

# GROUP 4

## CLUTCH, TRANSMISSION, UNIVERSAL JOINT

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### SECTION 4-A

## CLUTCH—SERIES 40-50

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### SERVICE BULLETIN REFERENCE

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## 4-1 CLUTCH SPECIFICATIONS

### a. Tightening Specifications

Part	Location	Thread Size	Torque Ft.Lbs.
Nut	Release Equalizer Ball Stud	1/2-20	55-60
Nut	Clutch Release Rod Adjust. Lock	3/8-16	20-25
Stud	Clutch Release Yoke Ball	1/2-20	30-35
Bolt	Clutch Cover to Flywheel	3/8-16	20-25

### b. Clutch Specifications

Clutch Type	Single Plate—Dry Disc
Driven Plate Diameter	10"
Driven Plate Facings—	
No. and Type	2 Woven
How Attached to Plate	Riveted
Facing Thickness	.125" ± .003"
Total Frictional Area	100.6 sq. in.
Maximum Run-out of Driven Plate at Rear Facing	.025"
Clutch Spring—	
Type	Crown
Total Pressure	1350 lbs.
Free Height, New	1 13/16"
Free Height, Minimum	1 11/16"

Height of Spring Retainer Ears from Flange Face of Clutch Cover	1 5/8"
Clutch Pedal Lash Adjustment	3/4" to 1"
Clutch Pedal Pressure	33 lbs.

## 4-2 DESCRIPTION OF CLUTCH

### a. Clutch Assembly

The single plate, dry disc clutch used in Series 40-50 when equipped with a synchromesh transmission is distinguished by a "crown" type clutch spring. The "crown" type spring serves the same purpose as conventional clutch release levers and drive lugs, in addition to providing pressure for clutch engagement.

The "crown" type clutch spring is a spring steel disc formed in waves to provide spring action and is cone-shaped when in the free position. Notches in the inner edge of the clutch

cover fit over the waves a short distance from the outer edge of clutch spring to transmit drive to the clutch spring. Twelve lugs cast on the pressure plate engage waves at the outer edge of clutch spring to take the pressure as well as drive from the spring. The pressure plate and clutch spring are attached to the clutch cover by six spring retainers which hook over ears on inner edge of cover, pass around outer edge of clutch spring and through holes in lugs on pressure plate. See figure 4-1.

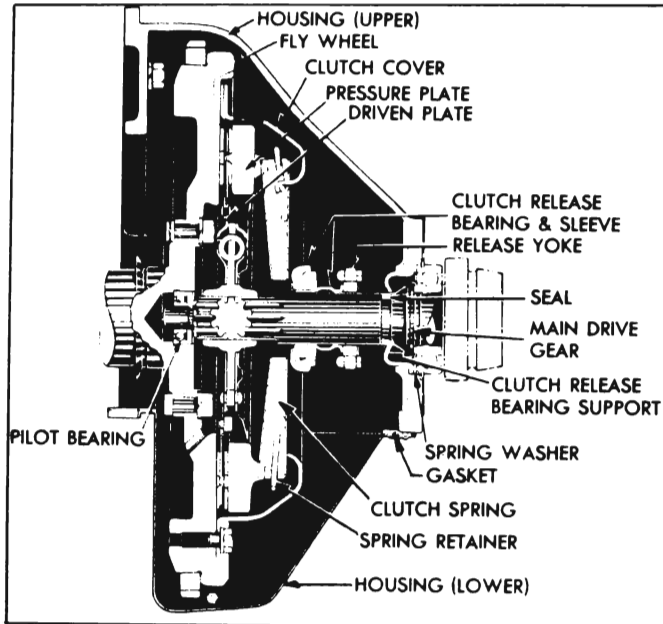


Figure 4-1—Clutch and Flywheel Assembly—Series 40-50

When the clutch is in the engaged position, the clutch cover compresses the clutch spring, causing it to exert heavy pressure against the pressure plate. The pressure plate clamps the driven plate against the flywheel with sufficient force to transmit the power of the engine without slippage. The power drive is from flywheel to clutch cover, cover to clutch spring, spring to pressure plate, and from pressure plate and flywheel to driven plate. See figure 4-1.

When the clutch is disengaged, the clutch release bearing presses forward against the high inner edge of clutch spring, which flattens the spring. The curved inner ends of the spring retainers act as fulcrum points which cause the spring to relieve pressure against pressure plate. The pressure plate is then pulled away from driven plate by the spring retainers.

#### b. Clutch Driven Plate

The clutch driven plate assembly is mounted with a free sliding fit on the transmission main drive gear and is keyed to the gear by ten splines. The front end of the main drive gear

is piloted by a ball bearing pressed into a recess in rear end of engine crankshaft. See figure 4-1.

The outer area of the driven plate is divided into segments which are formed in low waves

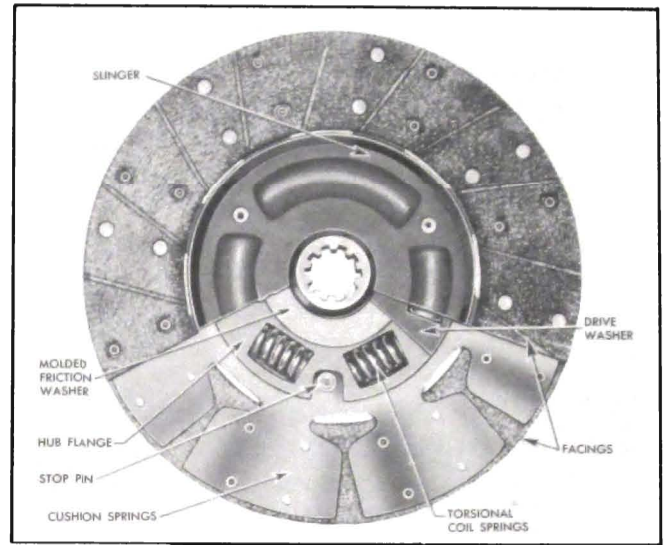


Figure 4-2—Driven Plate—Transmission Side

to provide springs between the plate facings and thereby cushion engagement of the clutch. A woven facing, grooved to give quick release, is riveted to each side of every segment of plate. When the clutch is fully released, the waved segments cause the facings to spread approximately .050" and the movement of pressure plate provides approximately .030" clearance to assure full release of driven plate. See figure 4-2.

The driven plate assembly is designed to prevent torsional periods of the engine from being transmitted to the transmission gears and causing rattle. This is accomplished by driving the plate hub through torsional coil springs and providing frictional dampening by means of molded friction washers.

The flange of driven plate hub and two molded friction washers are located between the drive washer and the plate which bears the facings. The plate and driven washer are solidly joined together by three rivets which are shouldered so that the hub may move independently of the plate and washer. When the parts are riveted together the molded friction washers are compressed between the hub flange and drive washer just enough to provide proper braking friction between these parts. Six coil springs are located in notches or recesses in the plate, hub flange, and drive washer so that the plate and washer drive the hub through these springs. The three shouldered rivets pass through notches in the edge of hub flange and serve as

stop pins for limiting compression of the coil springs whenever shock loads are transmitted through the clutch assembly. The coil springs are covered on transmission side of plate by a slinger which keeps oil or oil vapor from the driven plate facings. See figure 4-2.

#### d. Clutch Release Mechanism

The clutch pedal is supported on the car frame upon the same shaft and bracket which supports the brake pedal. The pedal is bushed and is lubricated through a passage in the shaft which has a lubrication fitting.

An over-center type actuating spring holds the pedal firmly against a rubber bumper on the toe board when clutch is in engaged position, and helps to reduce pedal pressure as it goes over center when clutch is disengaged. The actuating spring is attached to the frame by an eye bolt and to a short arm of clutch pedal by an extension which straddles the pivot point of pedal. The spring and extension are positioned so that the pedal is pulled downward when depressed to disengage the clutch. See figure 4-4.

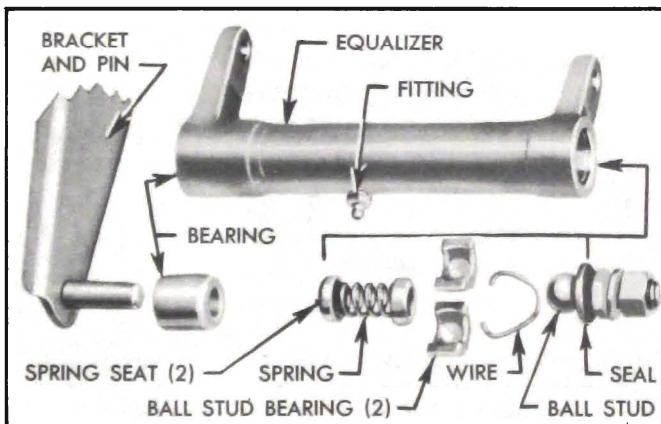


Figure 4-3—Clutch Release Equalizer—Disassembled

The clutch pedal is connected by a non-adjustable link to the outer arm of a release equalizer which provides a universal action in the release linkage. The equalizer permits smooth engagement of clutch withing being affected by movement of the engine on its mountings. The inner end of equalizer is fitted with a rubber bushing which rotates on the pin of a bracket attached to engine. The outer end of equalizer rotates on a ball stud attached to car frame. A spring and two spring seats inside equalizer maintain pressure on the split bearings which support equalizer on stud ball. A lubrication fitting is installed on equalizer and seals inclose both ends to exclude dirt and water. See figure 4-3.

The inner arm of clutch release equalizer is

connected by an adjustable rod to the outer end of the release yoke which is pivoted on a ball stud located in the flywheel housing. The yoke is held on the ball stud by a U-shaped spring riveted to yoke. A boot around the yoke provides a flexible closure for the yoke opening in flywheel housing. The inner end of release yoke is in position to push forward on the clutch release bearing sleeve when clutch pedal is depressed. A U-shaped spring riveted to release bearing sleeve holds bearing sleeve in contact with yoke.

A coiled return spring is connected between the clutch release rod clevis pin and the transmission shift idler lever bracket to keep the clutch release bearing out of contact with the clutch spring when clutch is engaged.

The clutch release bearing is furnished only as an assembly with the sleeve. The bearing is filled with lifetime lubricant in production and no further lubrication is required. The Series 40-50 release bearing has a rounded face where it contacts the clutch spring.

The clutch release bearing and sleeve assembly is mounted upon a bearing support which encircles the transmission main drive gear. The bearing support is flared at the rear end to seat in flywheel housing and is held in place by a spring washer and the outer race of transmission main drive gear bearing. See figure 4-1.

## 4-3 CLUTCH TROUBLE DIAGNOSIS

### a. Excessive Pedal Pressure

The pressure required to depress clutch pedal to toe board should not exceed 35 pounds. If pedal pressure is excessive, make certain that pedal is not binding in floor mat or the seal on underside of toeboard. Thoroughly lubricate clutch pedal and release equalizer with chassis lubricant. NOTE: *Excessive pedal pressure may be caused by using excessive grease gun pressure on equalizer, which may force the rubber inner bearing out into contact with equalizer bracket on engine.*

If excessive pedal pressure still exists after release linkage is properly lubricated, lubricate internal working parts of clutch as described in paragraph 4-4.

### b. Clutch Noise

Squeaking and grinding noises during clutch pedal operation are usually caused by heavy friction in the release linkage or internal parts of clutch assembly. Before condemning the re-

lease bearing, thoroughly lubricate clutch pedal and release equalizer and, if necessary, lubricate internal working parts of clutch as described in paragraph 4-4.

#### c. Clutch Grab or Chatter

A very slight amount of oil on driven plate facings will cause clutch grab and chatter. A new driven plate must be installed if original plate facings contain oil since removal of oil from facings is not practical.

When oil is found on facings, examine pilot bearing, transmission drainback, rear engine bearing and engine oil leaks which might drain into clutch housing past gasket between upper and lower flywheel housings. It is important that this gasket provides a good seal.

#### d. Clutch Drag or Failure to Release

To test for clutch drag or failure to release, depress clutch pedal to toeboard with engine running and shift transmission into low gear. Hold pedal depressed and shift transmission to neutral, wait about 15 seconds with pedal depressed and again shift into low gear. If clutch is not releasing completely a gear clash will occur.

If test shows that clutch is releasing properly and complaint is of gear clash going into low and reverse gears, refer to paragraph 4-10.

If test shows that clutch is not releasing properly, check clutch pedal lash (par. 4-4) and check release linkage for lost motion. Correct as necessary and again test for clutch drag.

If clutch drag cannot be corrected in release linkage, remove flywheel lower housing and check for proper contact between clutch spring and cover as described in paragraph 4-5 (b, step 9). If removal of clutch is found necessary, check driven plate for oil soaked or cracked facings, also for run-out and for free movement on main drive gear (par. 4-13, b).

#### e. Clutch Slipping

First make certain that clutch pedal is adjusted for specified lash (fig. 4-4) and that pedal is not binding. One type of clutch slippage is sometimes wrongly diagnosed as due to a weak clutch spring. This slippage occurs during gear shifting and full engagement of the clutch is not obtainable until the engine speed is reduced. After full engagement is obtained no further slippage occurs during acceleration or under full load. This condition is usually due to the clutch driven plate hub sticking on the splines of the

transmission main drive gear. Correction can be made by removing the clutch and thoroughly cleaning splines of driven plate and main drive gear then applying a light coating of Lubriplate.

If clutch spring is suspected of being weak, inspect it as described in paragraph 4-6, b.

## 4-4 CLUTCH ADJUSTMENT AND LUBRICATION

### a. Clutch Pedal Lash Adjustment

It is very important to maintain proper clutch pedal lash at all times. Insufficient pedal lash will cause pressure of release bearing against the clutch spring, resulting in abnormal wear of these parts; it may also cause clutch slippage and abnormal wear of driven plate if pressure is great enough to prevent positive engagement of clutch.

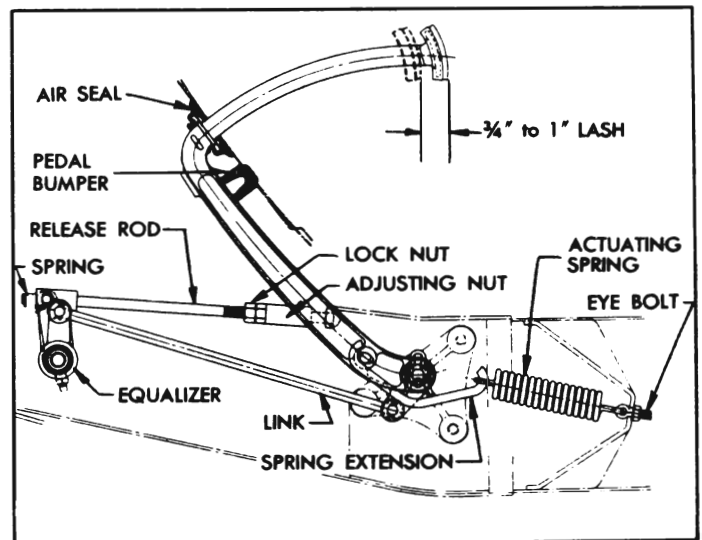


Figure 4-4—Clutch Pedal Lash Adjustment

1. Make certain that the actuating spring pulls clutch pedal firmly against pedal bumper on toe board when pedal is released. If pedal is not pulled against bumper, check pedal and linkage for binding or lack of lubrication; also check condition of actuating spring and make sure that spring eye bolt is fully tightened. See figure 4-4.

2. Check pedal free movement or lash by pushing on pedal pad until release bearing contacts clutch spring. *Do not mistake tension of pedal return spring as an indication of lack of pedal lash.* Free movement or lash of clutch pedal should be  $\frac{3}{4}$ " to 1", measured at pedal pad.

3. If adjustment is necessary, loosen lock nut and turn adjusting nut on clutch release rod as required to secure  $\frac{3}{4}$ " lash, then tighten lock nut securely. See figure 4-4.

**b. Lubrication of Clutch Internal Parts**

Lubrication of clutch pedal and release equalizer is included in Lubricare every 1000 miles (par. 1-1). Lubrication of clutch internal working parts is usually required only at time clutch is assembled and installed; however, if lubrication becomes necessary to eliminate squeaks or excessive pedal pressure, proceed as follows:

1. Remove flywheel lower housing. See figure 4-1.

2. Disconnect rod from clutch release yoke, unhook boot from opening in flywheel upper housing, and pull yoke outward to disengage it from ball stud.

3. Apply Lubriplate or Delco Brake Lubricant to ball stud and ball seat in yoke, then connect yoke to ball stud. Hook boot to opening in flywheel housing and connect release rod to yoke.

4. Examine clutch release bearing sleeve to see whether it is binding on release bearing support due to improper installation. Lubricate any contact point between bearing sleeve and support by brushing with Lubriplate or Delco Brake Lubricant.

5. Brush a small amount of Lubriplate or Delco Brake Lubricant on clutch spring at points of contact with clutch cover, and work clutch pedal a number of times to work lubricant into contact points.

6. Install flywheel lower housing, making sure that gasket is in condition to insure a tight seal.

**4-5 REMOVAL AND INSTALLATION OF CLUTCH****a. Removal of Clutch**

1. Remove rear axle assembly (par. 5-7) and transmission (par. 4-13). Remove flywheel lower housing.

2. Disconnect release rod from release yoke and remove yoke boot and release rod nut lock which are bolted to yoke. See figure 4-5.

3. Remove spring washer which retains release bearing support in flywheel housing and remove support and gasket.

4. Pull outward on release yoke to free it from the ball stud in flywheel housing and remove yoke and release bearing through bottom of housing. Separate yoke from bearing.

5. *Mark the clutch cover and the flywheel with a center punch so that cover can be reinstalled in the same position on flywheel in order to preserve engine balance.*

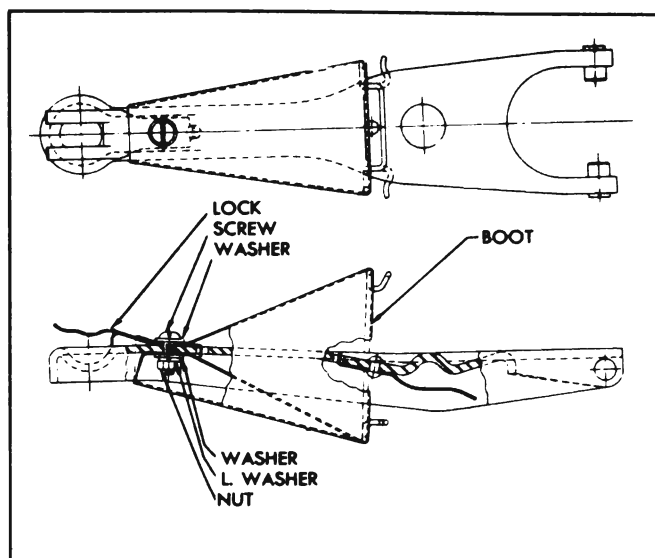


Figure 4-5—Clutch Release Yoke and Boot

6. Loosen each clutch cover bolt a little at a time in order to relieve clutch spring pressure evenly and avoid distortion of cover. Support pressure plate and cover assembly while removing the last cover bolts, then remove assembly and driven plate.

**b. Installation of Clutch**

1. Very sparingly apply front wheel bearing lubricant to main drive gear pilot bearing in crankshaft. If too much lubricant is used it will run out on face of flywheel when hot and ruin driven plate facings. Make sure that surface of flywheel is clean and dry.

2. Make sure that splines in driven plate hub are clean and apply a light coating of Lubriplate. Driven plate facings must be clean and dry.

3. Place driven plate on pressure plate with oil slinger toward pressure plate, then place clutch assembly in position against flywheel, *being sure to align marks made on flywheel and cover before removal.* Install cover bolts with lockwashers but do not tighten bolts.

4. Insert a spare main drive gear through hub of driven plate and into the pilot bearing. Tighten each clutch cover bolt several turns at a time to draw cover evenly into pilot of flywheel and avoid distortion of cover. While tightening cover bolts, move main drive gear from side to side to center driven plate with pilot bearing. If plate is not properly centered it will be difficult to slide transmission into place. Make sure all cover bolts are uniformly tightened.

5. Fill groove in release bearing sleeve with wheel bearing lubricant. Coat release yoke ball stud and ball recess in release yoke with Lubri-

plate or Delco Brake Lubricant. Attach release bearing to release yoke and attach yoke to ball stud in flywheel housing.

6. Install release bearing support with a new gasket, placing support in flywheel housing with the tab on support aligned with molded recess in housing to permit positive drain back of oil to transmission. Install spring washer with outer edge against bearing support.

7. Install transmission (par. 4-13), being sure to use Guide Pins J 851 to avoid damage to clutch driven plate which would result if weight of transmission is allowed to rest on main drive gear in driven plate hub.

8. Install boot and release rod nut lock on yoke (fig. 4-5), attach release rod to yoke, then adjust for clutch pedal lash of  $\frac{3}{4}$ " (par. 4-4).

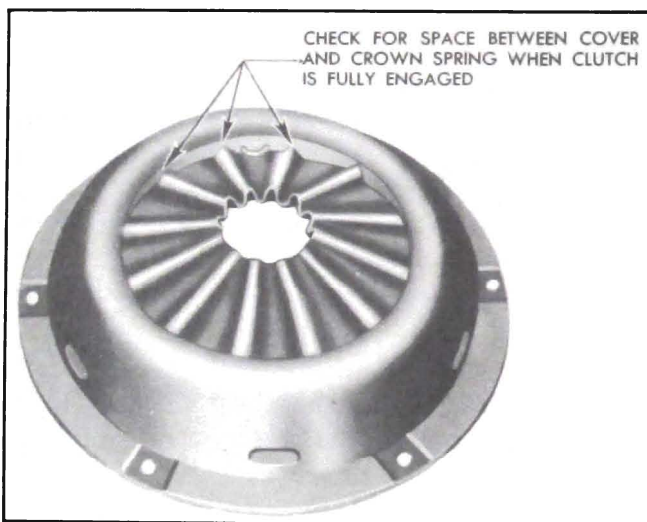


Figure 4-6—Points to Check Contact of Clutch Spring with Cover

9. Have a helper hold clutch fully disengaged, then check with a feeler gauge for space between cover and clutch spring at points of contact. See figure 4-6. The clutch will not fully disengage if any one of the clutch spring contact points fails to solidly contact the cover. This condition must be corrected by removing clutch and properly setting the spring retainer ears on cover. See figure 4-7.

10. Install flywheel lower housing, making sure that gasket is in condition to insure a tight seal. Install rear axle assembly (par. 5-7).

11. Road test car for clutch performance. *Under no circumstance should the clutch be harshly used immediately after installation of a new driven plate, flywheel, or pressure plate.* Sudden engagement of clutch with engine running at abnormal speed, or continual slipping of clutch, may permanently injure driven plate facings and may cause scoring of flywheel and

pressure plate. *When these parts are new they must be given moderate use for several days until nicely burnished. Be sure that car owner is advised of this requirement.*

## 4-6 DISASSEMBLY, INSPECTION, AND ASSEMBLY OF CLUTCH

### a. Disassembly of Clutch

1. Place pressure plate and cover assembly on flat work surface and *mark cover, pressure plate, and clutch spring* with paint so that parts can be reassembled in the same relationship to each other in order to preserve engine balance. See figure 4-12.

2. Unhook spring retainers from ears on clutch cover, using Assister Hook J 1039-2 shown in figure 4-12, Tool J 1039-1 shown in illustration is not used in this operation.

3. Lift off clutch cover, then unhook all spring retainers from clutch spring by working one leg of retainer toward center of spring and the other leg away from center. See figure 4-11.

4. Lift off clutch spring and remove retainers from pressure plate. See figure 4-10.

### b. Inspection of Clutch Parts

Wash all metal parts of clutch, except release bearing and driven plate, in suitable cleaning solution to remove dirt and grease. Soaking release bearing in cleaning solution may permit solution to seep into bearing and destroy the lubricant. Soaking driven plate in cleaning solution may damage the facings.

1. *Flywheel and Pressure Plate.* Examine friction surfaces of flywheel and pressure plate for scoring or roughness. Slight roughness may be smoothed with fine emery cloth, but if surface is deeply scored or grooved the part should be replaced.

2. *Clutch Cover.* Inspect clutch cover for cracks or distortion. Place cover on a flat surface and measure setting of each of the six ears where spring retainers are attached. The dimension from flange surface of cover to top surface of each ear should be  $1\frac{5}{8}$  inch. See figure 4-7. If dimension is not  $1\frac{5}{8}$  inch, and cover is otherwise serviceable, the ears should be bent as required, using care to avoid cracking the metal.

3. *Clutch Spring.* Inspect clutch spring for cracks, particularly at inner edge. Cracks weaken the spring and make replacement necessary.

It is a normal condition to have some wear at the inner edge of spring, resulting from release

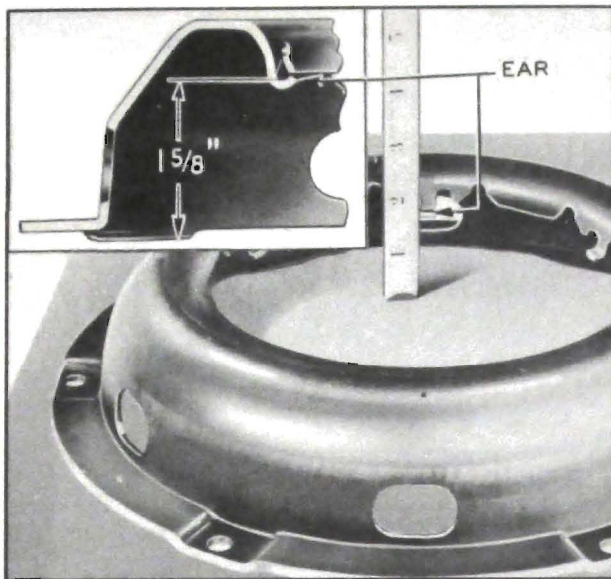


Figure 4-7—Setting of Spring Retainer Ears on Clutch Cover

bearing sliding radially on clutch spring. Due to variation in diameters of holes, the contact of bearing race may be at varying distances from edge of hole in different springs. If hole is of small diameter, release bearing forms depression having centers approximately  $\frac{3}{16}$ " from edge of hole. This type of wear does not affect the operation or efficiency of the clutch spring; the spring should not be discarded unless the depression is worn deep enough to cut through the metal. If hole is of large diameter, bearing will be at edge of hole resulting in thin metal. Unless the metal is worn to a sharp knife edge, the spring will operate satisfactorily and should not be discarded.

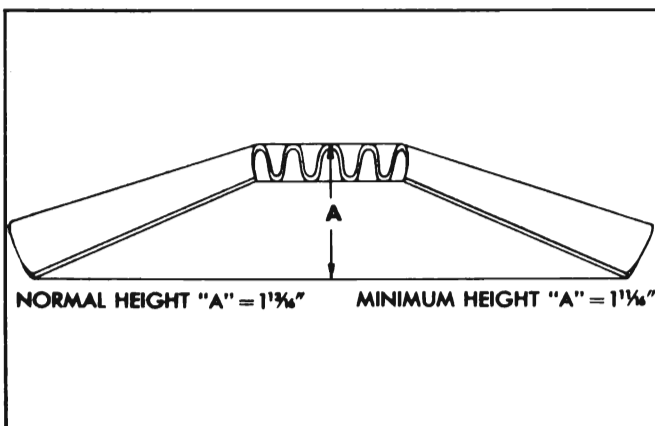


Figure 4-8—Clutch Spring Height

The clutch spring will flatten slightly due to the metal taking a permanent set, which is characteristic of any type of spring after continued flexing. The normal height of a new spring is  $1\frac{3}{16}$ ". See figure 4-8. After only a short period of usage this height will be reduced somewhat; however, if height is not less than  $1\frac{1}{16}$ " the

spring will retain sufficient pressure to prevent clutch slippage and will operate satisfactorily providing, of course, that spring is not cracked. NOTE: Testing a clutch spring by standing on it and jumping up and down, forcing spring through does not necessarily indicate spring should be replaced.

4. *Clutch Driven Plate.* Inspect driven plate for condition of facings, loose rivets, broken or very loose torsional springs and flattened cushion springs. See figure 4-2.

If facings are worn down to rivets or are oily, two plate assembly should be replaced. A very slight amount of oil on clutch facings will cause clutch grab and chatter. A large amount of oil on facings will cause slippage or drag. Removal of oil by solvents or by buffing is not practical since oil will continue to bleed from facing material when hot.

When oil is found on driven plate facings, examine transmission drainback hole, pilot bearing, engine rear bearing and other points of oil leakage, and the flywheel lower housing gasket. It is very important that this gasket provides a good seal.

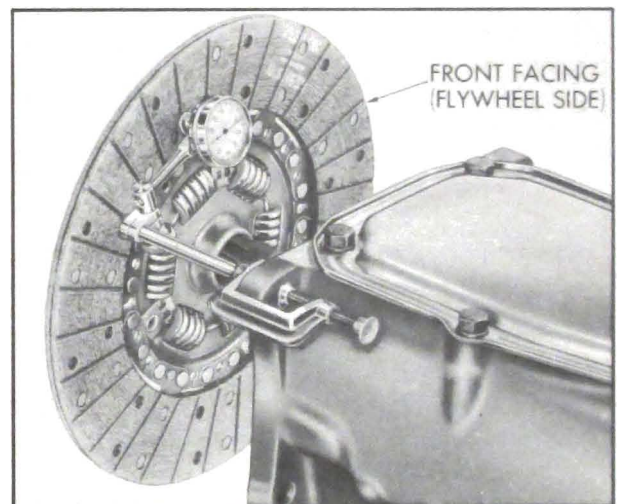


Figure 4-9—Checking Driven Plate for Run-out

Test the fit of driven plate hub on transmission main drive gear; an easy sliding fit should exist. Regardless of whether the old plate or a new one is to be installed, the plate should be checked for run-out. This check can be made by sliding the driven plate, *front side first*, over the transmission main drive gear until it is tight on the spline, then setting up a dial indicator to bear against the plate facing as shown in figure 4-9. While holding firmly against front end of main drive gear to take up play in main drive gear bearing, slowly rotate driven plate and observe the amount of run-out shown by indi-

cator. If run-out of front facing exceeds .025" the plate should not be used since it is not practical to correct excessive run-out by bending.

5. *Bearings.* Inspect clutch release bearing for scoring or excessive wear on front contact face. Test for roughness of balls and races by pressing and turning front race slowly. Inspect main drive gear pilot bearing in crankshaft. If bearing is rough or worn it should be replaced, using Puller J-164 for removal.

### c. Assembly of Clutch

1. At points where clutch spring contacts clutch cover, pressure plate, and ends of spring retainers, apply a light coating of Lubriplate or Delco Brake Lubricant (*this is not brake fluid*). Use sparingly—excessive lubrication will ruin driven plate facings.

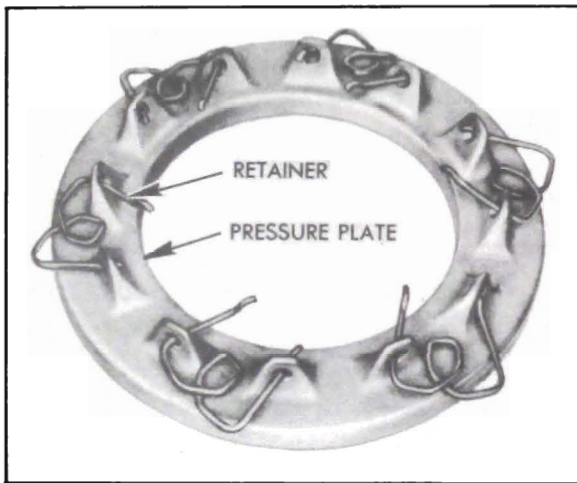


Figure 4-10—Positioning Spring Retainers

2. Install spring retainers through holes in pressure plate, with curves on ends upward, one end in toward center of plate and the other end out from center as shown in figure 4-10.

3. Place clutch spring on pressure plate *with marks made at disassembly in alignment*, then push spring retainers up over the spring. See figure 4-11.

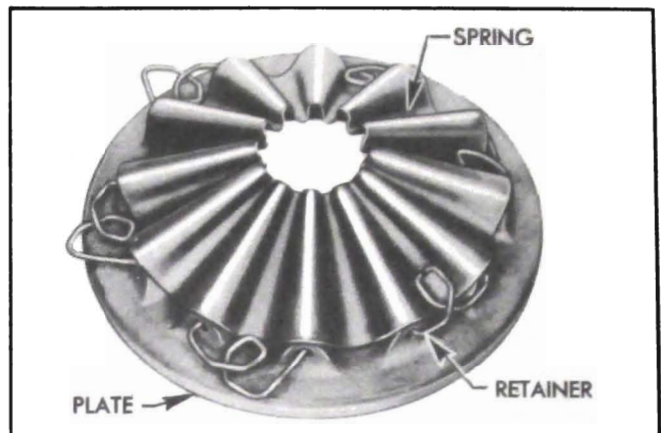


Figure 4-11—Assembling Pressure Plate, Clutch Spring and Retainers

4. Place clutch cover over spring and pressure plate *with marks made at disassembly in alignment*.

5. Use Assembly Tool J1039-1 and Assister Hook J1039-2 to hook loop of each spring retainer over ear on clutch cover. See figure 4-12. Do not hammer on tools to get them into place because this will distort clutch cover. Do not stretch retainers any further than is necessary to hook loop over ear on cover. If retainers appear weak or distorted they should be replaced in complete sets to insure even tension.

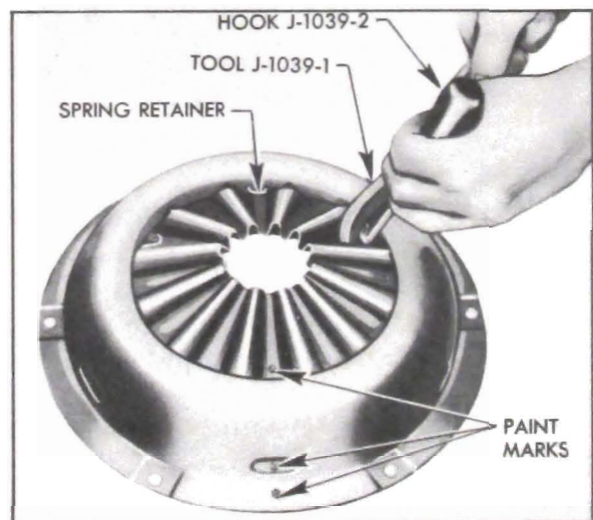


Figure 4-12—Attaching Spring Retainer to Cover