## Synchronizer Assembly and Mainshaft Assembly

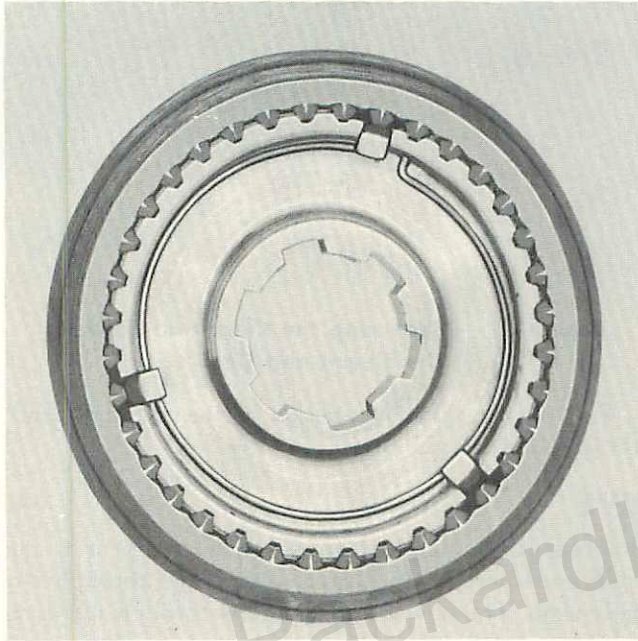
—Align the marks of the low and reverse sliding gear and the mainshaft. Install the gear on the shaft. The



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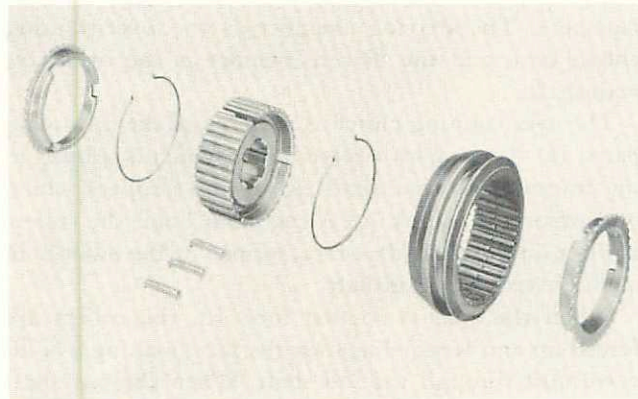
gear is installed with the shift fork channel toward the front end of the shaft. Install the second speed gear, with clutch cone toward front.

Place the synchronizer gear on the bench with the long hub up. Insert the shifter plates in the slots of the gear. Then align the marks made at disassembly and slip the sleeve on the gear. The shift fork channel in the sleeve must be down. Install the lock springs (see Fig. 14). The identical ends of the two lock springs



**Figure 14—Lock Springs Installed**

must be hooked in the same shifter plate. Fig. 15 illustrates the parts of the synchronizer assembly.



**Figure 15—Exploded View of the Synchronizer Assembly**

Place the rear blocking ring on the second speed gear. Align the marks of the gear and the shaft and install the synchronizer assembly on the mainshaft. The assembly should be installed with the shift fork channel to the rear of the shaft. Check the installation of the synchronizer gear to make sure that the short hub is

against the second speed gear. If not properly installed, the gear will be held away from the second speed gear, resulting in improper seating of the rear blocking ring.

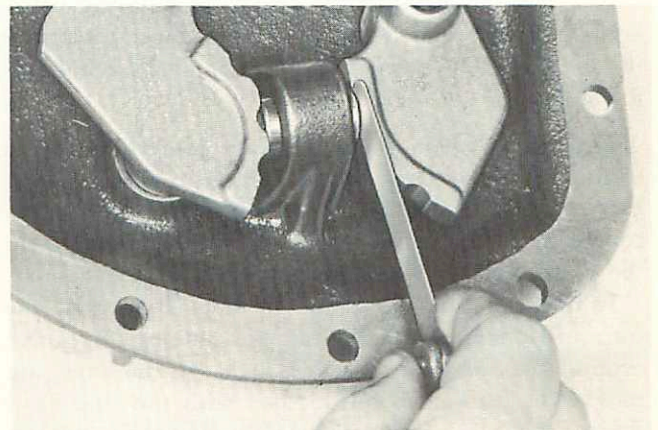
Install the retaining snap ring and slip the front bearing spacer on the shaft.

Install the mainshaft front bearing rollers in the end of the clutch shaft, using a stiff lubricant to hold them in position. Slip the front blocking ring on the clutch shaft.

Place a new gasket on the face of the rear housing. Shift the synchronizer sleeve into what would normally be the high position. Insert the end of the mainshaft through the rear bore of the case. Tilt the front end up so that the synchronizer sleeve will pass over the countershaft gear and start the end of the mainshaft into the front bearing rollers in the clutch shaft. Block up the rear housing to take the load of the mainshaft gears off the countershaft gear cluster. Lift the countershaft gear assembly and align the front thrust washer and the gear cluster with the shaft hole in the case. Rotate the housing and position it as during the countershaft removal. Align the thrust washer and spacer at the rear and start the countershaft into the case. Then, from the rear, push the assembly bar forward and start it into the case. Turn the shaft to align the keyway with the cutout in the case. Tap the countershaft into the gear, driving the assembly bar out ahead of it. Keep the assembly bar in contact with the countershaft to prevent dropping the bearing rollers. As the keyway approaches the case, insert the key and drive the shaft in until the end of the shaft is flush with the face of the case.

Make sure that the notches in the front blocking ring are aligned with the shifting plates and complete the installation of the mainshaft. Install the retaining cap screws.

Install the main drive gear bearing retainer without the gasket to determine the gasket thickness required. Check the clearance between the retainer and the case with a feeler gage (see Fig. 16). Remove the retainer



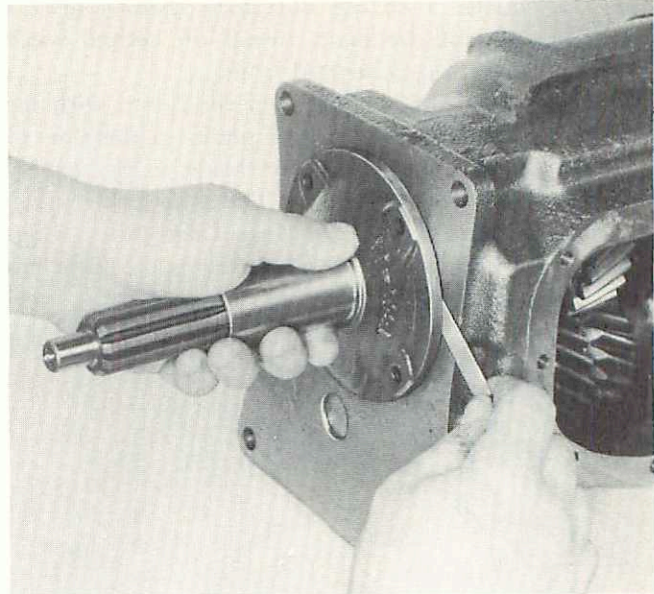
**Figure 16—Checking the Clearance Between the Retainer and Case**



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and install a gasket or a combination of gaskets of the proper thickness. Then reinstall the retainer.

**Cover**—Install new O-ring seals on the shift shafts. Insert one of the shift shafts in the side cover, being careful not to damage the seal. Install the shift lever. Insert the interlock sleeve in the cover. Set the shift shaft in the neutral position. Insert one of the interlock balls, the interlock pin, and the interlock spring in the sleeve. Start the other shift shaft into the cover. Place the other interlock ball in position at the end of the spring. Then push the ball into the sleeve, compressing the spring, and hold it in this position. Align the neutral notch of the shaft with the ball and slip the shaft inward to retain the ball. Install the other shift lever. Shift one of the shafts into an in-gear position and, with one end of the interlock sleeve against the cam of the shaft, measure the clearance between the other end of the sleeve and the cam (see Fig. 17). The clearance should be between .001" and .007". If the clearance is not within limits, replace the interlock sleeve. The sleeves are available in four different lengths. Therefore, select the proper length to provide the proper clearance.



**Figure 17—Measuring the Clearance Between the Sleeve and Cam**

Position the side cover gasket on the case and install the side cover assembly.

## OVERDRIVE

The overdrive is a device attached to the rear of the conventional three speed transmission which steps up the propeller shaft speed approximately 27.8 per cent in relation to engine speed. This, in effect, permits maintaining the same car speed while reducing the engine speed.

Three main mechanisms are employed in the overdrive: (1) The increase of propeller shaft speed over engine speed is obtained by driving the propeller shaft through a train of planetary gears. (2) An over-running clutch (or freewheeling unit) is a two speed driving connection. It is used to enable the propeller shaft to be rotated faster than engine speed at one time and at engine speed at another. (3) The engaging mechanism, which consists of a solenoid operating a sliding pawl, holds or releases the sun gear to engage or disengage the overdrive. Overdrive ratio is obtained by holding the sun gear.

**Planetary System**—The planetary gear train consists of the following parts: (a) The sun gear, which is held by the engaging pawl. (b) The planetary pinion cage consisting of four pinions carried on roller bearings in the cage. (c) The planetary ring gear.

In the overdrive, the planetary cage, rotated by the transmission mainshaft, causes the pinions to revolve around the sun gear, which is held by the engaging pawl. The pinions, being meshed with the ring gear, drive the ring gear approximately 30 per cent faster in the same direction as the cage rotation.

In direct drive the planetary cage is rotated by the

transmission mainshaft; however, the sun gear is not held and there is no power transmitted through the gear train. The power is transmitted through the over-running clutch. There is no step-up of speed, since all parts are rotating at the same speed.

**Over-running Clutch**—The over-running clutch is a simple one-way clutch, using a ratchet principle. It contains two essential members, the driving and driven members. The driving member is the over-running clutch cam, and the driven member is the overdrive mainshaft.

The over-running clutch is made up of the following parts: (a) A cam with twelve ramps which is splined to the transmission mainshaft. (b) Twelve rollers which operate on the ramps. (c) A cage that holds the rollers in place on the cam. (d) A race, formed by the inner bore of the overdrive mainshaft.

When the cam is rotated forward, the rollers are forced up and wedged against the race, making a solid drive unit through the tail shaft. When the tail shaft rotates faster than the cam, as it does in overdrive, the rollers move down the ramps and the unit slips and freewheels.

**Lockout**—Overdrive lockout is accomplished by moving the sun gear rearward and locking the pinions and the ring gear and mainshaft assembly into a single unit.

When the lockout knob is pulled out, a cam on the end of the lockout control shaft moves the lockout shift rail and the shift fork rearward. The shift fork, in



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turn, moves the sun gear rearward and the external clutch teeth of the gear engage with the internal clutch teeth of the pinion cage assembly.

Since the sun gear meshes with the pinions and has now engaged the clutch teeth of the pinion cage, the pinions cannot turn in the cage. Thus the assembly turns as a unit, driving the ring gear and the mainshaft as a unit by means of the teeth of the locked pinions. Power is then transmitted through the transmission mainshaft to the sun gear, to the pinion and cage assembly, and through the pinions to the ring gear and overdrive mainshaft.

**Engaging Mechanism**—The engagement of the overdrive is accomplished by the use of a pusher-type solenoid operating a sliding pawl. When energized, the solenoid pushes the pawl into the slots of the sun gear plate holding the sun gear.

To disengage the overdrive, a compression coil spring in the solenoid moves the pawl out of the plate, releasing the sun gear and permitting it to rotate.

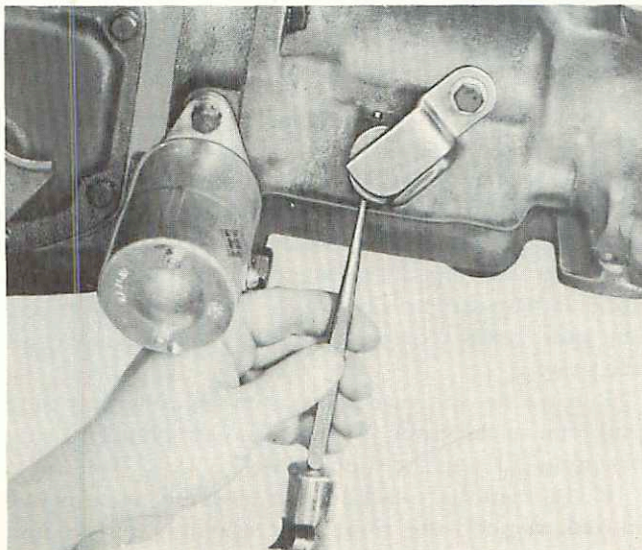
A balk ring is used to control the engagement of the pawl by preventing its engagement until the accelerator is released. This arrangement prevents sudden engagement of the pawl while power is being transmitted to the propeller shaft.

The operation of the solenoid is controlled by the governor switch and the kickdown switch.

## Disassembly

Remove the governor assembly, using Wrench J-4653.

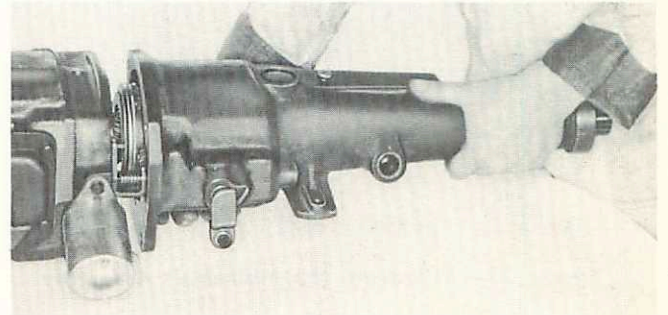
Drive out the lockout control shaft tapered retaining pin from the bottom as shown in Fig. 18. Work the lever and shaft assembly outward to disengage the cam on the end of the shaft from the shift rail. The lever



**Figure 18—Drive Out the Lockout Control Shaft Retaining Pin**

and shaft assembly can be removed at this time, but unless the seal is known to be leaking and is to be replaced, do not remove the shaft. Pulling the shaft through the seal may damage the sealing lip.

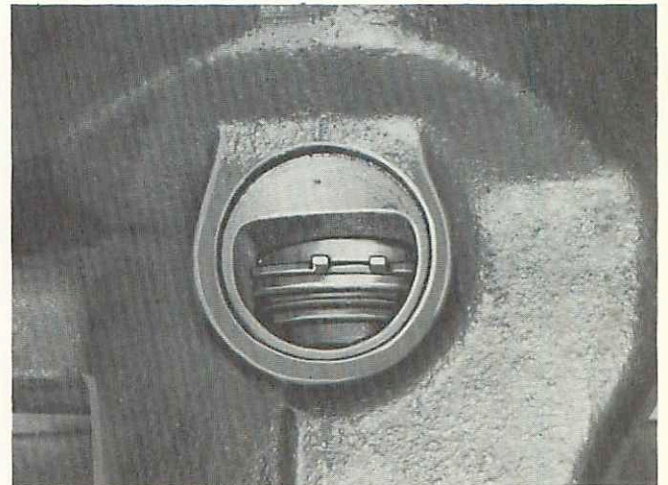
Remove the overdrive case retaining screws and pull the case and overdrive shaft assembly rearward (see Fig. 19) and remove the assembly. When the case is



**Figure 19—Removing the Overdrive Housing from the Transmission**

pulled rearward, the shift rail retractor spring may drop into the case. Some of the freewheel rollers will drop out of the cam and roller retainer assembly on the end of the transmission mainshaft. Care should be exercised to prevent losing the retractor spring or any of the twelve rollers.

Remove the welch plug from the top of the case to expose the overdrive shaft rear bearing snap ring (see Fig. 20). Then, using Snap Ring Pliers KMO 630, reach



**Figure 20—Overdrive Shaft Bearing Snap Ring**

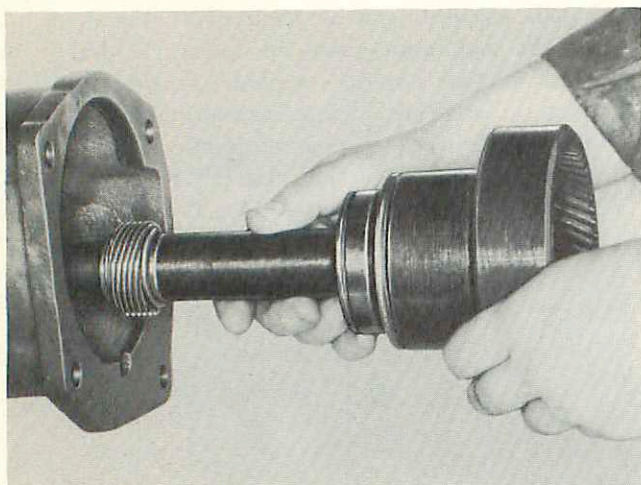
through the opening and spread the snap ring. At the same time tap the end of the shaft with a soft hammer to move the bearing out of the bore. Then remove the assembly from the case (see Fig. 21).

Remove the speedometer gear rear snap ring. Slip the gear rearward, remove the drive ball from the shaft, and slip the gear off the shaft.

Remove the other speedometer gear snap ring and the small bearing retaining snap ring. Then, using

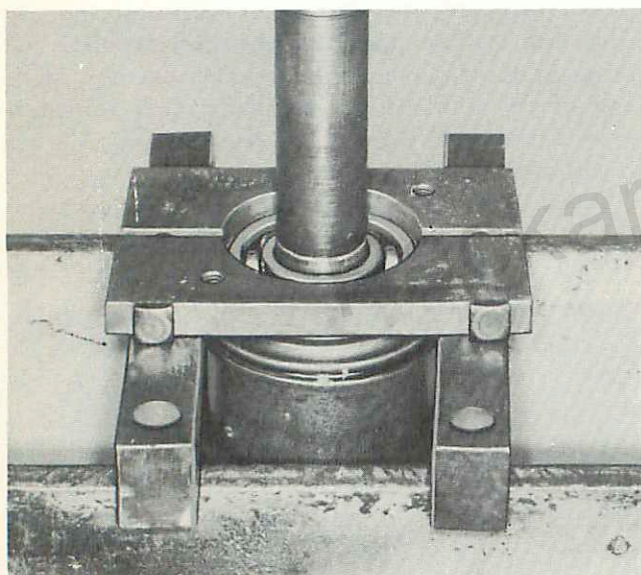


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**Figure 21—Removing the Mainshaft Assembly**

J-1298 Puller Plates or similar tool, place the assembly in an arbor press and press the shaft out of the bearing (see Fig. 22).



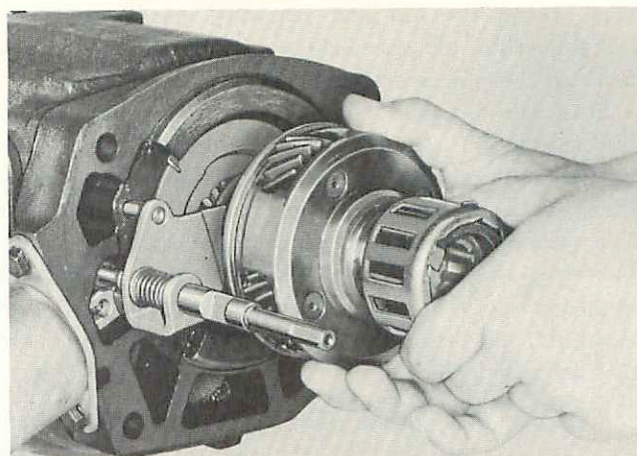
**Figure 22—Press the Shaft Out of the Bearing**

The ring gear may be removed from the shaft by removing the retaining snap ring and lifting the gear off the shaft.

Use Axle Shaft Oil Seal Remover J-943-B to pull the overdrive case oil seal.

Remove all of the rollers from the over-running clutch roller retainer. Remove the cam retaining snap ring. Slide the roller retainer and cam assembly, and the pinion and cage assembly off the transmission mainshaft (see Fig. 23).

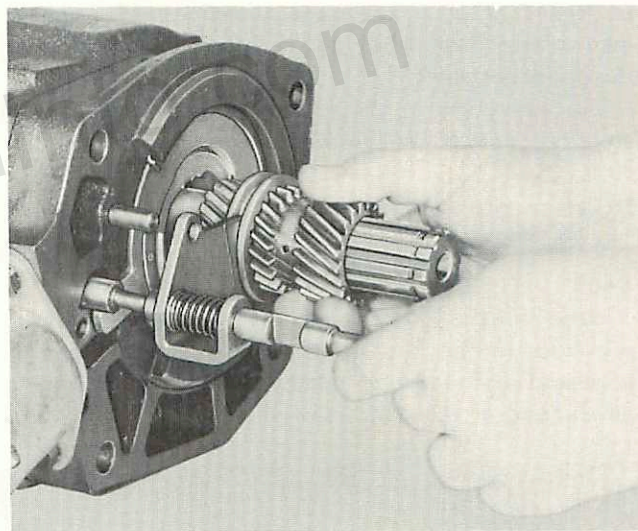
Remove the pinion cage assembly front snap ring from the mainshaft and mark or tag the ring so that it can be distinguished from the cam retaining snap ring when the unit is assembled. The cam retaining ring may be thicker since rings of various thickness



**Figure 23—Slide the Assembly off the Transmission Mainshaft**

are used to eliminate end play of the cam assembly and pinion cage assembly on the transmission mainshaft.

Pull the reverse plunger, shift rail and shift fork assembly out of the adapter while sliding the sun gear rearward and remove as an assembly (see Fig. 24).



**Figure 24—Remove as an Assembly**

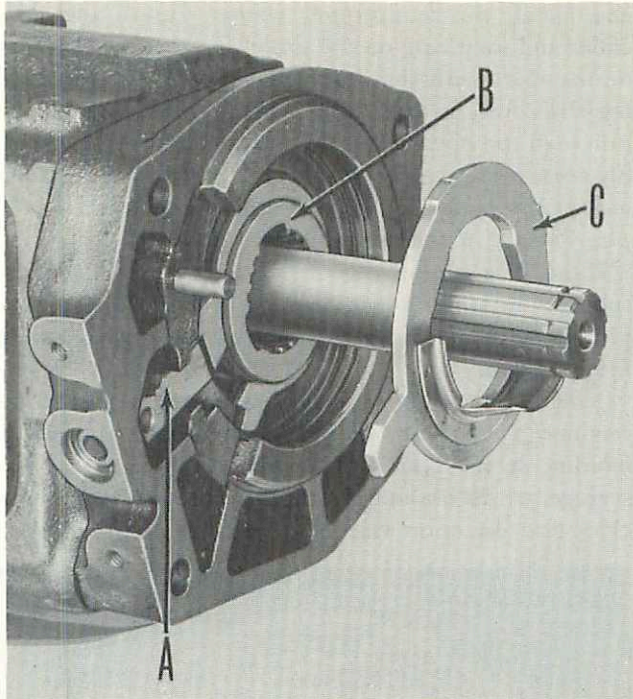
Separate the shift rail assembly from the sun gear. To remove the shift fork from the rail, compress the spring and cupped washer to expose the C washer. Remove the C washer and slip the shift rail out of the spring and fork. If necessary to remove the shift collar from the sun gear, remove the snap ring and slip the collar off the gear.

Remove the sun gear plate cover retaining snap ring and remove the cover (C, Fig. 25), gear plate and ring assembly (B), and the sliding pawl (A).

If the mainshaft and adapter assembly is to be removed, remove the side cover assembly screws and remove the cover assembly. Pull the mainshaft and adapter plate rearward as far as possible without moving the synchronizer sleeve off the gear. This distance is

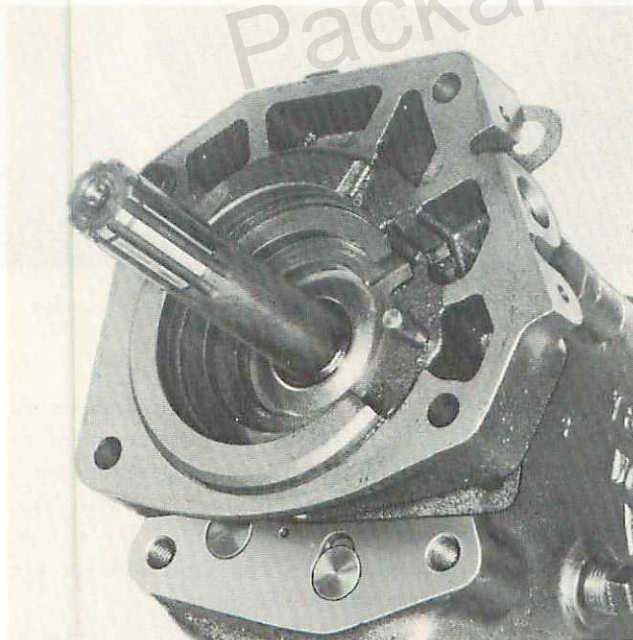


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**Figure 25—Remove the Sun Gear Plate Cover**

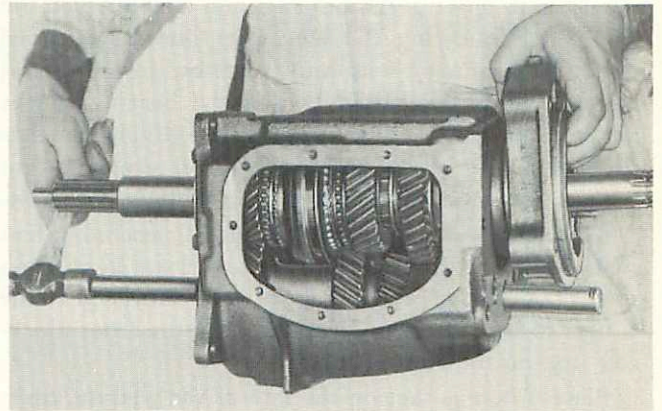
approximately three-fourths inch. Then turn the adapter to expose the end of the countershaft (see Fig. 26). The shaft is held in position by a Woodruff key.



**Figure 26—Turn the Adapter to Expose the End of the Countershaft**

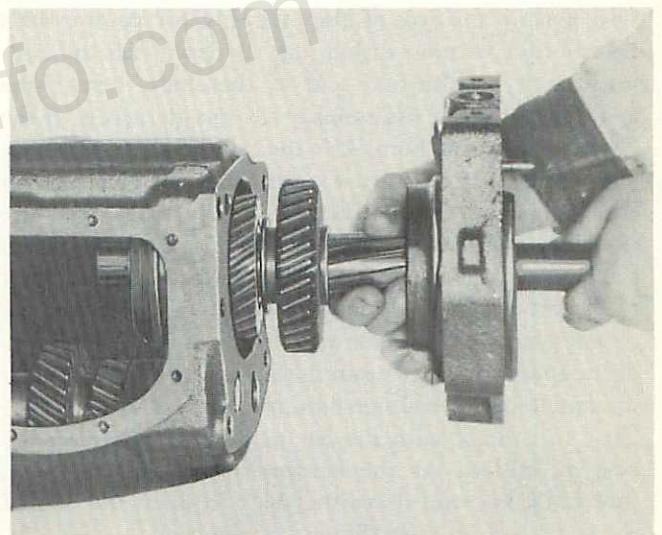
Use a suitable drift and start the countershaft back out of the case far enough to permit removal of the key. Lift the adapter plate to provide clearance for the countershaft and, using the Countershaft Assembly Bar J-5589, drive the countershaft out of the case (see Fig.

27). The countershaft gear cluster, with the assembly bar in place, will drop to the bottom of the case. Raise the front end of the mainshaft assembly so that the



**Figure 27—Driving the Countershaft Out of the Case**

synchronizer sleeve will pass over the gear cluster, and remove the adapter plate and shaft assembly from the case (see Fig. 28).



**Figure 28—Remove the Adapter and Shaft Assembly**

The disassembly procedure for the mainshaft assembly is the same as that outlined for the transmission except that an oil slinger is used behind the bearing in the adapter plate.

The remainder of the disassembly of the case, that is the disassembly and removal of the countershaft gear cluster, clutch shaft assembly, reverse idler pinion, and side cover assembly, is the same as for the transmission.

### Assembly

If the countershaft gear cluster, clutch shaft assembly, reverse idler pinion, or side cover has been removed



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or disassembled, assemble and install as outlined under Transmission.

Assemble the synchronizer and install the synchronizer, main shaft gears, bearing, and adapter plate on the shaft, following the same procedure as outlined under Transmission with one exception. Install the oil slinger, which is located behind the bearing in the adapter, so that the outer edge of the slinger contacts the outer race of the bearing. The oil slinger is not used in the three speed transmission without overdrive.

To install the adapter and mainshaft assembly, first make sure that the front bearing rollers are in position in the main drive gear and apply a stiff lubricant to the rollers to hold them in position. Place the front blocking ring on the clutch shaft.

Place a new gasket on the face of the adapter. Shift the synchronizer sleeves into what would normally be the high position. Insert the end of the mainshaft through the rear bore of the case and tilt the front end up so that the synchronizer sleeve will pass over the gear cluster. Position the assembly so that the front end of the shaft is within the clutch shaft but the end of the shaft has not entered the front bearing rollers. This will permit shifting of the assembly for countershaft installation without dislodging the front bearing rollers. Block up the rear end of the shaft. Rotate the adapter as during disassembly to provide access to the countershaft rear bore. Lift the countershaft assembly and align the front thrust washer and the cluster with the shaft front bore. Then, from the rear, push the assembly bar forward and start it into the case. Align the rear thrust washer and spacer with the countershaft rear bore. Lift the adapter assembly and start the countershaft into the case and cluster. Align the keyway of the shaft with the cutout in the case. Hold the adapter up and tap the countershaft into the case. Keep the shaft in contact with the bar to prevent dropping the bearing rollers. As the keyway approaches the case, insert the key and drive the shaft in until the end of the shaft is flush with the face of the case.

Rotate the adapter to its normal position. Make sure that the notches in the front blocking ring are aligned with the shifter plates. Then carefully insert the end of the mainshaft into the front roller bearings and move the assembly into position.

Insert the solenoid pawl in the adapter plate with the notched side up. Install the sun gear plate assembly, making sure the plate and pawl are properly positioned. Install the sun gear cover plate and large snap ring.

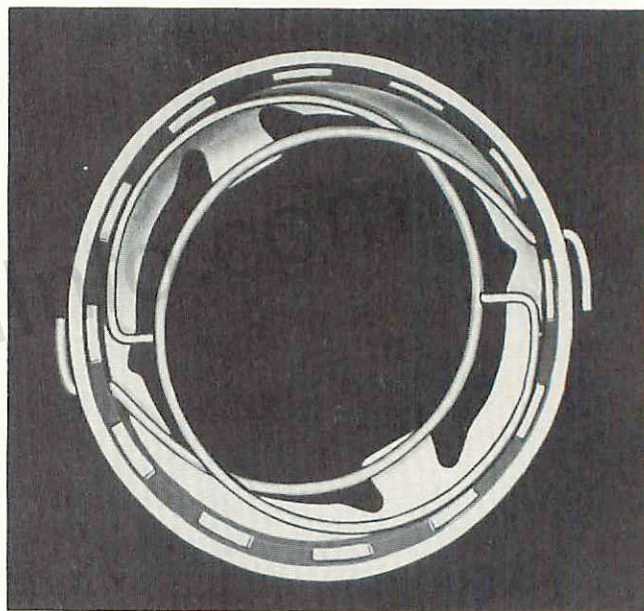
Install the solenoid operating rod oil seal. Hold the solenoid with the flat on the operating rod facing up. Insert the rod through the seal and into the pawl. Then turn the solenoid counterclockwise to align the mounting holes and install the retaining cap screws.

If disassembled, assemble the shift rail spring and cupped washer in the shift fork. Insert the shift rail

and install the retaining C washer. Install the shift collar and snap ring on the sun gear. Start the sun gear on the shaft with the shift collar to the front. Engage the shift fork in the collar and align the end of the rail with the opening in the adapter. Move the assembly forward, engage the sun gear with the gear plate and, at the same time, slip the shift fork on the guide pin. Then slip the assembly into position.

Install the pinion cage front snap ring. Align the splines and slip the pinion on the shaft. Engage the pinions with the sun gear and slide the cage assembly into position.

Assemble the cam roller retainer springs in the roller retainer. The springs should be installed so that when looking at the rear of the retainer the ends of the springs, which are outside the retainer, will point in a clockwise direction (see Fig. 29). Install the hooked



**Figure 29—Springs Should Point in a Clockwise Direction**

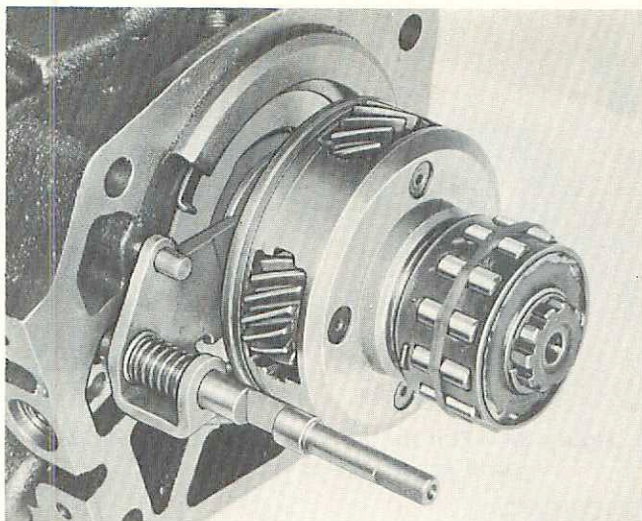
ends of the springs in the holes of the cam and seat the cam in the retainer. To check the installation of the springs, hold the cam and, while looking at the rear of the assembly, turn the retainer counterclockwise. Then release the retainer. If properly installed, the retainer will return to its original position. Make sure the lugs on the retainer engage the slots in the cam.

Slip the retainer on the shaft and install the retaining snap ring. Place the rollers into the retainer and use a rubber band to hold them in position (see Fig. 30). Rotate the retainer counterclockwise and, by means of the rubber band, hold the rollers at the bottom of the cam ramps.

If the ring gear has been removed from the overdrive shaft, slip the gear on the shaft and install the retaining snap ring.



## TRANSMISSION AND OVERDRIVE



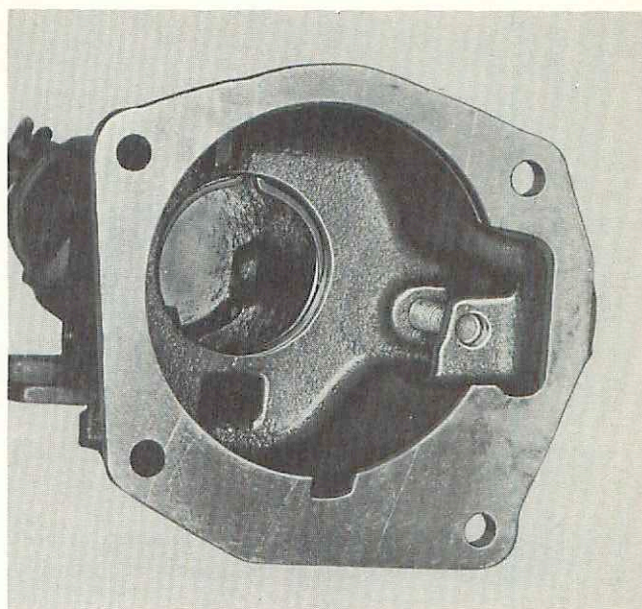
**Figure 30—Use a Rubber Band to Hold the Rollers in Position**

Press the shaft into the bearing and install the small snap ring.

Install the speedometer gear front snap ring. Place the drive ball in the shaft and slip the speedometer gear into position over the ball and install the other snap ring.

Install the housing rear oil seal.

Make sure that the bearing snap ring is properly seated in the groove in the housing and position the shift rail spring in the housing as shown in Fig. 31. Start the shaft into the housing. Align the bearing in the housing bore and tap the shaft rearward. As the bearing nears the snap ring, use a snap ring pliers, push the snap ring down and at the same time spread the ring as far as possible. Hold the ring in this position and



**Figure 31—Bearing Snap Ring Seated and Shift Rail Spring in Position**

tap the shaft rearward until the groove of the bearing is aligned with the snap ring, and release the snap ring. Install a new welch plug in the housing.

Support the housing assembly and move it toward the adapter while turning the shaft to align the pinions so they can enter the ring gear. Do not attempt to remove the rubber band which is holding the rollers. The roller race inside the shaft will push the rubber band off and it will dissolve in the lubricant.

Install the housing-to-adapter retaining screws. Install the shift lever and retaining pin.

Install the governor assembly.

## SOLENOID AND GOVERNOR

### Removal

Disconnect the cables from the solenoid terminals. Remove the solenoid retaining screws. Rotate the solenoid  $\frac{1}{4}$  turn clockwise and slip the plunger out of the pawl.

To remove the governor, disconnect the cable and, using Governor Wrench J-4653, remove the governor assembly.

### Installation

Insert the governor into the rear housing and engage the teeth of the drive gear. Then, using the governor wrench, tighten the unit securely. Connect the cable.

Install the solenoid so that the terminal screws are toward the rear. Turn the solenoid clockwise so that the flat on the plunger is up. Insert the plunger through the seal and engage the pawl. Turn the solenoid counter-clockwise  $\frac{1}{4}$  turn to lock the plunger in the pawl. Install and tighten the retaining screws. Connect the solenoid cables.

## GEARSHIFT ASSEMBLY

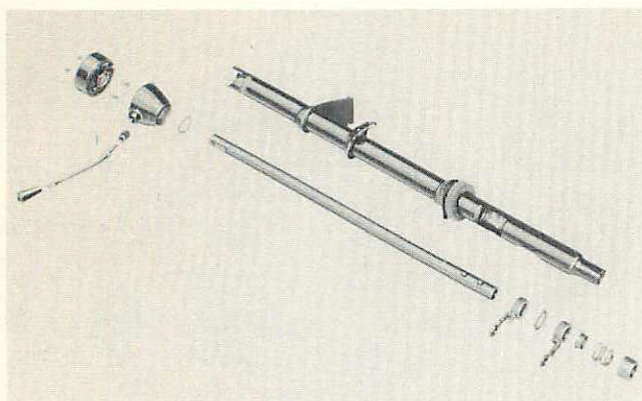
### Removal

Remove the cotter pins and disconnect the shift rods from the gearshift shaft levers. Loosen the clamp at the lower end of the jacket. If equipped with a backup light, disconnect the cable.

Remove the horn ring and steering wheel. Disconnect the directional signal cables connector. Remove the jacket bracket-to-instrument board bolts and bracket clamp bolt. Remove the steering gear and brake pedal floor opening cover. Then slip the steering column



# TRANSMISSION AND OVERDRIVE

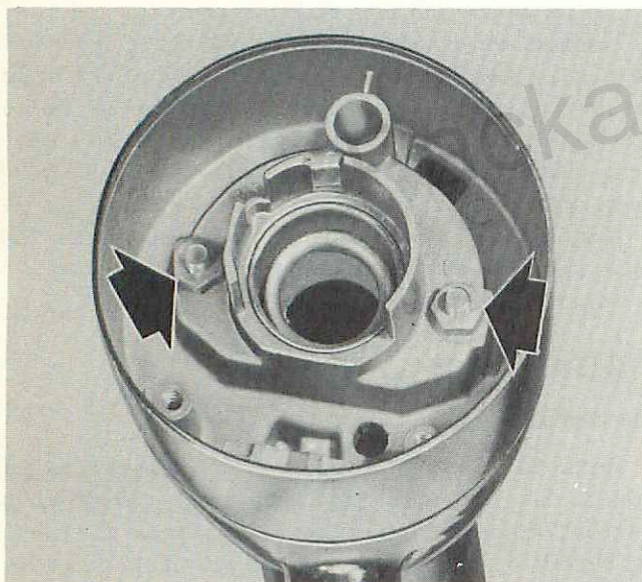


**Figure 32—Exploded View of the Gearshift Assembly**

jacket and gearshift assembly up off the steering post. Fig. 32 illustrates the parts of the gearshift assembly.

## Disassembly

Remove the directional signal operating switch and cables. Remove the two nuts indicated by arrows in Fig. 33 and slip the bracket and column bearing assembly

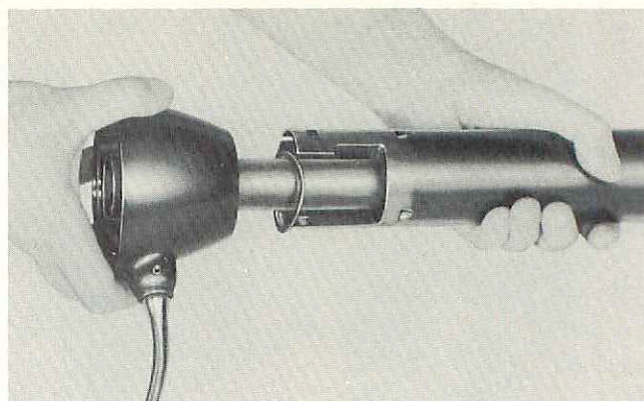


**Figure 33—Remove the Two Nuts Indicated by Arrows**

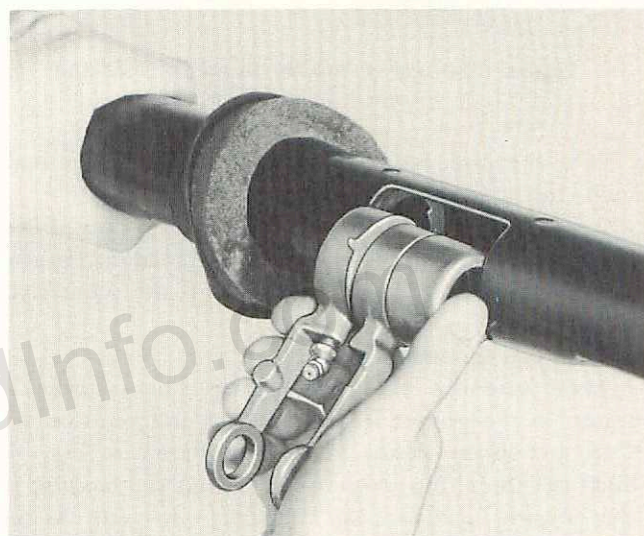
off the steering column. Remove the retaining screws. Pull the control tube, lever support, and lever out of the jacket as an assembly (see Fig. 34). Remove the spring washer from the tube.

To remove the lever, use a suitable drift, drive out the retaining pin, and slip the lever and grommet out of the support.

Remove the shift levers, spacer, spring retainer, spring, and spring housing from the jacket (see Fig. 35).



**Figure 34—Pull the Control Tube, Lever Support, and Lever Out as an Assembly**



**Figure 35—Remove the Shift Levers, Spacer, Spring Retainer, Spring and Housing**

## Assembly

Insert the low and reverse shift lever, spacer, and second and high shift lever. Assemble the spring and retainer in the spring housing and slip the assembly into the jacket.

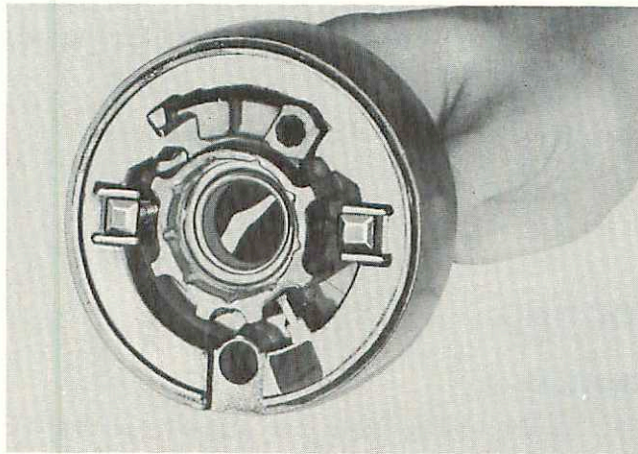
Slip the lever support on the control tube. Install the grommet on the lever. The grommet should be installed with the small end toward the inner end of the lever. Align the tube and support, insert the lever and install the retaining pin. Liquid soap will facilitate the installation of the grommet in the lever support. Place the spring washer on the flange within the jacket. Insert the control tube in the post jacket. Engage the keys on the control tube with the keyways of the shift levers and slip the control tube assembly into position.

If equipped with directional signals, thread the cables through the bracket. Insert the upper bracket retaining bolts in the bracket and start the nuts on the bolts. Push down and at the same time shift both nuts inward so that the heads of the bolts will be shifted away from the center of the bracket and onto the slight ramps at the



# TRANSMISSION AND OVERDRIVE

bolt holes (see Fig. 36). Hold the bolts in this position and slip the bracket into position on the jacket. Pull up on the nuts which will move the heads of the bolts off



**Figure 36—Push Down and at the Same Time Shift Both Nuts Inward**

the ramps and toward the center to engage the elongated slots of the jackets. Tighten the nuts securely.

## Installation

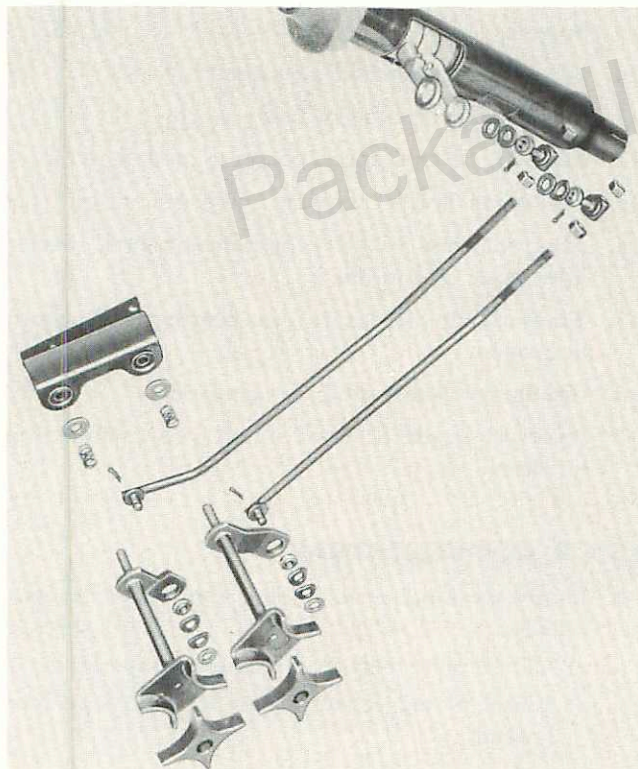
Slip the assembly down over the steering gear post. Position the assembly on the gear and install the jacket bracket-to-instrument board bolts loosely. If equipped with directional signals, install the operating switch and cables.

Install the steering wheel. Then shift the jacket assembly as required to obtain approximately  $\frac{1}{16}$ " clearance between the upper bracket and the hub of the wheel. Then tighten the jacket lower clamp.

Tighten the bracket-to-instrument board bolts. Install the gear brake pedal opening cover. Connect the directional signal cables. If equipped with backup light, connect the cable.

Adjust the gearshift rods as outlined under Adjustment.

## TRANSMISSION LINKAGE



**Figure 37—Exploded View of the Transmission Linkage**

## Removal and Disassembly

Remove the cotter pins, spring washers and plain washers, and disconnect the gearshift rods from the transmission shaft extension levers. Remove the shaft extension bracket retaining screws. Move the assembly away from the transmission to disengage the shaft extension driving blocks from the transmission shift shaft levers and remove the assembly from the car. Slip the extensions out of the bracket and remove the springs and washers from the extensions. Figure 37 illustrates the parts of the transmission linkage.

## Assembly and Installation

Assemble the washers and springs on the shaft extensions. Apply lubricant to the ends of the extensions and assemble in the bracket. The low and reverse extension has the short lever and is installed in the rear hole of the bracket.

Place the driving blocks in the ends of the extensions. Hold the assembly at the transmission and engage the driving blocks in the transmission shift shaft levers. Position the bracket on the frame side rail and install the retaining screws. Before installing the gearshift rods, check the adjustment of the rods as outlined under Adjustment. Then connect the rods to the shaft extension levers.

## GEARSHIFT ROD

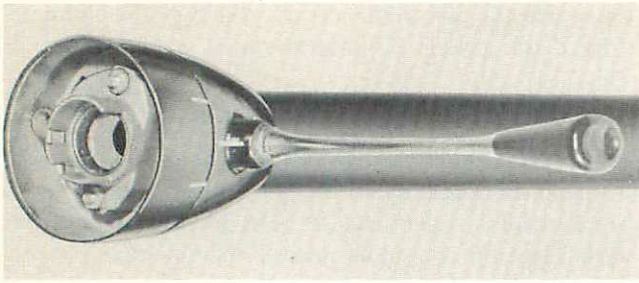
### Adjustment

Disconnect the gearshift rods at the shaft extension levers. Loosen the lock nuts on the gearshift rods. Mark or in some way identify the center point of travel of the

gearshift lever (see Fig. 38). (The wheel is removed in the illustration for photographic purposes only.) The gearshift lever must be in this position during the adjustment. Align the shaft levers so that the neutral



# TRANSMISSION AND OVERDRIVE



**Figure 38—Mark the Center Point of Travel of the Gearshift Lever**

position will be assured. Make sure that the transmission is in neutral. Then turn the nut or the rod by holding the nut, to adjust the length of the rod so that the end of the rod is aligned with the hole in the shaft extension lever. Slip the rod into the lever and install the washers and cotter pin.

Both rods are adjusted in the same manner.

## TROUBLE SHOOTING

### NOISY IN NEUTRAL

#### Description

Transmission noises in neutral, when the engine is idling, can generally be classified as a hiss or growl. Bearing difficulty is generally apparent as a hiss, although in severe cases, a bump or thud will be heard. Rough, worn, chipped, or scuffed gears are apparent as an intermittent growl or hum. An out-of-alignment condition between the transmission and the engine assembly will cause a grind after the transmission has been in service for some time.

#### Causes

1. Misalignment of transmission with engine assembly.
2. Clutch shaft bearing worn, rough, or dirty.
3. Constant mesh gears worn, scuffed, chipped, or burred.
4. Countershaft bearings scored, worn, dirty, or rough.
5. Second speed mainshaft gear bushing rough, scored, or badly worn.

6. Constant mesh gears not properly meshed or matched.
7. Replacement of only one constant mesh gear instead of the complete set.
8. Reverse idler pinion shaft or bushing rough, scored, or worn.
9. Reverse idler pinion worn, scuffed, chipped, or burred.
10. Eccentric countershaft gear assembly.
11. Countershaft sprung or badly worn.
12. Eccentric second speed constant mesh gear.
13. Too much lash in constant mesh gear train.
14. Abnormal end play of countershaft gear, reverse idler gear, or pinion.
15. Transmission mainshaft front bearings badly worn or broken.
16. Insufficient lubricant in transmission.
17. Incorrect grade or poor quality of transmission lubricant.

### NOISY IN GEAR—OVERDRIVE OR CONVENTIONAL

#### Description

Most transmission noises apparent in neutral will also be noticed in gear, although the frequency of the noise will increase. Transmission noises due to engine torsional periods occur at definite speeds and are not apparent throughout the entire speed range. Torsional transmission noises are usually a high-pitched, high frequency, metallic rattle.

#### Causes

1. Conditions causing noise in neutral—usually more pronounced at low road speeds.
2. Engine torsional periods being transmitted to transmission:
  - a) Clutch plate mechanical damper inoperative.
  - b) Clutch plate mechanical damper springs weak or broken.
3. Mainshaft rear bearing rough, worn, or dirty.
4. Sliding gear teeth rough, worn, burned, scuffed, pitted, chipped, or tapered.
5. Excessive clearance or end play of second speed mainshaft gear on mainshaft.
6. Noisy speedometer gears.
7. Overdrive gears or bearings scored, chipped, or worn (noticed only while driving in overdrive).



# TRANSMISSION AND OVERDRIVE

## OIL LEAKS

### Causes

1. Lubricant level too high in transmission case.
2. Damaged, improperly installed, or missing gaskets.
3. Damaged or improperly installed oil seals.
4. Damaged, improperly installed, or missing oil slingers.
5. Case plugs loose or threads damaged.
6. Case bolts loose or missing, or threads stripped.
7. Sand hole or crack in transmission case or cover.
8. Use of lubricant which foams excessively.
9. Vent hole clogged.

## DIFFICULT SHIFTING INTO GEAR

### Causes

1. Failure to release clutch completely.
2. Clutch sticking on splined pinion shaft.
3. Sliding gear tight on mainshaft splines.
4. Insufficient chamfer of sliding teeth.
5. Mainshaft splines distorted, burred, or otherwise damaged.
6. Incorrect interlock detent adjustment.
7. Synchronizer unit outer sleeve fits too tightly on synchronizer gear.
8. Improper adjustment or worn gearshift linkage.
9. Shift mechanism out-of-line or in need of lubrication.
10. Worn or damaged blocking ring.
11. Incorrect grade of lubricant.

## STICKING IN GEAR

### Causes

1. Engine clutch not completely released.
2. Insufficient chamfer at edge of gearshift lever detent ball notches.
3. Sliding gear tight on mainshaft splines.
4. Distorted, burred, or otherwise damaged mainshaft splines.
5. Improper adjustment of the gearshift control rods.
6. Bent or damaged shifting forks.

## LOCKED IN TWO GEARS

### Causes

1. Worn interlock sleeve.
2. Worn detent grooves on shift shafts.

## SLIPPING OUT OF HIGH GEAR

### Causes

1. Misalignment of transmission with engine assembly.
2. Clutch shaft gear teeth worn or tapered.
3. Insufficient shift lever interlock assembly spring tension.
4. Worn shift lever interlock assembly.
5. Improper adjustment of the gearshift control rods.
6. Shift fork bent, not providing full engagement of gears.

## SLIPPING OUT OF SECOND GEAR

### Causes

1. Abnormal clearance between second speed constant mesh gear and mainshaft.
2. Abnormal end play of second speed constant mesh gear on mainshaft.
3. Second speed clutch gear teeth worn, tapered, or distorted.
4. Insufficient shift lever interlock assembly spring tension.
5. Worn shift lever interlock assembly.
6. Insufficient gear mesh.
7. Improper adjustment of the gearshift control rods.
8. Bent shift fork.



# TRANSMISSION AND OVERDRIVE

## TRANSMISSION SLIPPING OUT OF LOW OR REVERSE GEAR

### Causes

1. Low and reverse sliding gear loose on mainshaft splines.
2. First and reverse sliding gear teeth worn or tapered.
3. Mainshaft splines worn or distorted.
4. Countershaft first speed gear worn or tapered.
5. Excessive end play of countershaft in transmission.
6. Reverse idler pinion teeth worn or tapered.
7. Excessive end play of reverse idler pinion in transmission case.
8. Insufficient gear mesh due to bent shift fork.
9. Insufficient shift lever interlock spring tension.
10. Worn shift lever interlock assembly.
11. Improper adjustment of the gearshift control rods.
12. Worn or damaged countershaft or countershaft bearings.

## TRANSMISSION IN GEAR—ENGINE RUNNING AND PROPELLER SHAFT DOES NOT ROTATE

### Causes

1. Engine clutch slippage.
2. Overdrive cam and rollers slipping.
3. Transmission pinion or mainshaft broken.
4. Transmission gear teeth stripped.
5. Gearshift forks broken.

## OVERDRIVE WILL NOT ENGAGE

### Causes

1. Electrical causes, see check-out chart.
2. Solenoid pawl sticking.
3. Solenoid plunger sticking.
4. Faulty baulk ring on the sun gear plate.

## OVERDRIVE "LOCK-UP" IN REVERSE GEAR

### Causes

1. Contact points of the governor closed or sticking.
2. Kickdown switch grounded.
3. Relay contacts closed or sticking. Relay terminal grounded.
4. Sun gear plate sticking.
5. Broken pawl.

## GEARSHIFT RATTLE

### Causes

1. Worn gearshift linkage.
2. Worn pivot bushings.
3. Loose shaft mounting bracket.



# TRANSMISSION AND OVERDRIVE

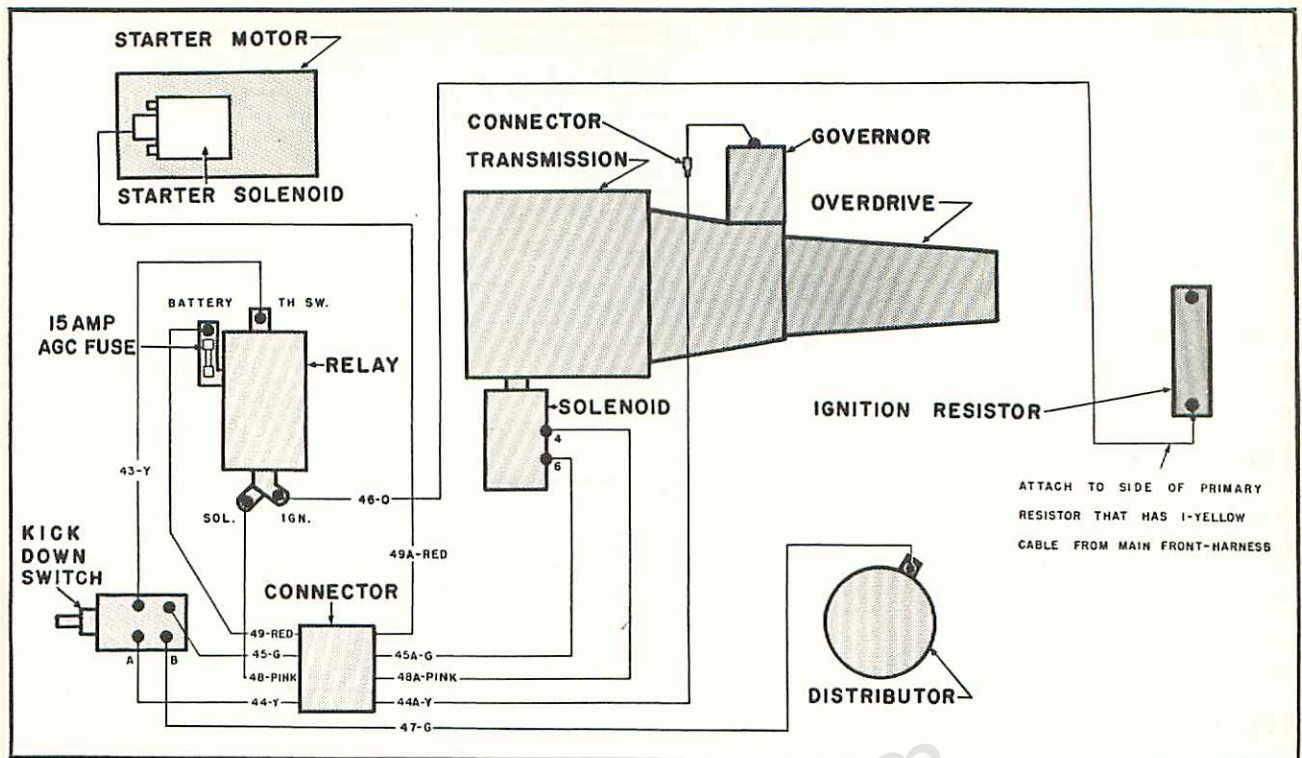
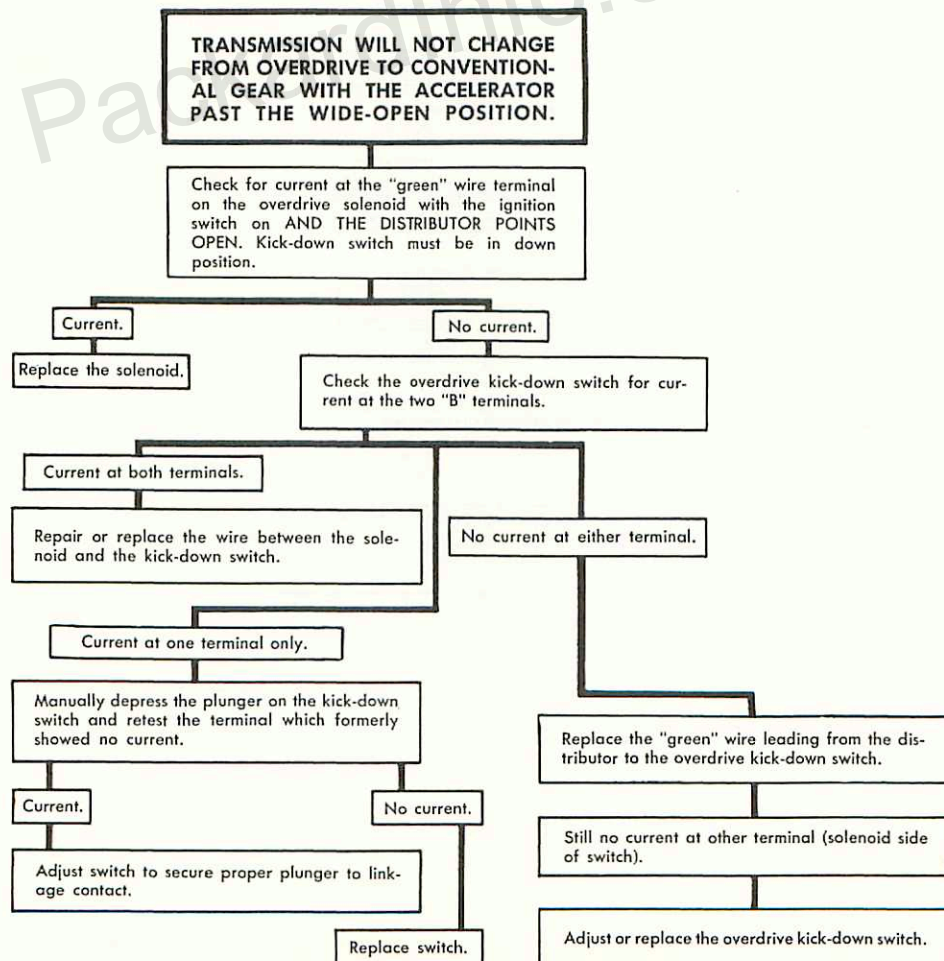
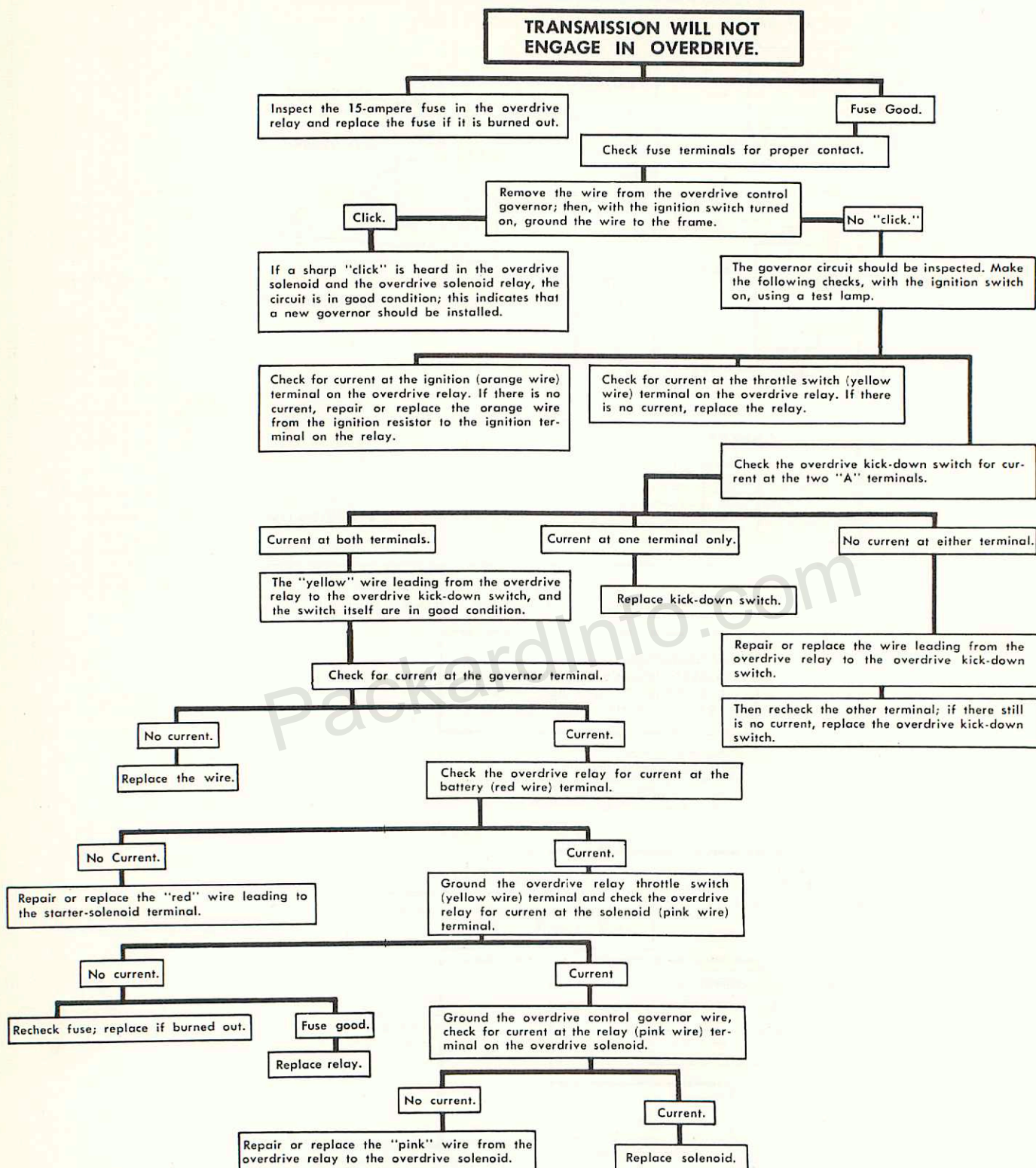


Figure 39 — Overdrive Wiring Diagram





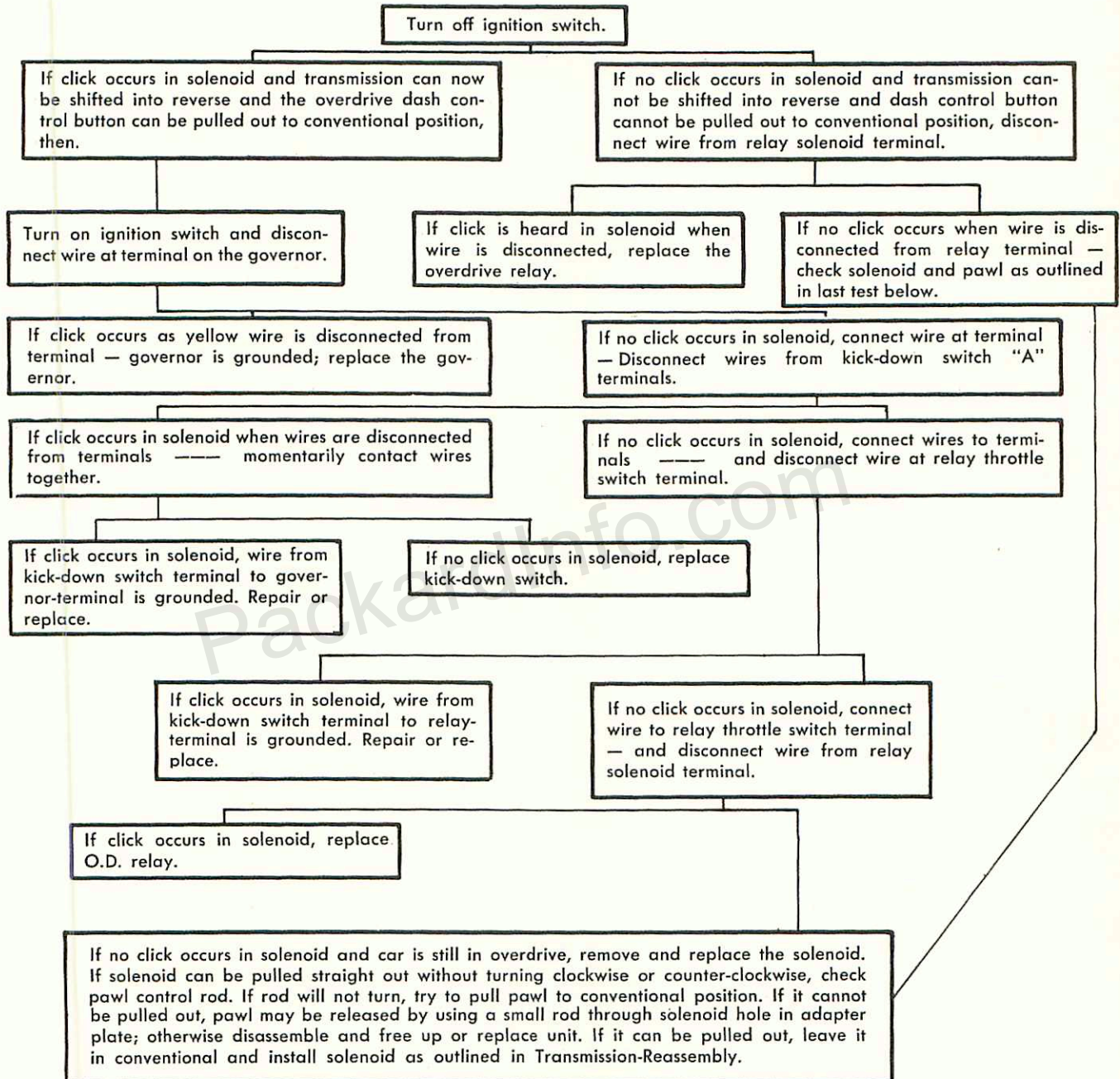
# TRANSMISSION AND OVERDRIVE





# TRANSMISSION AND OVERDRIVE

**TRANSMISSION CANNOT BE SHIFTED INTO REVERSE AND OVERDRIVE DASH CONTROL BUTTON CANNOT BE PULLED OUT INTO CONVENTIONAL DRIVE POSITION.**





# TRANSMISSION AND OVERDRIVE

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## NOTES

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