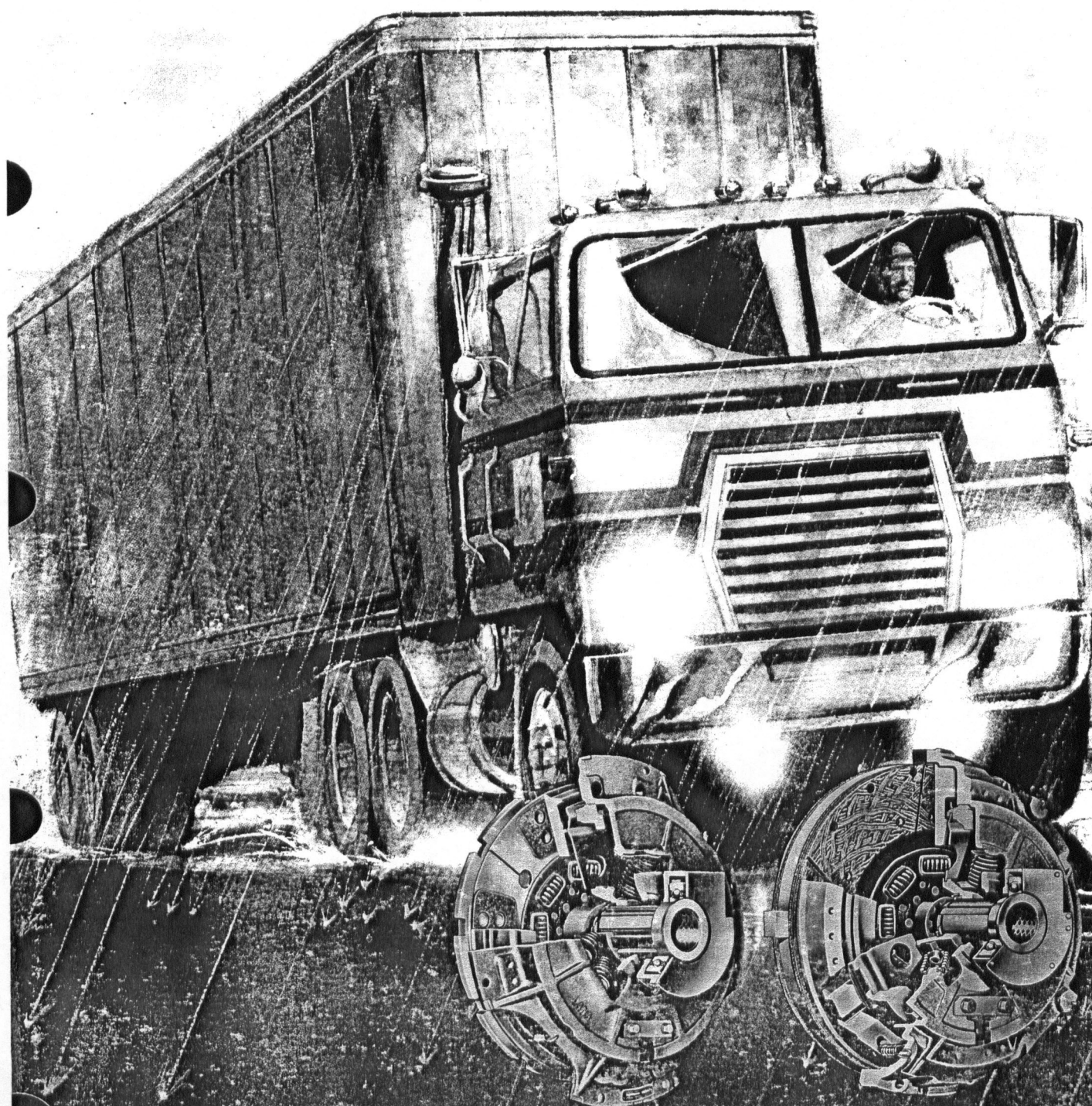


# SERVICE MANUAL

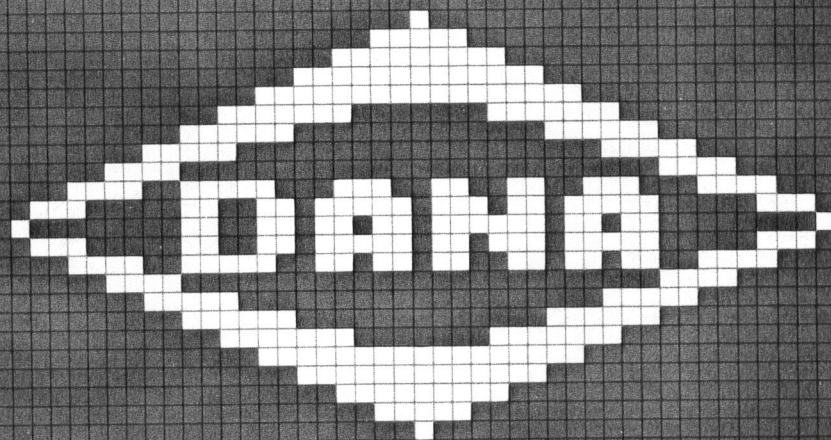
**SPICER®**



14" TWO PLATE

15 1/2" TWO PLATE

**Spicer® Angle-Spring and Angle-Spring 2  
Pull-Type Clutches**





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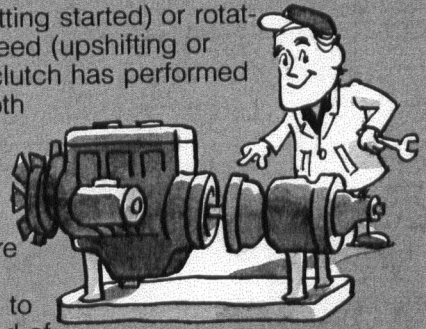
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### PURPOSE AND FUNCTION OF A CLUTCH

The purpose of a clutch is to transfer the power from the engine to the transmission which may be either stationary (getting started) or rotating at a different speed (upshifting or downshifting). The clutch has performed its function when both engine and transmission are rotating at the same speed.

To perform this function, clutches are provided with discs which are designed to slip for a short period of time as spring pressure is applied, forcing them together. When sufficient pressure has been applied, they stop slipping and rotate at the same speed as the engine.



### GENERAL DESCRIPTION

As seen in the exploded view, (Fig. 1) the major components of the Spicer Angle-Spring Clutch are the cover assembly and two driven discs separated by an intermediate plate. They are pull-type clutches of the dry disc design, adjustable, and have centrally located springs isolated from the heat of the pressure plate. Dampened driven discs (with springs) and ceramic facings (shown here) are considered standard and are recommended for most applications. Driven discs with solid centers and riveted organic facings are available.

In the 14-in. two-plate models, the intermediate plate separating the driven discs - is mounted inside a "pot-type" flywheel and carried on drive pins mounted in the flywheel itself.

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

Spicer 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.

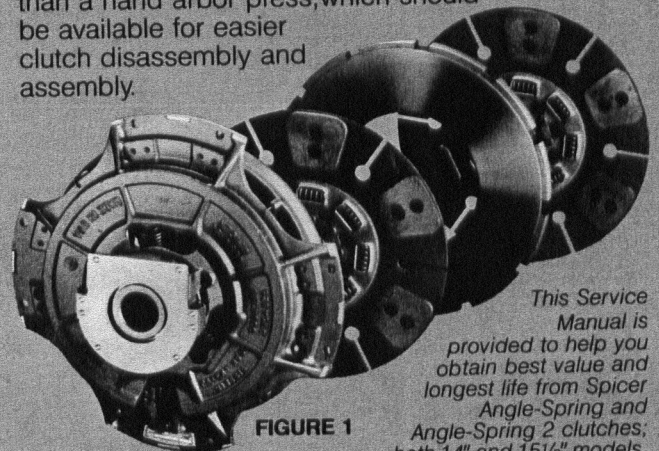


FIGURE 1

*This Service Manual is provided to help you obtain best value and longest life from Spicer Angle-Spring and Angle-Spring 2 clutches, both 14" and 15 1/2" models.*



**SPICER®**



## ADVANTAGES OF SPICER ANGLE-SPRING CLUTCHES

Several performance advantages are designed into Spicer Angle-Spring and Angle-Spring 2 Clutches. Pedal effort is reduced by as much as 35%. The load on the clutch plates is constant and uniform throughout the wear-life of the facing material. More efficient cover ventilation cools the clutch more quickly. And because pressure springs are isolated from the pressure plate which is the source of friction heat, they retain their load and do their job longer and better.



### SELF ADJUSTING

Spicer's Angle-Spring 2 is the most advanced clutch in the industry, which when properly installed never needs adjusting. The unique adjuster mechanism (Fig. 2) is built into the clutch cover. As facing wear occurs, the adjuster mechanism and clutch free pedal dimensions are automatically maintained at normal operating conditions.

### SELF ADJUSTER

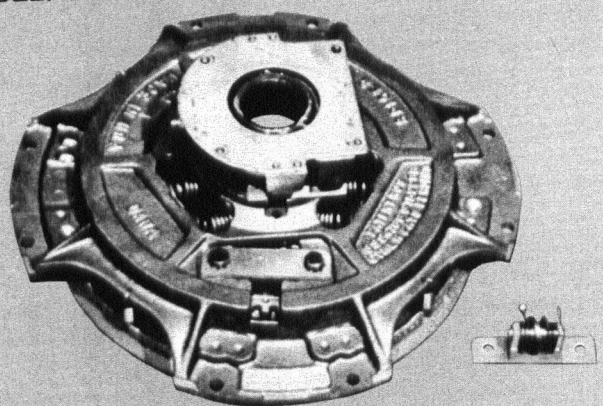


FIGURE 2

### HEAVY DUTY CLUTCHES

Both Spicer Angle-Spring and Angle-Spring 2 Clutches are available in 14", 14" Super Duty and 15½" two-plate models. The 14" Super Duty version gives you extra capacity for heavy-duty conditions, on and off highway, and for pick-up and delivery applications. The Super Duty has a thicker intermediate plate to absorb and dissipate up to 30% more heat. Driven discs are faced with six ceramic buttons per side to provide 50% more friction area.

### COAXIAL SPRINGS

Spicer's coaxial spring (spring within a spring) design (Fig. 3) increases the life of the clutch and whole drive train by dampening the torsional vibrations which are inherent in all drive lines.

### DRIVEN DISC OPTIONS

Spicer offers several choices in driven disc designs. The proper selection depends on the operating conditions the vehicle will encounter. The options are; organic material, rigid (Fig. 4), organic material, dampened (Fig. 5),

### COAXIAL

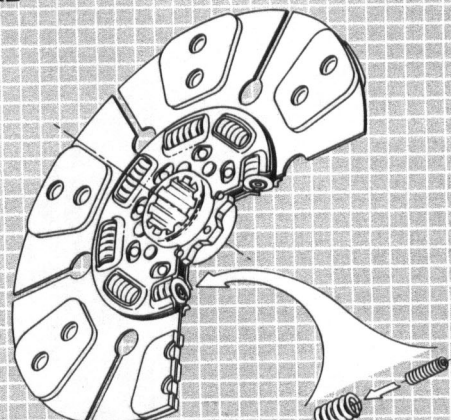


FIGURE 3

### ORGANIC, RIGID

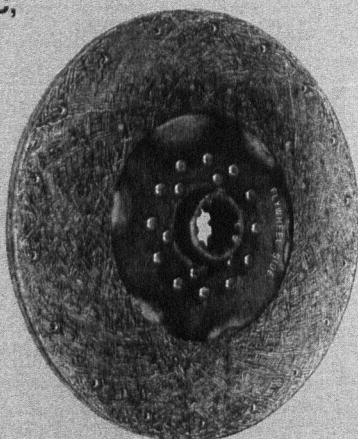


FIGURE 4

### ORGANIC DAMPENED

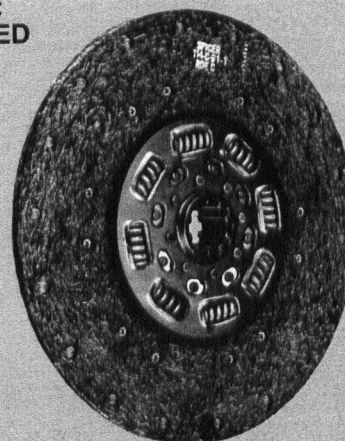


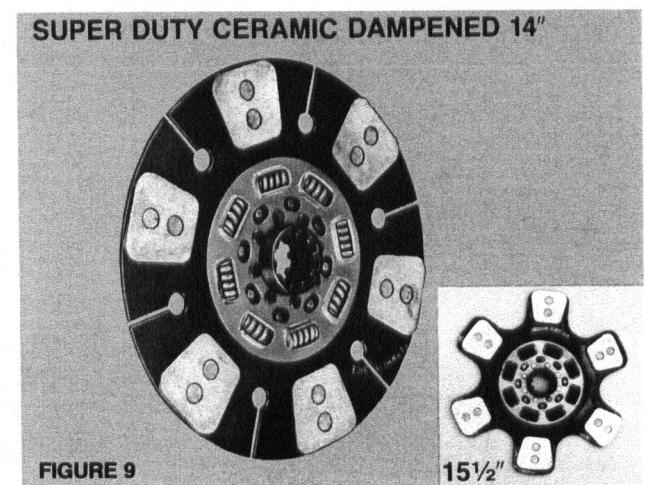
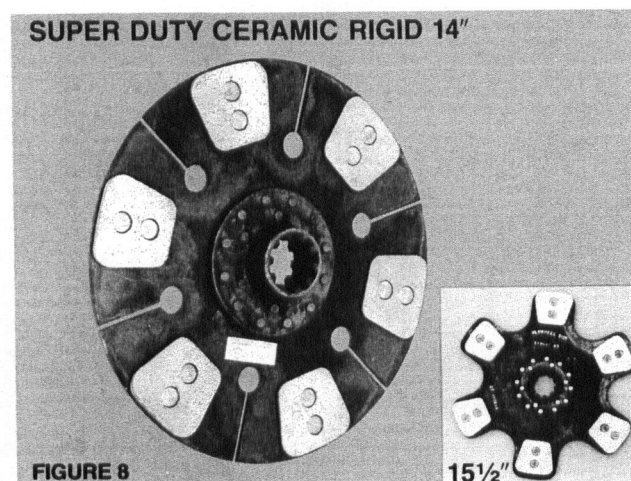
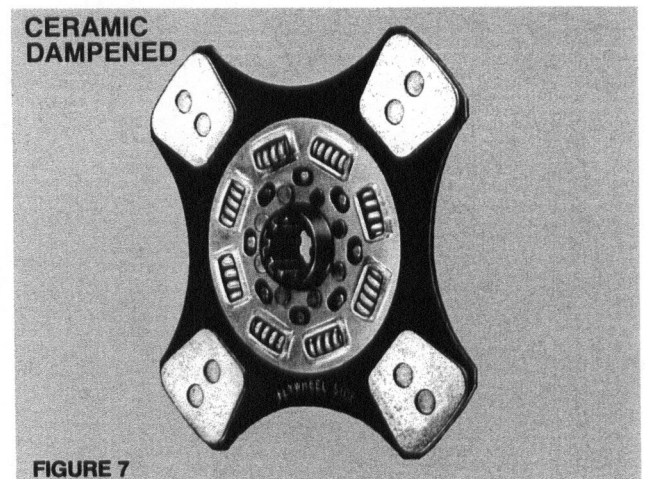
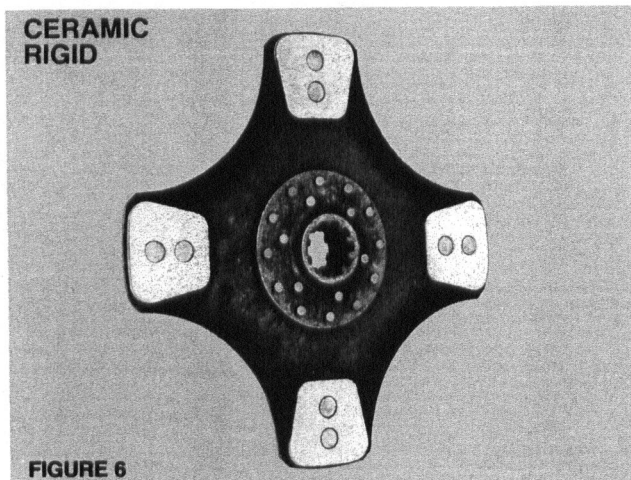
FIGURE 5

## DRIVEN DISC OPTIONS

4-button ceramic, rigid (Fig. 6), 4-button ceramic, dampened (Fig. 7), 6-button ceramic, rigid (Fig. 8) and 6-button ceramic, dampened (Fig. 9).

**Four-button ceramic facings** – To obtain extended clutch life in vehicles operating under normal, over-the-road conditions, 4-button ceramic clutch facings are recommended.

**Six-button ceramic facings** – For vehicles such as rear dumps, cement mixers, landfill trucks, etc., operating on/off highway, in mud, sand or uneven ground, Spicer recommends the super-duty 6-button ceramic facing clutch for long life and high torque capacity.





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CERAMIC  
RIGID

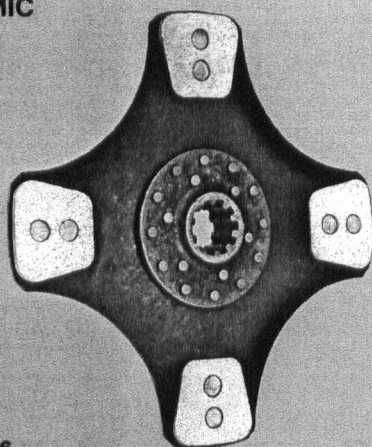


FIGURE 6

CERAMIC  
DAMPENED

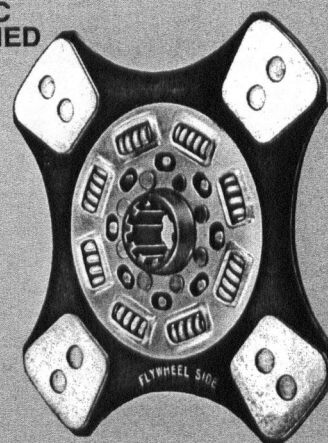


FIGURE 7

SUPER DUTY CERAMIC RIGID 14"

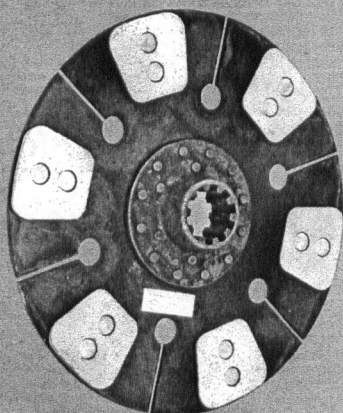
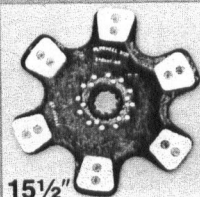


FIGURE 8



15½"

SUPER DUTY CERAMIC DAMPENED 14"

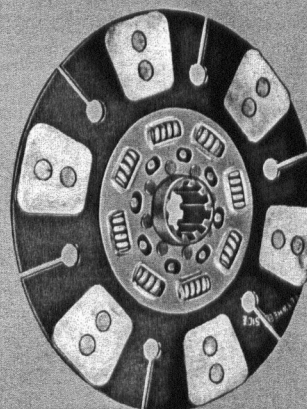
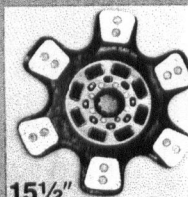


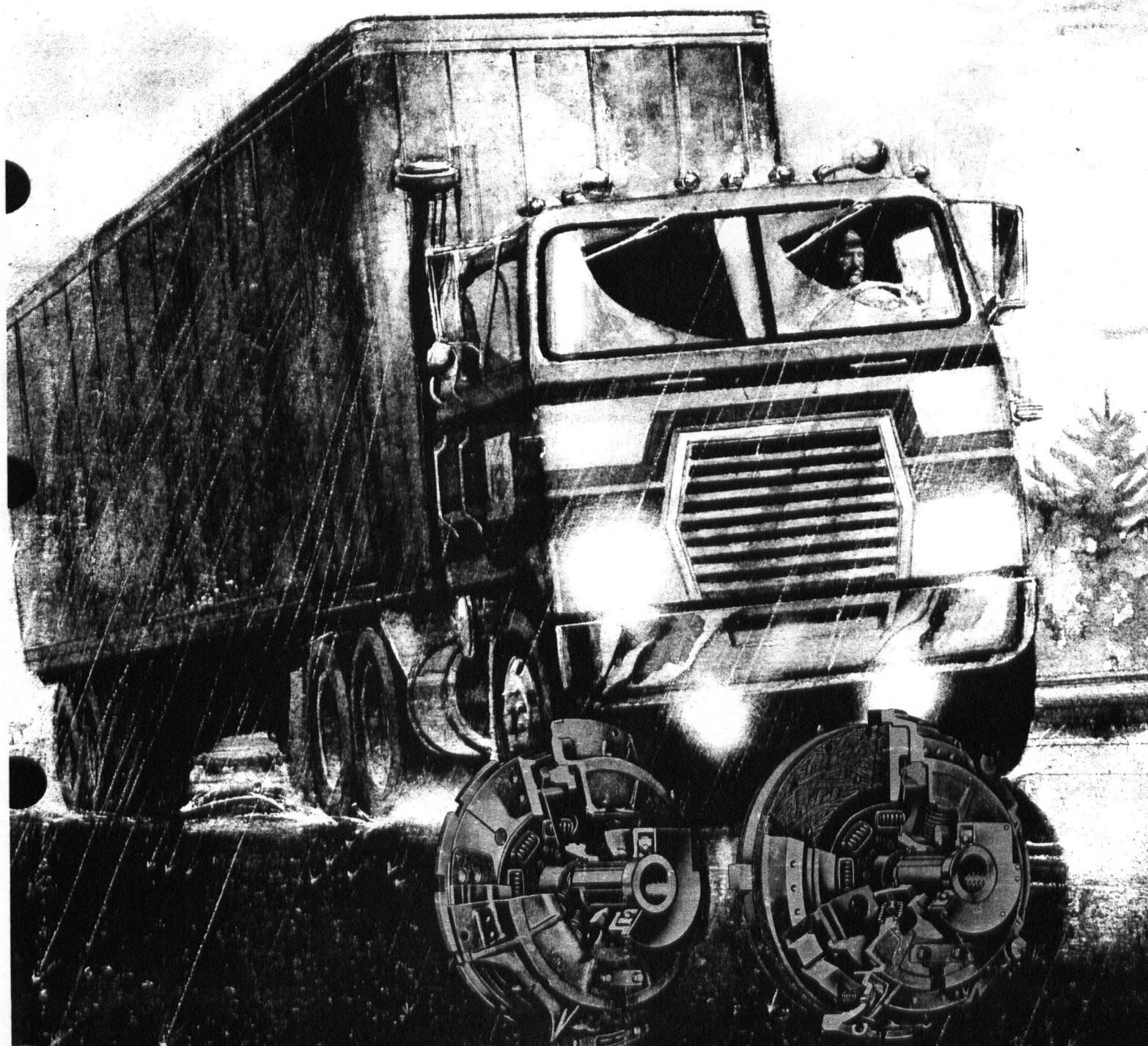
FIGURE 9



15½"

# SERVICE MANUAL

**SPICER®**

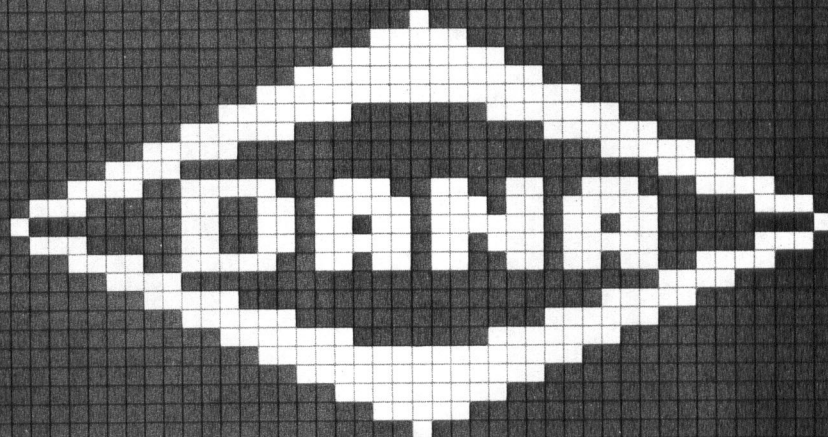


14" TWO PLATE

15½" TWO PLATE

**Spicer® Angle-Spring and Angle-Spring 2  
Pull-Type Clutches**

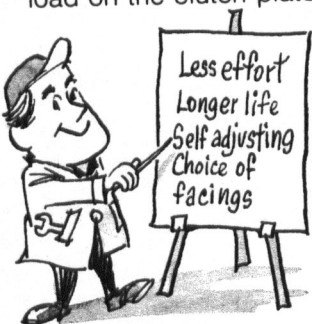






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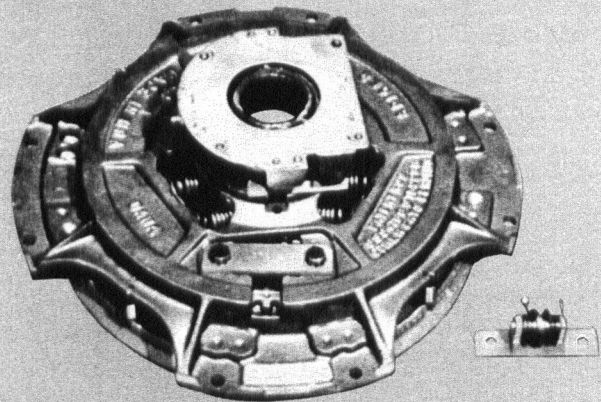


FIGURE 2

ORGANIC,  
RIGID

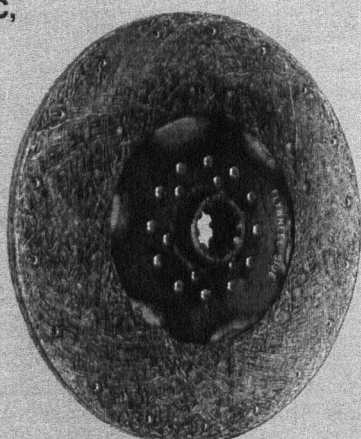


FIGURE 4

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COAXIAL

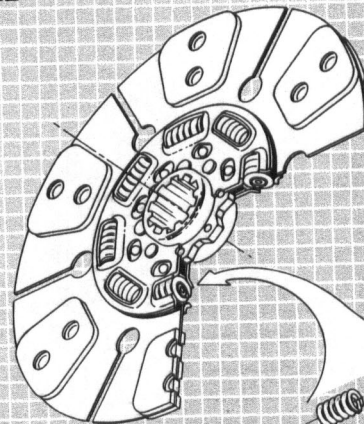


FIGURE 3

ORGANIC  
DAMPENED

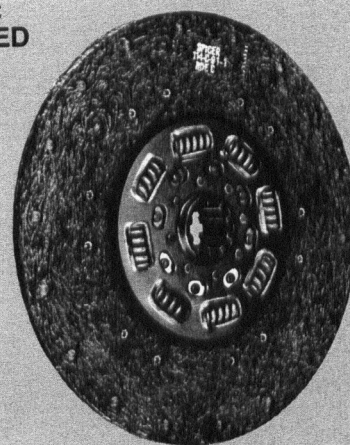


FIGURE 5



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CERAMIC  
RIGID

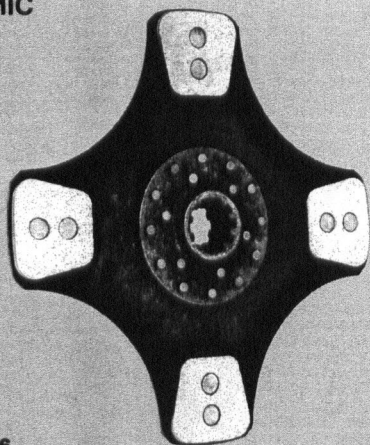


FIGURE 6

CERAMIC  
DAMPENED

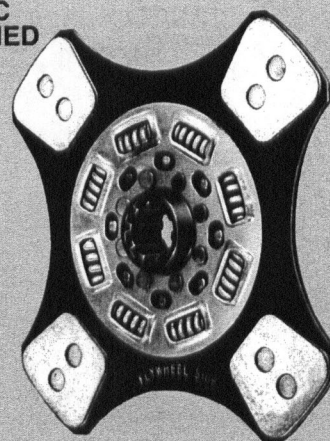


FIGURE 7

SUPER DUTY CERAMIC RIGID 14"

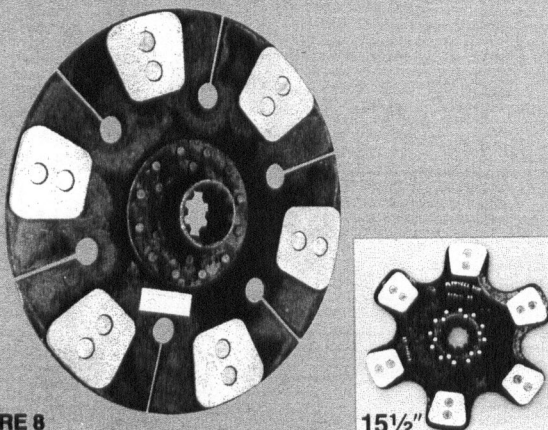


FIGURE 8

SUPER DUTY CERAMIC DAMPENED 14"

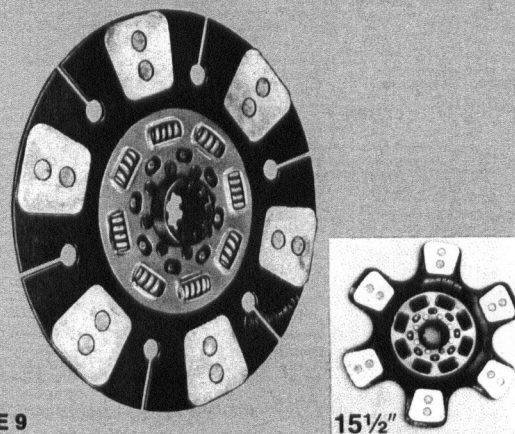


FIGURE 9

**SPICER®****TORQUE-LIMITING CLUTCH BRAKE**

Spicer provides a torque-limiting clutch brake (Fig. 10) which is designed to slip when loads of 20-25 ft. lbs. are reached, preventing damaging overloads to the clutch brake. This brake is not designed for upshifting.

**ANTI-RATTLE SPRINGS**

Spicer 14-inch Super Duty clutches, with their thicker intermediate plate, require anti-rattle springs. (Fig. 11) These reduce wear between the intermediate plate and the drive pin and improve clutch release. (Fig. 12) If not used, there is excessive wear to the intermediate plate drive slot which will result in poor clutch release. Anti-rattle springs are positioned as indicated in the illustration with the round portion of the hole facing the flywheel face. Three equally spaced.

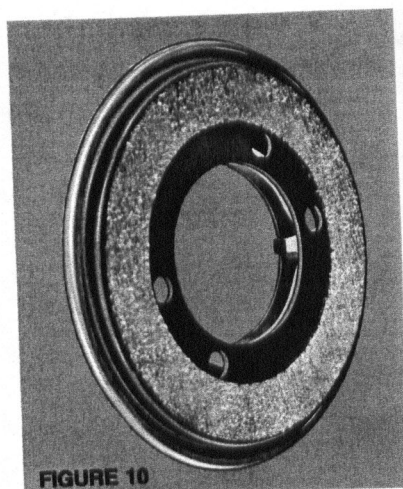
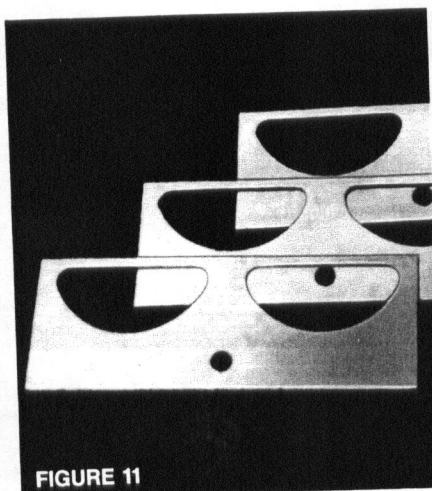
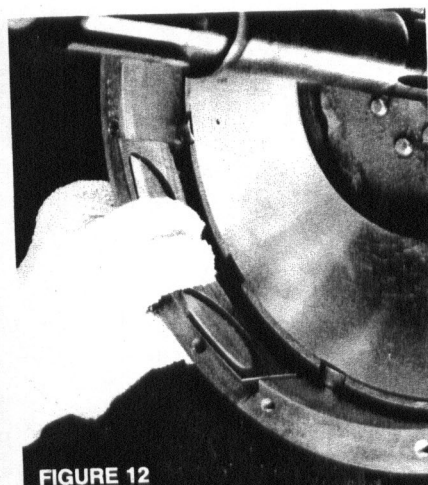
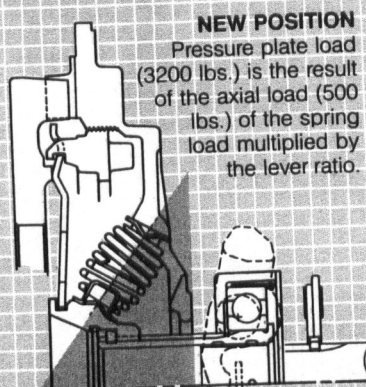
**Torque Capacity** – Spring loads for various plate loads are available to match the clutch to a specific engine size.

**Smooth Engagements** – Flexing of levers gives a cushioning effect that is easy on clutch facings, transmissions and drive line components.

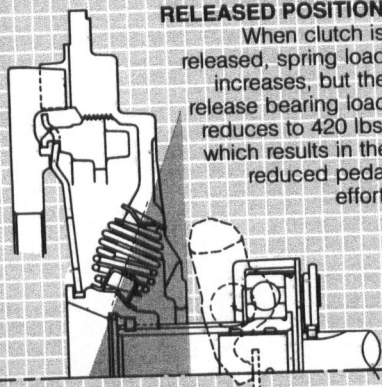
**Balance Maintained** – Because all major parts are balanced at the factory, clutch balance is maintained even when parts are interchanged or replaced.

**Knife Edge Lever Design** – Provides less friction and consequently less wear.

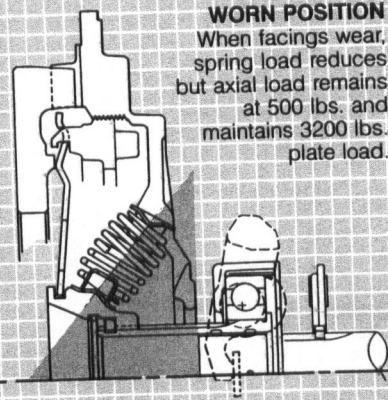
**Internal Adjustment** – Simple and quickly maintained. Accessible through the inspection hole located on the clutch housing.

**FIGURE 10****FIGURE 11****FIGURE 12****HOW THE SPICER ANGLE-SPRING CLUTCH WORKS****NEW POSITION**

Pressure plate load (3200 lbs.) is the result of the axial load (500 lbs.) of the spring load multiplied by the lever ratio.

**RELEASED POSITION**

When clutch is released, spring load increases, but the release bearing load reduces to 420 lbs. which results in the reduced pedal effort.

**WORN POSITION**

When facings wear, spring load reduces but axial load remains at 500 lbs. and maintains 3200 lbs. plate load.



## CLUTCH SELECTION DATA

The proper match of a clutch to a vehicle should be made by using the formula below, which takes into consideration the vehicle's gross weight, the engine, transmission, rear axle and tires. All of these combined are called the Gradeability Factor. For adequate clutch life the vehicle must have a Gradeability Factor of at least 15%. Less than this puts undue stress on the clutch. Here's how to figure it.

$$\text{Gradeability (\%)} = \frac{867 \times T \times R}{r \times \text{GVW}} - \text{Rrg}$$

T - Gross engine torque in ft. lbs.

R - Axle ratio x transmission ratio (first gear)

Rrg - Rolling resistance in equivalent grade percent

(See Chart Below)

r - Rolling radius of tires

GVW - Gross vehicle weight in pounds

### ROLLING RESISTANCE

	Road Surface	Equivalent Grade %
<b>CONCRETE</b>	Excellent	1
	Good	1.5
	Poor	2
<b>ASPHALT</b>	Good	1.25
	Fair	1.75
	Poor	2.25
<b>MACADAM</b>	Good	1.5
	Fair	2.25
	Poor	3.75
<b>COBBLES</b>	Ordinary	5.5
	Poor	8.5
<b>SNOW</b>	2 inches	2.5
	4 inches	3.75
<b>DIRT</b>	Smooth	2.5
	Sandy	3.75
<b>MUD</b>	-----	3.75 to 15

### CLUTCH CAPACITY

Using the same gross engine torque as used in the previous formula, you can select a clutch using the Clutch Capacity Selection Chart. A 14-inch clutch is the standard. A 15½-inch clutch will take greater load. For safety, please note these speed limitations:

14" clutch - Maximum engine speed 3300 RPM

15½" - Maximum engine speed 2600 RPM

### CLUTCH CAPACITY SELECTION CHART FOR 2-PLATE CLUTCHES

SIZE	CLUTCH PLATE LOAD - LBS.	SPRINGS COLOR CODE	FACING	RECOMMENDED MAX. ENGINE TORQUE - LB. FT.
14"	2800	Red	Organic	820
14"	2800	Red	Ceramic (4-pad)	1000
14"	3200	Plain	Organic	1000
14"	2800	Red	Super Duty Ceramic (6-pad)	1090
14"	3200	Plain	Super Duty Ceramic (6-pad)	1250
15½"	2800	Red	Organic	940
15½"	2800	Red	Ceramic	1200
15½"	3200	Plain	Organic	1070
15½"	3200	Plain	Ceramic	1370
15½"	3600	Yellow	Organic	1250
15½"	3600	Yellow	Ceramic	1650

## RECOMMENDED OPERATION AND MAINTENANCE FOR LONG CLUTCH LIFE

Spicer clutches will last many thousands of miles if properly installed, used and maintained. They are designed and built to withstand rugged use. But regardless of their strength and quality, their life will be shortened if they are abused.

### EXCESS FRICTION HEAT, A CLUTCH'S WORST ENEMY

Almost every early failure of a clutch can be traced to excess friction heat - all of which can be prevented by proper operation and maintenance. Here's how:

#### **Do not "ride or slip" the clutch.**

Once a clutch is fully engaged, there is no heat generated and little or no wear. However, during the brief period when the clutch is picking up the load, considerable heat is generated. By riding or slipping the clutch, the period of partial engagement is lengthened - causing unnecessary heat and wear.

**Always start in the proper gear.** Obviously, an empty vehicle can be started in a higher gear than a fully loaded one. But starting in a gear too high for the load can cause clutch slippage, too much heat and unnecessary wear. Drivers should be trained to use a gear low enough to prevent excess wear on the clutch. *A gear that will start the vehicle moving with the engine at idle speed is usually correct.* If the engine must be revved up to prevent stalling, the gear selection is too high.

**Do not shift until vehicle has reached proper speed.** Upshifting before the vehicle has reached the right speed is almost as bad as starting off in too high a gear. When the difference between the vehicle speed and the engine speed is too great, the clutch is forced to slip. The result is extra heat and wear.

#### **Match the clutch to the vehicle and the job.**

Improper specification may result in a clutch too light duty for the job it must perform, resulting in early burn-out. It may be a perfectly good clutch when used in the application for which it was designed, but totally inadequate for heavy duty use.

Mismatching the clutch to the vehicle is not only bad for the clutch, it can cause early wear on the whole drive train.

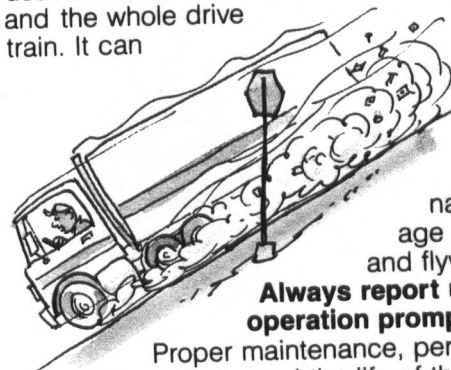
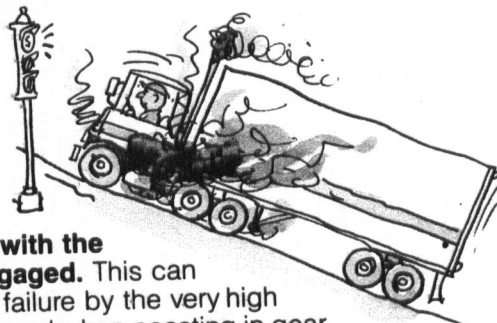


**Never hold a vehicle on a hill with the clutch.** To hold on a hill with the clutch requires that the clutch be purposely slipped. By doing this enough heat can be generated to burn up the clutch.

#### **Never coast with the clutch disengaged.**

This can cause clutch failure by the very high RPM encountered when coasting in gear with the clutch released. In this situation, the rear wheels are driving the disc through the multiplication of the rear axle and transmission ratios. This can result in over 10,000 RPM, beyond the burst strength of the facing material. Something as simple as coasting down an unloading ramp can burst a driven disc.

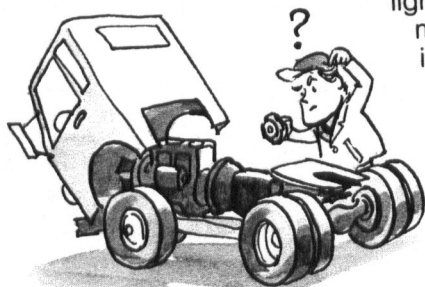
**Never engage the clutch while coasting.** This should not even have to be said, since responsible drivers should never coast with clutch disengaged. Re-engaging a clutch after coasting causes tremendous shock to the clutch and the whole drive train. It can



result in internal engine damage and/or clutch and flywheel failure.

#### **Always report unusual clutch operation promptly.**

Proper maintenance, performed on time, will greatly extend the life of the clutch. The driver should report any change in free pedal (free travel), slippage or any strange "feel" to the clutch operation.





## CLUTCH REMOVAL AND REPLACEMENT

Spicer clutches should be replaced when adjustment cannot correct for a loss of free pedal or a slipping clutch.

### TRANSMISSION REMOVAL

When removing the transmission and drive shaft, use a sling or a jack to maintain alignment. (Fig. 16) Do not let the rear of the transmission drop and don't let the transmission hang unsupported in the splined hubs of the clutch discs. Taking these precautions will prevent bending and distortion of the clutch discs.

Before pulling the transmission free, disconnect the external clutch linkage. (Fig. 17)

### CLUTCH REMOVAL

Install the spline aligning tool into the release bearing assembly and the driven discs. (Fig. 18) An old transmission input shaft may be used for this purpose. Insert two  $\frac{5}{8}$ " spacers between the flywheel ring and the release bearing housing (Fig. 19), then loosen the mounting bolts around the flywheel.

**Note:** Be sure to progressively loosen the mounting bolts in a criss-cross pattern to prevent cocking and bending within the clutch and insure easy removal of the clutch mounting bolts. The spacers relieve the heavy internal spring load in the clutch assembly.

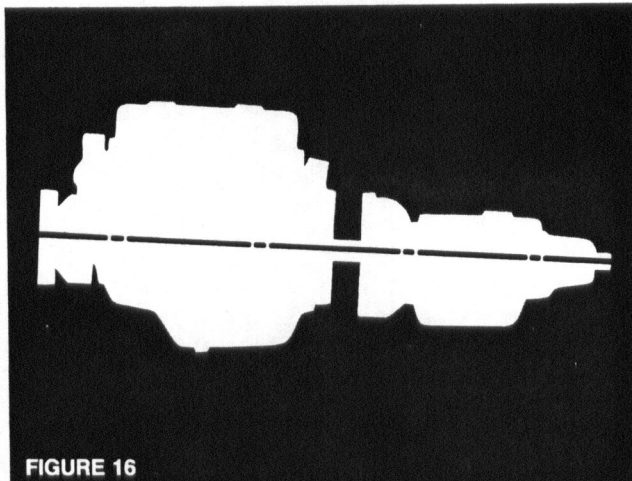


FIGURE 16

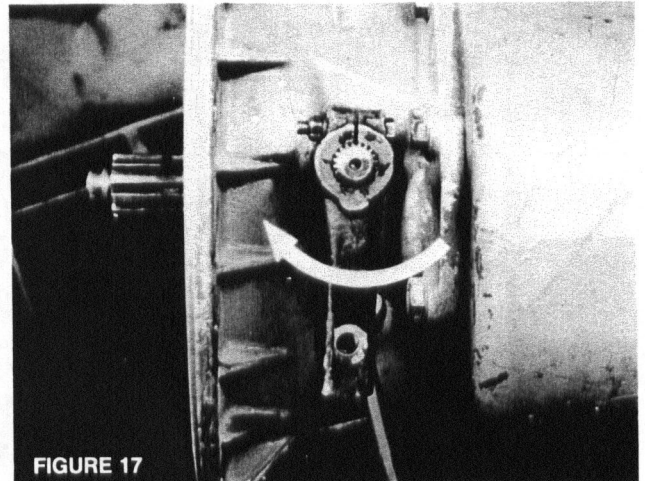


FIGURE 17

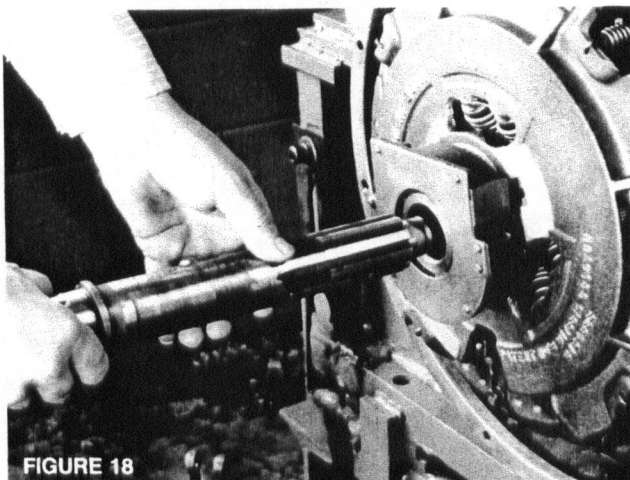


FIGURE 18

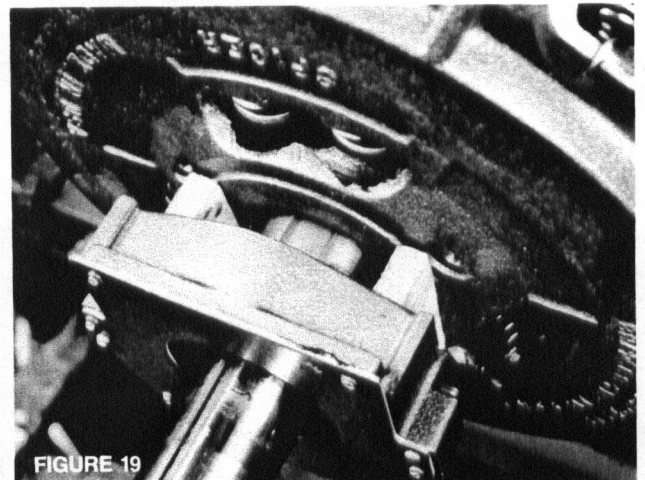


FIGURE 19

**Note:** Because of the weight of a 15½" clutch, (Fig. 20) install two guide studs in the top mounting bolt holes to facilitate removal. Now remove the mounting bolts and carefully remove the clutch assembly.

#### ENGINE AND TRANSMISSION ALIGNMENT

The engine and transmission must line up. To check for this, make the following checks or measurements. Surfaces being gauged or measured must be clean for accurate measurements.

#### INSPECTION

Inspect the mating faces of the transmission clutch housing and the engine flywheel housing. (Fig. 21) Any appreciable wear on either housing will cause misalignment. Replace housing if worn. Most wear will be found on the lower half of the facings. Most common wear areas are between the 3 and 8 o'clock positions. (Fig. 22)

With dial indicator secured to engine flywheel or crankshaft (Fig. 23) and gauge finger against housing pilot, rotate flywheel by hand. With chalk or soapstone, mark high and low points. Total indicated difference between high and low points must be .008" or less.

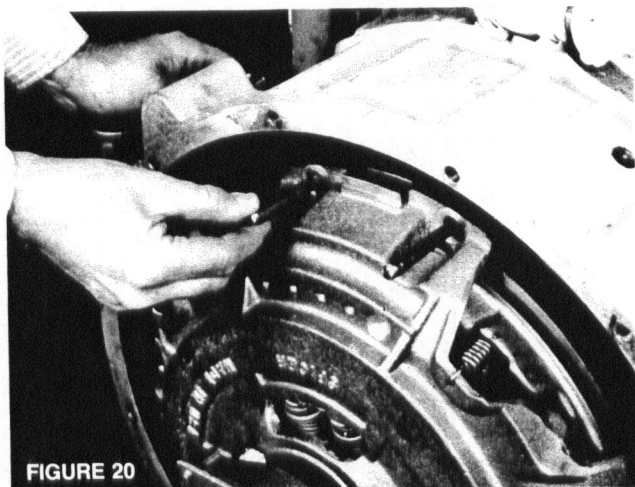


FIGURE 20

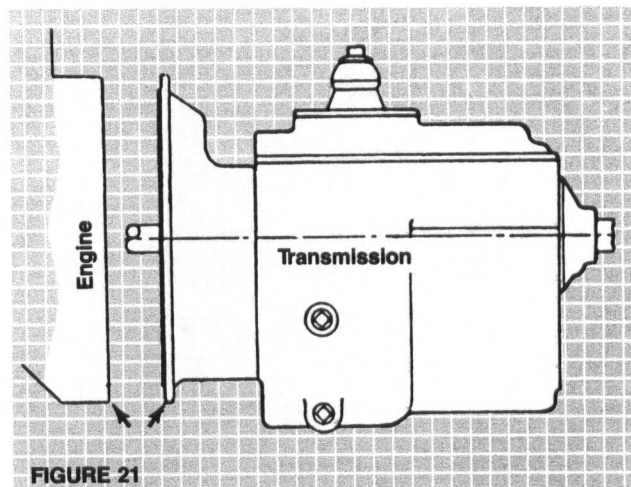


FIGURE 21

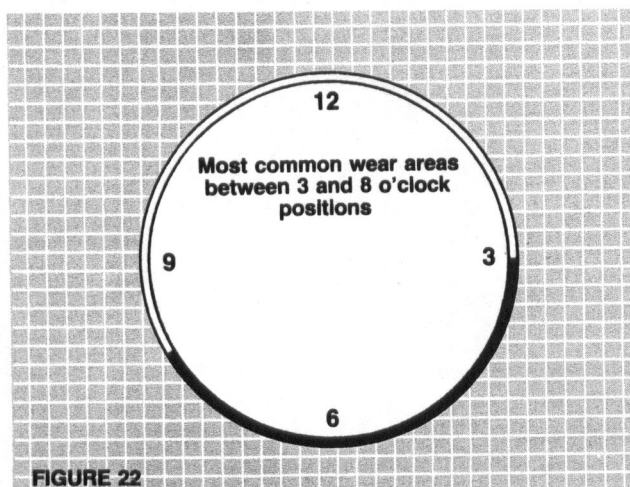


FIGURE 22

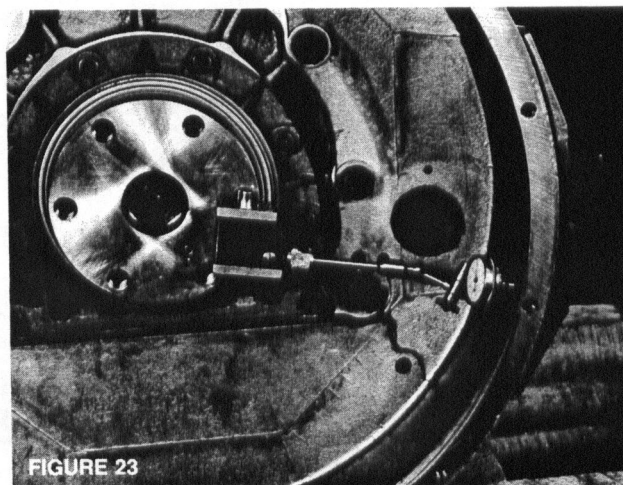


FIGURE 23



Now move gauge finger to contact face of engine flywheel housing. (Fig. 24) Rotate flywheel and mark high and low points. Total runout should not exceed .008".

Next, secure dial indicator to engine flywheel housing with gauge finger on face of flywheel near the outer edge. (Fig. 25) Rotate flywheel. Maximum permissible runout is .0005" per inch of flywheel diameter. For instance, with a 14" clutch, .007" runout is allowable.

Now move gauge finger to contact pilot bearing bore surface. (Fig. 26) Rotate flywheel. Maximum total allowable runout is .005".

If any of these limits are exceeded, the problem must be corrected or misalignment will cause premature wear to drive train components.

#### **Installation of New 14" Clutch**

Start by replacing the drive pins in the flywheel. Flywheel must be removed from engine. (Fig. 27) Remove the two set screws from each of the drive pins, then remove the drive pins using a punch and hammer.

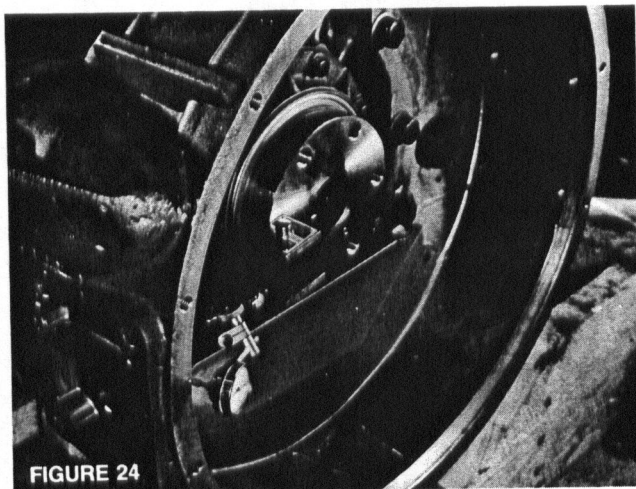


FIGURE 24

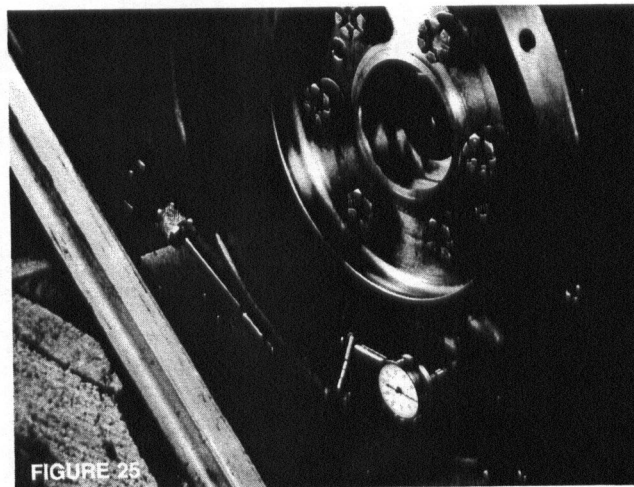


FIGURE 25

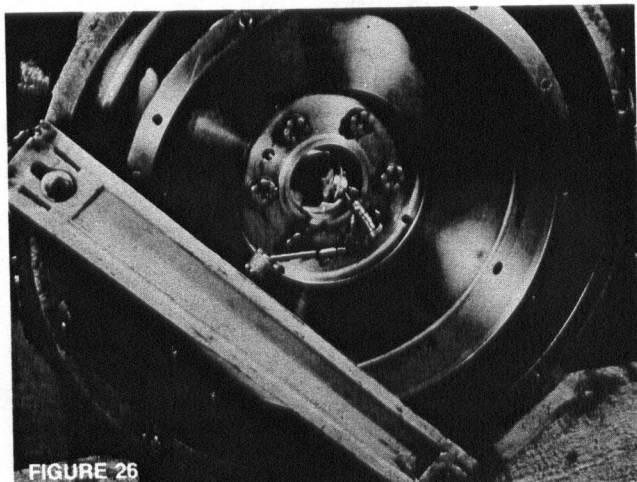


FIGURE 26

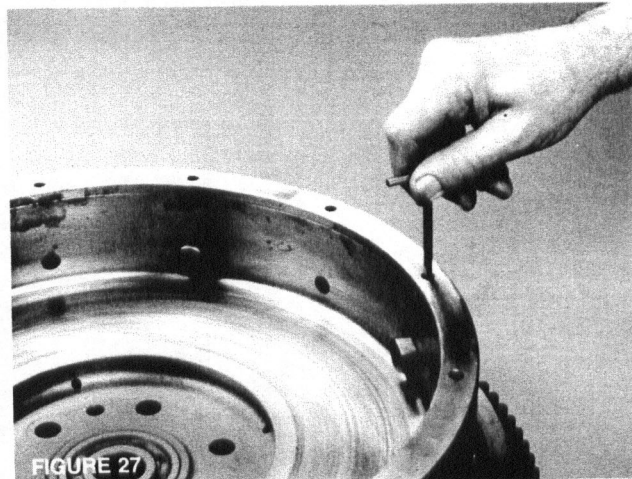


FIGURE 27

Install six new drive pins in the flywheel, equally spaced. (Fig. 28) Make sure that the shanks of the drive pins are a press fit in the flywheel rim, and that the heads are square with the friction face. Position intermediate plate over drive pins.

The minimum clearance between the drive pins and the drive slots should be .006". If the proper clearance is not obtained, re-check the drive pins for squareness. To check this, apply pressure to the intermediate plate in one direction and measure the clearance between each drive pin and slot on the same side of the pins. (Fig. 29) **Caution!** *Never file the intermediate plate slots to obtain the correct clearance. Doing so will cause unequal load on the pins. This is a frequent cause of a poor or no release complaint in newly installed clutches and can result in broken drive pins.*

If the alignment and clearance are OK, remove the intermediate plate (Fig. 30) and lock the drive pins in place with new set screws. All vehicles should use two  $\frac{3}{8}$  by  $\frac{3}{8}$  set screws to lock each drive pin in place. Reinstall flywheel to engine. Refer to engine manual for torque specs. Replace pocket bearing. Pocket bearing must have press fit.

Next place the front driven disc assembly (Fig. 31) in the flywheel with the side stamped "flywheel" facing the engine.



FIGURE 28



FIGURE 29



FIGURE 30

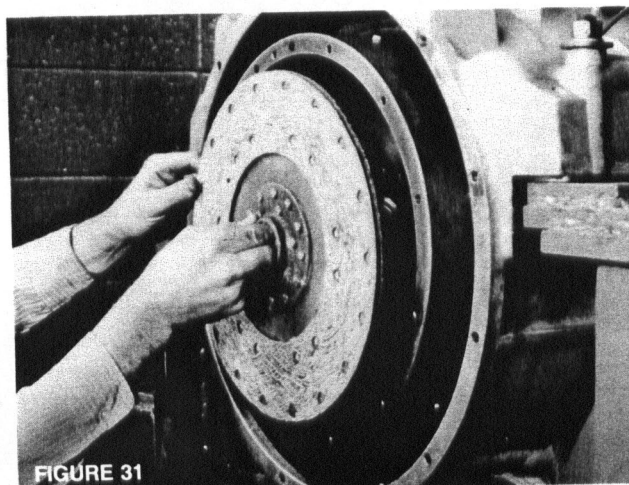


FIGURE 31



(Fig. 32) Install the intermediate plate in the flywheel locating the drive slots on the drive pins.

On 14" Super Duty installations, (Fig. 33) be sure to use three anti-rattle springs equally spaced between the drive pins. Install with rounded sections towards the flywheel face. 14" Super Duty Clutches have thicker intermediate plates and six ceramic buttons. Do not mix standard and Super Duty discs. **Caution:** Wear heavy gloves when installing anti-rattle springs. They have sharp edges.

Now insert the spline aligning tool (Fig. 34) thru the hub of the rear driven disc with the side stamped "pressure plate" facing the transmission. Install the rear driven disc behind the intermediate plate. **Be sure the side stamped "pressure plate" faces the transmission.** Insert the aligning tool thru the hub of the front driven disc and into the pilot bearing. Position the cover assembly on the flywheel (Fig. 35) with the adjuster assembly or lock strap aligned with the opening in the bell housing. Start the  $\frac{3}{8}$ " Grade 5 (or better) mounting bolts with lock washers and tighten finger tight to hold the assembly in place. Bolts should be  $1\frac{1}{4}$ " long.

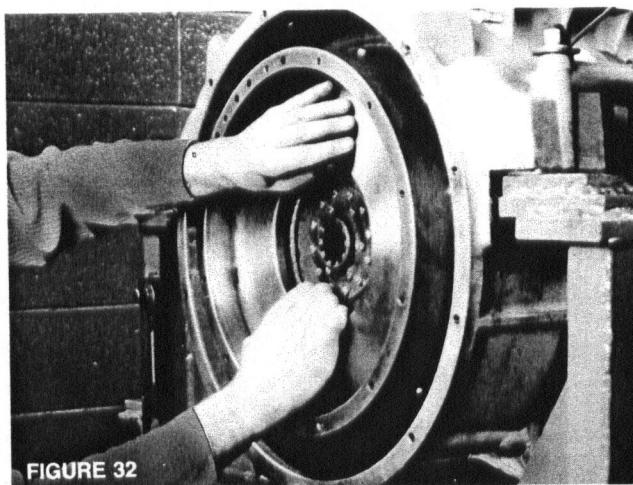


FIGURE 32

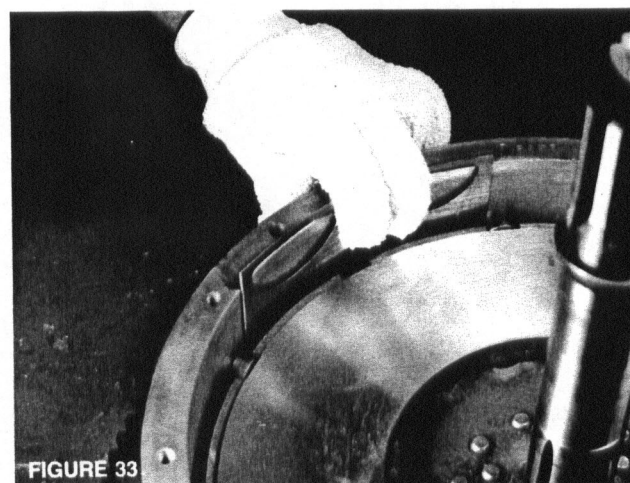


FIGURE 33

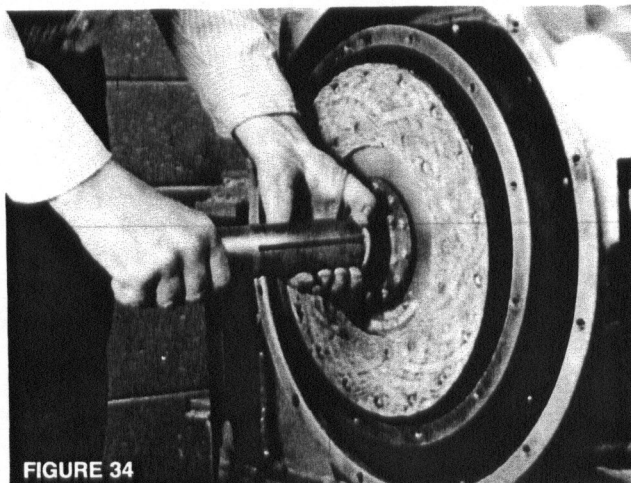


FIGURE 34

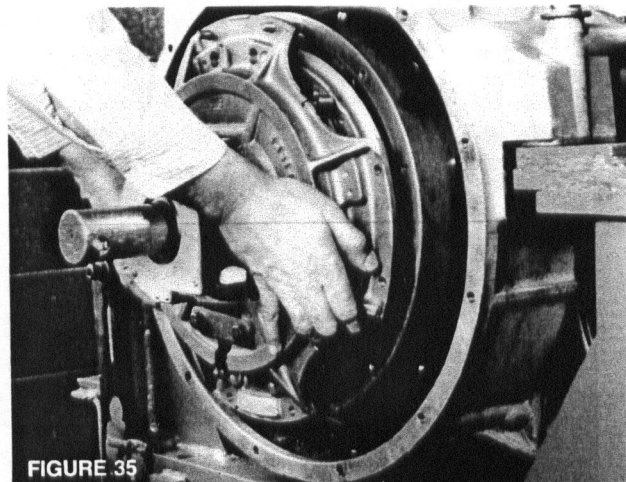


FIGURE 35



Tighten the bolts progressively in the sequence shown (Fig. 36) to pull the clutch ring into its proper position in the flywheel pilot. **Caution!** Failure to tighten the bolts as described can cause permanent damage and/or an out of balance condition. As the bolts are tightened, the wooden blocks should fall free. If they do not fall free be sure to remove them. For the final torque, progressively tighten all the bolts to 25 to 30 lb. ft. Finally, remove the aligning tool. This may require a tap with a mallet.

#### INSTALLATION OF A 15 1/2" CLUTCH

Insert two guide studs, 5" long into the two upper mounting holes of the flywheel. (Fig. 37) Rotate the flywheel to level the guide studs. (Fig. 38) Insert (Fig. 39) the spline aligning tool through the release bearing sleeve.

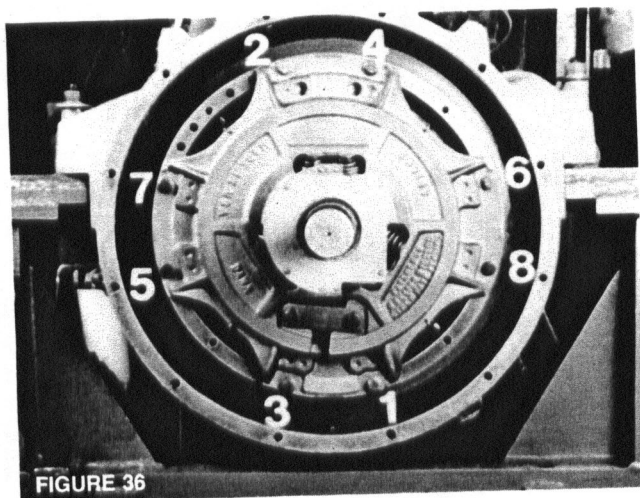


FIGURE 36

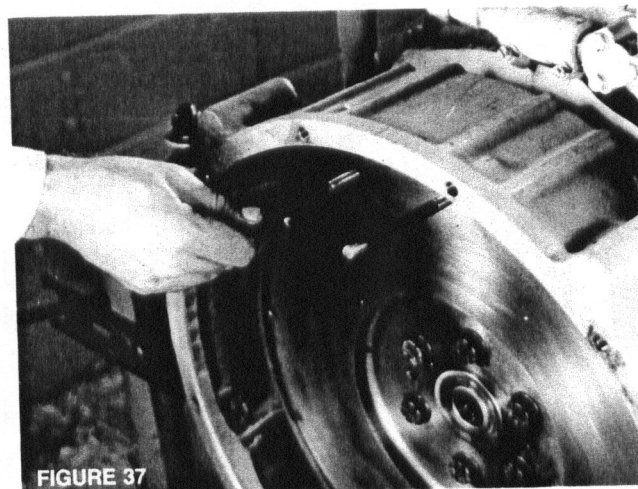


FIGURE 37

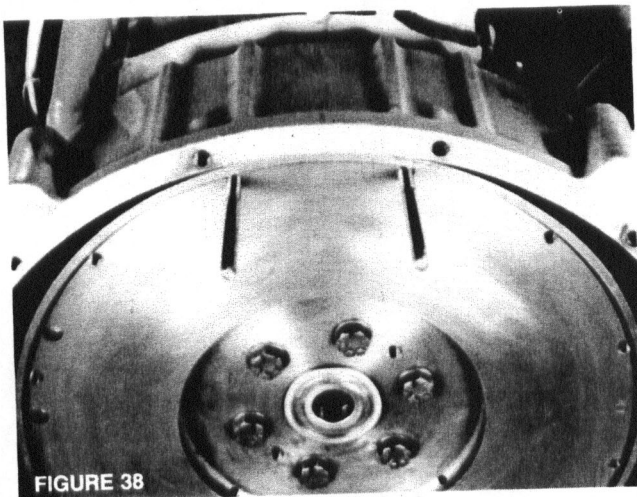


FIGURE 38

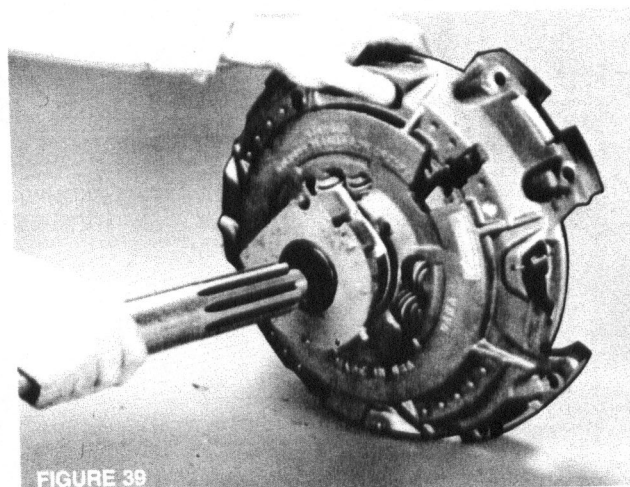


FIGURE 39



(Fig. 40) Then install the rear driven disc on the tool with the side stamped "pressure plate" facing the pressure plate. (Fig. 41) Place the intermediate plate in the clutch cover. Align the driving lugs of the plate with the slots provided.

Install the front driven discs (Fig. 42) on the aligning tool with the side stamped "flywheel" facing the engine. (Double check that driven discs are as shown.) (Fig. 43) Position the clutch over the two guide studs

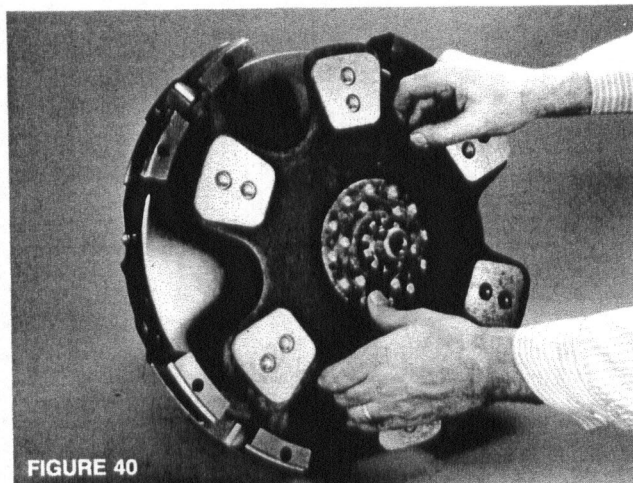


FIGURE 40

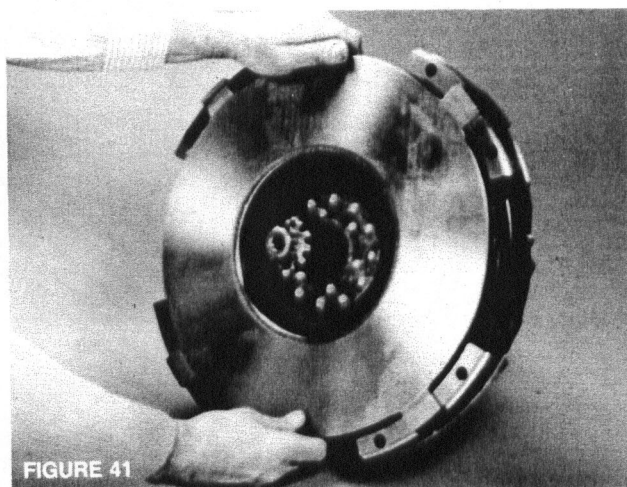


FIGURE 41



FIGURE 42

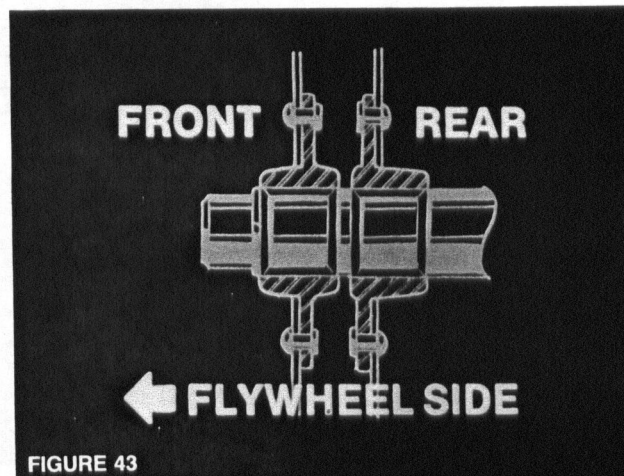
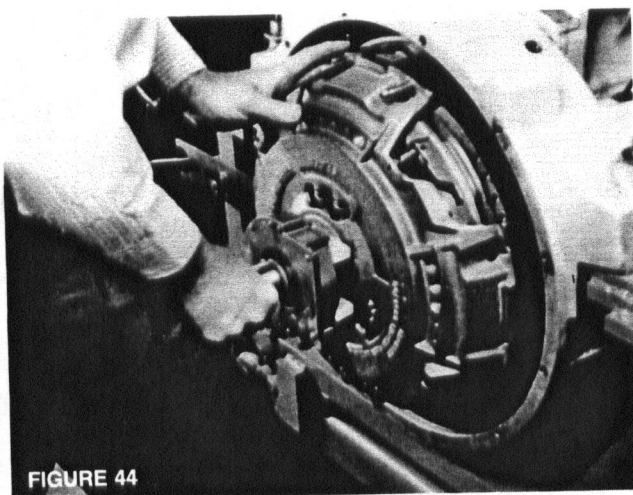
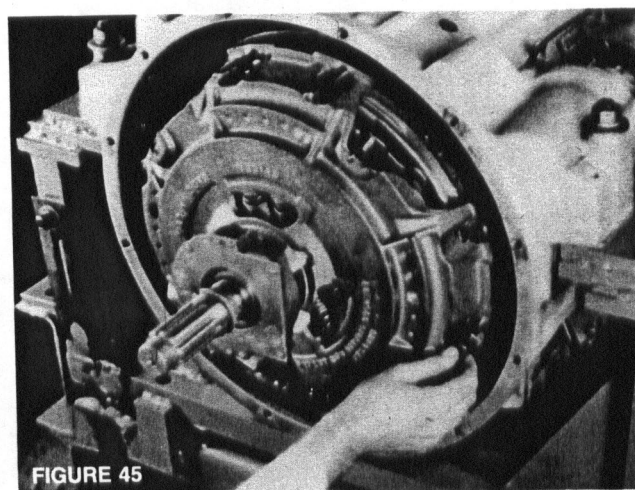
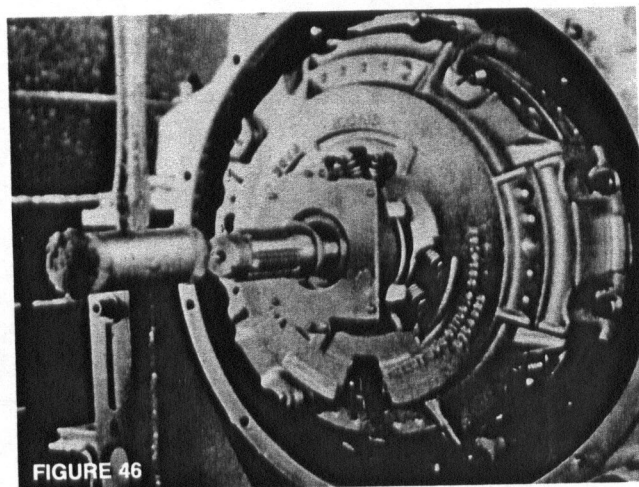
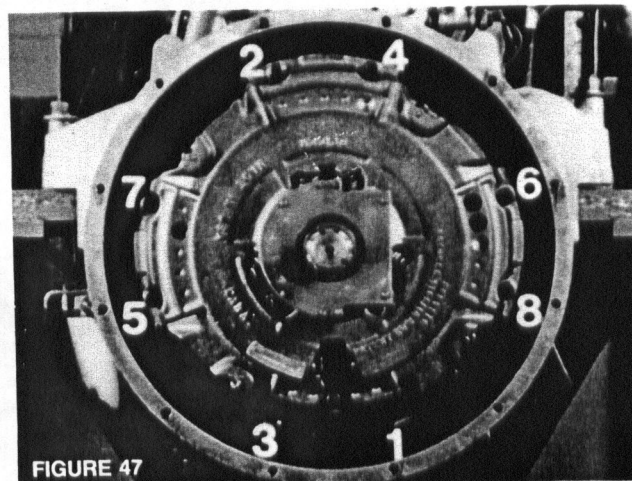


FIGURE 43

(Fig. 44) and slide the assembly forward until it starts in the flywheel pilot. (Fig. 45) Start six  $\frac{7}{16}$ " Grade 5 (or better) mounting bolts with lock washers and tighten finger tight. (Fig. 46) Tap the aligning tool to make sure it is centered and seated in the pilot bearing, then remove the two guide studs and replace them with the  $\frac{7}{16}$ " bolts and lock washers. (Fig. 47) Tighten the 8 bolts progressively in the sequence shown. **Remember that if the bolts are not tightened in sequence it can cause permanent damage and/or an out of balance condition.** The final torque is 45 to 50 lb. ft.


**FIGURE 44**

**FIGURE 45**

**FIGURE 46**

**FIGURE 47**



If a clutch brake is used, (Fig. 48) be sure to install it before installing the transmission. When installing the transmission, observe the following notes and cautions:

Shift the transmission into gear. Maintain the proper engine transmission alignment. Be sure the transmission is square to and aligned with the engine when it is raised into position. **Note:** Check wear on fingers of clutch release yoke, cross shaft and cross shaft bushings. Replace yoke, if necessary.

Be sure the release bearing yoke (Fig. 49) clears the bearing and is rotated over the wear pads as the transmission is moved forward. Align the splines by turning the transmission output shaft. Do not force the transmission into the clutch or flywheel housing. If it does not enter freely, investigate the cause of the problem.

(Fig. 50) Don't let the transmission drop or hang unsupported in the driven discs. Install transmission mounting bolts, torque to proper specs and attach linkage. You are now ready to adjust the clutch.

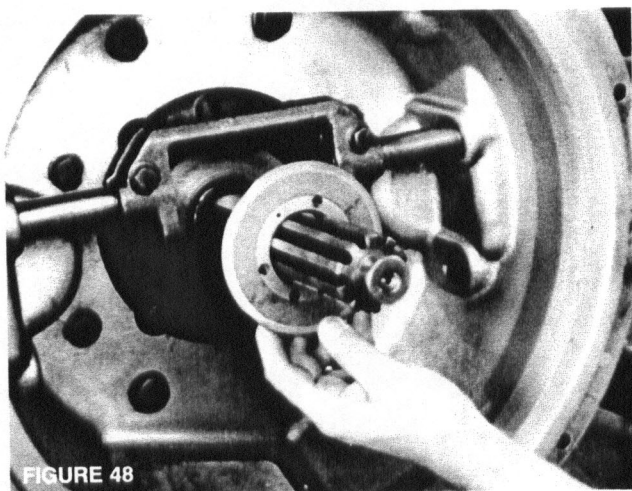


FIGURE 48

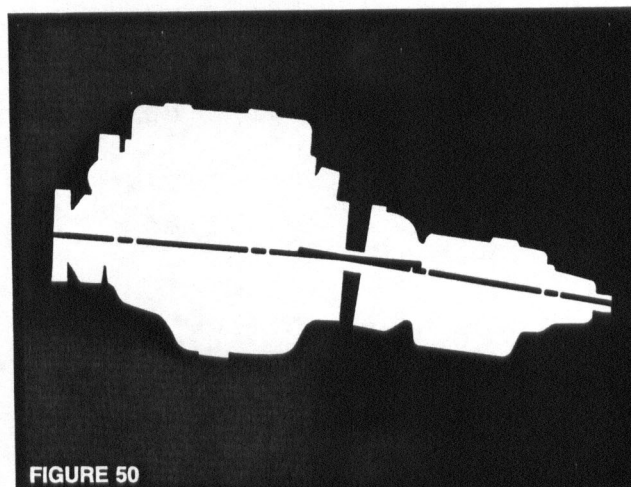


FIGURE 50

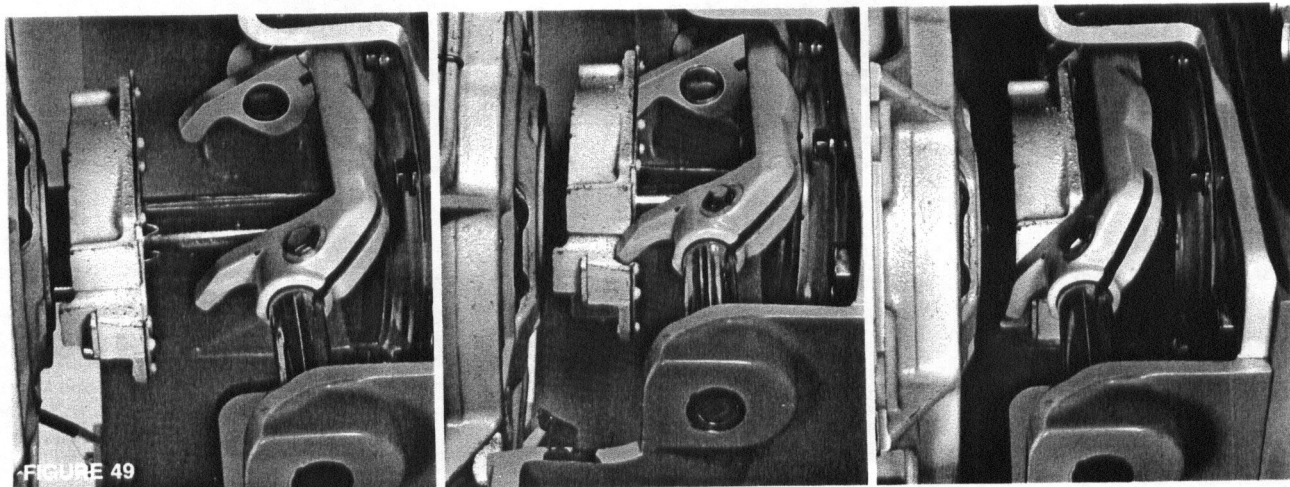


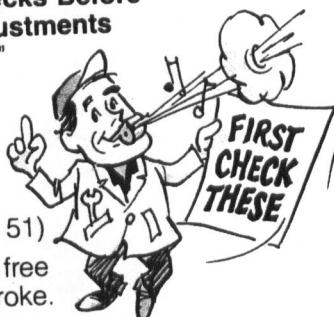
FIGURE 49

## ADJUSTMENT PROCEDURE FOR SPICER ANGLE-SPRING AND ANGLE-SPRING 2 CLUTCHES

### IMPORTANT: Critical Checks Before Making Any Internal Adjustments

1. Clutch brake "squeeze" (increased resistance) must occur 1" above floor boards. This adjustment is made by shortening or lengthening the external linkage rod. (Fig. 51)

2. There must be 1½" of free pedal at the top of the stroke. If not, the clutch will slip or burn out. (Fig. 52) This adjustment is made internally in the clutch - **never with the linkage**.



3. There must be ½" movement of the clutch release bearing for the clutch to release properly. (Fig. 53) If these conditions exist, the clutch is properly adjusted. If not, adjustment of the clutch is accomplished by using the adjusting ring. (Fig. 54) Specific instructions for manual and self-adjusting clutches are as follows:

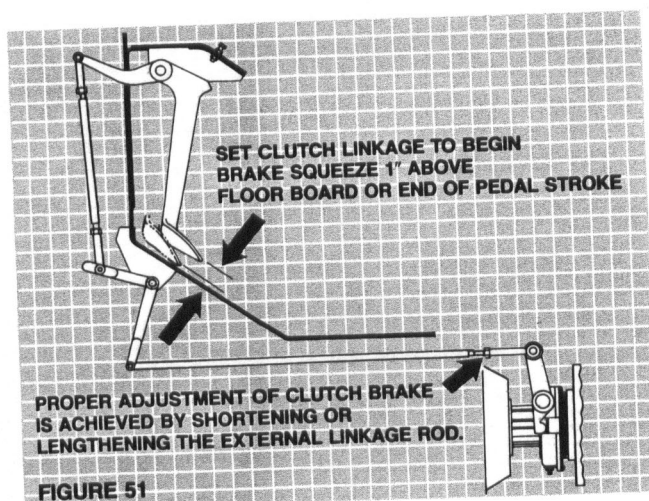


FIGURE 51

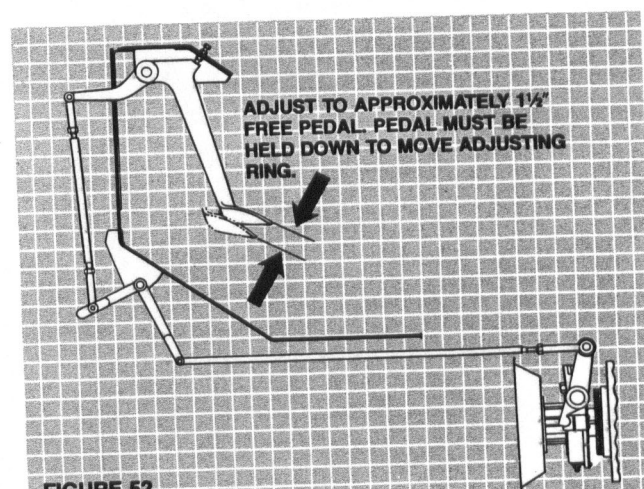


FIGURE 52

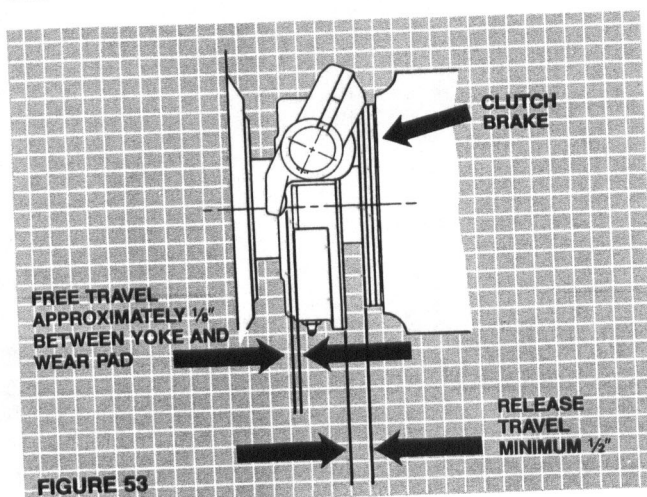


FIGURE 53

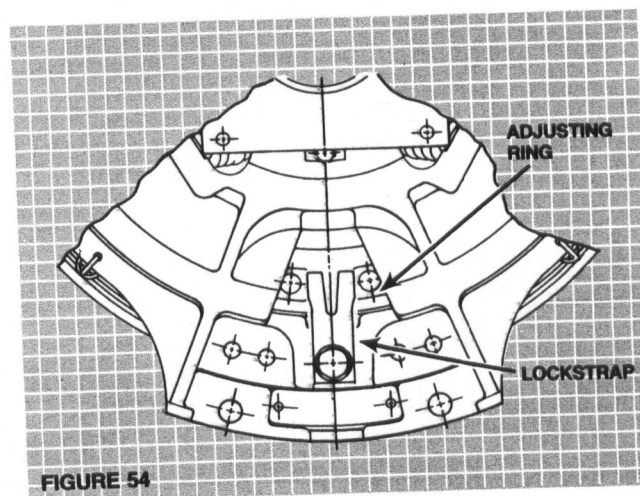


FIGURE 54



#### ADJUSTING FREE PEDAL FOR MANUAL ADJUSTING CLUTCHES ONLY

Adjust approximately 1½" free pedal. **Pedal must be held down to move adjusting ring.**

Remove adjusting lockstrap.

Turning the adjusting ring clockwise moves the release bearing toward the transmission. (Increases Free Pedal)

Turning adjusting ring counter-clockwise moves the release bearing toward the engine. (Decreases Free Pedal) Reinstall lockstrap and inspection cover.

**Caution:** Make sure you use same length bolt when reinstalling lockstrap. A longer bolt will lock up the clutch assembly.

#### ADJUSTING FREE PEDAL FOR SELF ADJUSTING CLUTCHES ONLY

**Note:** There must be ½" release bearing travel for self-adjuster to function.

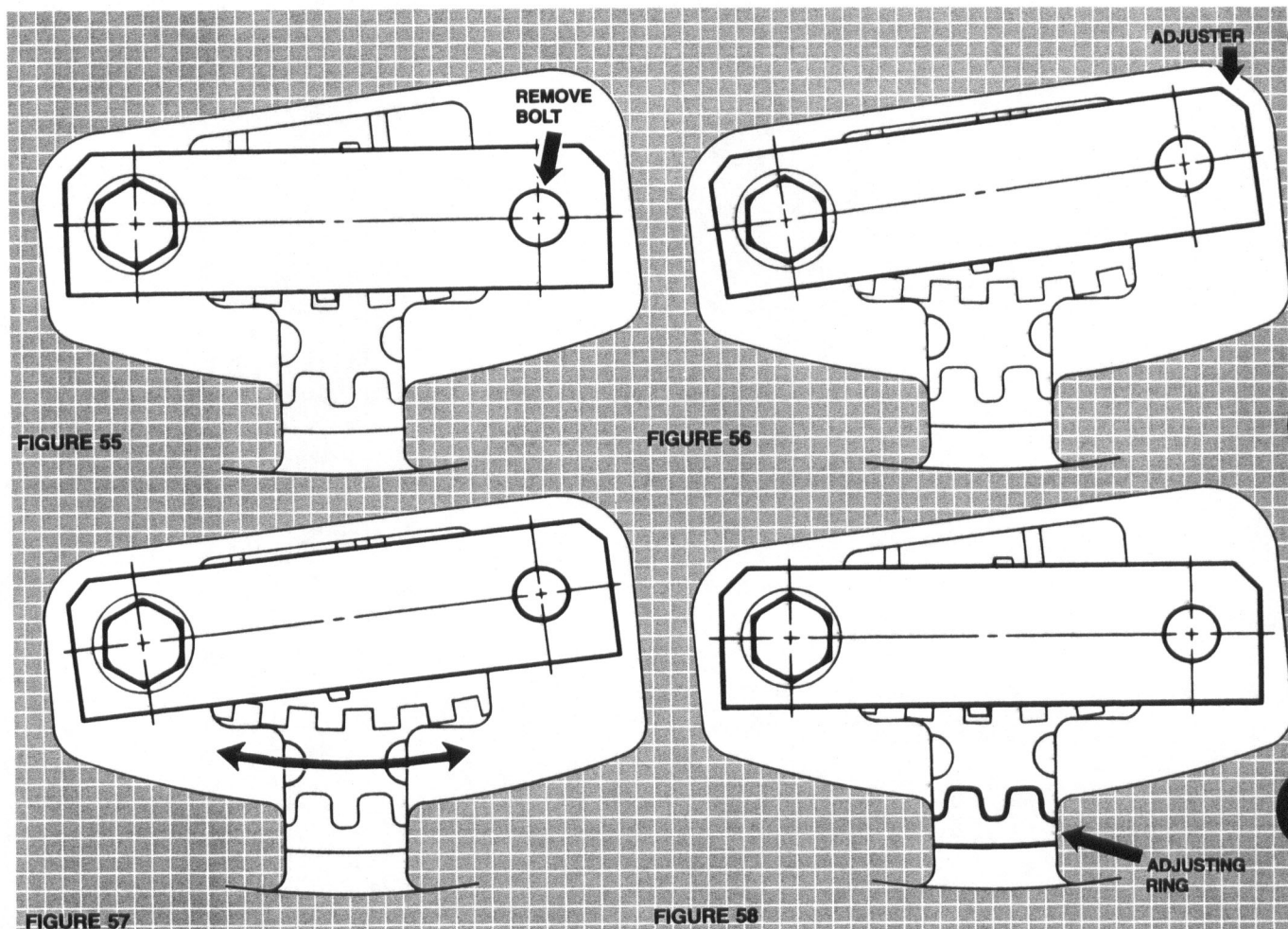
**A.** Remove right bolt. Loosen left bolt one turn. (Fig. 55)

**B.** Rotate adjuster upward. (Fig. 56) This will disengage worm gear from the adjusting ring to allow manual adjustment. Hold adjuster disengaged and tighten left bolt.

**C.** Rotate adjusting ring until approximately 1½" of free pedal is acquired - pedal must be down. (Fig. 57) Rotate clockwise to increase free pedal, counter clockwise to decrease.

**D.** Loosen left hand bolt, rotate adjuster assembly downward to engage worm with adjusting ring teeth. (Fig. 58) Adjusting ring may have to be rotated slightly to allow worm to mesh.

**E.** Install right bolt and tighten both bolts. (Fig. 59) (30-35 lbs. ft. torque)



Visually check to see if actuator arm (A.) is inserted into release sleeve retainer (B). (Fig. 60) If adjusting assembly is installed properly, the adjuster assembly spring will move back and forth as pedal is stroked.

**Note:** The clutch will not self-adjust if the actuator arm is not inserted into the release sleeve retainer or release bearing travel is less than 1/2".

30-35 LBS. FT. TORQUE

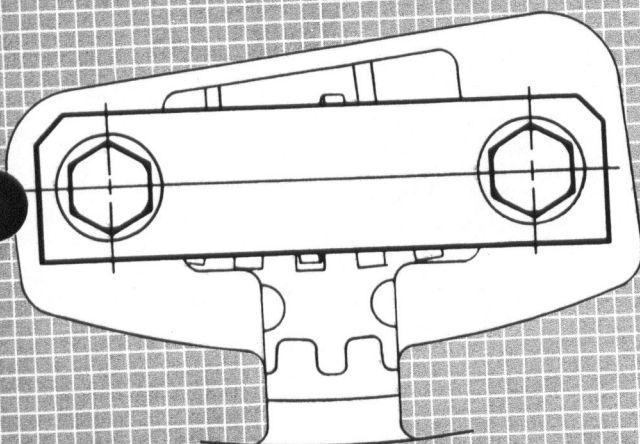


FIGURE 59

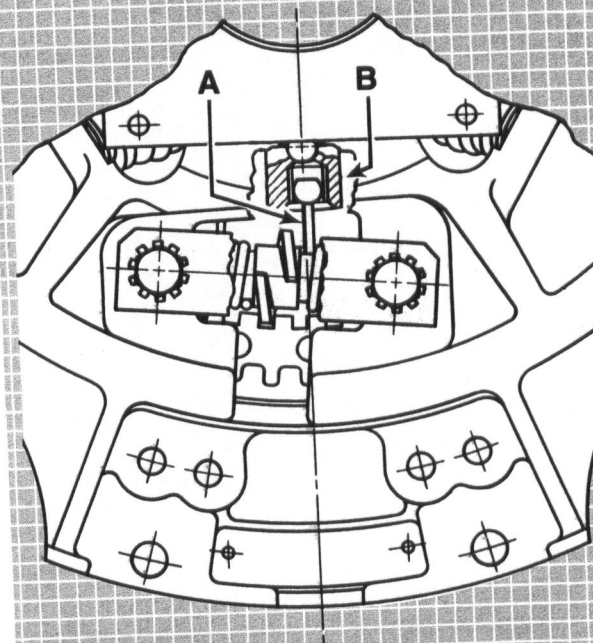


FIGURE 60



### ADJUSTING FREE PEDAL, SYNCHRONIZED TRANSMISSION, NO CLUTCH BRAKE

For manual adjusting clutches: Remove lockstrap. For self-adjusting clutches: Remove right hand bolt from adjuster arm. Rotate right side of arm up. (Fig. 61)

With pedal depressed, turn adjusting ring to obtain approximately  $\frac{9}{16}$ " between clutch cover and release bearing housing. Turning the adjusting ring clockwise moves release bearing toward the transmission. Turning adjusting ring counterclockwise moves release bearing toward the engine. Check measurement with pedal up.

Set free travel to obtain  $\frac{1}{8}$ " between yoke and wear pad ( $1\frac{1}{2}$ " free pedal measured at the clutch pedal). Proper adjustment is achieved by shortening or lengthening external linkage.

**Note:** Hydraulic linkage – Refer to manufacturer's specifications for proper adjustment of system.

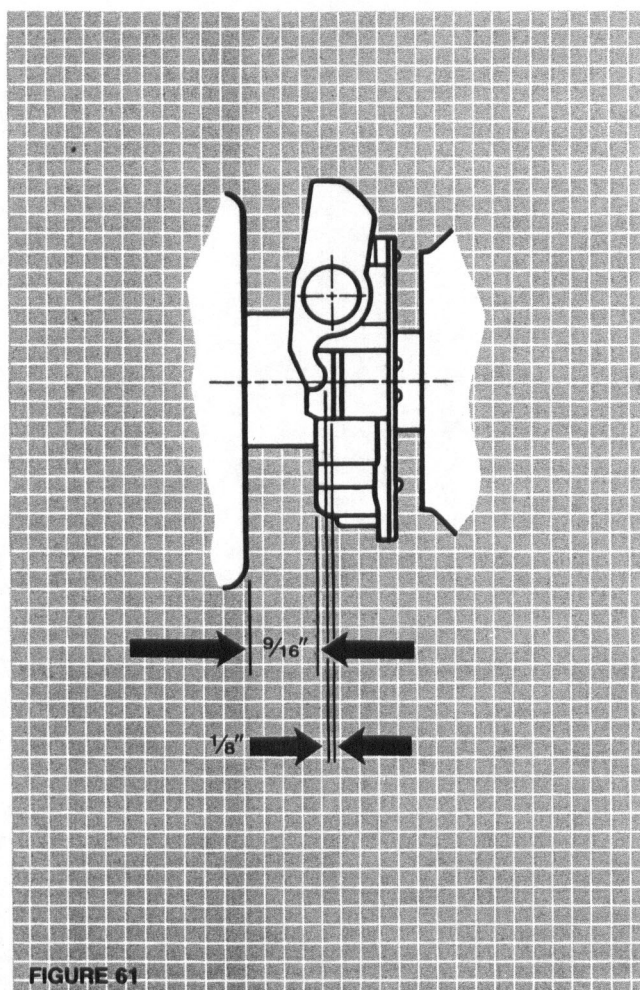


FIGURE 61

## LUBRICATION

Clutches should be lubricated after adjustment and at regular maintenance intervals. Lubricate the release bearing (Fig. 62) with a recommended lubricant as shown. Clutches with permanently sealed release bearings require no lubrication.

**Note:** It is important that a high temperature lubricant be used as listed below. **Do not** use chassis lubricant.



### RECOMMENDED LUBRICANTS

SUPPLIER	PRODUCT
Chevron Oil Co.	S.R.I. #2 Teknifax BRB-2
American Oil Co.	Amoco Lithium - M.P. Grease
City Service Co.	Citgo Premium Lithium Grease #2
Fiske Refining Co.	Lubriplate 630-2
Keystone Lubricating Co.	# 81 Light
Mobil Oil	Mobilgrease M.P.
Shell Oil Co.	Retinax A
Shell Oil Co.	Alvania #2
Atlantic Richfield Co.	Arco M.P.
Humble Oil Co.	Lidok 2
Texaco	Multifax #2
Texaco	Premium RB

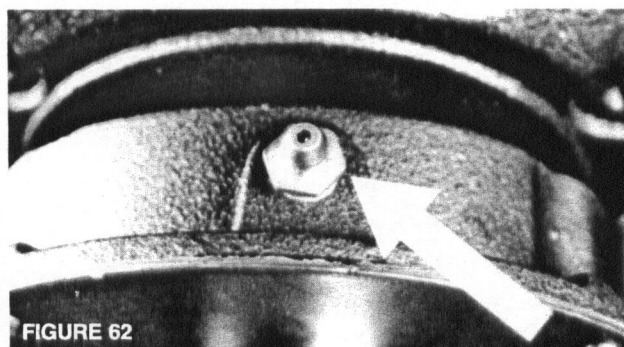


FIGURE 62

**SERVICE SPECIFICATIONS**

SUBJECT	AS-1402 14-inch Two-plate	AS-1552 15½-inch Two-plate
Minimum Bell Housing Size for Mounting (S.A.E.)	No. 2	No. 2
Pilot Diameter (inches)	14.750 17.747	17.156/17.153
Bolt Circle (inches)	15.500	16.625
Flywheel Pot Depth (inches)	2-15/16	Flat
Clutch Bell to C/L of Release Yoke (inches)	3-3/4 (105-C-137 Yoke) 4-3/16 (105-C-64 Yoke)	3-3/4 (105-C-137 Yoke) 4-3/16 (105-C-64 Yoke)
Disc & Facing Thickness-Standard	.463/.428	.487/.452
Hub Spline Size (inches, No. splines)	1-3/4-10 2-10	1-3/4-10 2-10
Disc. Assembly Max. Runout (T.I.R.)	.015	.015
Disc. Assembly Max. Out-of-Flat	.020	.020
Release Sleeve Bushing Dia. (new)	1.754/1.750 2.010/2.008	1.754/1.750 2.010/2.008
Intermediate Plates, driving lugs to slot clearance (new min.)	.006	.006
Intermediate Plates, driving lugs to slot clearance (max. worn)	.015 to .020	.015 to .021
Pressure Plates, driving lugs to slot clearance (new)	.004 to .008	.003 to .010
Pressure Plates, driving lugs to slot clearance (max. worn)	.020	.016/.021
Intermediate Plates & Pressure Plates: Out-of-Flat	.000 to .004 Concave	.000 to .004 Concave
Scoring-Max. depth that can be re-used	.015	.015
Release Sleeve Retainer, driving lugs to slot clearance (max. worn)	.020	.020



## TROUBLE SHOOTING

### CLUTCH SLIPPING

Probable cause	Correction
1. No free pedal	1. Re-adjust per instructions.
2. Release mechanism binding	2. Check release mechanism and linkage. Lube if necessary.
3. Worn clutch facings	3. Replace facings or complete disc, if necessary.
4. Grease or oil on facings	4. Replace facings.
5. Weak pressure springs	5. Replace springs.
6. Overloaded clutch	6. Check to assure that proper clutch has been specified

### NOISY CLUTCH

Probable cause	Correction
1. Clutch release bearing dry or damaged.	1. Lubricate bearings or replace
2. Flywheel pilot bearing dry or damaged.	2. Lubricate bearings or replace
3. Clutch release bearing housing striking flywheel ring.	3. Adjust clutch. Also check wear on cross shafts, bell housing bushings and release yoke fingers. Replace if necessary.
4. Improper clearance between drive slots and drive lugs on pressure plates.	4. Clearance should be no less than .006"





### POOR CLUTCH RELEASE

Probable cause	Correction
1. Clutch adjustment not correct.	1. Recheck adjustment per instructions.
2. Flywheel pilot bearing too tight in flywheel or on end of drive gear.	2. Free pilot bearing to a light push. If bearing is rough, replace it.
3. Damaged clutch release bearing.	3. Replace bearing. If bearing is grease type, lubricate with recommended lube.
4. Clutch release shaft projecting through release yoke.	4. Relocate release shaft so that it does not project. Check bell housing bushings and release yoke for wear.
5. Release yoke contacting cover assembly at full release position.	5. Replace release yoke with proper yoke.
6. Release yoke not aligned properly with release bearing.	6. Check flywheel. Probably has been resurfaced more than the .060" recommended.
7. Intermediate plate sticking on drive lugs (AS-1402 only)	7. Check that drive pins are 90° square to flywheel surface and that there is minimum .006" clearance between drive pins and intermediate plate slots.
8. Pressure plate not retracting.	8. a. Check pressure plate drive lugs for .006" clearance. b. Check pressure plate return springs for proper tension. c. Check amount of release travel. d. Lever nose out of groove.
9. Driven disc distorted.	9. Should be straight within .015". Replace if they can't be straightened.
10. Worn splines on drive gear of transmission.	10. Check drive gear and driven disc hubs for excess wear.
11. Disc facings gummed with oil or grease.	11. Replace facings or entire disc. Cleaning not recommended. Check for leak causing gumming.
12. Broken intermediate plate.	12. Replace entire intermediate plate/driven disc assembly. Damage such as this is almost always caused by abusive use of clutch.

### Helpful Hints to Operate Vehicles With Ceramic Clutch Facings

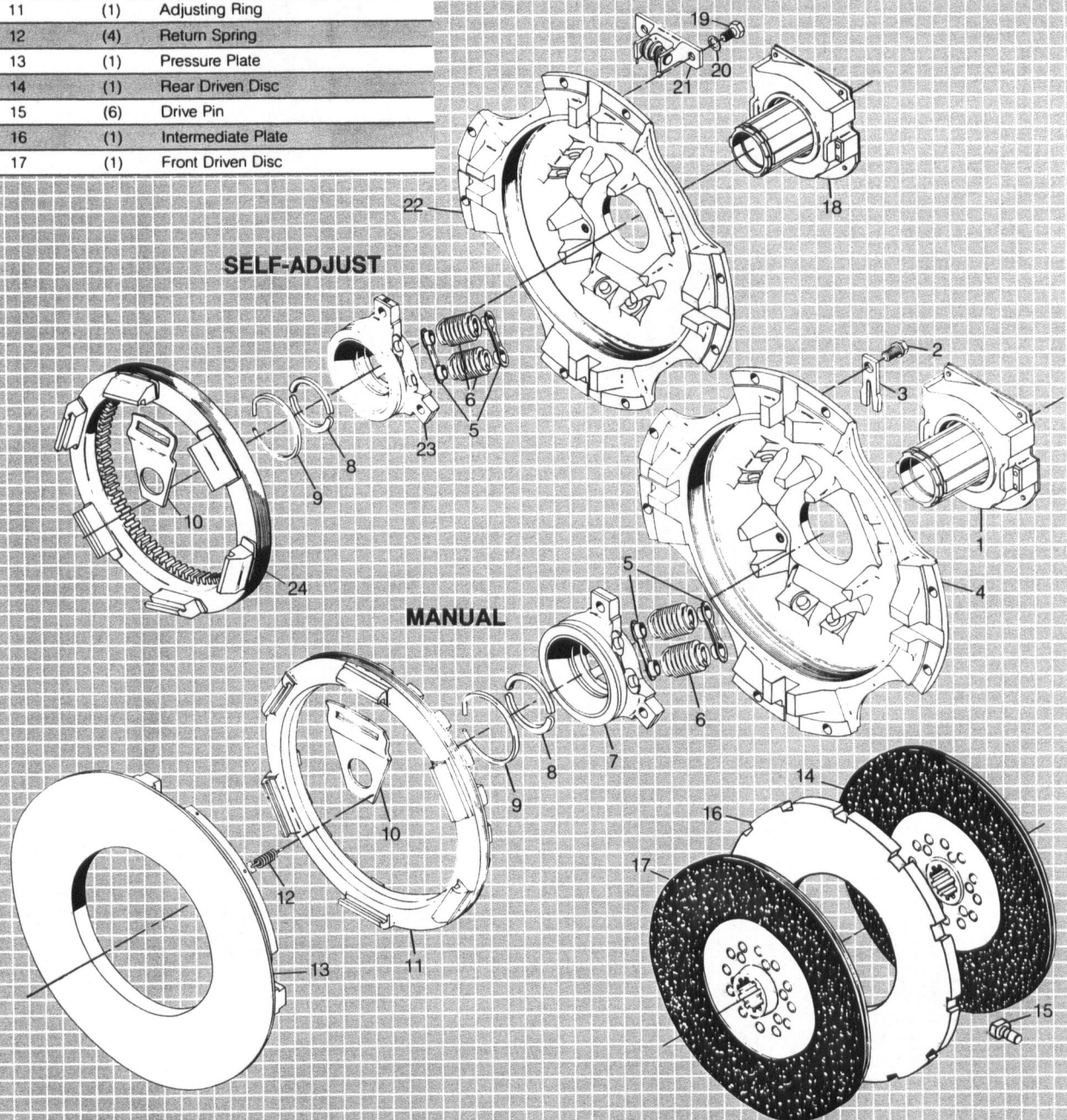
1. Driver must start vehicle in first gear.
2. Ceramic facings slip-period is shorter than organic facings.
3. While operating a ceramic clutch the driver has to engage the clutch before giving the engine any fuel (engine at idle).
4. If driver tries to slip ceramic clutch facings by raising R.P.M.'s with accelerator and riding or feathering clutch pedal, the vehicle will experience erratic engagement.

## PARTS LIST 14" Angle Spring & Angle Spring 2 Clutches Manual and Self Adjusting

Call-out No.	No. Req'd	Part Name
1	(1)	Release Sleeve & Bearing Assembly
2	(1)	Bolt & Lockwasher Assembly
3	(1)	Adjusting Ring Lock
4	(1)	Flywheel Ring
5	(6)	Spring Pivot
6	(6)	Pressure Spring
7	(1)	Release Sleeve Retainer
8	(2)	Release Sleeve Ring
9	(1)	Snap ring
10	(6)	Lever
11	(1)	Adjusting Ring
12	(4)	Return Spring
13	(1)	Pressure Plate
14	(1)	Rear Driven Disc
15	(6)	Drive Pin
16	(1)	Intermediate Plate
17	(1)	Front Driven Disc

Call-out No.	No. Req'd	Part Name
<b>FOR SELF ADJUSTING CLUTCH</b>		
18	(1)	Release Sleeve & Bearing Assembly
19	(2)	Bolt
20	(2)	Lockwasher
21	(1)	Adjuster Assembly
22	(1)	Flywheel Ring
23	(1)	Retainer and Spring Sleeve Assembly
24	(1)	Adjusting Ring

*Note: Balance of Components are interchangeable.*





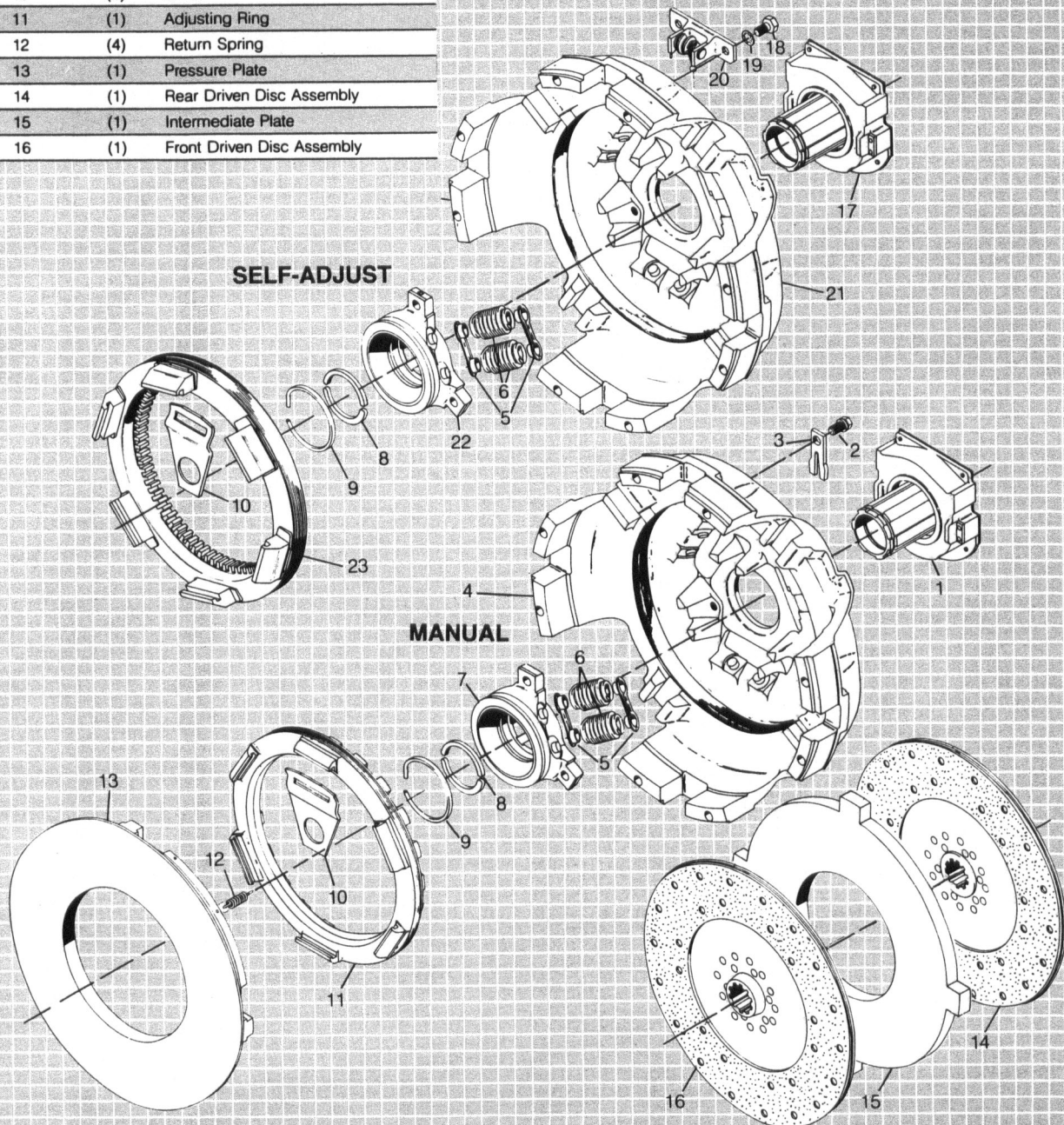
# PARTS LIST 15½" Angle Spring & Angle Spring 2 Clutches Manual and Self Adjusting



Call-out No.	No. Req'd	Part Name
1	(1)	Release Sleeve & Bearing Assembly
2	(1)	Bolt & Lockwasher Assembly
3	(1)	Adjusting Ring Lock
4	(1)	Flywheel Ring
5	(6)	Spring Pivot
6	(6)	Pressure Spring
7	(1)	Release Sleeve Retainer
8	(2)	Release Sleeve Ring
9	(1)	Snap Ring
10	(6)	Lever
11	(1)	Adjusting Ring
12	(4)	Return Spring
13	(1)	Pressure Plate
14	(1)	Rear Driven Disc Assembly
15	(1)	Intermediate Plate
16	(1)	Front Driven Disc Assembly

Call-out No.	No. Req'd	Part Name
<b>FOR SELF ADJUSTING CLUTCH</b>		
17	(1)	Release Sleeve & Bearing Assembly
18	(2)	Bolt
19	(2)	Lockwasher
20	(1)	Adjuster Assembly
21	(1)	Flywheel Ring
22	(1)	Retainer & Spring Sleeve Assembly
23	(1)	Adjusting Ring

**Note:** Balance of Components are interchangeable.





## SERVICE AIDS

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Spicer has a good selection of literature and other service aids to assist you in selecting and maintaining Angle-Spring and Angle-Spring 2 Clutches. The reply cards are for your ordering convenience.

### TRAINING PROGRAMS

Spicer offers two training programs:

1. Failure Analysis, a slide program
2. Removal, Replacement and Adjustment of 14" and 15½" Angle-Spring Pull-Type clutches

Both programs are available on request. Both are conducted on your premises and last for about 90 minutes each.

Fill out and mail reply card to arrange for a training program for your people. 30 days notice required.

### Training Program Order Form

We are interested in your training program:

- ☐ Failure Analysis
- ☐ Removal, Replacement, Adjustment of 14" and 15½" Angle-Spring Pull-Type Clutches

Please contact us to make arrangements.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

### Training Program Order Form

We are interested in your training program:

- ☐ Failure Analysis
- ☐ Removal, Replacement, Adjustment of 14" and 15½" Angle-Spring Pull-Type Clutches

Please contact us to make arrangements.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

### Literature Order Form

Please send me the following:

- ☐ 1212 Super Duty Clutches
- ☐ 1213 Torque Limiting Clutch Brake
- ☐ 1214 Angle-Spring & Angle-Spring 2
- ☐ 1215 Stamped Angle-Spring
- ☐ 1216 Coaxial Driven Disc

### Service Literature

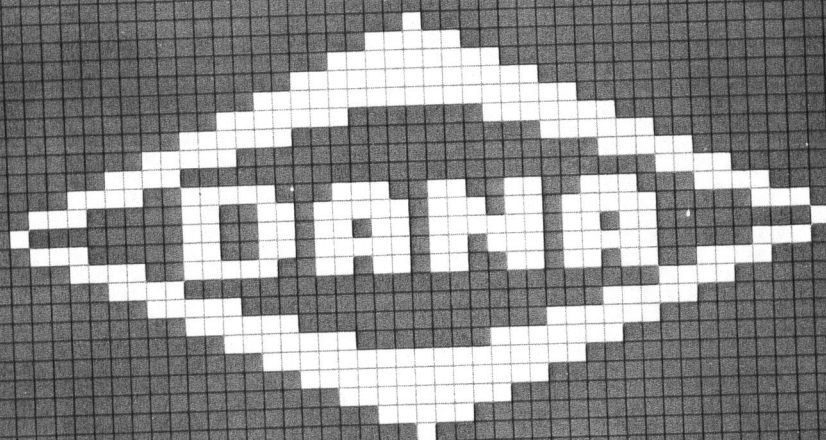
- ☐ 1305 Adjusting Procedures Wall Chart
- ☐ 1308 Service Manual
- ☐ 1314 Initial Adjustment A-S 2
- ☐ 1318 Clutch Replacement Wall Chart
- ☐ 1703 Instruction Sheet for Angle-Spring

Name \_\_\_\_\_

Company \_\_\_\_\_

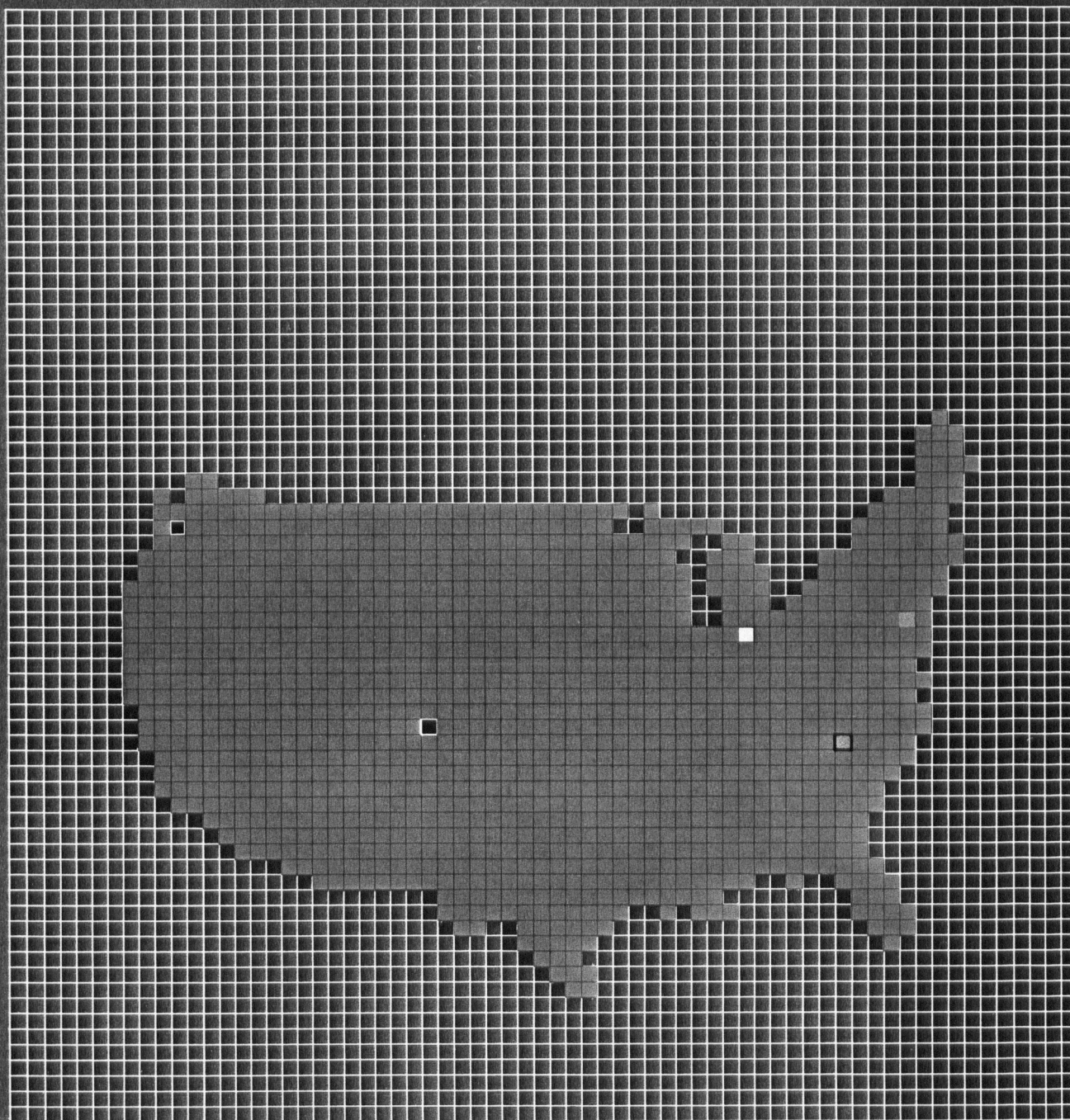
Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_





## TECHNICAL SERVICE LOCATIONS



### DANA CORPORATION

Spicer Clutch Division

5th & Brandon/Auburn, IN. 46706/219/925-3800

#### □ COLORADO SPRINGS PLANT

1210 Garden of the Gods Road  
Colorado Springs, Colo. 80907  
303/599-7240

#### □ PACIFIC NORTHWEST REGION

1037 Thomas Ave., S.W.  
Renton, Washington 98055  
206/271-3750

#### ■ SOUTHEAST REGION

2810 Interstate Street  
Charlotte, North Carolina 28208  
704/394-0582

#### ■ AUBURN PLANT

5th and Brandon Streets  
Auburn, Indiana 46706  
219/925-3800

#### ■ NORTHEAST REGION

396 Devon Drive  
Exton, Pennsylvania 19341  
215/532-4980