FORD

Service Manual

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NEW HOLLAND

Tractors
FW-20, FW-30, FW-40, FW-60

Reprinted
40003040

REPAIR MANUAL
FOR
FORD
FW-20, FW-30
FW-40, FW-60
TRACTORS

Ford Tractor Operations

Ford Motor Company

Troy, Michigan 48084

SE 3920

Printed in U.S.A.

This is your NEW "Part one-clutch" for your Ford FW Tractor Repair Manual SE3920. Remove your old "Part one-clutch" and replace it with this new material.

Contents

Steiger Clutch, Operation and Maintenance

General:

The major cause of clutch failures could be summarized with two words: "EXCESSIVE HEAT." Excessive heat is not the amount of heat a clutch can normally absorb and dissipate, but the amount of heat a clutch is "FORCED" to absorb and attempt to dissipate.

Most clutches are designed to absorb and throw off more heat than encountered in normal clutch operation without damage or breakdown of the friction surfaces. Clutch installations are engineered to last many thousands of hours under normal operating temperatures and if properly used and maintained they will give satisfactory service.

However, if a clutch is "slipped" excessively or asked to do the job of a fluid coupling, high heat quickly develops to destroy the clutch. Temperatures generated between the flywheel, driven discs and pressure plates can be high enough to cause the metal to flow and the friction facing material to char and burn.

Heat or wear is practically non-existent when a clutch is Fully Engaged but during the moment of engagement, when the clutch is picking up the load, it generates considerable heat. An improperly adjusted or slipping clutch will rapidly generate sufficient heat to destroy itself.

Proper training of drivers, as well as mechanics, is essential for long and satisfactory clutch life. The tractor operator should be taught how to operate the tractor properly, not left to experiment for himself. Starting in the right gear, clutch malfunctions and "when to write up a clutch for readjustment" are the more critical points to cover in operator training programs.

The maintenance personnel should not be left out of the picture. Mechanics attending operator training programs have a chance to see what operator errors can do to clutch life and be in a better position to spot and analyze failures during their clutch maintenance and rebuild programs.

Clutches are designed and recommended for specific vehicle applications and loads. These limitations should not be exceeded. Excessive or extreme overloading is not only injurious to the clutch, but to the entire vehicle power train as well if the total gear reduction in the power train is not sufficient to handle excessive overloads.

"Riding" the clutch pedal is very destructive to the clutch, since a partial clutch engagement permits slippage and excessive heat.

"Riding" the clutch pedal will also put a constant thrust load on the release bearing, which can thin out the lubricant. Release bearing failures can be attributed to this type of operation.

Holding the vehicle on an incline with a slipping clutch is asking the clutch to do the job normally expected of a fluid coupling. A slipping clutch accumulates heat faster than it can be dissipated, resulting in early failures.

Description:

Operators and mechanics should be aware of the fact that the Steiger Angle-Spring Clutches have provisions for an internal clutch adjustment. This permits the clutch "itself" to be readjusted while it is in the tractor. Operators and mechanics should be advised that, unlike competitive clutches, YOU DO NOT ADJUST THE EXTERNAL LINKAGE ON A STEIGER ANGLE-SPRING CLUTCH TO COMPENSATE FOR WEAR. LINKAGE SHOULD ONLY BE RESET TO PROVIDE FOR PROPER FREE-PEDAL AFTER THE INTERNAL CLUTCH ADJUSTMENT HAS BEEN MADE.

On all models Series I and II tractors, including the Series III Wildcat, the clutch is activated by means of direct mechanical linkage.

On all model Series III tractors equipped with a 1010 transmission, with the exception of the Series III Wildcat, the clutch is activated hydraulically by means of a clutch master cylinder and slave cylinder arrangement.

Steiger Angle-Spring Clutches utilize twin 6-button "ceremetallic facing" driven discs and are of the adjustable, pull-type design for heavy duty service, utilizing centrally located pressure springs entirely isolated from the heat of the pressure plate.

Operation and Maintenance

In the 14 inch (35.56 cm) two-plate models, the intermediate plate separating the driven discs is mounted inside a "cup-type" flywheel and carried on drive pins mounted in the flywheel itself. The 14 inch (35.56 cm) clutch will have a 1.75 inch (4.445 cm) -10 spline transmission input drive gear.

The 15.50 inch (39.37 cm) two-plate clutch requires a "flat-type" flywheel. The intermediate plate separating the driven disc is mounted and carried on drive pins inside the clutch cover assembly. The 15.50 inch (39.37 cm) clutch will require a 2.00 inch (5.08 cm) -10 spline transmission input drive gear.

In all models, the pressure plate is driven by four drive lugs, which mate with four drive slots in the clutch cover itself. The pressure plate also carries four return springs to retract the pressure plate when the clutch is disengaged.

The clutch release bearing rotates continuously since the inner race of the bearing is pressed on the release sleeve. However, the clutch release bearing only carries a thrust load when the clutch is released.

The clutches are ventilated to circulate cooling air through the clutch whenever the engine is running.

The clutch design is such that maintenance is readily accomplished without special tools other than a hand arbor press, which should be available for easier clutch disassembly and assembly.

Internal clutch adjustment is simple and quickly maintained by turning the threaded adjusting ring, which is accessible through the inspection plates located on the clutch housing.

A clutch brake is installed to the heavy-duty pull-type clutch as an aid to gear shifting when the vehicle is stationary. The clutch brake is located between the release bearing housing and transmission bearing cap. The steel washer has a tang on the I.D. to engage the transmission main drive gear. When the clutch pedal is fully depressed, the disc is squeezed between the release bearing housing assembly and transmission bearing cap to stop the rotation of the main drive gear and clutch discs.

Constant clutch capacity is maintained regardless of facing wear. There is no direct contact between pressure springs and pressure plate; therefore, springs will not take a set and lose pressure due to heat. The threaded internal adjusting ring permits a quick internal adjustment to restore the springs to their original height and pressure.

Clutch balance is maintained even though parts are interchanged or replaced in the field. All major parts are balanced individually at the factory.

NOTE: *Later production clutch assemblies have "knife-edge" design release levers in the adjusting ring. This design can be readily evidenced by the absence of the release lever pins and clips used on the former design.*

The newer design "knife-edge" lever and ring will be directly interchangeable with the earlier design as a complete ring assembly.

Refer to Parts Identification Section for specific identification of designs.

14.00" CLUTCH PARTS IDENTIFICATION

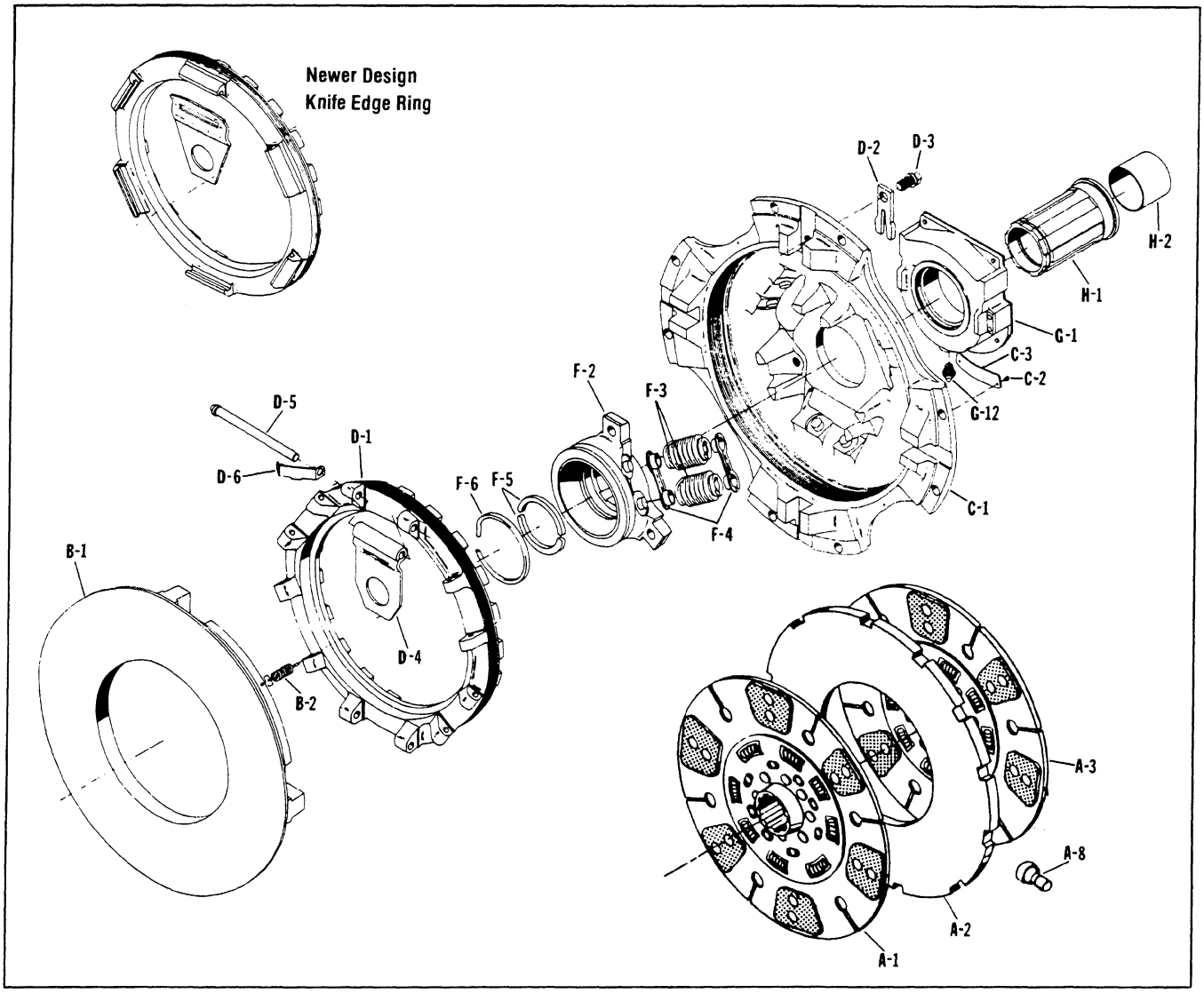


Figure 1:

A-1	DISC, driven front	D-4	LEVER
A-2	PLATE, intermediate	D-5	PIN, pivot
A-3	DISC, driven rear	D-6	CLIP, spring
A-8	DRIVE PIN	F-2	RETAINER, release sleeve
B-1	PLATE, pressure	F-3	SPRING, pressure
B-2	SPRING, return	F-4	PIVOT, spring
C-1	RING, flywheel	F-5	RING, release sleeve
C-2	PIN, name plate	F-6	RING, snap
C-3	PLATE, name	G-1	BEARING & COVER, Sub-Assembly
D-1	RING, adjusting	G-12	NIPPLE, Zerk
D-2	LOCK, adjusting ring	H-1	RELEASE SLEEVE, Sub-Assembly
D-3	BOLT & lock washer assembly	H-2	BUSHING, Release Sleeve

15.50" CLUTCH PARTS IDENTIFICATION

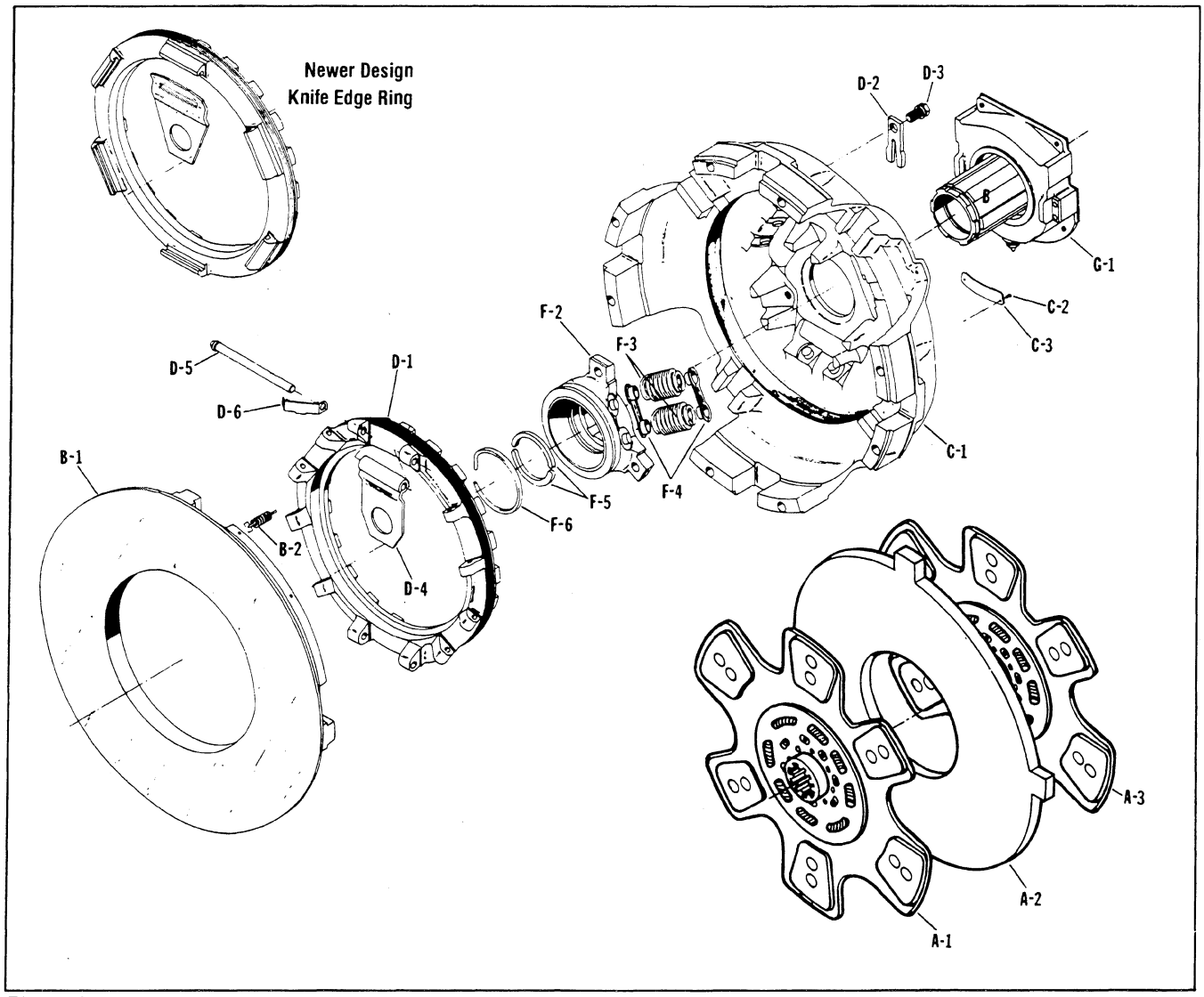


Figure 2:

A-1	DISC, driven front	D-4	LEVER
A-2	PLATE, intermediate	D-5	PIN, pivot
A-3	DISC, driven rear	D-6	CLIP, spring
B-1	PLATE, pressure	F-2	RETAINER, release sleeve
B-2	SPRING, return	F-3	SPRING, pressure
C-1	RING, flywheel	F-4	PIVOT, spring
C-2	PIN, name plate	F-5	RING, release sleeve
C-3	PLATE, name	F-6	RING, snap
D-1	RING, adjusting	G-1	RELEASE BEARING & SLEEVE ASSEMBLY
D-2	LOCK, adjusting ring		
D-3	BOLT & lock washer assembly		

Clutch Adjustment

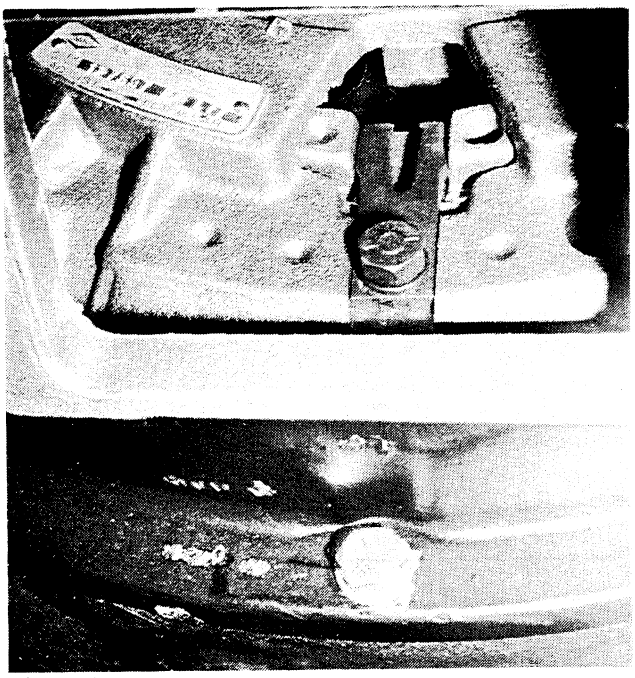


Figure 1:
A—Ring Lock Strap

Do not attempt to adjust the clutch with external linkage. After adjusting the clutch, then adjust external linkage (if required) to get 1/8 inch (3.175 mm) clearance between the tips of the release yoke fingers and the thrust pads of the release bearing assembly.

Procedure

1. Remove the switch key and set the parking brake.
2. Remove the access cover from the flywheel housing (see Fig. 1).
3. Rotate engine until the ring lock strap is visible in the center of the inspection opening (see Fig. 1).

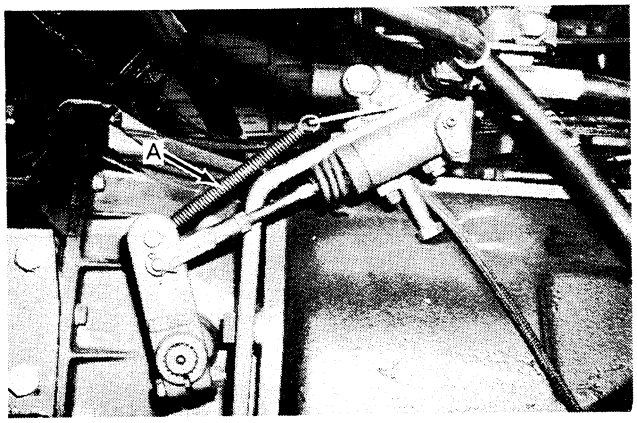


Figure 2:
A—Spring

4. Disconnect the clutch outer arm spring (A-Fig. 2).

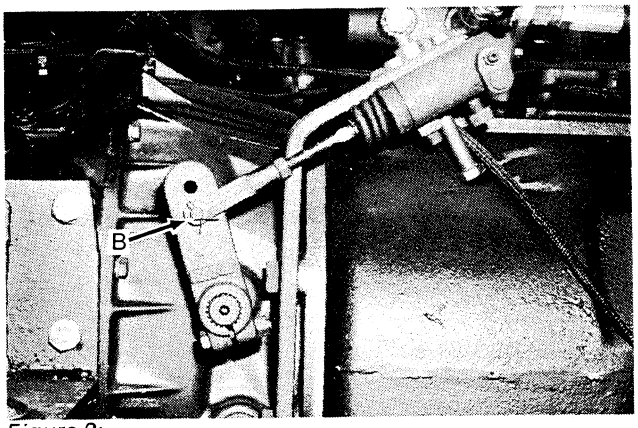


Figure 3:
B—Clevis Pin

5. Remove the pin from the slave cylinder rod clevis (B-Fig. 3).

Clutch Adjustment

5. On the hydraulic actuated clutch, rotate clutch outer release arm forward (CCW) (on the mechanical clutch "pull up" on the lever) by hand until a slight resistance is felt to remove any slack in the release bearing carrier (A-Fig. 4). At this point, the distance between the rear face of the release bearing assembly and the front face of the transmission brake disc (with brake disc rearward against front transmission bearing cap) must be 1/2 inch (.50 inch) (12.7 mm) (Fig. 5). If the distance is not correct, proceed to the next step.

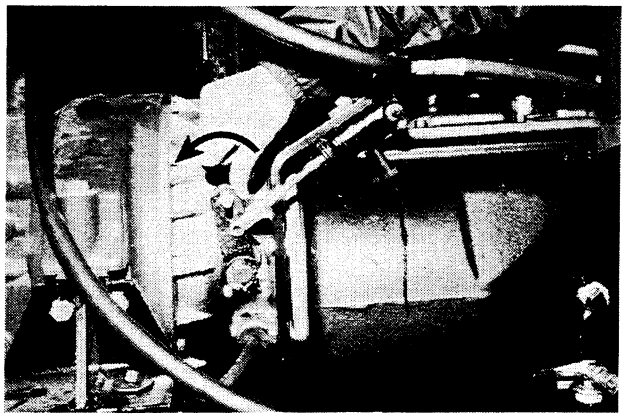


Figure 4:

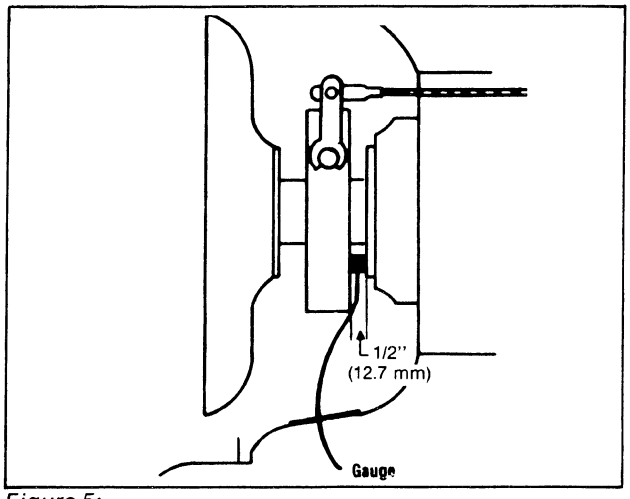


Figure 5:

6. Temporarily reinstall pin into the rod clevis (this is necessary to "release" the clutch before the adjusting ring can be turned). Remove the ring lock strap from the clutch assembly (see Fig. 6).

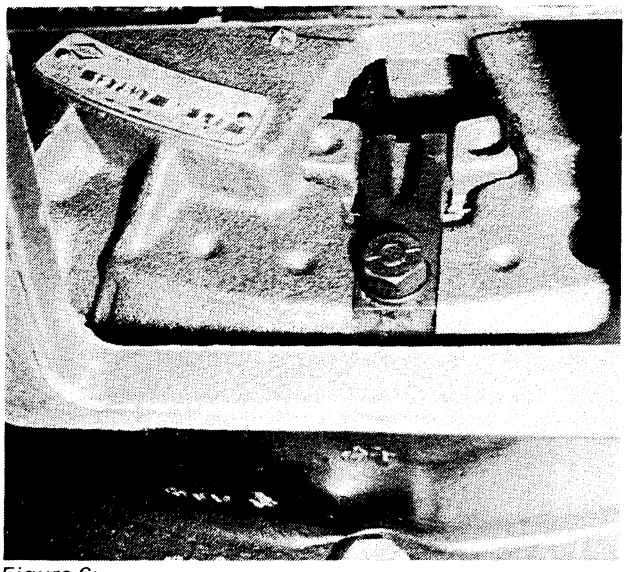


Figure 6:

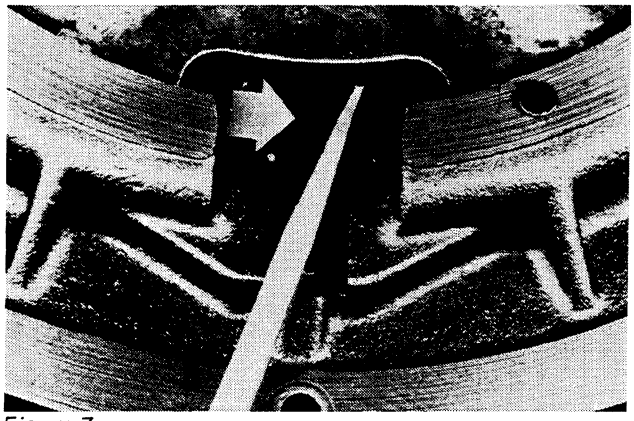


Figure 7:

7. With an assistant holding the clutch in the "released" position (or securely blocking the clutch), turn the adjusting ring "in" or "out" to obtain the desired .50 inch (12.7 mm) clearance. (Fig. 7)

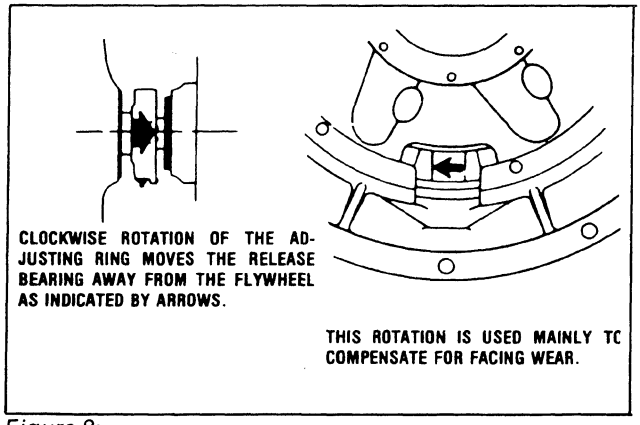


Figure 8:

NOTE: *Turning the adjusting ring "CW" (in) moves the release bearing assembly toward the transmission (Fig. 8). Turning the ring "CCW" (out) moves the bearing away from the transmission (Fig. 9). Moving the ring three (3) notches will change the dimension approximately 1/16 inch. THE CLUTCH MUST BE "RELEASED" TO TURN THE ADJUSTING RING. The clutch ring lock strap must be installed before engine operation.*

8. After making the ring adjustment, engage the clutch and remove clutch rod clevis pin. "Repeat step 5" to recheck clearance. Remember, clearance is measured with the clutch engaged and all slack removed from the release bearing carrier.

9. **If clearance is correct, "reinstall" the ring lock strap. Install inspection cover.**

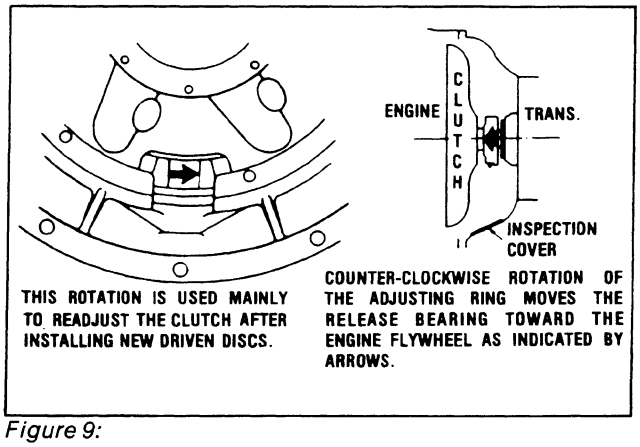


Figure 9:

Clutch Adjustment

"Mechanical Clutch" External Linkage Adjustment:

10. Check pedal free travel as follows before installing rod clevis pin. Rotate clutch outer arm until the clutch release yoke fingers contact the release bearing thrust pads (a slight resistance should be felt). Hold and mark the end of the clutch "cross shaft" in this position, while observing the mark on the end of the cross shaft rotate the shaft back (away from the release bearing) 1/8 inch (3.175 mm) from the marked position. Screw clutch rod clevis "in" or "out" so that the pin will go through clevis and clutch release arm freely in this position. (see Fig. 10).

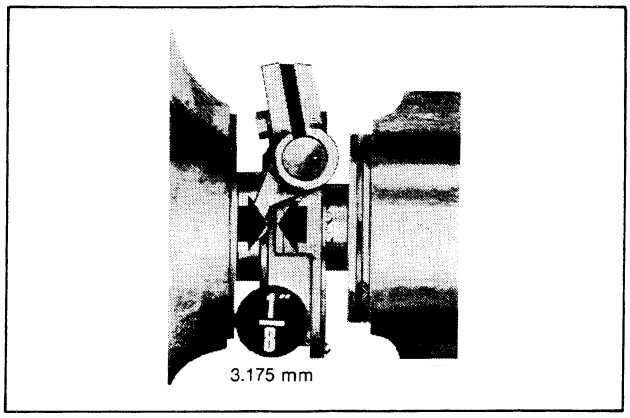


Figure 10:

NOTE: *When 1/8 inch (.125") (3.175 mm) clearance is correct, there will be approximately 1-1/2 inch (3.81 cm) "total" pedal free travel through the linkage (Fig. 11).*

11. Reinstall the clevis pin, split key and clutch external return spring.

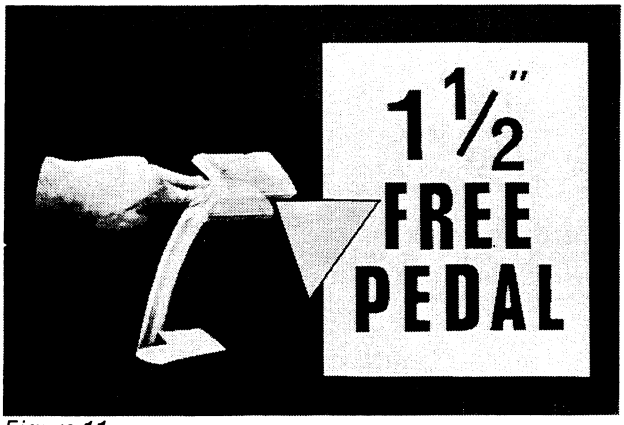


Figure 11:

Hydraulic Clutch "External" Linkage Adjustment:

IMPORTANT:
Before making external clutch "linkage" adjustment, check and make clutch adjustment as described in "clutch" adjustment (steps 1 through 9), then proceed as follows:

1. Check clutch master cylinder actuator rod length to obtain .125 inch (.317 cm) movement of the rod before the master cylinder piston is actuated with the pedal in the full up position. This clearance is necessary to ensure full retraction of both the master cylinder and slave cylinder pistons. If adjustment should be necessary, loosen the jamb nut on the actuating rod and screw the rod "in" or "out" to obtain the recommended .125 inch (.317 cm) lash and retighten the jamb nut. (see Fig. 12).

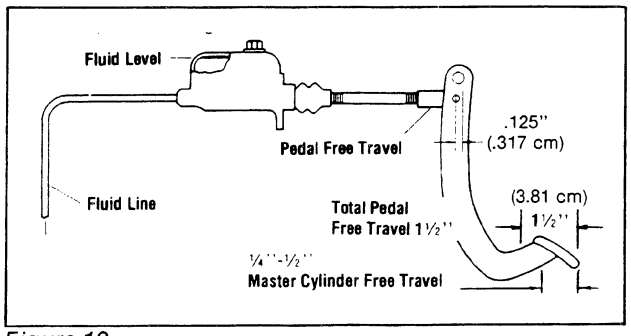


Figure 12:

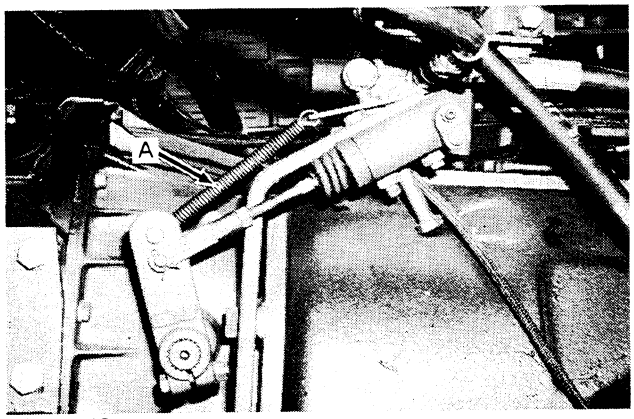


Figure 13:

2. On the left side of the transmission, remove the external clutch arm return spring (A—Fig. 13).

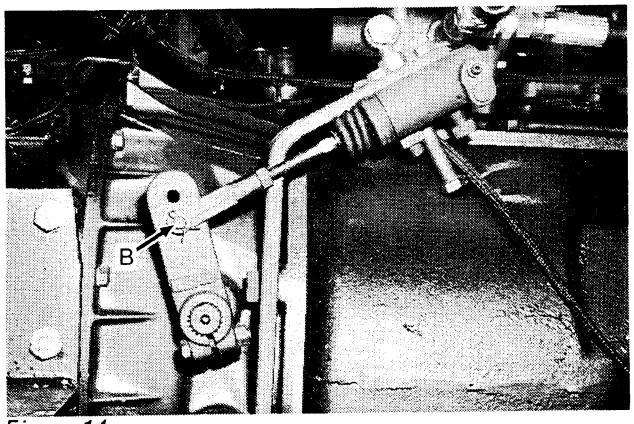


Figure 14:

3. Remove the pin from the slave cylinder actuator rod clevis (B—Fig. 14).

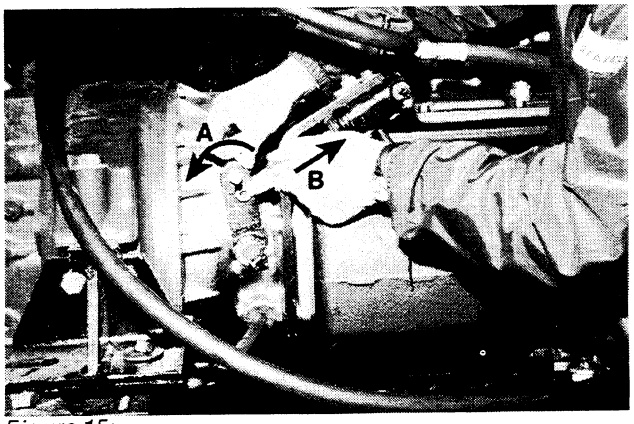


Figure 15:
A—Rotate Clutch arm "CCW"
B—Bottom Slave Cylinder Rod.

4. Rotate the clutch cross shaft "counter-clockwise" until a slight resistance is felt. At the same time, push in on the slave cylinder actuator rod to "bottom" the slave cylinder piston. (Open the bleeder valve momentarily, if necessary. The slave cylinder piston must be fully retracted) (see Fig. 15).

Clutch Adjustment

With the clutch cross shaft arm rotated forward (CCW) and the slave cylinder actuator rod fully "retracted," the slave cylinder actuator rod should be .125 inch (.317 cm) "short" from the center of the clutch cross shaft arm pin hole to the center of the slave cylinder clevis pin hole. If this dimension is not correct, screw the actuator rod clevis in or out to obtain this dimension (Fig. 16). When the dimension is correct, reinstall the actuator rod clevis pin. This adjustment will provide .125 inch (.317 cm) clearance between the tips of the release yoke and the thrust pads on the release bearing (Fig. 17).

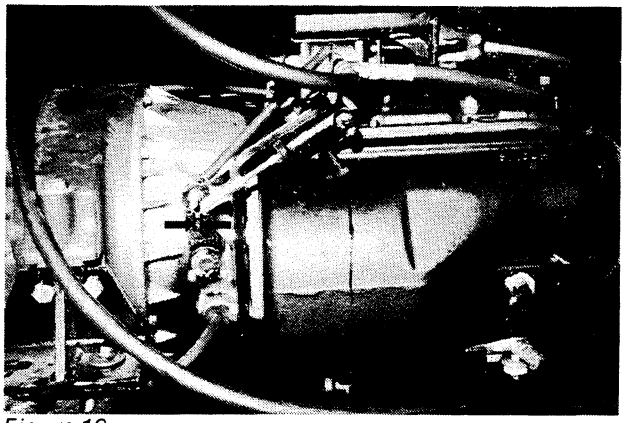


Figure 16:
A—Dimension to be .125"

NOTE: *An alternative method for making slave cylinder adjustment is to rotate the clutch cross shaft outer arm "CCW" until resistance is felt, and with the slave cylinder actuating rod and piston fully retracted, screw the actuator rod clevis "in" or "out" until the pin holes are aligned. From this position, "shorten" the actuator rod by screwing the clevis "in" 5½ turns. Lock the jamb nut and install the clevis pin and external return spring.*

IMPORTANT:

Reinstall clutch external return spring.

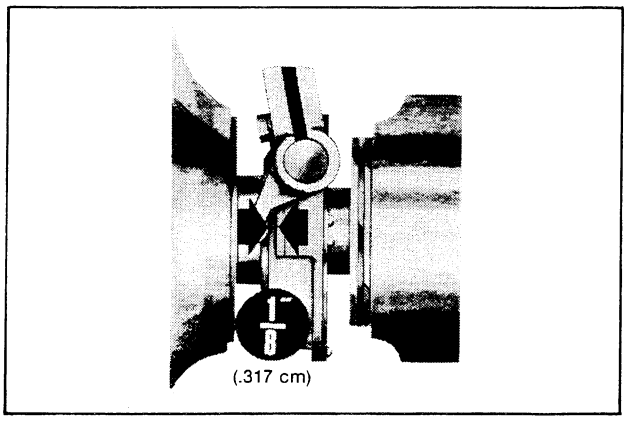
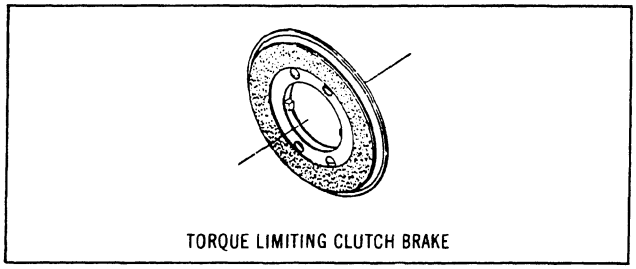


Figure 17:

Clutch Brake Installation



TORQUE LIMITING CLUTCH BRAKE

Torque-Limiting Clutch Brake

The torque limiting feature is provided by internal Bellevilles, which are driven by a hub. The Bellevilles react against the clutch brake covers with facing material positioned between each Belleville and cover. The hub and Belleville combination slips with respect to the covers after approximately a 25 to 30 ft. lb. load has been exceeded.

Longer tang life is provided by the brake's ability to limit torsionally induced damage. Also, 5° of free play is provided between the hub and Bellevilles so that the inertia of the Bellevilles can not load the hub directly. Inertia present in the covers is allowed to load the hub only up to the 25 to 30 ft. lb. load mentioned above. And, the tangs themselves are thicker to absorb what remaining torsionals do find their way to the hub.

There is no extra work on the driver's part to activate the brake. He just depresses the clutch pedal to the floorboard, beyond the normal clutch disengage position, causing the clutch release bearing to come in contact with the clutch brake. Because the brake is splined to the transmission main drive gear, the transmission is slowed down or stopped. The driver can then shift from first to reverse or from reverse to first without clashing or putting undue strain on the gears.

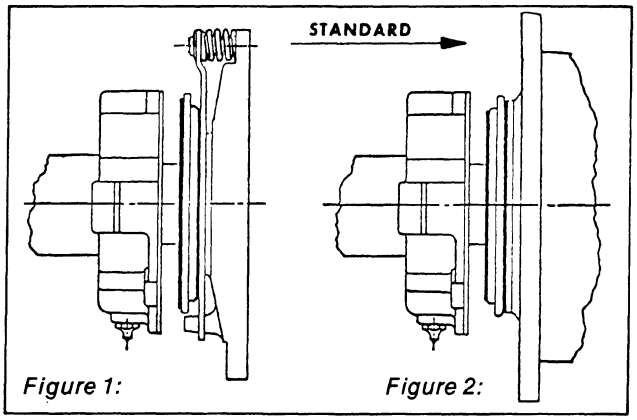


Figure 1: *Figure 2:*

When using this Clutch Brake with Spicer Transmission equipped with spring-loaded backing plate, it must be mounted with small diameter facing toward transmission (see Figure 1).

When used with Spicer Transmission equipped with standard bearing cap, it should be mounted with large facing diameter toward transmission (see Figure 2).

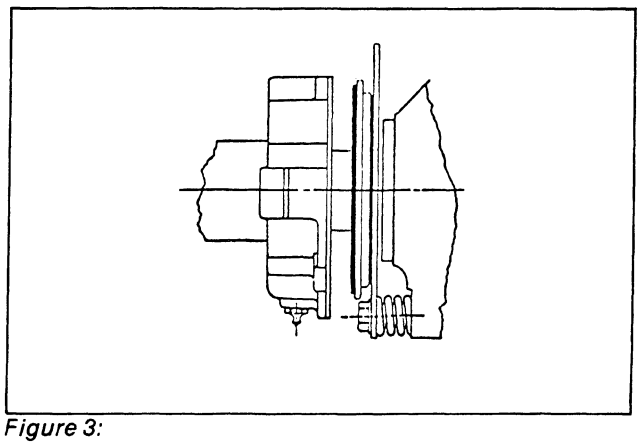


Figure 3:

When used with Fuller Transmissions, it must be mounted with small facing diameter toward transmission (see Figure 3).

Anti-Rattle Springs

Installation (14" Clutch Only)

Select the proper anti-rattle springs to be installed.

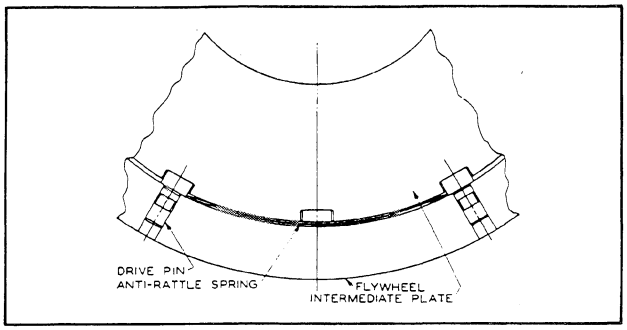
1. Install the front driven disc in the flywheel.

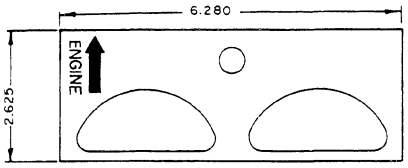
2. Install the intermediate plate and check for proper clearance between the plate and drive pins (.006" min. at all locations).

3. Install the appropriate anti-rattle springs between the O.D. of the intermediate plate and I.D. of the flywheel. Push the springs forward until they have bottomed in the flywheel and when properly installed, they will set in approximately 3/16" from the clutch mounting flange of the flywheel.

4. Install the rear driven disc and complete the installation in the normal manner.

NOTE: *The springs MUST be installed with the solid edge toward the engine for proper operation.*





If flywheel has six Drive Pins, install three Springs spaced alternately (120° apart).

Removal and Disassembly

Transmission Removal

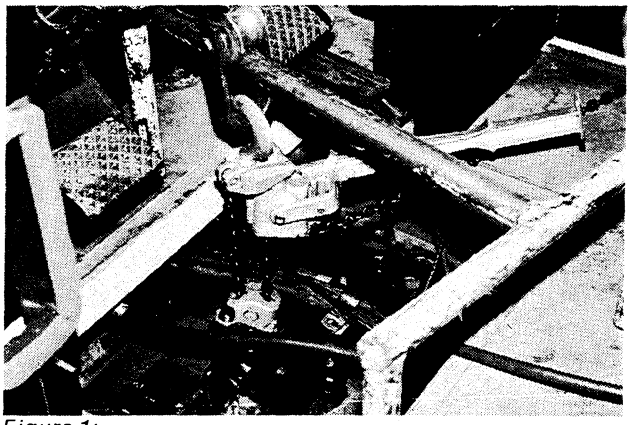


Figure 1:

A suitable "sling" or transmission jack should be used to properly support and maintain the engine/transmission alignment when removing or installing a transmission on an engine. DO NOT let the rear end of the transmission drop down and hang unsupported in the splined hubs of the clutch discs to avoid bending or distorting the friction discs. Disconnect the external linkage from the clutch release arm to permit the release yoke to turn up and pull free of the release bearing thrust pads. (see Fig. 1).

Clutch Removal

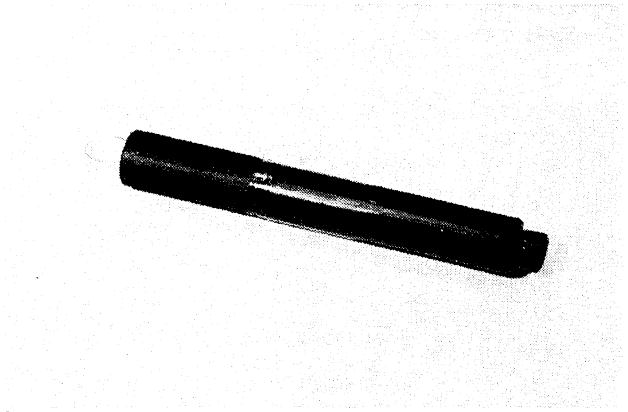


Figure 2:

Clutch Disc Aligning Tool
P/N 58-005—14-1/2" Clutch
P/N 58-056—15-1/2" Clutch

1. Prior to actual clutch removal, assemble a clutch disc aligning tool to the driven disc and release bearing assembly. (see Fig. 2).

Removal and Disassembly

Spacer Blocks

It is important that two 3/4" blocks of wood be inserted between the clutch release bearing housing and clutch flywheel ring as the clutch mounting bolts are loosened around the flywheel. These blocks will relieve the heavy internal spring load, preventing cocking and bending within the clutch and insure easy removal of remaining mounting bolts. (see Fig. 3 & 4).

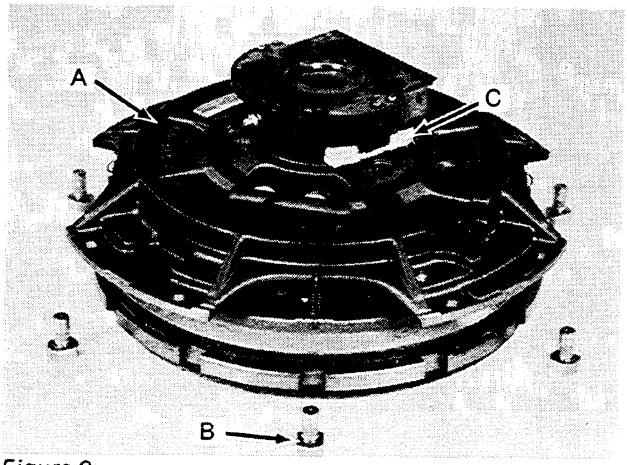


Figure 3:

A—14" Clutch Assembly
B—Flywheel Drive Pins
C—Spacer Blocks

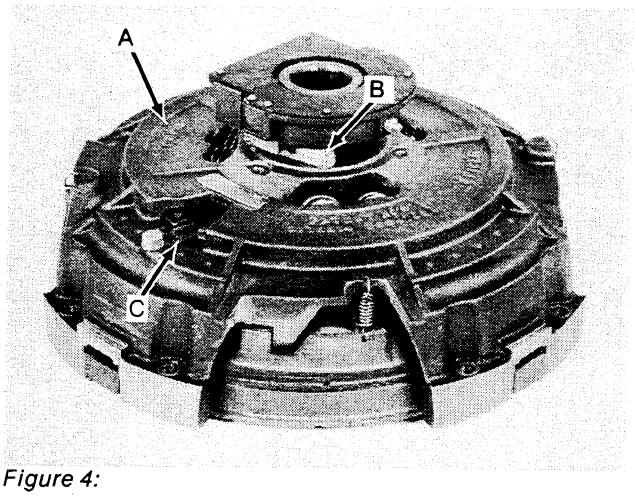


Figure 4:

A—15.50" Clutch Assembly
B—Spacer Blocks
C—Ring Lock Strap

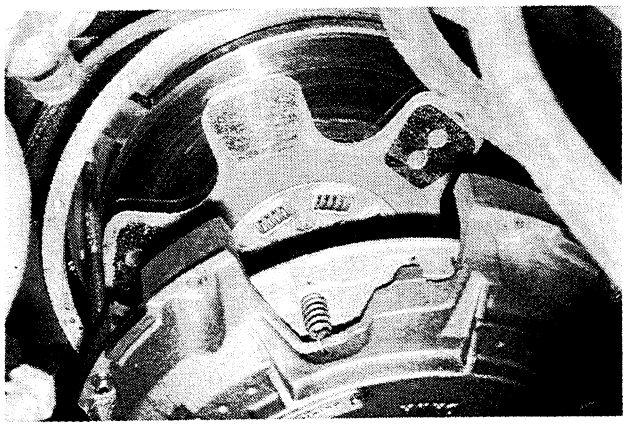


Figure 5:

2. When all bolts have been removed, slide clutch assembly back and off using caution to keep aligning tool in place to retain discs and intermediate plate. (see Fig. 5 & 5A).

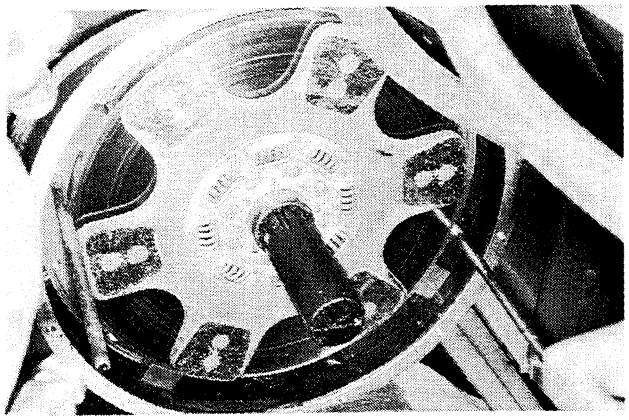


Figure 5A:

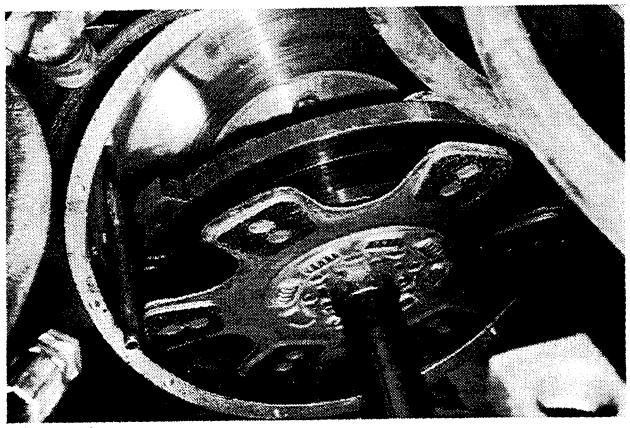


Figure 6:

3. Carefully remove aligning tool, rear disc, intermediate plate and front disc (see Fig. 6).

4. See Inspection Section for checks of flywheel.

Removal and Disassembly

5. Remove bolt and lock washer assembly and adjusting ring lock (D-2). Use screwdriver or similar wedge to remove adjusting ring lock (see Fig. 7).

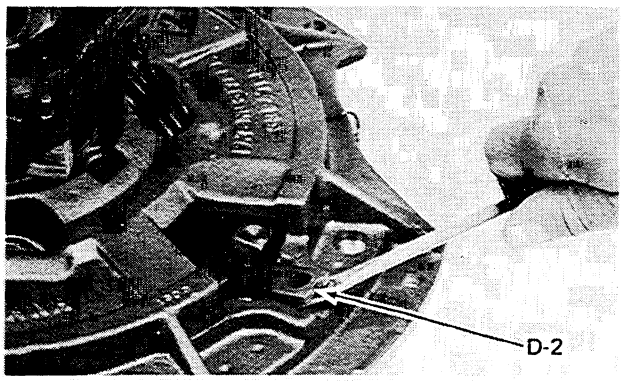


Figure 7:

6. Set clutch assembly (without driven discs and intermediate plate) upside down on a flat table or workbench. Unhook four return springs (B-2) from flywheel ring (C-1) and lift pressure plate (B-1) off (see Fig. 8).

NOTE: *Mark pressure plate in relation to the flywheel ring for reassembly purposes.*

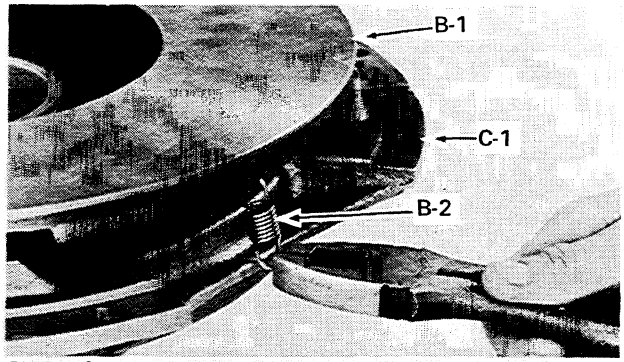


Figure 8:

7. Turn the adjusting ring (D-1) and lever assembly counter-clockwise until free of flywheel ring (C-1). Then lift and remove assembly (see Fig. 9).

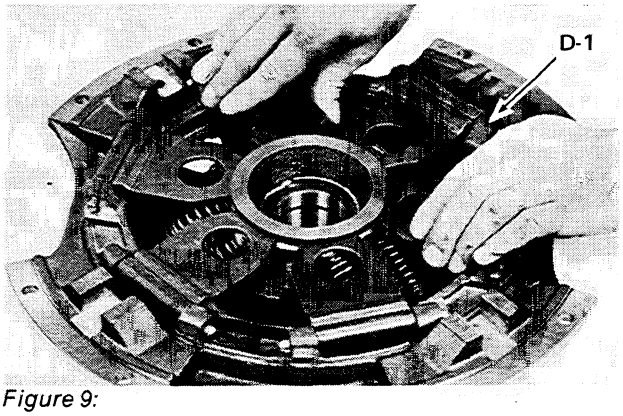


Figure 9:

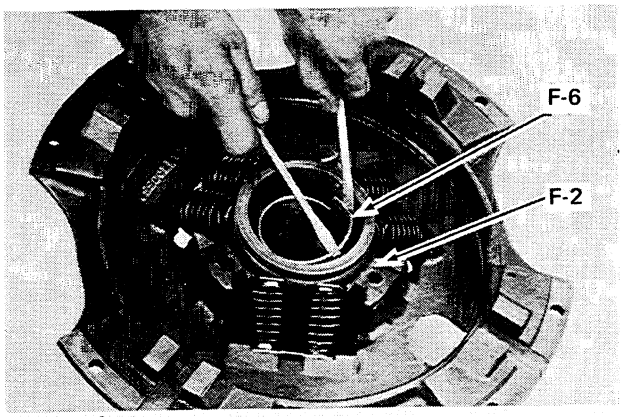


Figure 10:

8. Remove snap ring (F-6) from release sleeve retainer (F-2) (see Fig. 10).

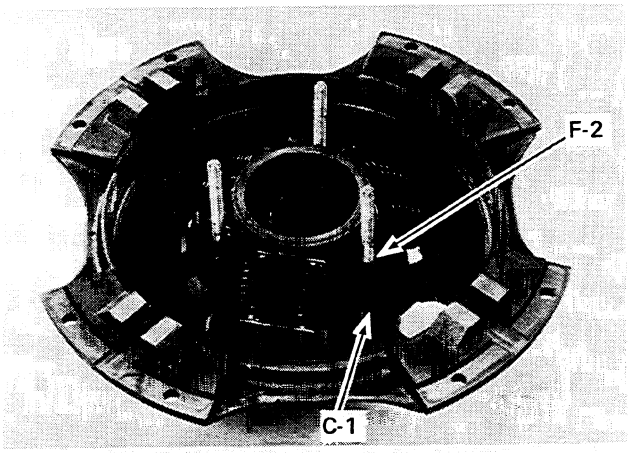


Figure 11:

9. Install three 5/16" x 5" threaded rods through clearance holes in release sleeve retainer (F-2) and into holes provided in flywheel ring. Threaded rod must pass through flywheel ring far enough to put hex nuts on both ends (see Fig. 11).

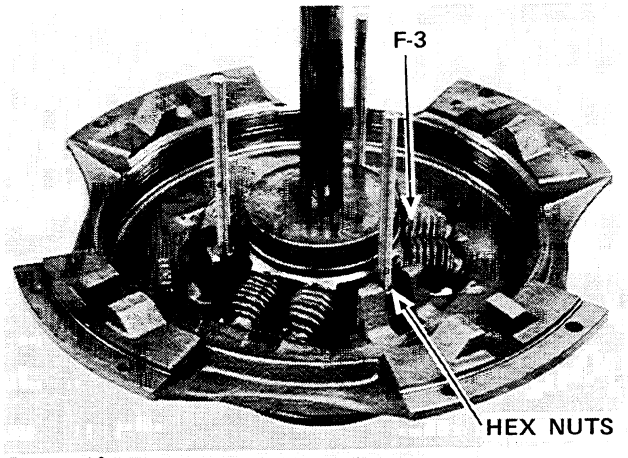


Figure 12:

10. Place assembly on an arbor press with a piece of tubing (see Note), supporting the release sleeve. Compress retainer until drive lugs bottom on flywheel ring and draw three hex nuts tightly against retainer (see Fig. 12).

NOTE: *Use a short piece of 2-1/2" or 2-3/4" O.D. tubing to support release sleeve assembly. DO NOT support on clutch release bearing cover rivet heads.*

Removal and Disassembly

11. Raise arbor. Tilt assembly and remove 3/4" wooden blocks (see Fig. 13).

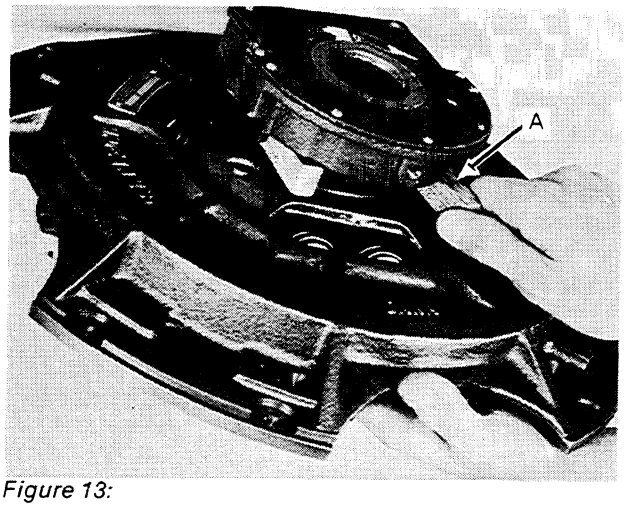


Figure 13:

12. Again, support release sleeve on tubing as in Step 10. Remove half ring locks (F-5). Now release sleeve and bearing assembly are free to slide through retainer toward rear of clutch (see Fig. 14).

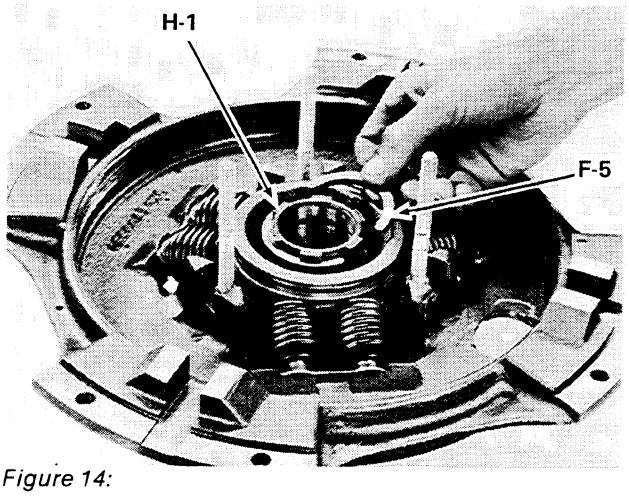


Figure 14:

13. To disassemble pressure springs (F-3) and retainer, compress retainer to relieve load on hex nuts. Back off hex nuts and remove load on pressure springs. Remove pressure springs and spring pivots (F-4) (see Fig.15).

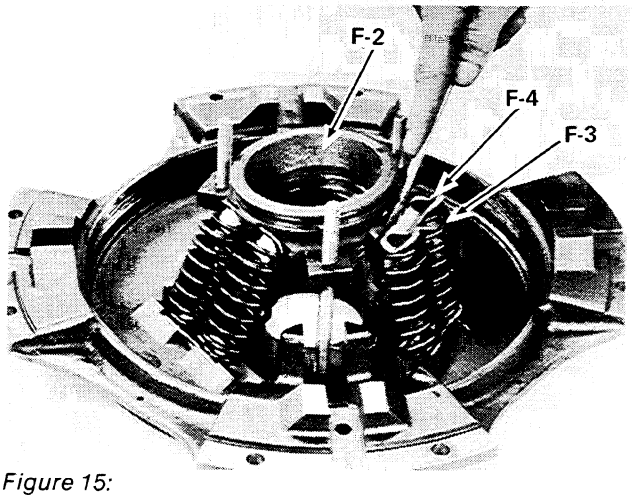


Figure 15:

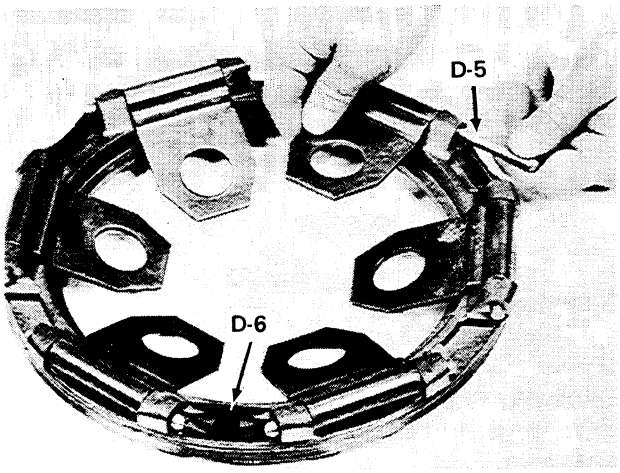


Figure 16:

14. To complete the ring disassembly, remove the retainer clip (D-6) from pivot pins (D-5), and remove pins and levers (see Fig.16).

NOTE: *All parts must be clean and dry for inspection.*

NOTE: *Later "knife-edge" design adjusting ring will not have pivot pins and clips as shown in Fig. 16 (see Fig. 17).*

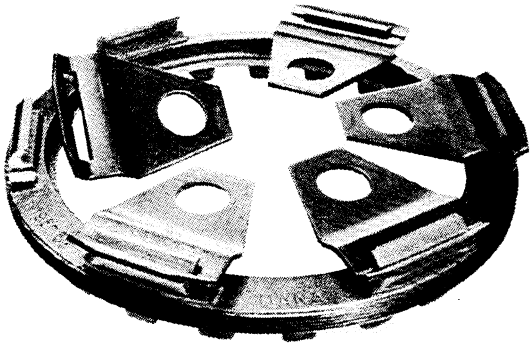


Figure 17:

Inspection

Release Levers (D-4)

Inspect levers for excessive wear at points of contact with pressure plate, release sleeve retainer and pivot pin. If levers are bent or worn, replace with new levers. It is good preventive maintenance to replace levers during clutch rebuild.

Release Sleeve Retainer (F-2)

Inspect for wear in lever groove and internal splines. Refer to specifications for driving slot clearance between flywheel ring drive slots and release sleeve retainer drive lugs.

Spring Pivots (F-4)

Inspect for cracks; if visible, replace.

Release Sleeve Sub-Assembly

Check bushing for excessive wear. Check bearing diameter for tight fit. Refer to Specifications, and replace if necessary.

Release Bearing and Sleeve Assembly (G-1)

We recommend replacing the release bearing and sleeve assembly as a unit at the time of clutch rebuild.

Part Name	Spline Size
Rel. Brg. & Sleeve Ass'y.	1-3/4-10
Rel. Brg. & Sleeve Ass'y.	2-10

The above assemblies are available as service replacement items.

Adjusting Ring (D-1)

Check pivot pin holes for wear. Clearance may not exceed .010" between pin and hole. Inspect for cracks; replace if cracks are visible.

Flywheel Ring (C-1)

Inspect the flywheel ring for cracks. **Replace if cracks are visible.** Check slots for indentation caused by wear of pressure plate driving lugs. Note Specifications for slot limits.

Inspect bolt circle face and pilot for nicks and burrs due to removal or handling. Remove burrs with file to insure proper seating and squareness when clutch is mounted to flywheel.

Pressure Plate (B-1)

Inspect fulcrum for wear. If wear exceeds .015", remachine. See Specifications for maximum rework.

Inspect friction surface of pressure plate for scoring, burning, heat checking or distortion. If friction surface is badly scored, heat checked, warped or dished in excess of .010", resurface, or replace with new pressure plate. Smooth and flat pressure plate surfaces must be used for satisfactory clutch life.

Check drive lugs for wear per Specifications.

Intermediate Plate (A-2)

Inspect friction surfaces of intermediate plate for heat checks, scoring or distortion as noted in the above paragraph. Inspect driving slots of intermediate plate for wear. See Specifications.

Driven Discs (A-1 & A-3)

Inspect disc assembly for cracks, loose rivets, worn splines, warped or dished condition. Restraighten if dished or warped—.015" maximum runout. Replace if hub is cracked, or splines are worn excessively.

Super-duty discs have six trapezoidal ceramic buttons. This combination of more ceramic buttons and thicker intermediate plate provides longer life and increased torque capacity. (Fig. 18).

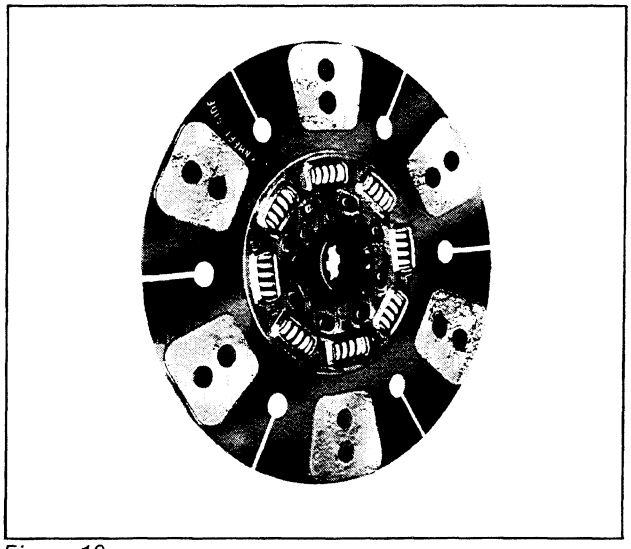


Figure 18:

Remaining Clutch Life

Many clutches are replaced as a preventative maintenance item at low mileage during repairs of the transmission or engine. Before the Clutch Assembly is replaced, the unit should be inspected for the following items:

1. Heat cracks in the pressure plate.
2. Excessive wear in all drive slots.
3. Broken springs.
4. Dry or damaged release bearing.
5. Broken intermediate plate.
6. Excessive driven disc hub spline wear.
7. Burned facings.
8. Excessive wear on drive pins or intermediate plate slots.

If the above list has been inspected and looks to be in good condition, determine the approximate remaining clutch life by measuring the thickness of the rear driven disc assembly (A-3) and comparing this measurement to that listed in the Specification section.