GROUP 4

CLUTCH, S-M TRANSMISSION

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SECTION 4-A

CLUTCH

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4-1 CLUTCH SPECIFICATIONS

a. Tightening Specifications

Part	Location	Thread Size	Torque Ft. Lbs.
Bolt	Clutch Cover to Flywheel	5/16-18	25-35
Bolt	Flywheel Housing to Cylinder Block	3/8 -16	45-60
Spec. Ball	Clutch Equalizer Ball to Release Shaft	7/16-20	60-85
Bolt	Rear Mounting Pad to Transmission	7/16-14	50-60
Stud	Clutch Equalizer to Bracket to Frame	1/2 -13	20-30
Bolt	Transmission to Flywheel Housing	7/16-14	40-45

b. Clutch Specifications

Clutch Type	Single Plate-Dry Disc
Clutch Pedal Pressure	28-32 Lbs.
Clutch Pedal Lash	7/8" - 1 1/8"
Driven Plate Diameter	11" x 6 1/2"
Driven Plate Facings -	
Type and Number	Woven Molded, 2
Attachment to Plate	Rivets
Facing Thickness	.135 ± .002"
Total Effective Area (sq. in.)	61.85
Max. Allowable Run-out at Rear Face of Plate	.025"
Clutch Springs -	
Type and Number	Coil, 8
Total Pressure (lbs.)	1839
Spring Pressure (lbs.) @ Length	6 Springs 227 ± 5 lbs. @ 1.736
	3 Springs 159 ± 5 lbs. @ 1.736
Free Length	Approx. 2 5/8"
Press. Plate Driving Lug Clearance in Cover	.005" - .008"
Height, Inner Ends of Release Levers to Flywheel	2.062
Max. Allowable Variation	.030"

4-2 DESCRIPTION OF CLUTCH

A single plate, dry disc clutch is used in Models equipped with synchromesh transmissions. The clutch is of conventional design with coil type clutch springs and three release levers. The release levers are adjustable.

a. Clutch Assembly

The clutch cover is bolted to the flywheel and three lugs on the pressure plate engage slots in the cover to transmit torque to the plate. Eight clutch springs are located between the cover and the pressure plate. The three clutch release levers are located so that their inner ends are in position to be engaged by the clutch release bearing. The levers pivot on fulcrums bolted to the clutch cover and in the three pressure plate lugs. See Figure 4-1.

The outer ends of the release levers are weighted so that at higher engine speeds where slipping is liable to occur, centrifugal force causes more pressure to be applied on the pressure plate. The faster the clutch revolves, the greater the pressure exerted against the clutch plate, thereby increasing the torque transmitting ability of the clutch. This additional pressure allows the use of a clutch which requires lower foot pressure at the pedal for normal clutch operation.

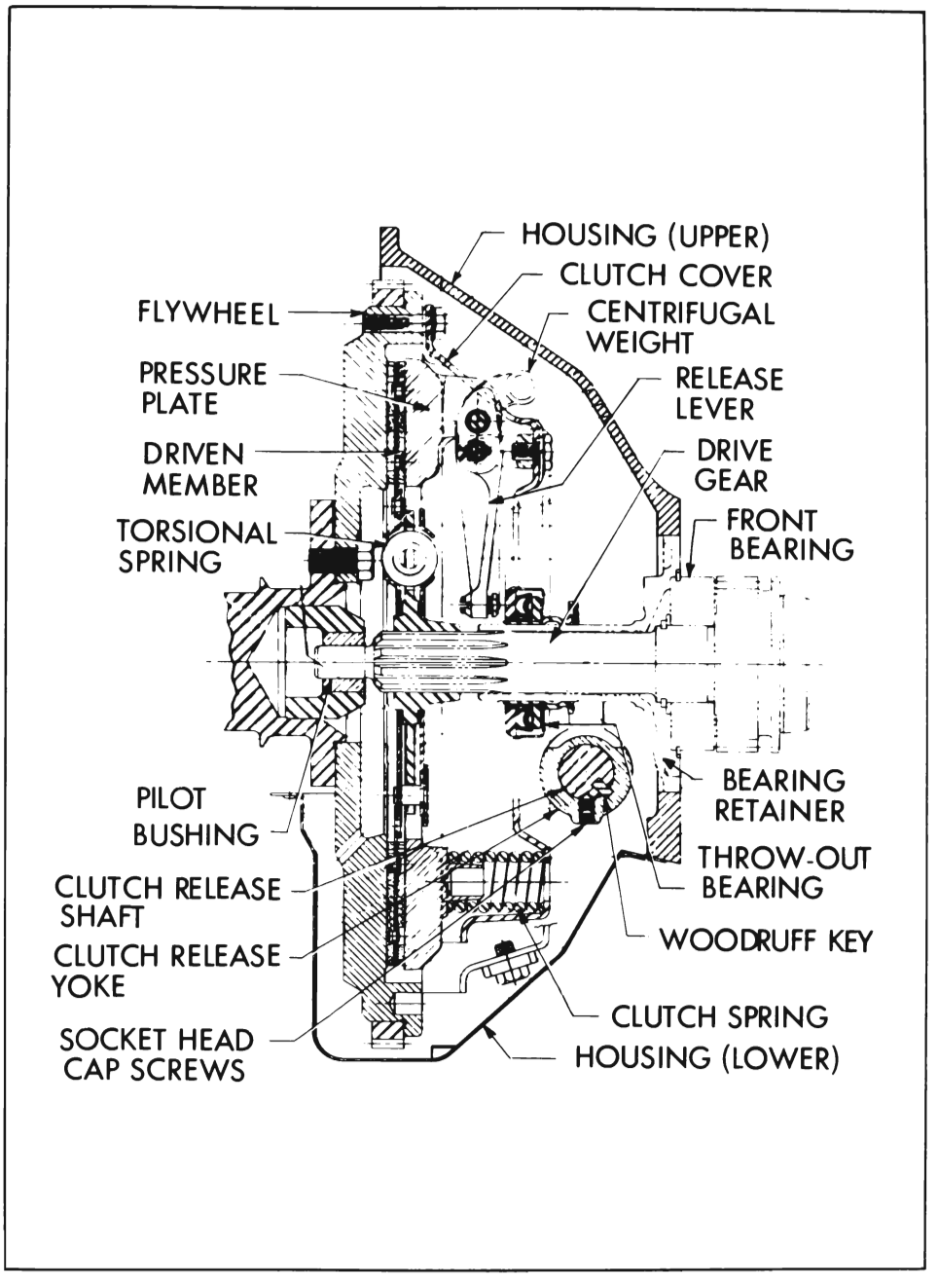

Figure 4-1—Clutch and Flywheel Assembly

When the clutch is in the engaged position, the release levers are clear of the release bearing and the clutch springs cause the pressure plate to clamp the driven plate against the flywheel with sufficient force to transmit power of the engine without slippage. The power drive is from flywheel to clutch cover, cover to pressure plate, and from pressure plate and flywheel to driven plate.

When the clutch is disengaged, the clutch release bearing presses forward on the inner ends of the release levers which pivot and force the pressure plate rearward against the pressure of clutch springs. The pressure plate is moved rearward far enough to free the driven plate. See Figure 4-1.

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 bushing pressed into a recess in the rear end of the engine crankshaft. See Figure 4-1.

The outer area of the driven plate is divided into segments which are formed in low waves to provide springs between the plate facings and thereby cushion engagement of the clutch. A molded facing, grooved to give release,

is riveted to each side of every segment of the plate. When the clutch is fully released, the waved segments cause the facings to spread approximately .055" and the movement of pressure plate provides an additional clearance of approximately .030" 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.

c. Clutch Linkage

The clutch pedal is of the suspended type and pivots on a shaft which extends through the clutch pedal bracket. The clutch pedal returns against a non-adjustable pedal stop on the bracket assembly.

The pedal rod extends through the floor pan to connect the pedal linkage to the clutch equalizer. The equalizer pivots between a ball stud located at the upper flywheel housing at one end and the frame at the other.

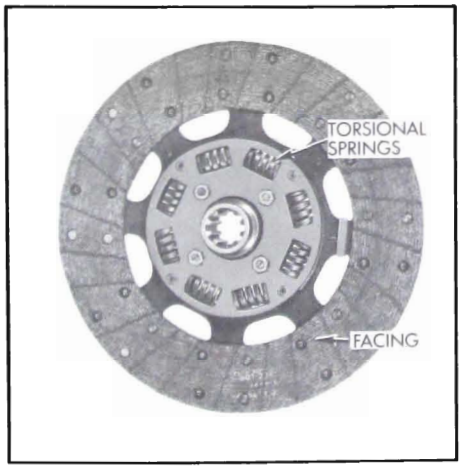

Figure 4-2—Driven Plate - Transmission Side

A heavy overcenter spring is stretched between an eye-bolt, which is anchored through the cowl at one end, and the clutch linkage at the other.

The upper clutch release rod is fastened to the clutch release lever (see Figure 4-3). The lower end of the release rod is fastened to the clutch equalizer with a clevis and retainer. Clutch adjustment is obtained on the lower clutch release rod.

The clutch release shaft pivots in the upper flywheel housing (see Figure 4-4). The clutch release shaft is retained in the upper flywheel housing by the clutch release lever and clutch equalizer (see Figure 4-4).

The clutch release yoke is positioned to push forward on the throw-out bearing when the clutch pedal is depressed. A U-shaped spring riveted to the throw-out bearing holds the throw-out bearing in contact with the clutch release yoke. The clutch release rod length must be adjusted to provide clearance between the throw-out bearing and the clutch release levers.

The throw-out bearing is mounted over the front bearing retainer which retains the transmission main drive gear bearing. The throw-out bearing is filled with lifetime lubricant in production and no further lubrication is required. Lightly lubricate inside diameter of throw-out bearing with wheel bearing lubricant or a heavy grease before installing.

4-3 CLUTCH TROUBLE DIAGNOSIS

a. Excessive Pedal Pressure

The pressure required to depress clutch pedal to toe board should not exceed 32 pounds. If pedal pressure is excessive, make certain that pedal rod is not binding where it passes through the cowl. Thoroughly lubricate equalizer with chassis lubricant. Lubricate all linkage pins with engine oil. If excessive pedal pressure still exists after release linkage is properly lubricated, lubricate internal working parts of clutch as described in paragraph 4-5.

b. Clutch Noise

Squeaking and grind noises during clutch pedal operation are usually caused by heavy friction in the release linkage or internal parts of clutch assembly. Before condemning the throw-out bearing, thoroughly lubricate equalizer and, if necessary, lubricate internal working parts of clutch as described in paragraph 4-5.

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 bushing, transmission drainback, rear engine bearing, and oil leaks which might drain back into clutch housing between upper and lower flywheel housings.

d. Clutch Drag or Failure to Release

To test for clutch drag or failure to release depress clutch pedal to toeboard and put 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 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.

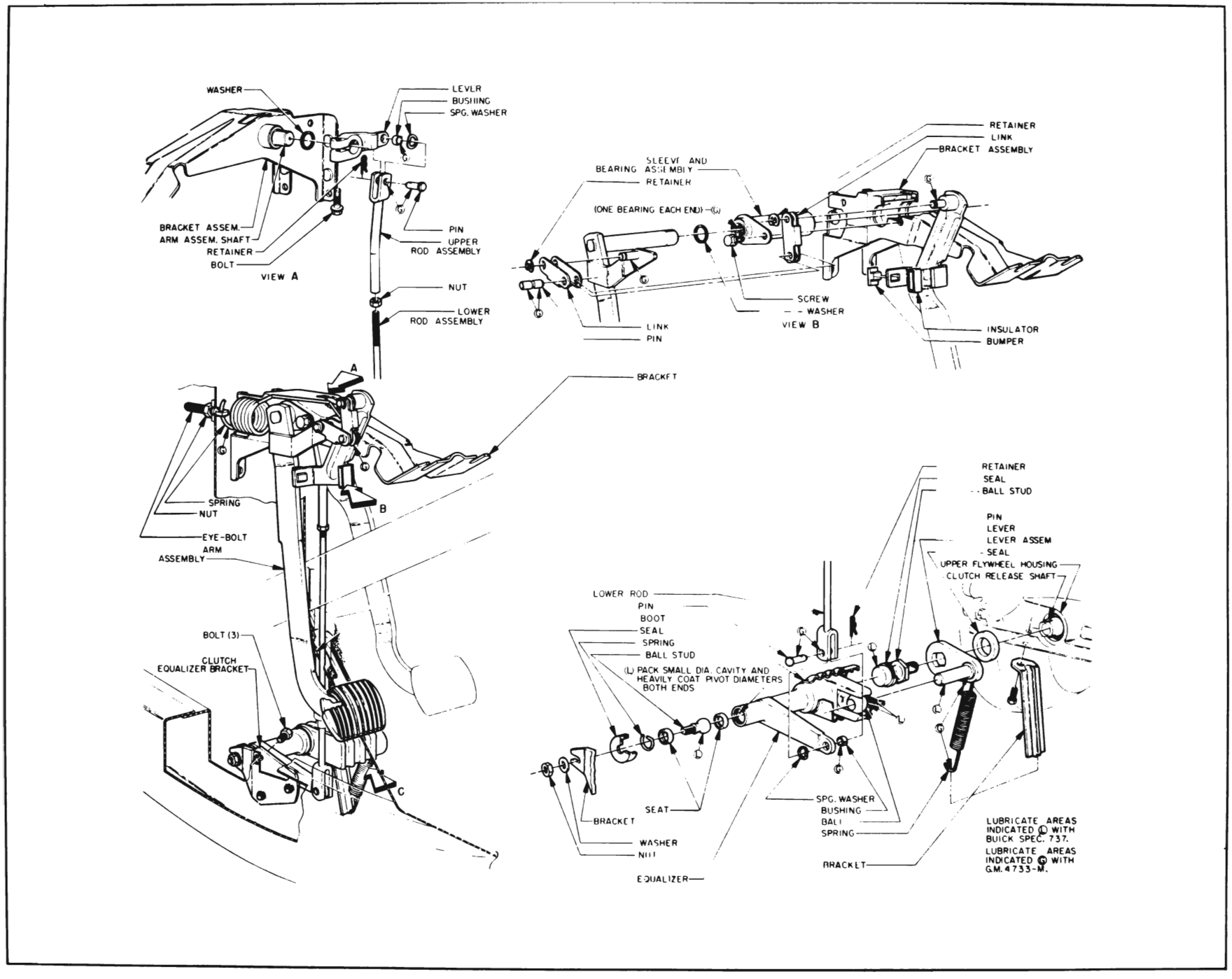

Figure 4-3—Clutch Linkage

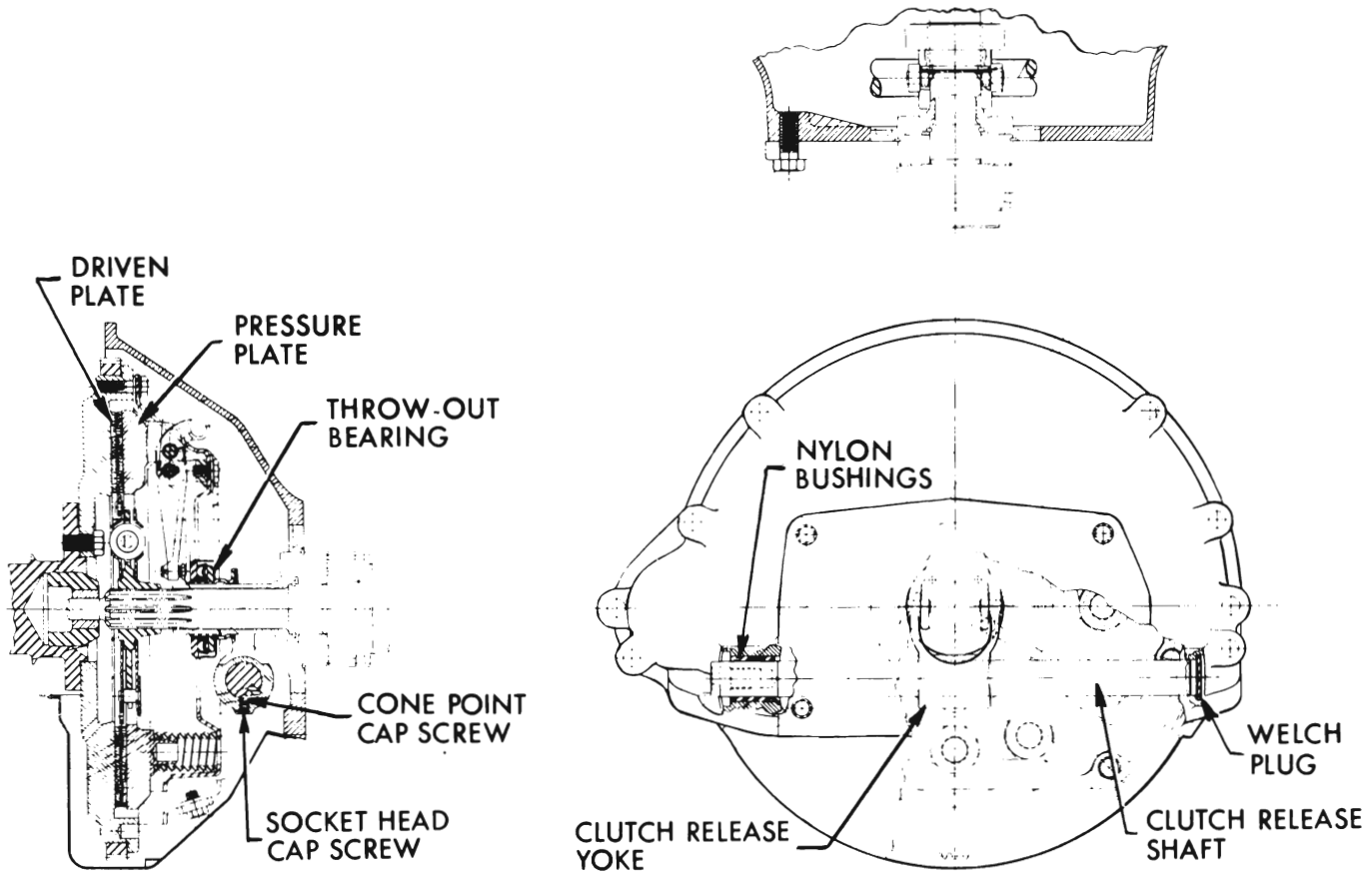

Figure 4-4—Clutch Information Assembly

If clutch drag cannot be corrected in release linkage, remove clutch and check height of release levers. Check driven plate for oil soaked or cracked facings, also for run-out and free movement on main drive gear (par. 4-6).

e. Clutch Slipping

First make certain that clutch pedal is adjusted for specified lash (7/8" to 1") and that pedal is not binding. One type of clutch slippage is sometimes wrongly diagnosed as due to weak clutch springs. 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. Make sure that release lever pins are not binding, and that pressure plate driving lugs are not binding in clutch cover.

4-4 CLUTCH ADJUSTMENT

Pedal lash (free pedal) must be adjusted occasionally to compensate for normal wear of clutch facings. As the driven plate wears thinner, pedal lash decreases.

It is very important to maintain pedal lash at all times. Insufficient pedal lash will cause the throw-out bearing to ride against the release levers all of the time, resulting in abnormal wear of these parts. It may also cause clutch slippage and abnormal wear of the driven plate, flywheel, and pressure plate if pressure on the release levers is enough to prevent positive engagement of the clutch.

Check pedal lash (free pedal) by pushing on the pedal pad with the hand. Pedal lash should be 7/8" to 1" measured at the pedal pad.

Adjust pedal lash as follows:

1. Make certain that clutch pedal returns firmly against pedal bumper when pedal is released. If pedal does not contact bumper, check pedal and linkage for binding or lack of lubrication. See Figure 4-3.

2. With car raised, lift outer end of clutch equalizer until throw-out bearing contacts clutch release levers. Free movement at outer end of equalizer should be approximately 3/16". This should give correct lash at pedal.

3. If free movement is not about 3/16", remove clevis pin from bottom end of clutch release rod and rotate rod as required to make free movement correct. Reinstall clevis pin with new cotter pin.

4. Check to make sure pedal lash is between 7/8" and 1".

4-5 REMOVAL, LUBRICATION AND INSTALLATION OF CLUTCH

a. Removal of Clutch

1. Remove propeller shaft from front companion flange.

2. Remove transmission as described in paragraph 4-13.

3. Remove clutch equalizer shaft.

4. Disconnect clutch return spring.

5. Remove ball stud from clutch release shaft.

6. Remove clutch release lever.

7. Remove clutch release seal (see Figure 4-4).

8. Remove nylon bushing (see Figure 4-4).

9. Remove socket head cap screw on clutch release shaft. From same hole remove second socket head (cone point).

10. Pull clutch release shaft out approximately three (3) inches. Slide release yoke and throw-out bearing off end of release shaft. Remove release shaft.

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

12. Loosen each clutch cover bolt a turn at a time in order to relieve clutch spring pressure evenly and thereby avoid distortion of the cover. Metal spacers (such as 1/4" nuts) placed between release levers and inner edge of clutch cover will aid remove and later reinstallation by holding clutch springs partially compressed.

13. Support pressure plate and cover assembly while removing last bolts then remove the cover assembly and driven plate.

b. Lubrication of Clutch

Lubrication of the clutch release equalizer is required only when the clutch is overhauled; if lubrication becomes necessary between overhauls to eliminate squeaks or excessive pedal pressure, the clutch must be removed from the car.

1. Very sparingly apply wheel bearing lubricant in pilot bushing 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 coat of Lubriplate. Apply a light coat of Lubriplate on

transmission drive gear splines. Slide driven plate over transmission drive gear several times. Remove driven plate and wipe off all excess lubricant pushed-up by hub of plate. Driven plate facings must be kept clean and dry.

3. Coat diameter of throw-out bearing with wheel bearing lubricant. Make sure transmission front bearing retainer sleeve is clean and apply a light coat of wheel bearing lubricant. Slide throw-out bearing over transmission retainer several times. Remove throw-out bearing and wipe off all excess lubricant pushed up by hub of bearing.

4. If clutch pressure plate driving lugs are dry, brush a little Lubriplate in between clutch cover and driving lugs, also between driving lugs and release levers. Wipe off any excess lubricant.

c. Checking Release Lever Height

Correct release lever height is essential to insure complete release of the clutch and also to allow smooth, positive engagement of the clutch. Before reinstalling a clutch pressure plate and cover assembly, release lever height should be checked as follows:

1. Mount clutch assembly for checking by placing Adjusting Gauge J-1036 on a spare flywheel and then placing clutch assembly over gauge so that release levers are directly above machined bosses of gauge. See Figure 4-5.

NOTE: Thickness of gauge at machined bosses is .295"; height of gauge at hub is 2-1/16".

2. Install cover bolts and tighten each a turn at a time until all are uniformly tight.

3. Zero dial indicator by mounting dial indicator on Support J-1013. See Figure 4-5. Then set support on flat surface, press indicator down against surface until indicator hand turns approximately one revolution, and tighten indicator to support. Now set indicator face to zero.

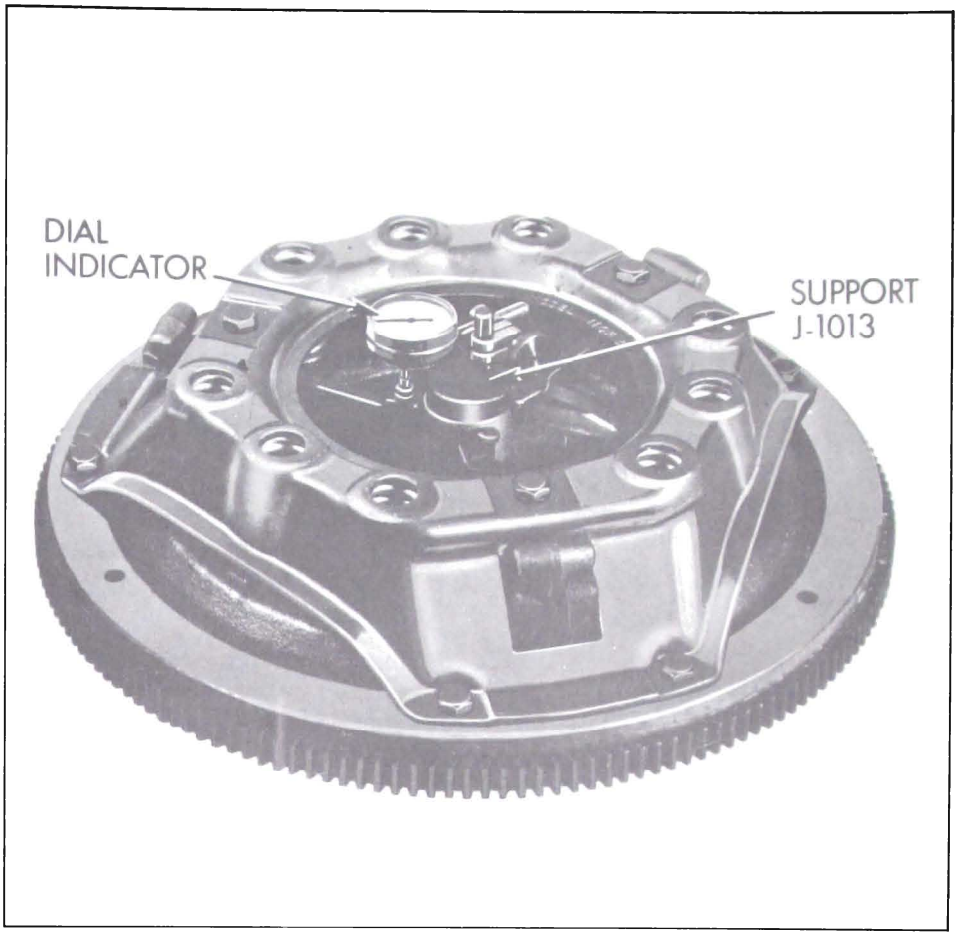

Figure 4-5—Checking Release Lever Height

4. To measure release lever height, carefully place support and indicator on hub of gauge so that indicator stem bears on inner end of each release lever in turn. Indicator hand must turn one revolution and then read within plus or minus .031". Also, all three levers must read within .031" of each other.

5. If release lever heights are not within these specifications, adjust levers as described in subparagraph below.

d. Adjusting Release Lever Height

When any release lever height varies over .031" from the height of the gauge hub, or when the highest and lowest release lever are not within .031" of each other, release lever height must be adjusted.

1. Check tightness of three release lever yoke bolts by tightening to 25 foot pounds.

2. Check release lever height as described in subparagraph above. If any one lever is not within specifications, it is recommended that all three levers be adjusted.

3. Turn each adjusting screw up or down as required to give a dial indicator reading of zero. (Any free movement or "play" should be removed by holding lever downward.)

4. Remove clutch assembly from spare flywheel by loosening cover bolts a turn at a time until metal

spacers are pinched between clutch levers and inner edge of clutch cover. A string or wire fastened to each spacer will keep it from dropping inside the clutch assembly during installation on the car.

5. Turn clutch assembly over so that pressure plate side is up and adjusting screw buttons are contacting a solid surface.

6. Stake each adjusting screw to release lever by peening release lever material into adjusting screw slot at both sides. A blunt screwdriver which nearly fills the slot may be used.

e. Installation of Clutch

1. Place driven plate on pressure plate with raised torsional spring part projecting into center of pressure plate, then place driven plate and pressure plate assembly in position against flywheel. Be sure to align marks on clutch cover with marks on flywheel. Install cover bolts and lockwashers, but do not tighten bolts yet.

2. Insert a spare main drive gear through hub of driven plate and into pilot bushing. Tighten each clutch cover bolt one turn at a time to draw cover down evenly and avoid distortion of cover. While tightening cover bolts, move main driven gear from side to side to center driven plate with pilot bushing. If plate is not properly centered, it will be very difficult to slide transmission into place. Make sure all cover bolts are tightened securely.

3. Remove three spacers from between clutch cover and release levers, if used.

4. Install clutch release shaft part way into upper flywheel housing and install woodruff key into shaft.

5. Slide clutch release yoke onto shaft and slide shaft into place. CAUTION: Make sure release yoke is installed so cone pointed cap screw can be installed into counter bore on shaft. (See Figure 4-4).

6. Install clutch release yoke over woodruff key. Install cone point socket head cap screw first. Install second socket head cap screw in same hole. (See Figure 4-4).

7. Install nylon bushing

8. Install clutch release seal.

9. Install clutch release lever.

10. Install ball stud to clutch release shaft.

11. Install clutch equalizer shaft.

12. Install clutch release rod with retainer pin. Adjust clutch pedal lash as described in paragraph 4-4.

13. Install transmission as described in paragraph 4-12. Be sure to use guide pins to avoid damage to clutch driven plate.

14. Install flywheel lower housing.

15. 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 INSPECTION OF CLUTCH

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 would permit solution to seep into bearing and destroy the lubricant. Soaking driven plate in cleaning solution would damage the facings.

1. Flywheel and Pressure Plate. Examine friction surfaces of flywheel and pressure plate for scoring and 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. Check clearance between pressure plate driving lugs and edges of slots in cover, using feeler gauges. The clearance should be .005" to .008"; excessive clearance may cause rattle when engine is intermittently accelerated with clutch disengaged.

3. 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 near rivets or are oily, the 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. 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 bushing, engine rear main bearing and other points of oil leakage.

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 4-6. 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 indicator. 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.

4. 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 bushing in crankshaft. If bushing is rough or worn it should be replaced.

4-7 ALIGNMENT OF FLYWHEEL UPPER HOUSING

The flywheel upper housing which joins the synchromesh transmission to the engine crankcase is attached to the crankcase by bolts, with two straight dowels to maintain alignment.

Misalignment between the pilot hole which receives the main drive gear bearing in rear wall of housing and the pilot bushing in rear end of crankshaft may cause the transmission to be noisy or to slip out of high gear. To insure correct alignment in production, the pilot hole is bored in the housing after it is assembled to the cylinder crankcase. The flywheel housing furnished for service is completely machined, but it must be checked for alignment after installation.

If an existing housing is suspected of being out of alignment it may be checked after removal of the transmission and clutch assemblies. If a new housing or cylinder crankcase is being installed, alignment should be checked before the flywheel, clutch and transmission are installed. When checking alignment the engine must be in an upright position, dowel pins must be installed, and all housing bolts must be tight.

a. Checking Alignment of Flywheel Upper Housing

1. Remove transmission (par. 4-5) and clutch, leaving flywheel in place.

2. Attach Indicator Support J-4710-1 to flywheel with two flywheel bolts. Mount dial indicator and hole attachment on pilot as shown in Figure 4-16. Adjust ball end of hole attachment to bear against side of pilot hole in flywheel housing.

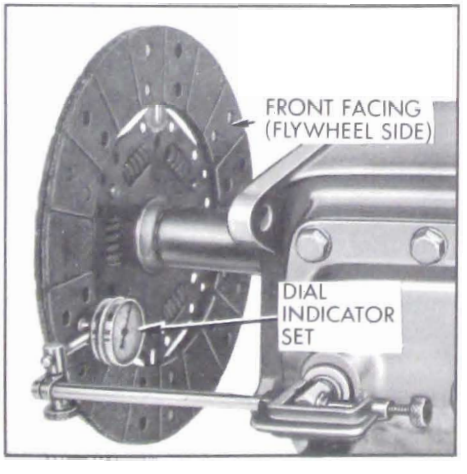

Figure 4-6—Checking Driven Plate for Run-Out

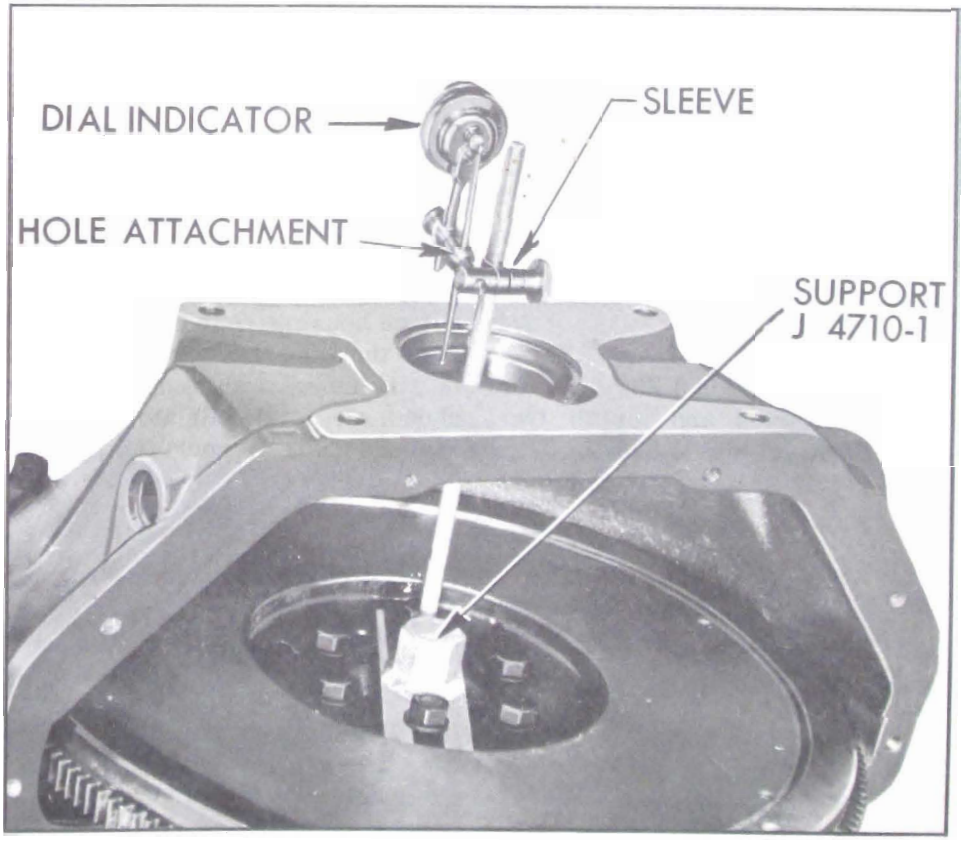

Figure 4-7—Checking Alignment of Housing at Pilot Hole

3. Turn flywheel very slowly and note total run-out of pilot hole as shown by dial indicator. If total indicator reading is .005" or less, flywheel housing alignment is satisfactory. If run-out exceeds .005", correction must be made as follows:

b. Correction of Flywheel Upper Housing Misalignment

1. Remove flywheel upper housing and dowel pins from crankcase.

2. Drill out bolt holes in flywheel housing with a 1/2" drill.

3. Install flywheel housing without dowel pins, and leave bolts just loose enough to permit shifting of housing by tapping with lead hammer.

4. Install dial indicator as shown in Figure 4-16, and check run-out at pilot hole in housing.

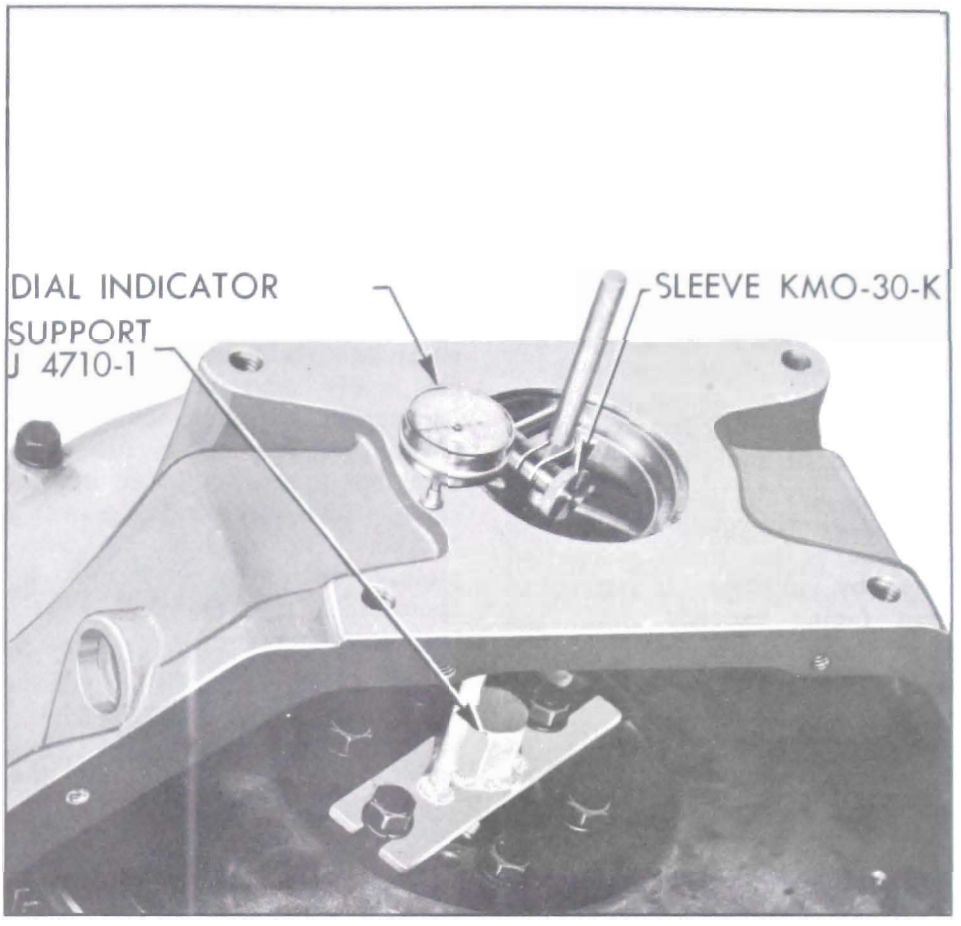

Figure 4-8—Checking Run-Out of Rear Face of Housing

5. Shift housing by tapping with lead hammer as required to bring run-out at pilot hole within .003" indicator reading. Tighten housing bolts and re-check run-out.

6. Using Special Reamer J 2548-3 and Ratchet Wrench J 808-6, ream the dowel holes and install two oversize dowel pins J 808-5.

7. Mount dial indicator to bear against rear face of flywheel housing at a radius of 2 1/2", as shown in Figure 4-8.

8. Turn crankshaft and note run-out of housing rear face, making sure that end thrust of crankshaft is all one way while making this check. If total indicator reading exceeds .003", check for dirt or burrs between housing and crankcase.

9. If no dirt or burrs are present, cement paper shims of proper thickness to crankcase in position required to give an indicator reading of .003" or less, when all bolts are securely tightened.

10. Install clutch and transmission (par. 4-5).