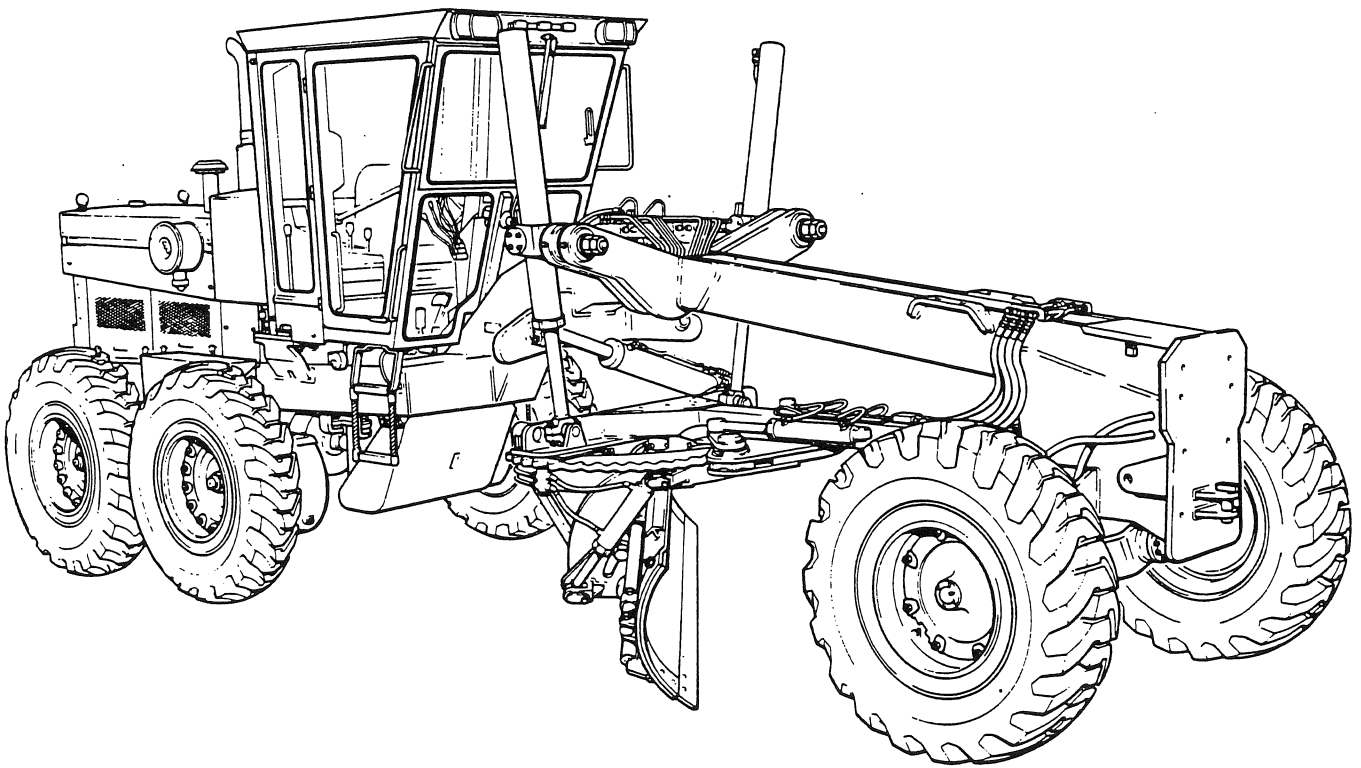


## SECTION 7

# ENGINE CLUTCHES



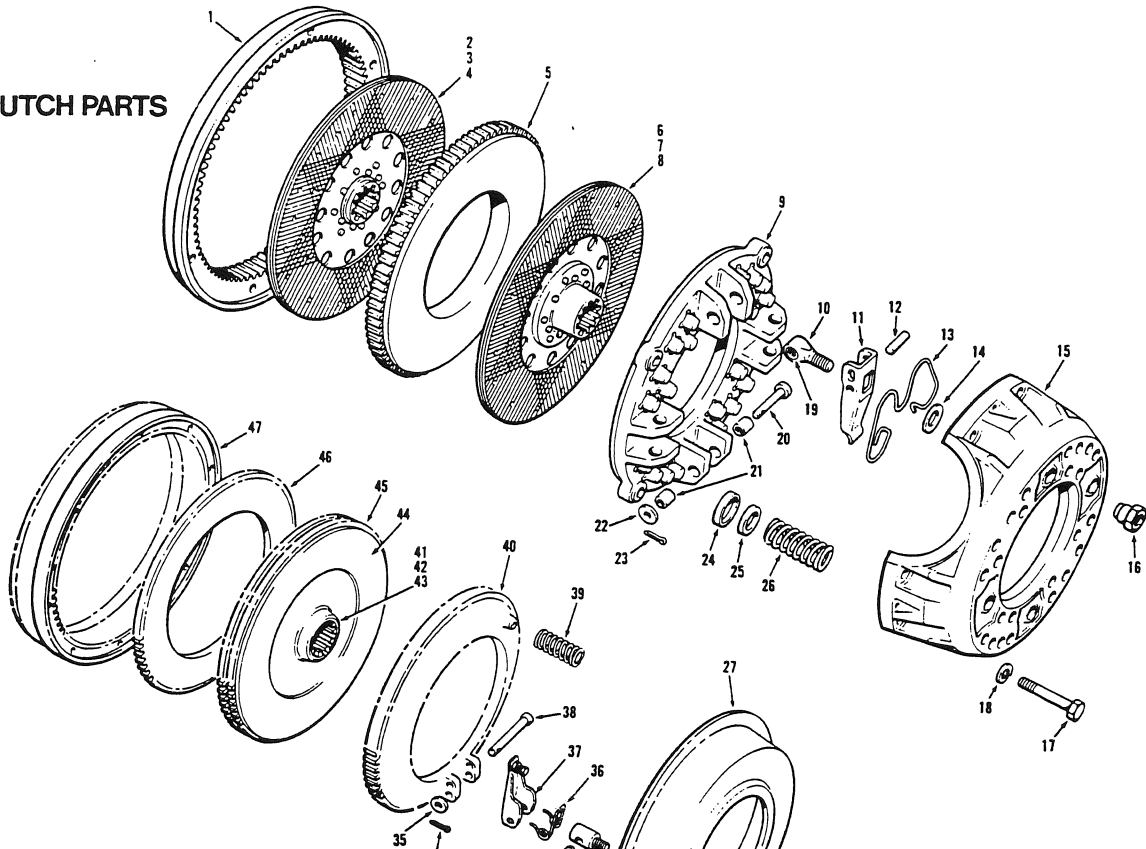


700 SERIES SHOP MANUAL  
ENGINE CLUTCHES

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16" CLUTCH PARTS



13 1/2" CLUTCH PARTS

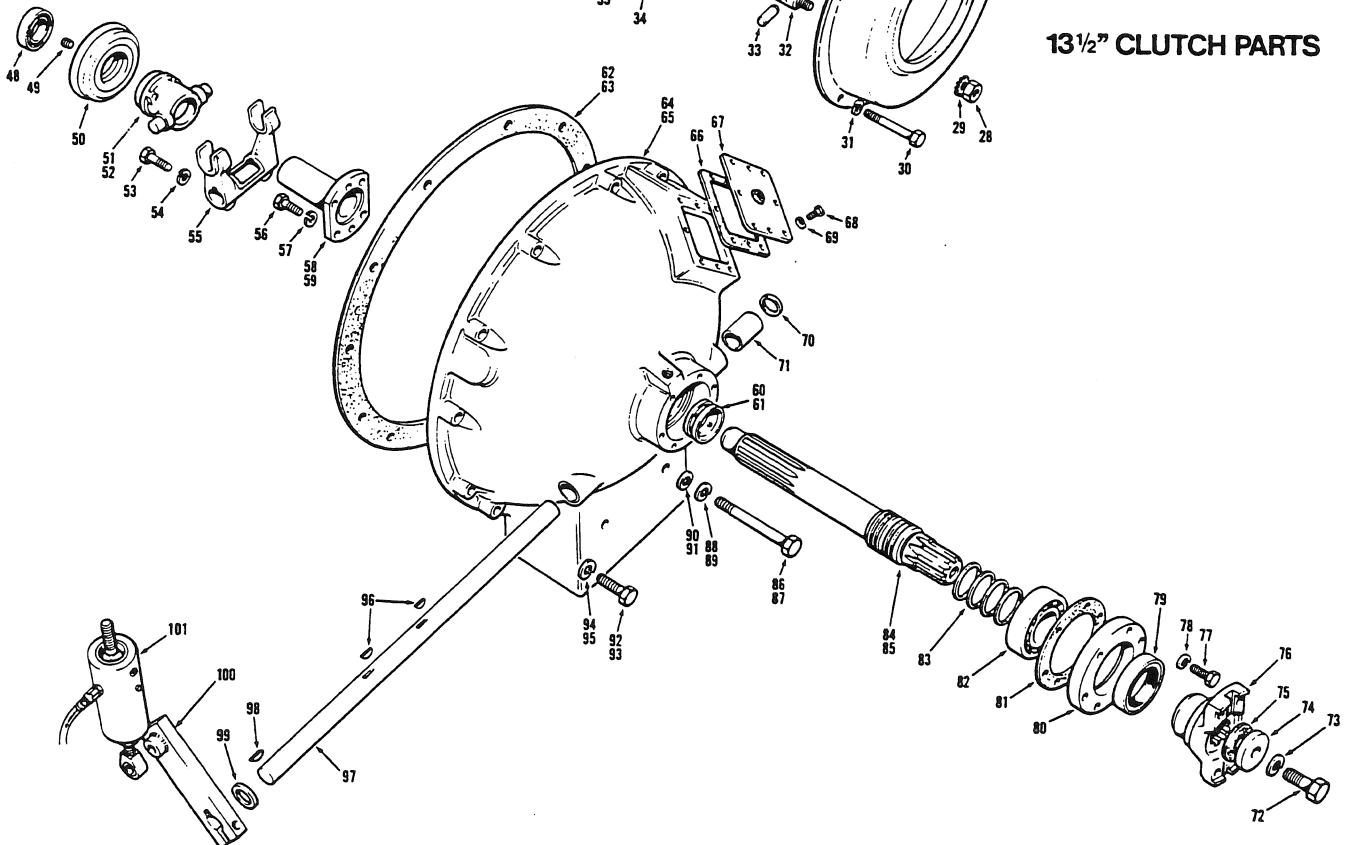


Fig. 1

**700 SERIES SHOP MANUAL  
ENGINE CLUTCHES**

<b>Item</b>	<b>Description</b>	<b>Item</b>	<b>Description</b>	<b>Item</b>	<b>Description</b>
1	Drive ring	42	Washer	73	Lockwasher
2	Driven member	43	Rivet	74	Retaining washer
3	Cork lining	44	Inner disc	75	Gasket
4	Rivet	45	Outer disc	76	Yoke
5	Spacer	46	Outer disc	77	Capscrew
6	Driven member	47	Drive ring	78	Lockwasher
7	Cork lining	48	Pilot bearing	79	Outer seal
8	Rivet	49	Orifice pipe plug	80	Seal housing
9	Pressure plate	50	Release bearing	81	Gasket
10	Eye bolt assembly	51	Sleeve -	82	Bearing
11	Release Lever		13½ inch clutch	83	Seal ring
12	Pivot pin	52	Sleeve -	84	Shaft -
13	Anti-rattle spring		16 inch clutch		13½ inch clutch
14	Washer	53	Capscrew	85	Shaft -
15	Backing plate	54	Lockwasher		16 inch clutch
16	Adjusting nut	55	Yoke	86	Capscrews -
17	Capscrew	56	Capscrew		13½ inch clutch
18	Lockwasher	57	Lockwasher	87	Capscrews -
19	Needle bearing	58	Release guide -		16 inch clutch
20	Lever pin		13½ inch clutch	88	Lockwashers -
21	Needle bearing	59	Release guide -		13½ inch clutch
22	Washer		16 inch clutch	89	Lockwashers -
23	Cotter pin	60	Sleeve -		16 inch clutch
24	Retainer washer		13½ inch clutch	90	Seal washers -
25	Insulating washer	61	Sleeve -		13½ inch clutch
26	Spring		16 inch clutch	91	Seal washers -
27	Backing plate	62	Gasket -		16 inch clutch
28	Jam nut		13½ inch clutch	92	Capscrews -
29	Washer	63	Gasket -		13½ inch clutch
30	Capscrew		16 inch clutch	93	Capscrews -
31	Lockwasher	64	Clutch housing -		16 inch clutch
32	Pivot block		13½ inch clutch	94	Lockwashers -
33	Pivot pin	65	Clutch housing -		13½ inch clutch
34	Cotter pin		16 inch clutch	95	Lockwashers -
35	Washer	66	Gasket		16 inch clutch
36	Anti-rattle spring	67	Cover	96	Keys
37	Lever assembly	68	Capscrew	97	Shaft
38	Lever pin	69	Lockwasher	98	Keys
39	Spring	70	Oil seal	99	Oil seal
40	Pressure plate	71	Bushing	100	Cross shaft arm
41	Splined hub	72	Capscrew	101	Slave cylinder assy.

**Key to Fig. 1**

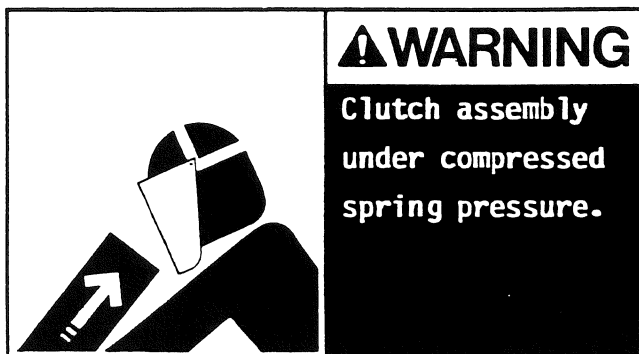
700 SERIES SHOP MANUAL  
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General



Make sure proper tools are available and in good working order. You will require a safe lifting device; the appropriate drifts and shop tools.

The clutch assemblies should only be serviced by qualified service personnel.



Refer to the 700 Series Parts Manual when ordering replacement parts. Refer to Lubrication Specifications detailed in the front of this manual for the recommended transmission oil and brake fluid.



ALWAYS PUT THE GRADER IN THE SERVICE POSITION BEFORE ATTEMPTING ANY OVERHAUL, MAINTENANCE OR INSPECTION PROCEDURE.

PARK THE GRADER ON A LEVEL SURFACE AND FULLY LOWER THE MOLDBOARD AND ALL ATTACHMENTS. IF IT IS NECESSARY TO ADJUST OR SERVICE THE MOLDBOARD OR ATTACHMENTS IN A RAISED POSITION, SUPPORT THEM WITH PROPER STANDS OR BLOCKS. APPLY THE PARKING BRAKE. TURN THE IGNITION SWITCH TO THE "OFF" POSITION AND REMOVE THE KEY. OPERATE ALL HYDRAULIC CONTROLS TO ENSURE THAT NO ACCUMULATED PRESSURE REMAINS IN THE HYDRAULIC SYSTEM. INSTALL CHOCKS AT THE FRONT AND REAR WHEELS. TURN THE ISOLATION SWITCH TO THE "OFF" POSITION. THE ISOLATION SWITCH IS LOCATED BEHIND THE ENGINE SIDE PANELS. ON ARTICULATED MACHINES, INSTALL THE LOCKING PINS ON BOTH SIDES OF THE HINGE. ALLOW THE ENGINE AND HYDRAULIC SYSTEM TO COOL BEFORE WORKING IN THESE AREAS. THE GRADER IS READY FOR SERVICING.

NOTE

Weights, measures and tolerances appear in Metric (SI), Imperial and U.S. quantities. Following the internationally accepted standard, the decimal point is denoted by a comma in all Metric measurements.

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ENGINE CLUTCHES

Description and Operation

Champion motor graders are equipped with a multi-plate, wet-type clutch.

The inching clutch pedal needs to be used only when starting or stopping the grader or when changing direction. A major advantage of the clutch is that it allows the operator to start the grader moving under heavy loads without stalling or putting undue strain on the rest of the drive train. Another plus is its superior inching and feathering capabilities. The operator may use the clutch to ease the grader into tight areas and maintain precise control at low speed operations.

On the 16 inch clutch, the clutch pedal is connected to the assembly by the hydraulic circuit and slave cylinder. When the pedal is depressed, brake fluid causes the piston in the slave cylinder to be extended, causing the cross shaft to turn. This pushes the clutch yoke against the release bearing. The release bearing moves the clutch fingers, which pull the pressure plate back, thereby releasing the clutch driven members.

Oil enters the clutch housing through an orifice and is divided to provide lubrication and cooling to the clutch components. Oil is bled off the main inlet flow to provide lubrication, through a 3/32 inch (2,4 mm) drilling, to the clutch shaft bearing. Four piston rings prevent the oil from passing between the shaft and the housing

and direct through cross drillings to the center of the shaft where the oil passageways carry it to the distribution orifices. Oil flows over the friction surfaces, cools them and lubricates the bearings throughout the assembly. Oil leaves the assembly through a drain in the clutch housing and flows back to the transmission.

16 inch clutches are on grader models 740, 740A, 760, 760A, 780 and 780A.

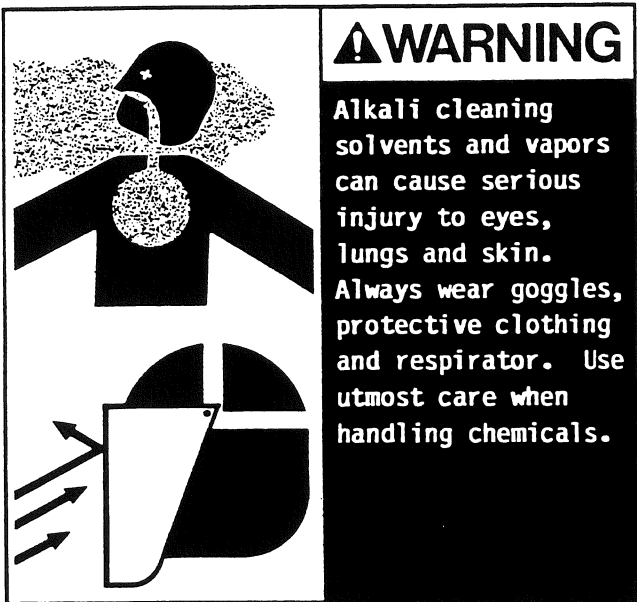
The 13½ inch clutch functions like the 16 inch clutch but differs in design features. Instead of two friction plates and spacers, three are used to increase driving torque. The spacer closest to the flywheel takes the wear normally put on the flywheel. This means the flywheel should never require refacing.

Oil is used to cool the plates and lubricate the bearings. The lubricating oil from the transmission lube circuit enters through an orifice. Some oil flows through the 3/32 inch (2,4 mm) drilling to the clutch shaft bearing; the remainder goes down the 3/8 inch (9,5 mm) rifle drilling in the clutch shaft to two cross bores and then out to cool the plates and driven members. The pilot bearing and release bearing are splash lubricated. All oil drains back to the clutch sump and then returns to the transmission sump.

13½ inch clutches are on grader models 710, 710A, 720, 720A, 730 and 730A.

## Cleaning and Inspection

### Cleaning - Bearings and Small Parts



You are recommended to wear cotton gloves when handling bearings. This prevents transfer of skin acids and perspiration onto bearing races.

Immerse bearings and small parts into a cleaning solvent. You can use a hot tank system and a mild alkali solvent. Agitate the parts to remove all foreign matter.

Parts should remain in the solvent long enough to be thoroughly cleaned. In the hot tank system, heated parts help to evaporate the solvent and rinse water. Thoroughly rinse parts to remove all traces of dirt and solvent.

After rinsing, immediately dry the part using moisture-free compressed air while rotating them slowly by hand. **DO NOT** spin the bearing when drying. Make sure all oil passages are unblocked. Lubricate all bearings with system oil; wrap in clean, lint-free cloth or paper and store in a cool, dry place.

### Inspection - General

A careful and thorough inspection of all parts is extremely important. Replace all parts showing indications of wear or damage.

### Inspection - Bearings

Carefully inspect all rollers, cages for wear, nicks or chipping. After inspection, lubricate all bearings with system oil; wrap in clean, lint-free cloth or paper and store in a cool, dry place.

### Inspection - Seals

Replace all seals. Handle seals carefully; particularly when being installed. Cutting, scratching or curling of the sealing lips seriously reduces efficiency. Lubricate all sealing lips with system oil.

Apply a thin coating of sealant, Champion part number 19200 onto the outer diameter of the oil seal carrier. This ensures an oil-tight fit in the bore. Lubricate all oil seal lips and O-rings before installation.

### Inspection - Disc Teeth and Shafts

If non-destructive detection equipment is available, use the process to check parts. Examine the teeth of all drive members, disc and drive rings for wear, pitting, chipping, nicks, cracks and scores. Inspect the pilot shaft for signs of wear or damage. Check and clean the oil passageways.



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**Cleaning and Inspection (continued)**

**Inspection - Clutch Housing**

To inspect the clutch housing, ensure the housing is thoroughly clean and all mating surfaces and bearing bores are free from nicks and burrs. Check for evidence that would cause subsequent oil leaks.

**Inspection - 13½ Inch Clutches**

With a commercially available spring tester, check the pressure springs for loss of pressure or heat set. Replace the springs if they have taken a heat set or if the spring pressure is below 170 lbs. (77.1 kg) at a compressed length of 1.81" (46,0 mm).

Replace the drive ring, if evidence of damage or wear has occurred. Excessive damage or wear may cause drag problems. The discs must slide freely in the drive ring.

Check the pivot blocks for wear at the bottom of the slotted hole. If wear has occurred, replace the pivot block. The pivot roller must roll within the slot and therefore must not be restricted by wear in the pivot block causing the levers not to work properly.

Check the backing plate circumference for damage due to improper installation into the drive ring. Replace the backing plate if the edges have been damaged, pushed up or if the mounting holes are out of alignment.

The lever adjusting screws should be replaced if they show wear caused by the release bearing.

Check the friction face of the pressure plate for dish warpage, nicks or excessive marks (discoloration).

When reconditioning the pressure plate for a 13½ inch clutch assembly the dimension from the pressure plate face to the center of the lever pin holes in the boss should not be less than 1.636" (41,6 mm).

The pressure plate friction face must be ground to 32 RMS. Grinding must be followed with a one minute polishing operation using 300 grit emery cloth in a circumferential direction to create a surface **texture** which is compatible with the friction material.

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**Cleaning and Inspection** (continued)

The friction face must be flat within .005" (0,13 mm) TIR and parallel with the plane of the 3 pin holes within .003" (0,08mm).

Check for wear in the lever bosses of the pressure plate caused by contact of the pivot rollers. Also check to see if the teeth on the outside diameter are worn, replace the pressure plate if either situation has occurred.

When reconditioning the outer steel discs for 13½ inch clutch assembly, the minimum thickness of any plate after grinding is .232" (5,9 mm). The plate must be ground to a 32 RMS finish and then followed with a one minute polishing operation in a circumferential direction using 300 grit emery cloth to create a surface **texture** compatible with the friction material. The discs must be flat within .005" (0,13 mm) TIR.

The minimum disc pack thickness after rebuilding and machining is 1.051" (26,7 mm). Replace the inner disc assemblies when the facing material is worn to the bottom of the grooves. Alternate the inner and outer discs during reassembly. To retain the disc packs, place hardened flat washers on the cavity side of the splined hub, install the rivets with the heads on the same side.

Then install hardened flat washers on the rivets on the other side of the splined hub. Using the special rivet tool, Champion part number 45567, roll the end of the rivet. **DO NOT** peen the end of the rivet.

**Inspection - 16 Inch Clutches**

With a commercially available spring tester, check the pressure springs for loss of pressure or heat set. Replace the springs if they have taken a heat set or if spring pressure is below 220 lbs. (99,8 kg) at a compressed length of 2.06" (52,4 mm).

Replace the drive ring, if evidence of damage or wear has occurred. Excessive damage or wear may cause drag problems. The spacer disc must slide free in the drive ring.

Check the friction face of the pressure plate for dish warpage, nicks or excessive heat marks (discoloration).

When reconditioning the pressure plate for a 16 inch clutch assembly the dimension from the pressure plate face to the center of the lever pin holes in the boss should not be less than 1.591" (40.4 mm).

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**Cleaning and Inspection (continued)**

**NOTES**

Pressure plate friction faces must be ground to 32 RMS in a circumferential direction to create a surface texture compatible with the friction material.

When new driven members are being used, it is recommended to soak them for a minimum of 12 hours in Champion approved transmission fluid.

The friction face must be flat within .005" (0,13 mm) TIR and parallel with the plane of the 4 pin holes within .003" (0,08 mm).

When using the flywheel or a decompression fixture as a setup stand, the surface **MUST** be smooth and flat within .002" TIR for accurate lever heights.

**Torque Guide**

Fig. No.	Application	Torque Value		
		N.m	kgf.m	lbf.ft
Fig. No. 32	Release guide capscrews .....	27,1	2,8	20
Fig. No. 36	Seal housing capscrews .....	20,4	2,1	15
Fig. No. 37	Yoke retaining capscrews .....	230,5	23,5	170
Fig. No. 44	13½" Clutch housing capscrews (short) ....	47,5	4,8	35
Fig. No. 44	13½" Clutch housing capscrews (long) ....	47,5	4,8	35
Fig. No. 44	16" Clutch housing capscrews (short) ....	47,5	4,8	35
Fig. No. 44	16" Clutch housing capscrews (long) ....	47,5	4,8	35
Fig. No. 82	Pivot block jam nuts .....	54,2-61,0	5,5-6,2	40-45
Fig. No. 83	Lever adjusting nuts .....	27,1-33,9	2,8-3,5	20-25

**Special Tools**

The following tools are recommended when overhauling the 13½ inch and 16 inch clutches. The tools help to remove and install precision-machined parts.

Champion Tool Part Number	Description
<b>5629</b>	Clutch Repair Pilot Shaft
<b>45567</b>	Rivet Tool - Long solid anvil

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ENGINE CLUTCHES

Engine Clutch Housing - Removal

**Fig. 2**

Descriptive procedures for the clutch housing removal, disassembly, reassembly and installation will be the same for all models, including the 13½ inch and 16 inch clutch assemblies.

Park the grader on level ground. Place the transmission mode lever in **Neutral**. Lower the moldboard onto wooden blocks. Shut down the engine and place the machine in the **Service Position**. Begin by removing the covering panels over the filters, all side panels and the intermediate panels.

**Fig. 3**

Remove the muffler clamp, the support brace and the muffler. Cap the turbo exhaust outlet.

**Fig. 4**

Remove the fuel return line. Cap the fitting and the open port. The fuel level must be below the port.

**Fig. 5**

Disconnect the leads from the back-up lights, if so equipped.

**Fig. 6**

Remove the clamp and air intake pipe, cap the filter inlet port.

**Fig. 7**

Remove the capscrews retaining the engine hood and lift the hood off the grader.

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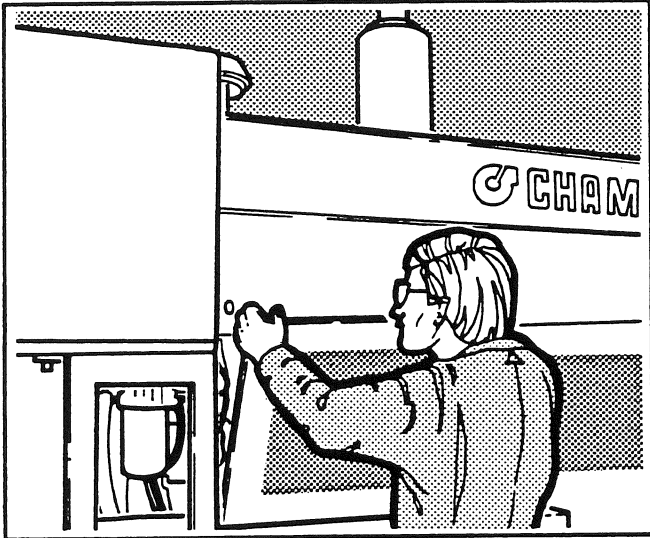


Fig. 2

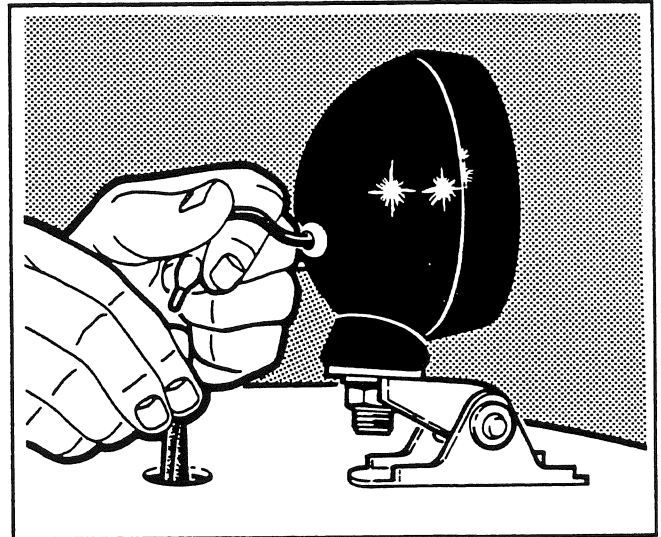


Fig. 5

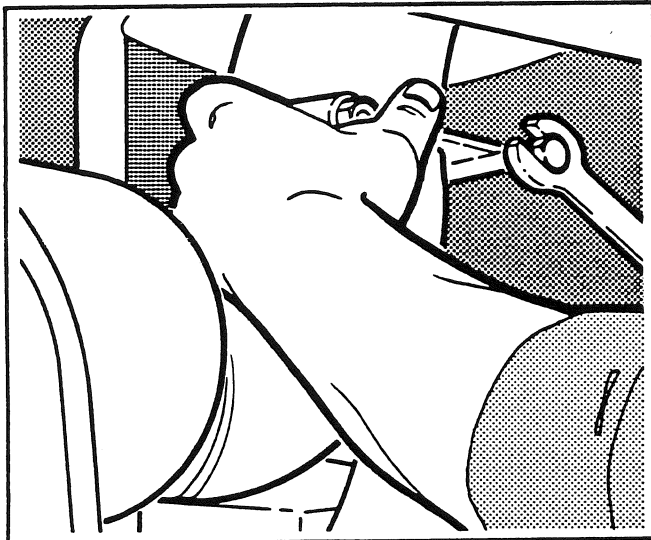


Fig. 3

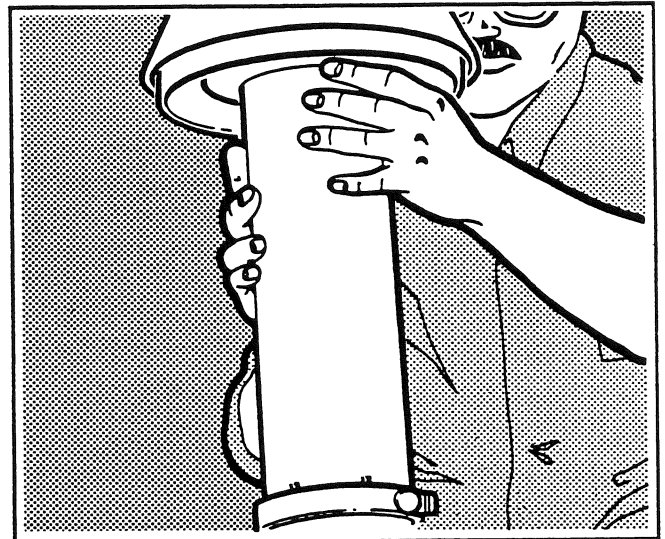


Fig. 6

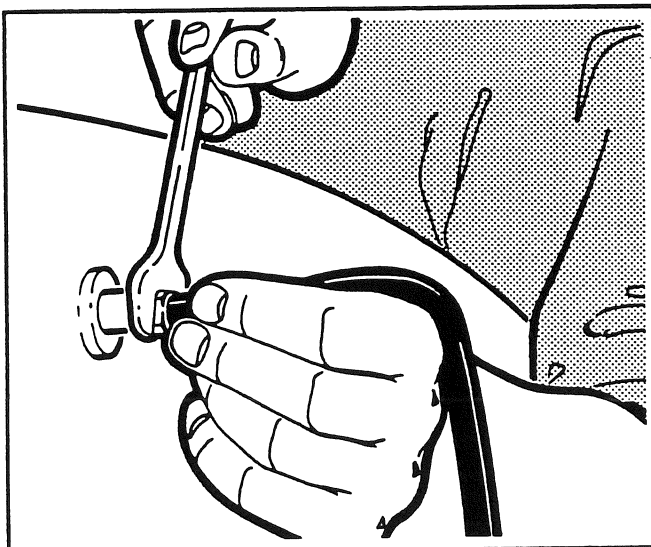


Fig. 4

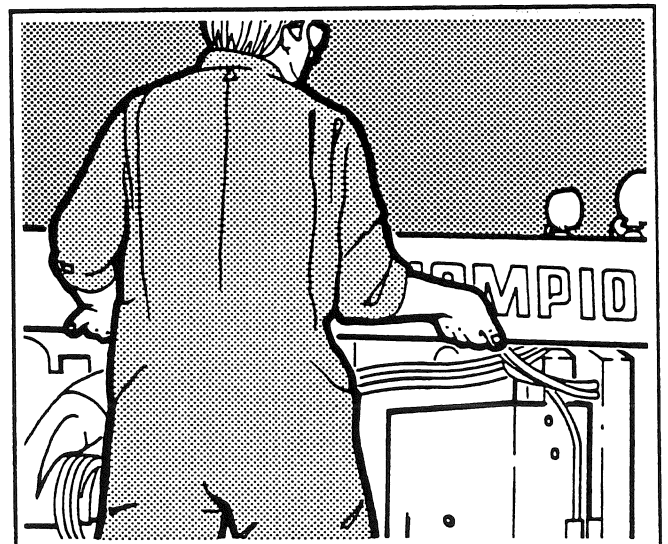


Fig. 7

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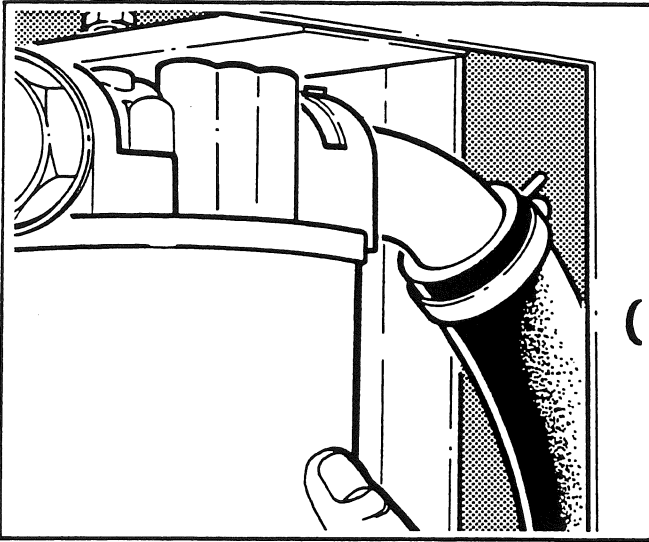


Fig. 8

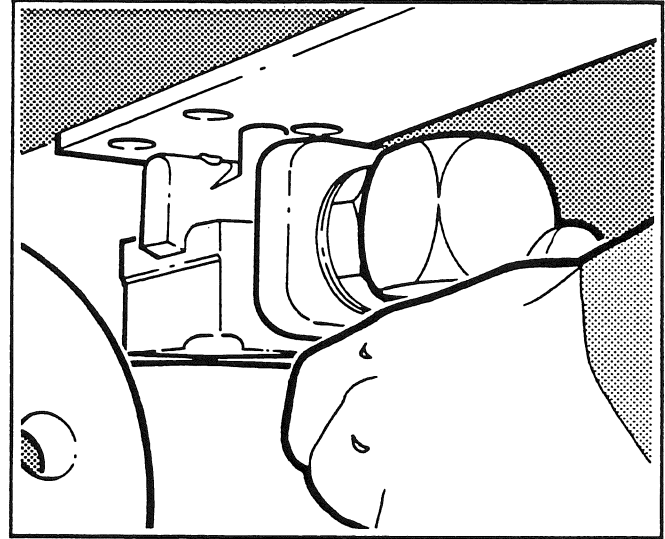


Fig. 11

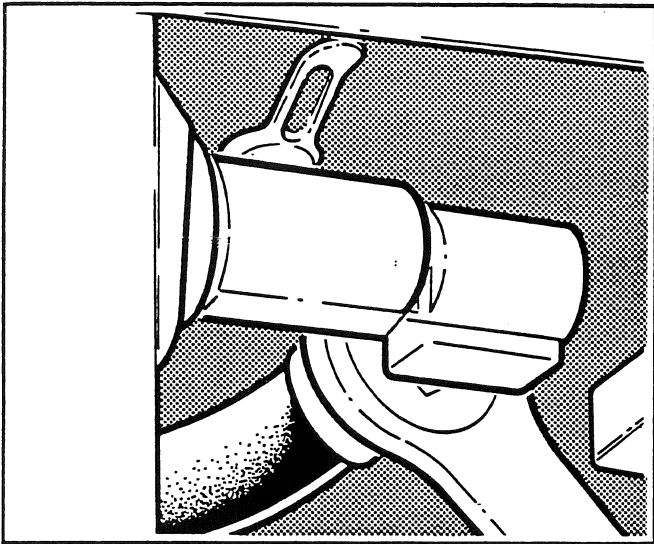


Fig. 9

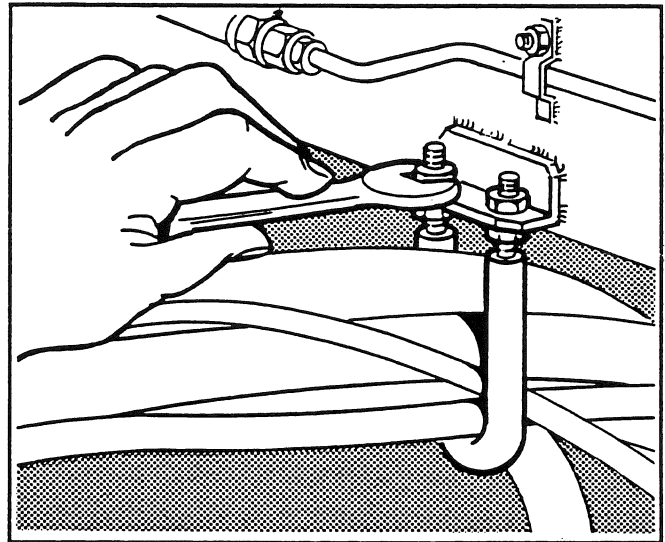


Fig. 12

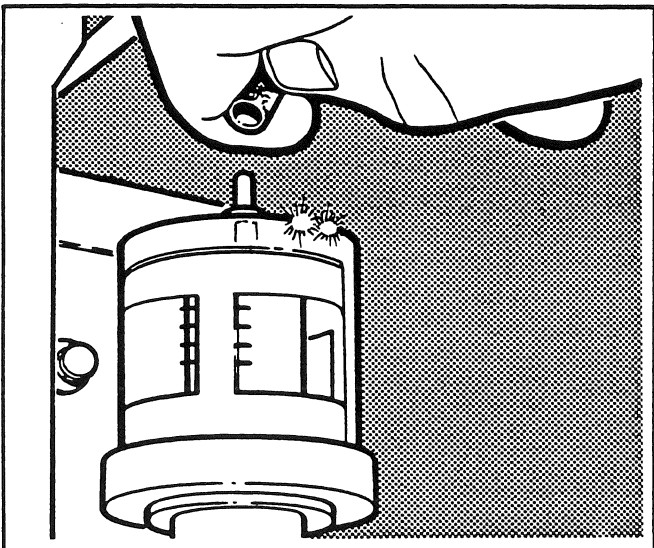


Fig. 10

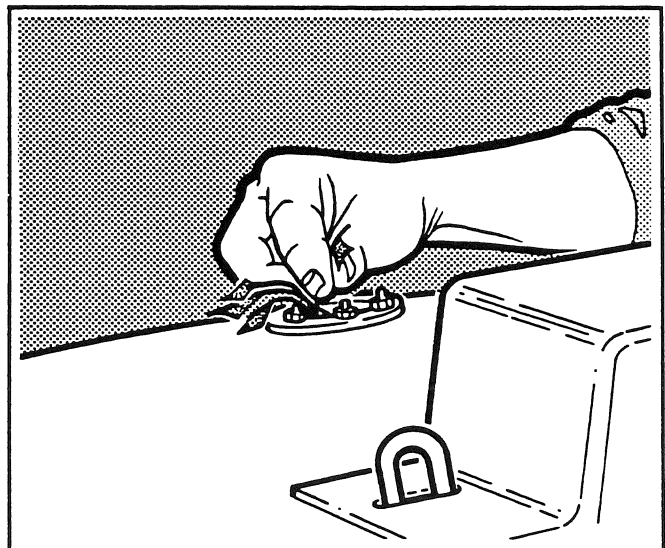


Fig. 13

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**Removal** (continued)

**Fig. 8**

Remove the hydraulic filter at the bracket.

**Fig. 11**

Remove the transmission filter from the fuel tank stand bracket.

**Fig. 9**

Shut off the fuel supply and remove the fuel supply line. Cap the hose fitting.

**Fig. 12**

Remove the hose supporting bracket.

**Fig. 10**

Remove the hose to the air filter restriction indicator.

**Fig. 13**

Identify the electrical wires and disconnect them from the fuel tank sending unit.

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**Removal** (continue)

**Fig. 14**

Remove the air duct from the turbo charger and cap the turbo charger and duct.

**Fig. 17**

Remove the clutch housing drain line and cap the open port and hose.

**Fig. 15**

Remove the capscrews retaining the fuel tank stand to the frame. Use a safe lifting device and remove the fuel tank, stand and air cleaner assembly.

**Fig. 18**

Identify and remove the vent hose on the clutch housing to avoid confusion during reassembly. Cap the open port and hose. Identify and remove the clutch lubrication oil supply hose and cap the open port.

**Fig. 16**

Disconnect the upper driveshaft. Ensure that the universal joint bearings **DO NOT** fall off during this procedure. Remove the driveshaft.

**Fig. 19**

Remove the bracket securing the slave cylinder to the clutch housing. Remove the capscrew and the clutch cross shaft arm (100) off the shaft (97). Move the slave cylinder (101) to a safe location out of the way.



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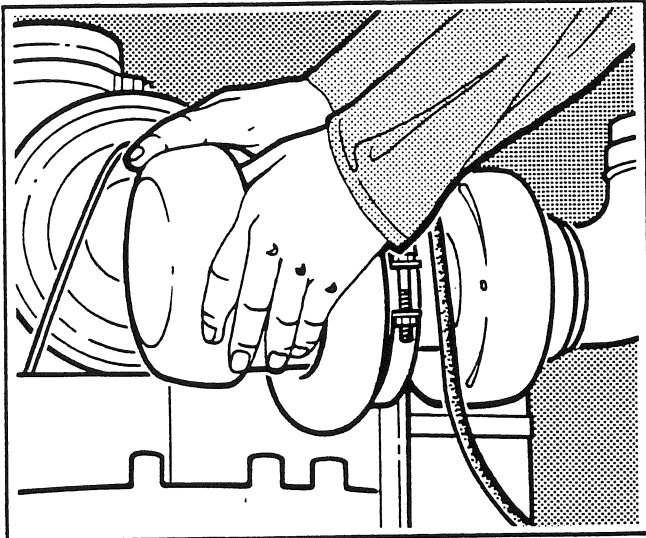


Fig. 14

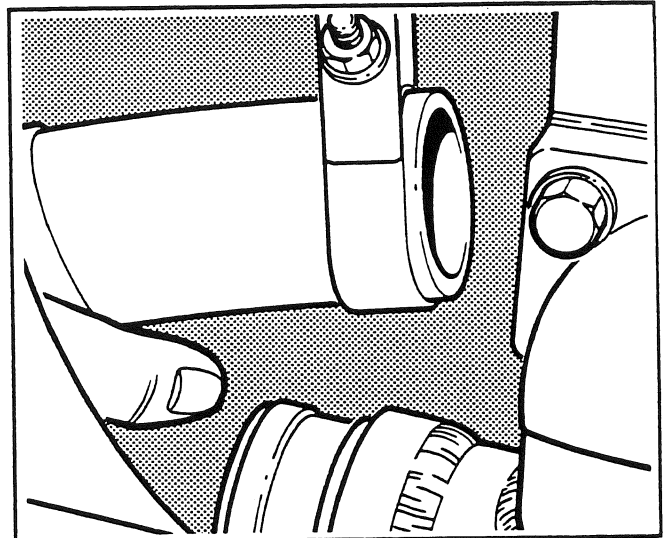


Fig. 17

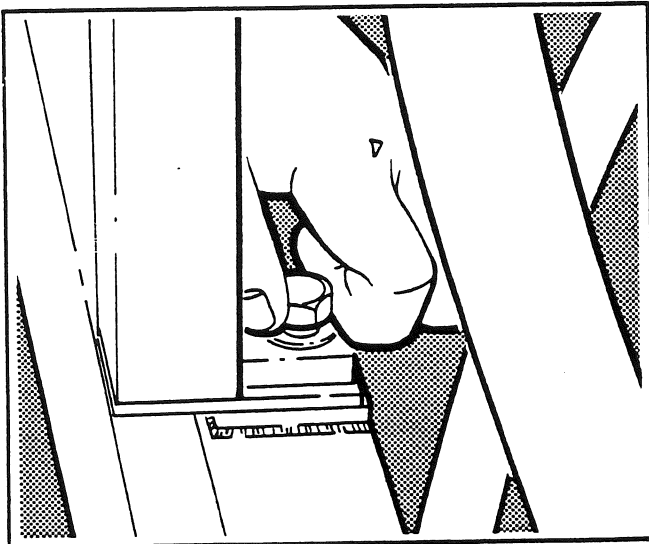


Fig. 15

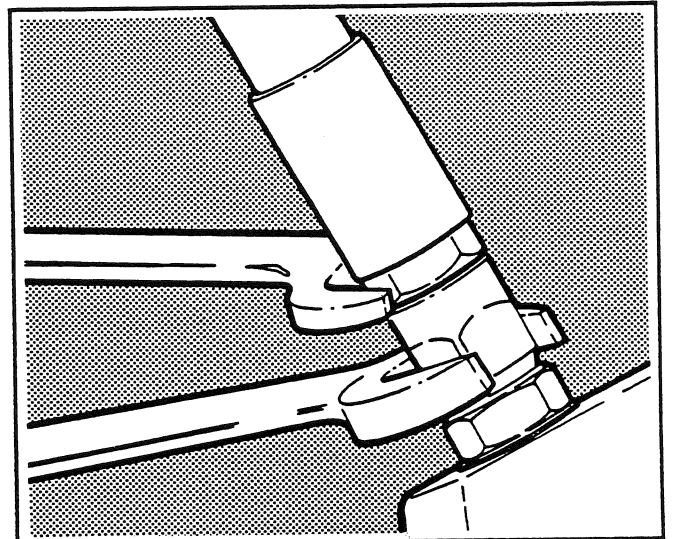


Fig. 18

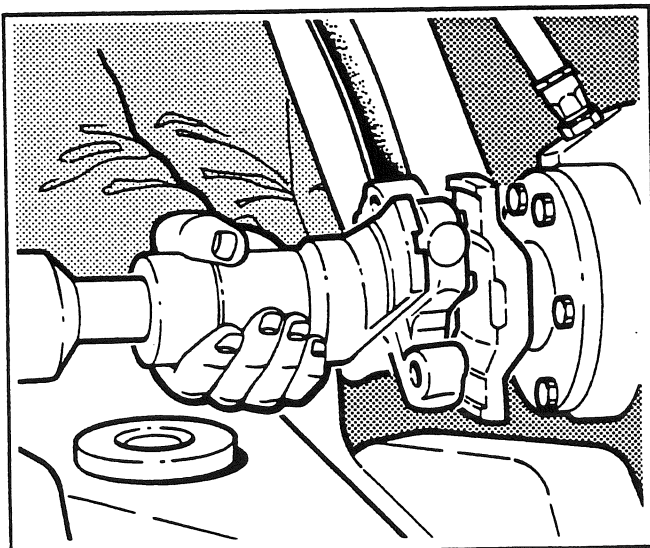


Fig. 16

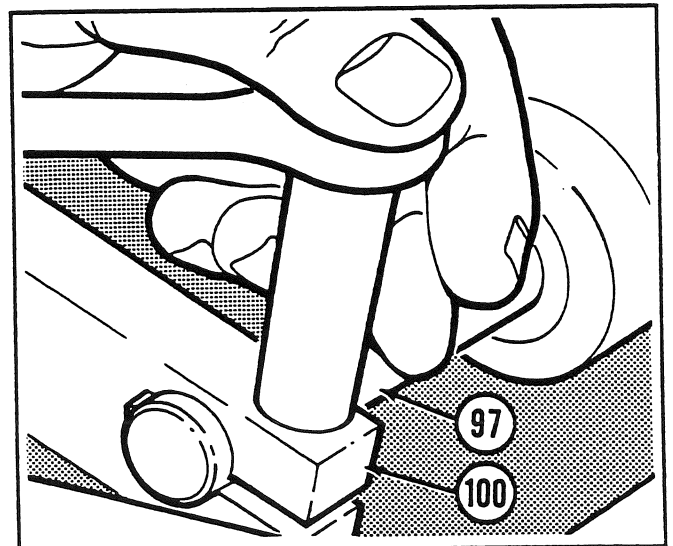


Fig. 19

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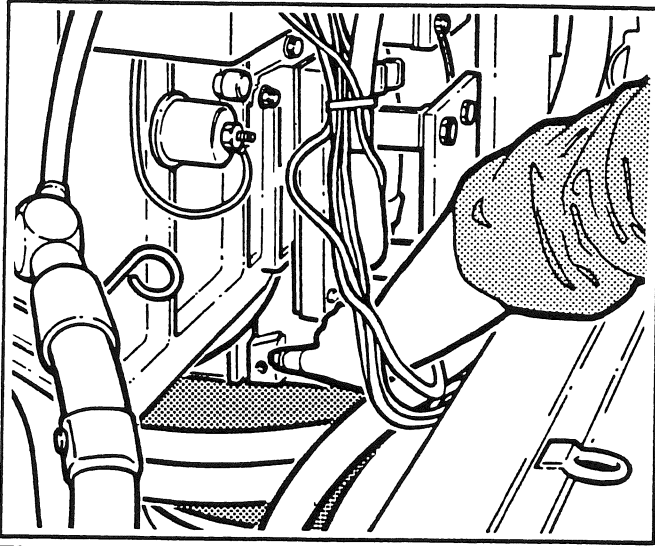


Fig. 20

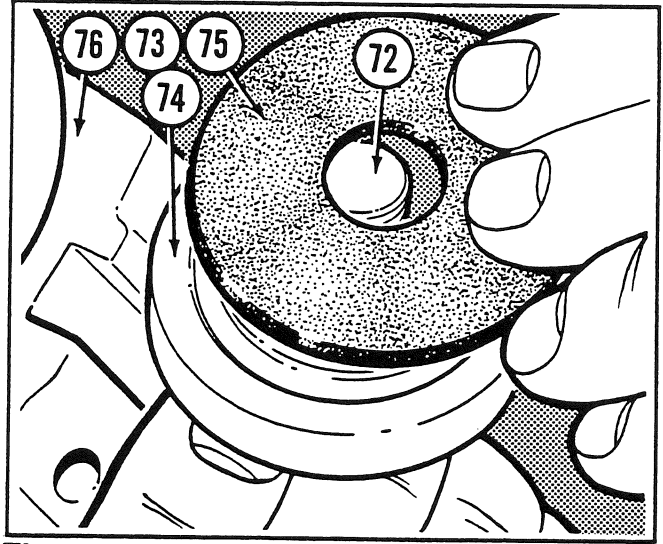


Fig. 23

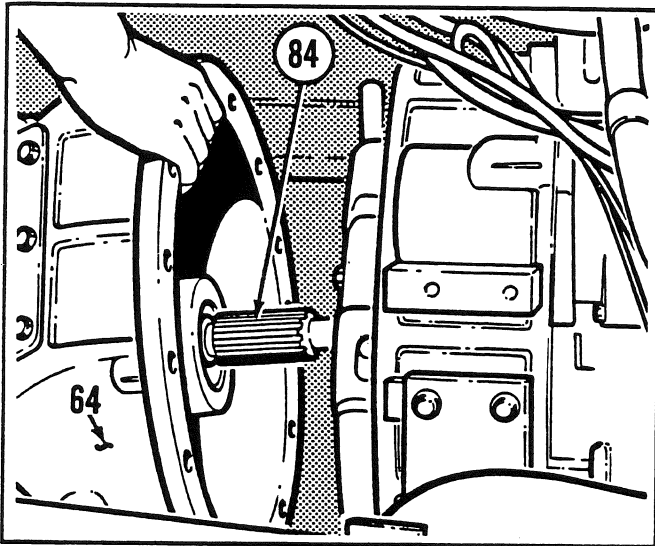


Fig. 21

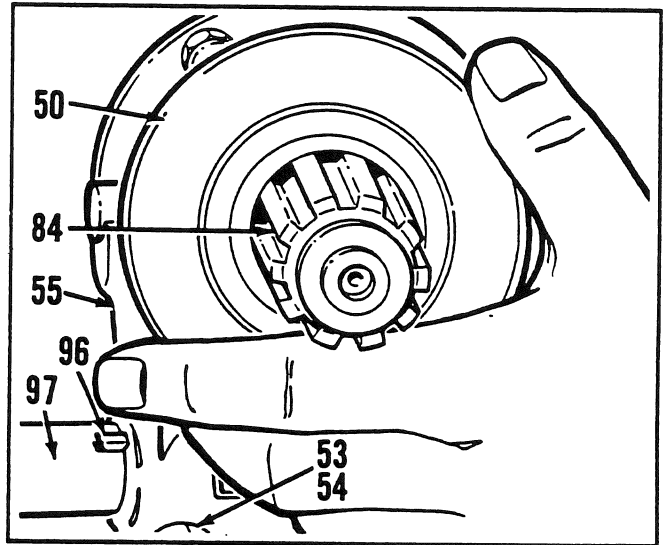


Fig. 24

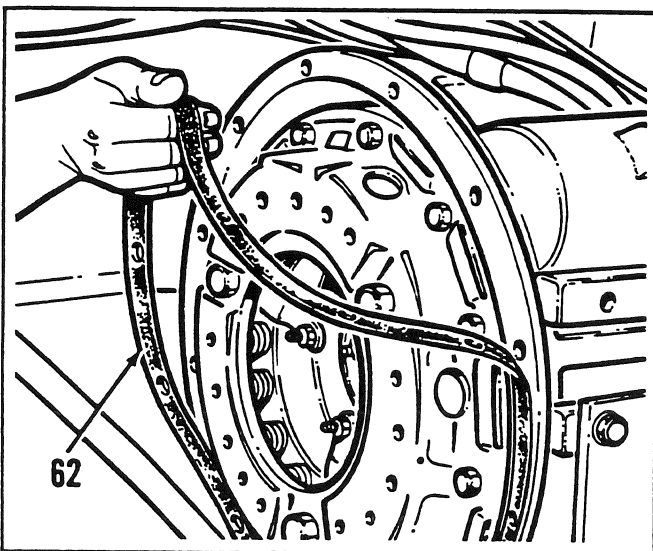


Fig. 22

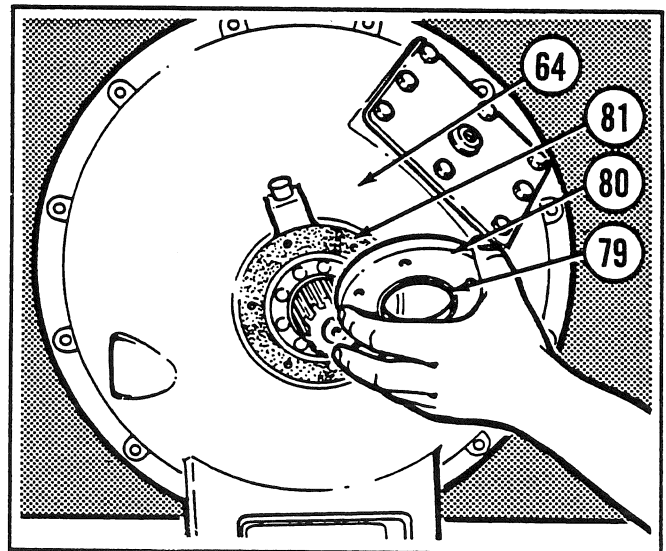


Fig. 25

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**Removal (continued)**

**Fig. 20**

On the 13½ inch clutch, remove the socket head capscrews retaining the drain manifold to the clutch housing.

**Fig. 21**

Remove the capscrews (86), (92). Use a pry bar to carefully separate the clutch housing (64) from the engine. Disengage the pilot shaft (84) from the friction pack hub. Remove the clutch housing (64) and place it on a clean work bench.

**NOTE**

**Champion oil clutch assembly housings are made of aluminum. DO NOT torque capscrews beyond the values recommended in this Shop Manual section.**

**Engine Clutch Housing - Disassembly**

**Fig. 22**

Remove and discard the clutch housing gasket (62).

**Disassembly (continued)**

**Fig. 23**

Place the clutch housing (64) in a vise with soft jaws. Be careful not to damage the lip of the housing in the vise. From the back of the housing remove the capscrew (72), Lockwasher (73), retaining washer (74), gasket (75) and the drive yoke (76).

**Fig. 24**

Pull the release bearing (50) and the sleeve assembly (51) off the pilot shaft (84) and out of the housing (64). Remove the capscrews (53) and lockwasher (54) retaining the yoke (55). Use a hammer and a soft metal drift to move the yoke along the shaft (97) enough to expose the keys (96). Remove the keys from the slots in the shaft. Remove the cross shaft from the housing (64) and slide the yoke off the shaft.

**Fig. 25**

Remove the capscrews (77) and lockwashers (78) retaining the seal housing (80). Remove the seal housing and discard the gasket (81). Place the seal housing on a appropriate support and remove and discard the seal (79).

**700 SERIES SHOP MANUAL**  
**ENGINE CLUTCHES**

**Disassembly** (continued)

**Fig. 26**

Remove the bearing (82) from the clutch housing (64) by alternately inserting an appropriate soft metal drift into the two  $\frac{1}{4}$  inch (6,4 mm) holes on the inside of the housing. Force the bearing and pilot shaft assembly (84) out of the clutch housing.

**Fig. 27**

Cap and remove the fitting from the back of the housing (64).

**Fig. 28**

Remove the capscrews (56) and lockwashers (57) retaining the bearing guide (58) in the housing (64) and remove the bearing guide.

**Fig. 29**

Place the pilot shaft (84) upright on a clean workbench, remove the sealing rings (83), the bearing (82) and the pipe plug (49). Inspect the bearing and discard if necessary. Examine the shaft splines for signs of damage or wear. Also clean the lubrication passages in the shaft.

**Fig. 30**

Examine the sleeve (60) in the clutch housing bore (64). If it is worn or damaged, it must be replaced. When the sleeve is being replaced, cool the new sleeve in a freezer or with dry ice, then place the sleeve into position. Remove and discard the cross shaft oil seals (70), (99). Inspect the bushings (71), if they must be removed, use a hammer and the appropriate drift to force them out of the housing (64).

**Fig. 31**

Support the release bearing (50) with a vise and use a soft metal drift to remove the sleeve (51). Inspect the release bearing and sleeve, replace them if necessary.

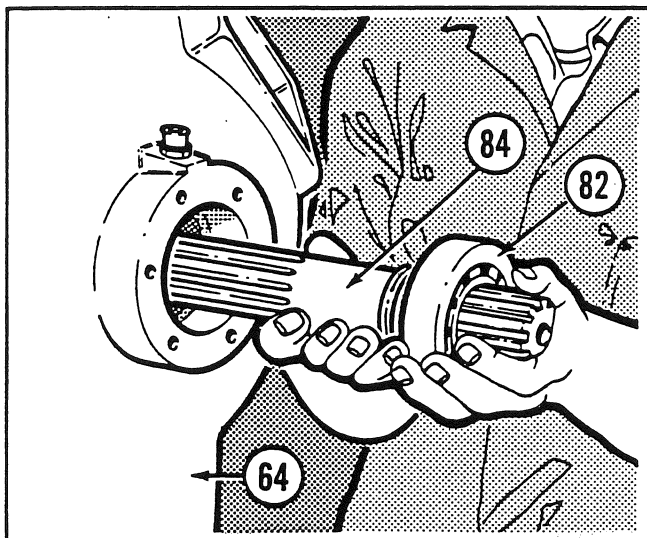


Fig. 26

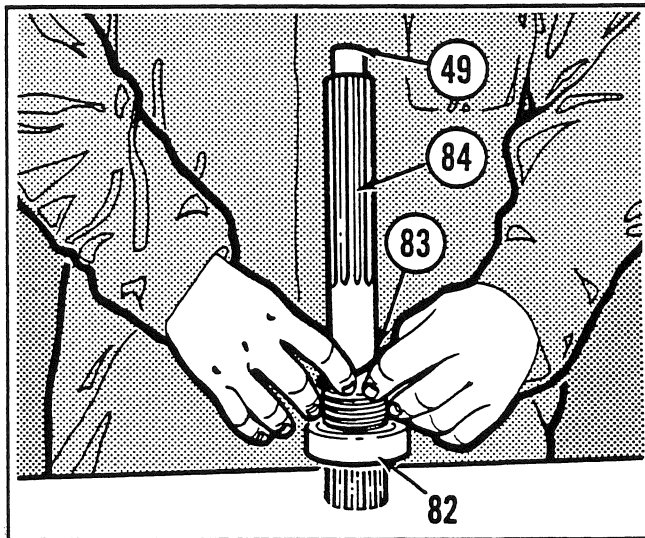


Fig. 29

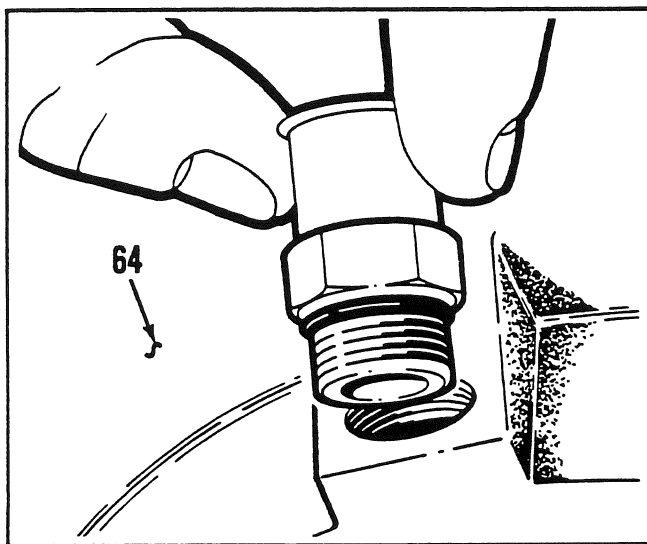


Fig. 27

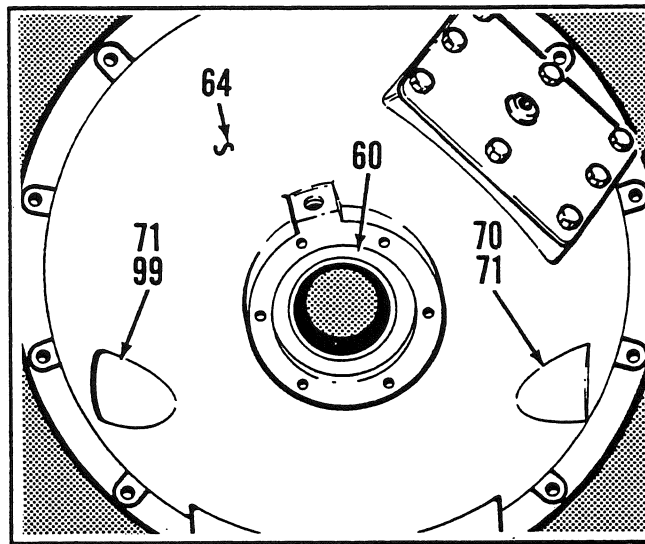


Fig. 30

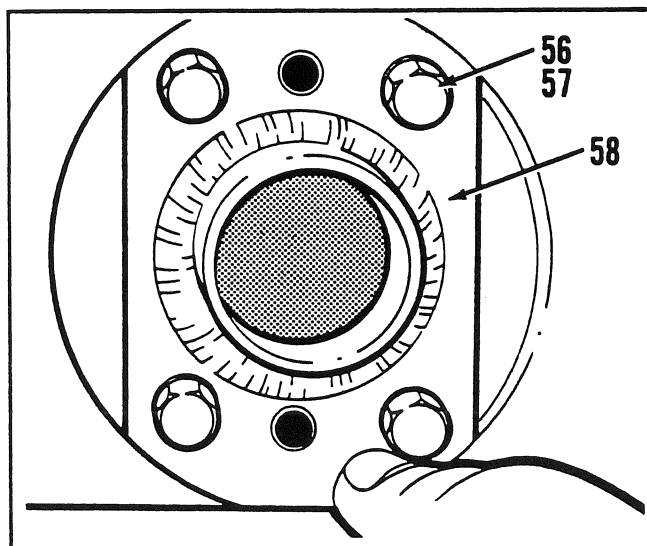


Fig. 28

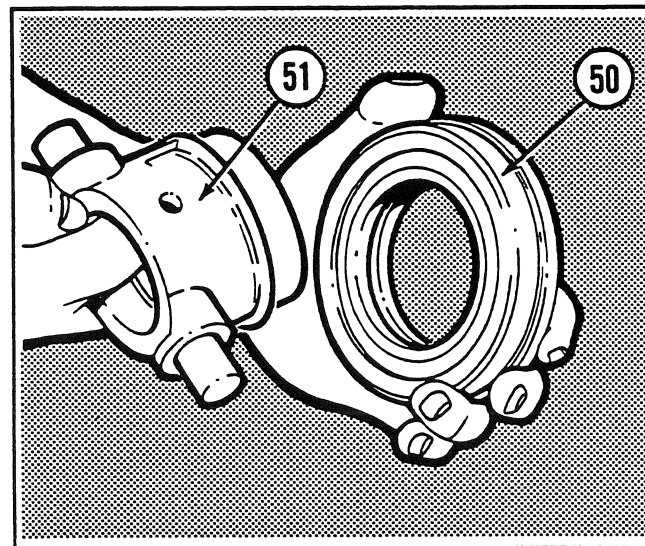


Fig. 31

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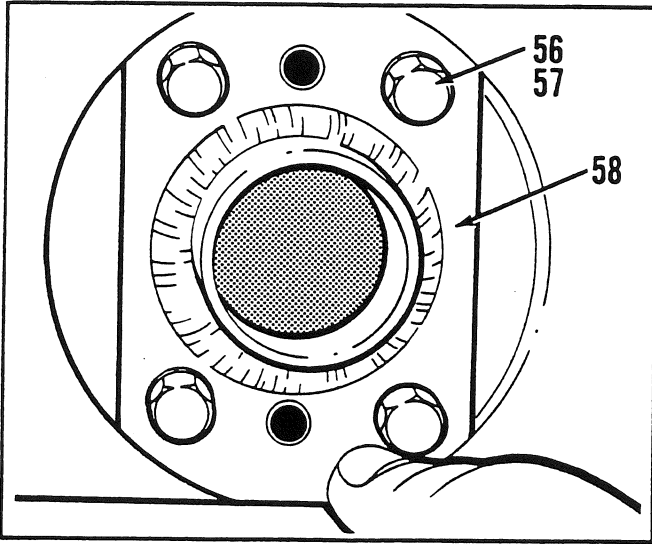


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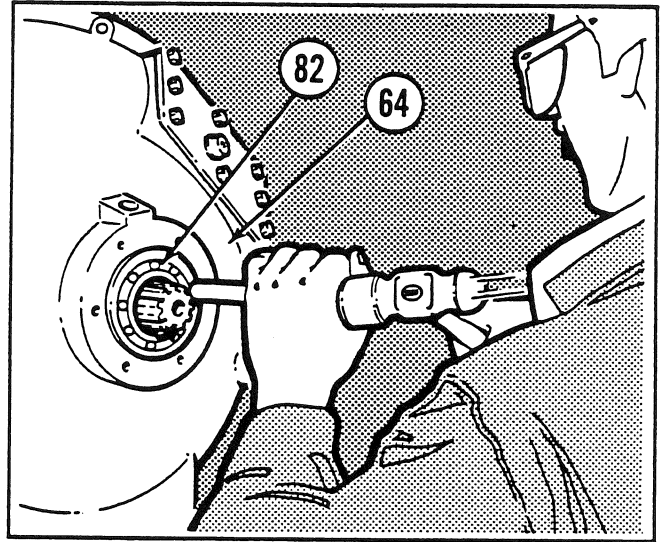


Fig. 35

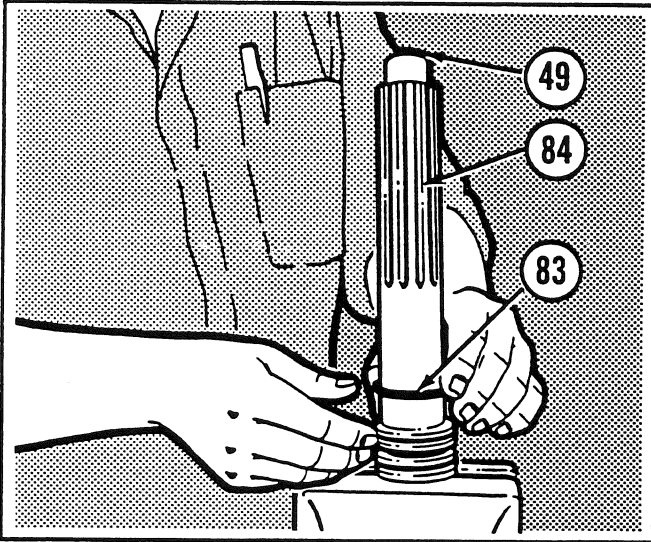


Fig. 33

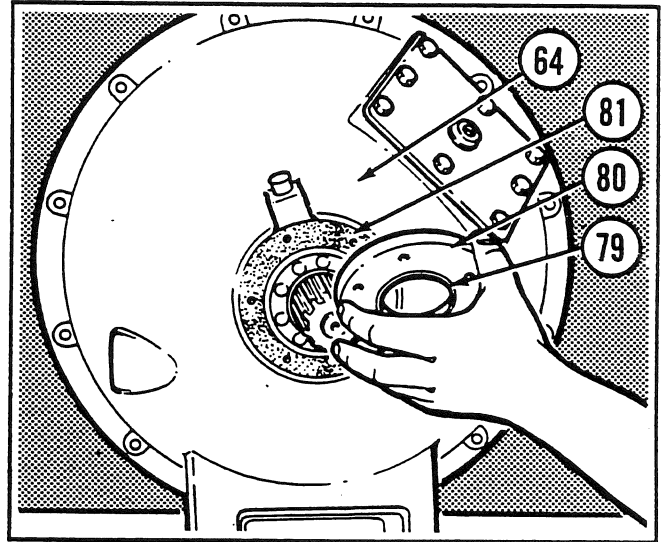


Fig. 36

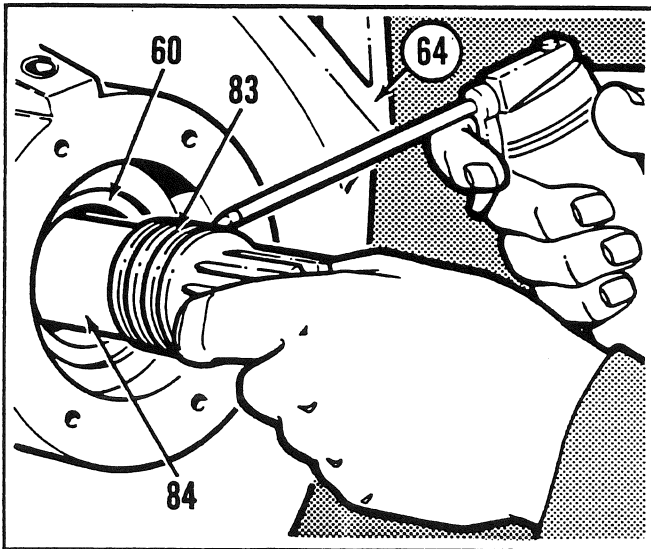


Fig. 34

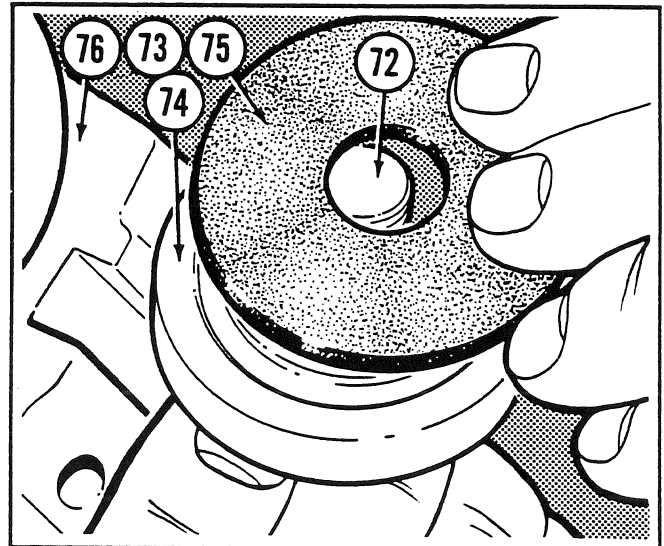


Fig. 37

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Engine Clutch Housing - Reassembly

**Fig. 32**

Mount the bearing guide (58) in the housing (64) and ensure that it is properly seated into the counterbore of the housing. Retain the guide with the lockwashers (57) and capscrews (56) and tighten them to the specified torque.

**Fig. 33**

Place the pilot shaft (84) upright in a vise with soft jaws. Install the orifice pipe plug (49) into the end of shaft. Install and alternate the position of the end gaps of the four sealing rings (83) on the shaft.

**Fig. 34**

Lubricate the sealing rings (83) and carefully insert the shaft (84) into the housing (64). Be careful not to damage the rings during this procedure, as they fit loosely. Ensure that the shaft rotates freely, and the rings are completely seated in the sleeve (60).

**Fig. 35**

Lubricate the roller bearing (82) and install it into the housing (64) with a hammer and a soft metal drift.

**Fig. 36**

Place the seal housing (80) on an appropriate support and gently tap the new outer seal (79) into place. Install a new gasket (81) on the seal housing and mount the housing and gasket assembly on the clutch housing (64). Retain the seal housing with the capscrews (77), lockwashers (78) and tighten them to the specified torque.

**Fig. 37**

Lubricate the outer seal (79) with transmission fluid and install the drive yoke (76). Install the gasket (75), the retaining washer (74) and the lockwasher (73) and retain them with the capscrew (72). Tighten the capscrew to the specified torque.

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**Reassembly** (continued)

**Fig. 38**

Remove the cap from the fitting and install the fitting into the clutch housing (64).

**Fig. 39**

Use an appropriate installation drift and install the cross shaft bushings (71) in the housing (64) if required. Lubricate and install new oil seals (70), (99) into the housing with an appropriate installation drift.

**Fig. 40**

Before installing the cross shaft (97) in the clutch housing (64), smooth any rough edges around the key slots with emery paper. This will ensure that the oil seals are not damaged when the cross shaft is installed. Lubricate the oil seals (70) and install the cross shaft into the clutch housing. Align the holes in the yoke (55) with the cross shaft and slide the yoke onto the shaft. Use a brass drift and hammer to install the woodruff keys (96) into the key slots on the shaft. Slide the yoke into place on the shaft over the woodruff keys. Secure the yoke into position on the cross shaft with the lockwashers (54) and the capscrews (53) to finger tightness only to retain the yoke in position.

**Fig. 41**

Note the lubrication groove in the release bearing (50) and the lubrication hole in the sleeve (51). Align the groove and the hole to ensure proper lubrication. Install the bearing in the sleeve with a soft faced hammer.

**Fig. 42**

Install the sleeve (51) and the release bearing (50) with the lubrication hole at the top. Engage the trunnions in the yoke (55). Once the sleeve (51) and bearing assembly (50) is firmly seated and correctly aligned, secure the yoke (55) to the cross shaft (97) by tightening the capscrews (53) to the recommended torque.

**Engine Clutch Housing - Installation**

**Fig. 43**

When working on the 13½ inch clutch, apply gasket eliminator, Champion part number 25303 to the manifold drain opening. Install a new gasket (62), (63) on the mounting surface of the clutch housing.



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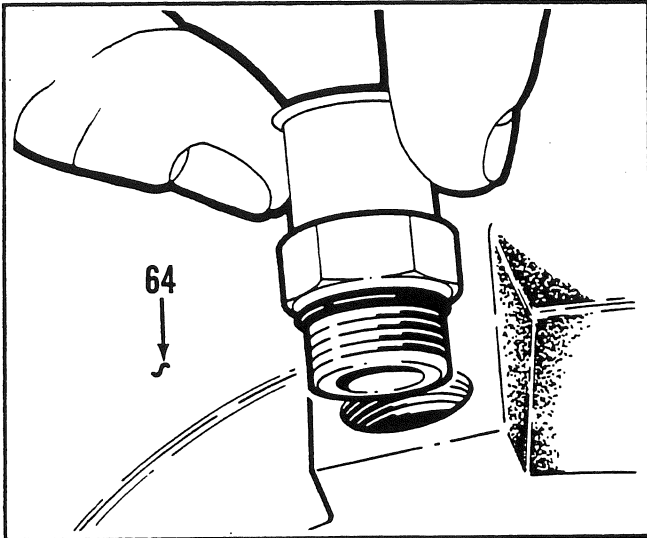


Fig. 38

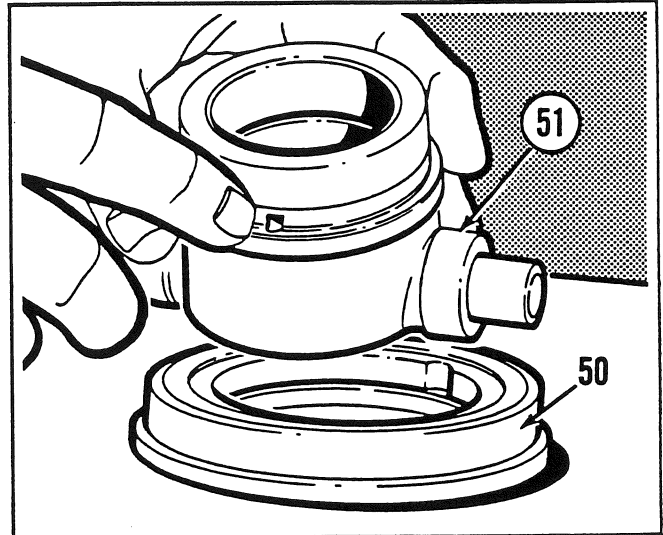


Fig. 41

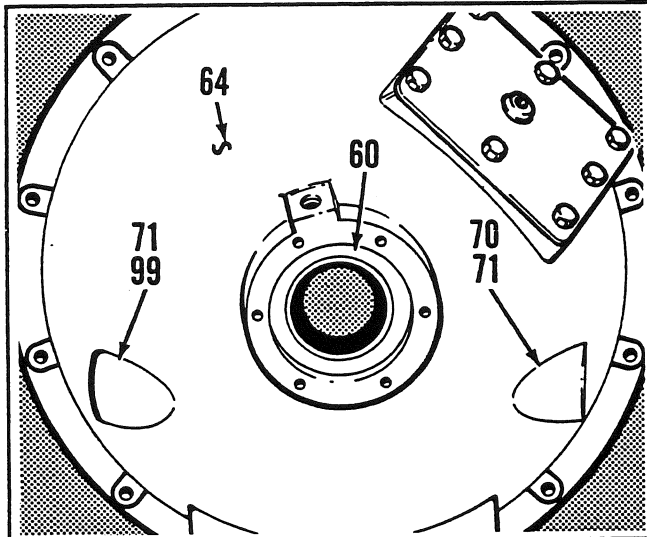


Fig. 39

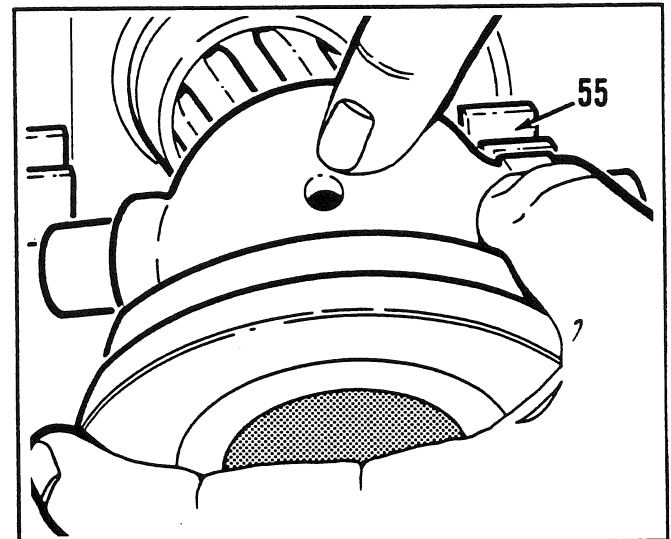


Fig. 42

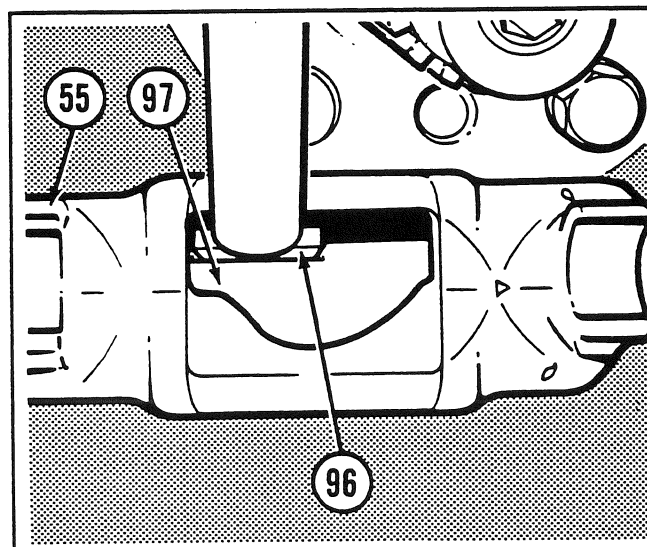


Fig. 40

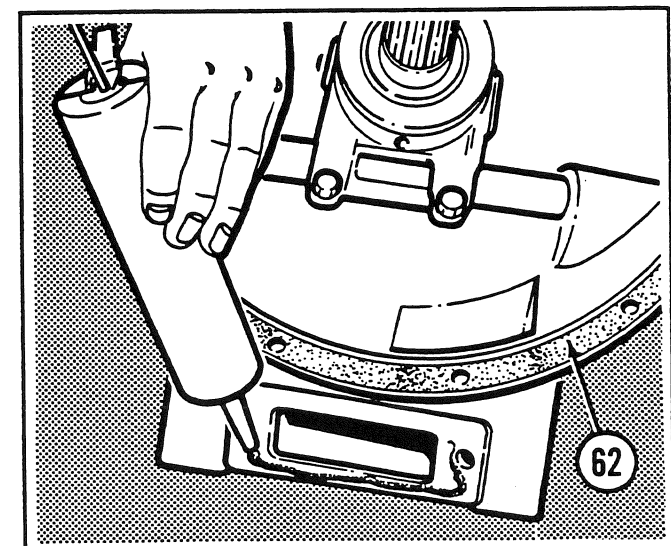


Fig. 43

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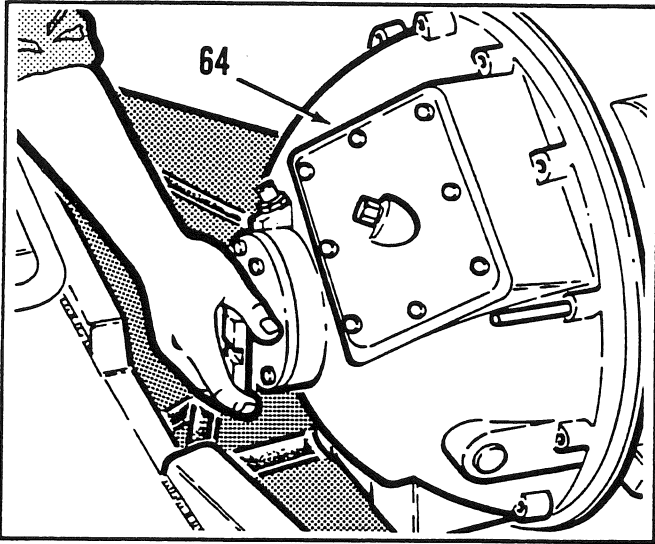


Fig. 44

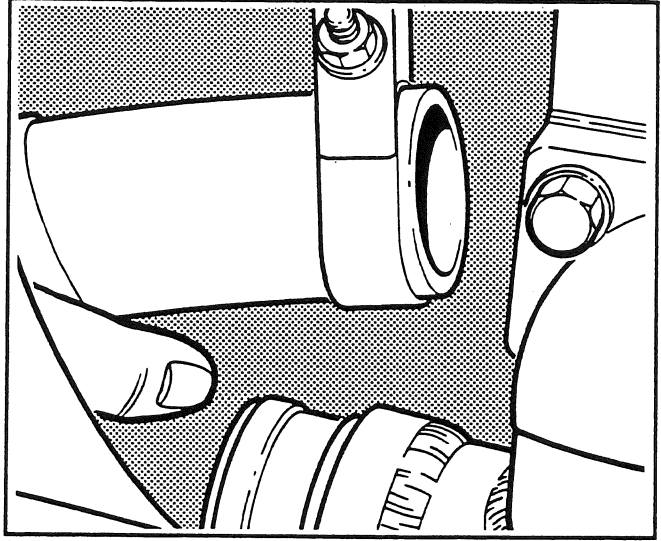


Fig. 47

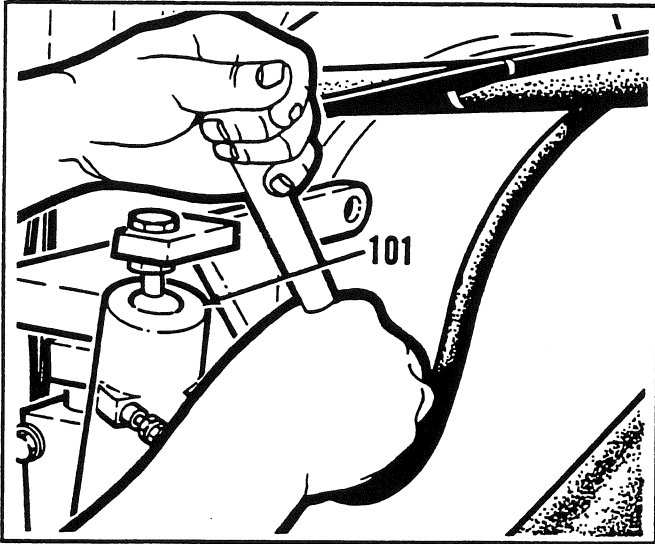


Fig. 45

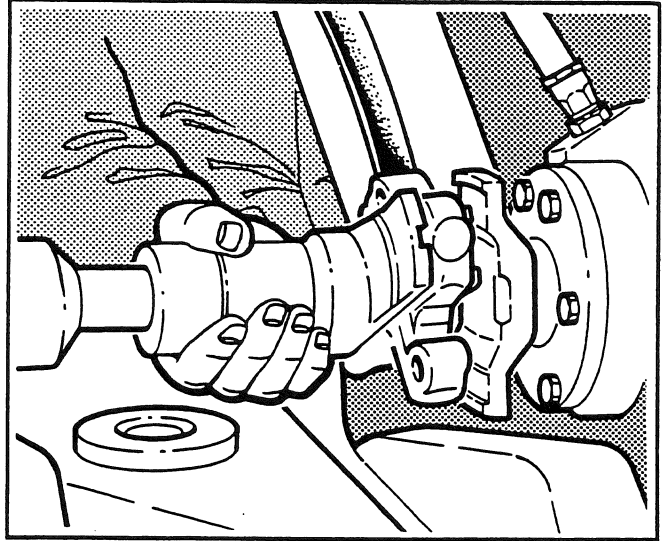


Fig. 48

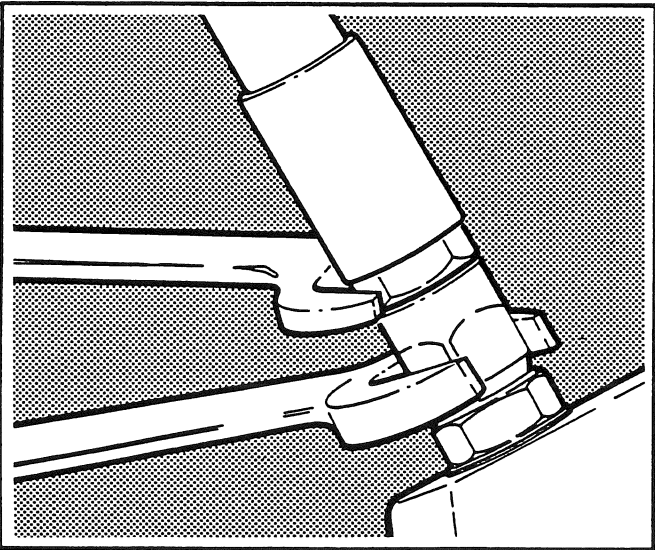


Fig. 46

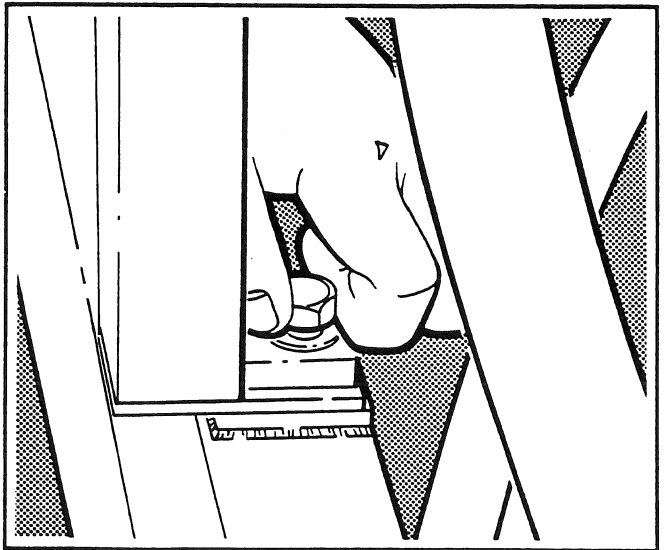


Fig. 49

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**Installation** (continued)

**Fig. 44**

Install two threaded dowel pins in the flywheel housing at the nine o'clock and three o'clock positions. Slide the clutch housing (64) into position. During this procedure move the pilot shaft (84) gently to make sure that it engages the splines of the friction pack hub. Once the clutch housing is firmly in place, install the capscrews (86), (92) and lockwashers (88), (94). On the two lower capscrews (86) use new seal washers (90), (91). Remove the dowel pins and install the capscrews.

**Fig. 45**

Install the slave cylinder (101) and mounting bracket. Install the remaining clutch housing capscrews and tighten them in a diagonal sequence to the recommended torque. Ensure the woodruff key is on the shaft.

**Fig. 46**

Uncap and install the lubrication pressure line and the clutch housing vent line.

**Fig. 47**

Install the clutch housing drain line. Remove the caps from the hose and port.

**Fig. 48**

Inspect the universal joints and slip joint on the upper drive shaft. Check to see that the universal joints are aligned. Place the female end towards the clutch housing. Install the capscrews and tighten them. Grease both universal joints and slip joint.

**Fig. 49**

Use a safe lifting device and install the fuel tank, stand and the air cleaner assembly onto the frame. Retain the stand to the frame.

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**Installation** (continued)

**Fig. 50**

Remove the caps and fit the the air duct onto the turbo charger inlet and secure it with the clamp. Ensure a tight and secure installation.

**Fig. 53**

Install the vacuum line to the air filter restriction indicator.

**Fig. 51**

Reconnect the fuel supply line and open the fuel feed petcock located on the rear of the fuel tank sump.

**Fig. 54**

Install the transmission filter to the fuel tank stand.

**Fig. 52**

Install the hydraulic filter to the fuel tank stand.

**Fig. 55**

Install the hose supporting bracket.

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ENGINE CLUTCHES

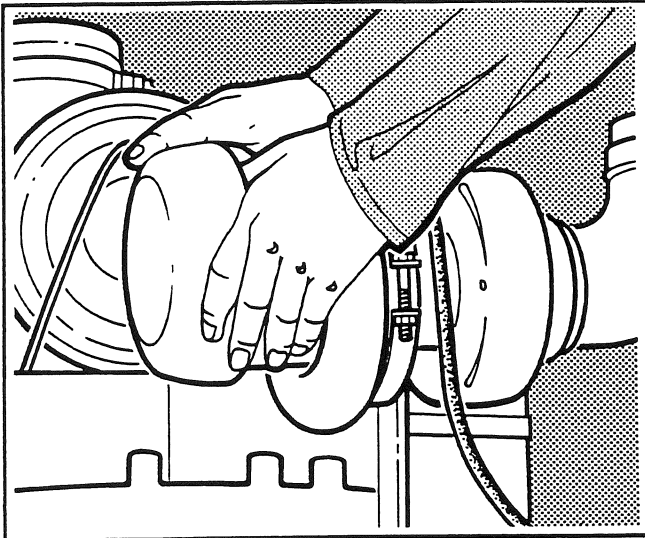


Fig. 50

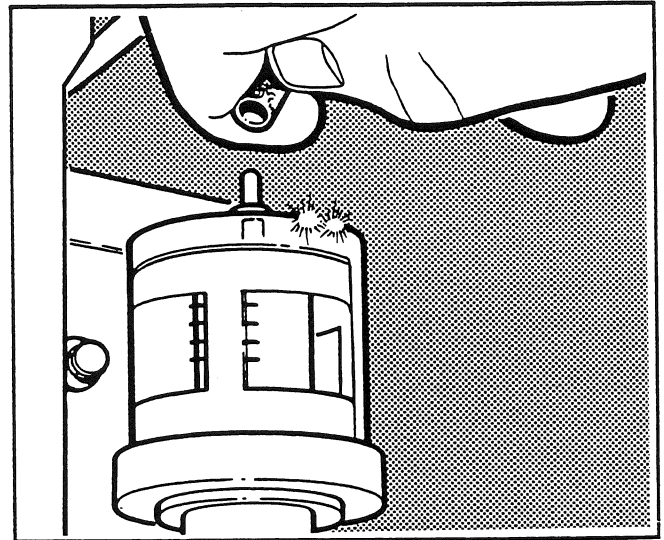


Fig. 53

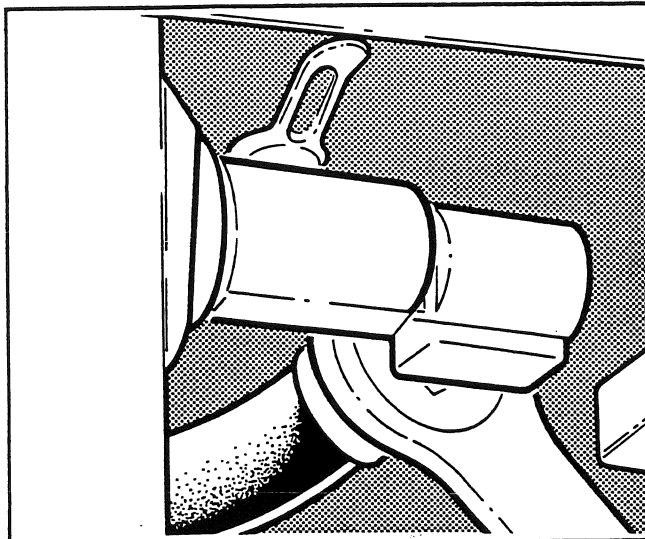


Fig. 51

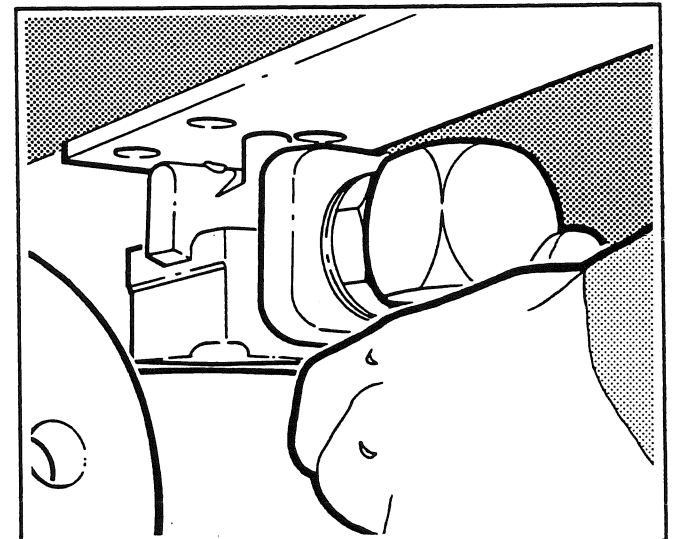


Fig. 54

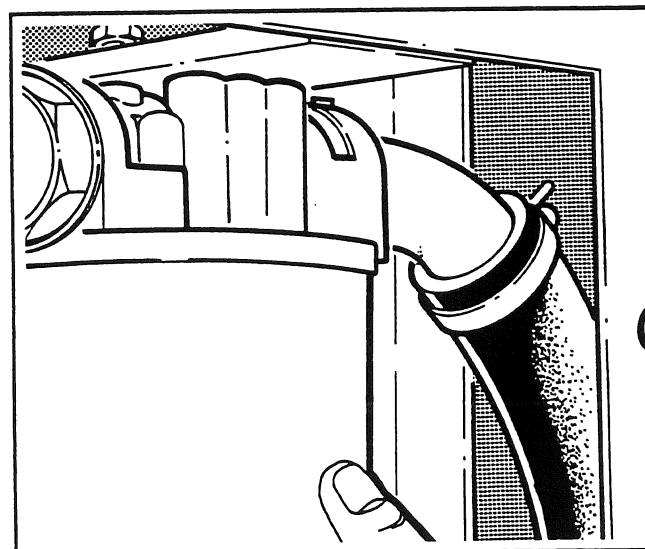


Fig. 52

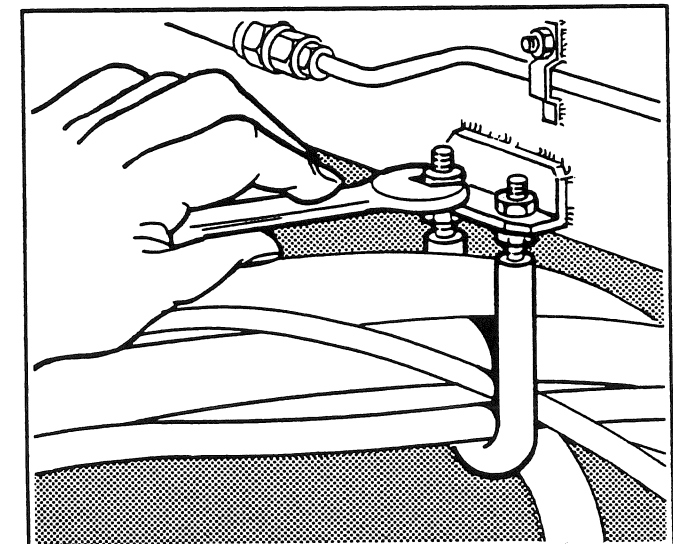


Fig. 55

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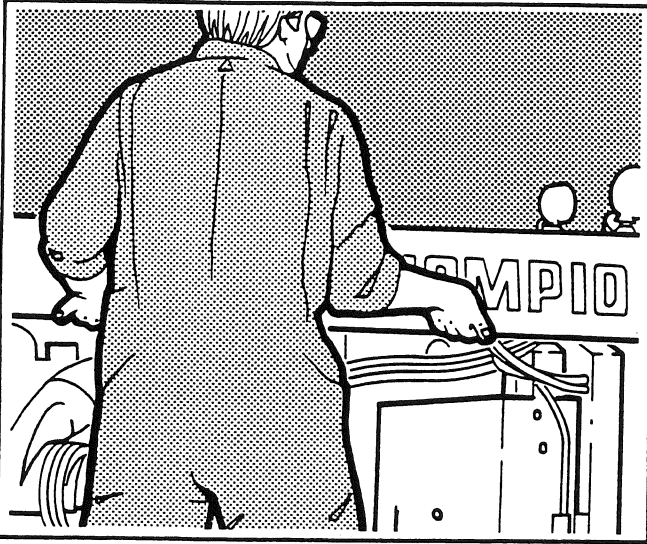


Fig. 56

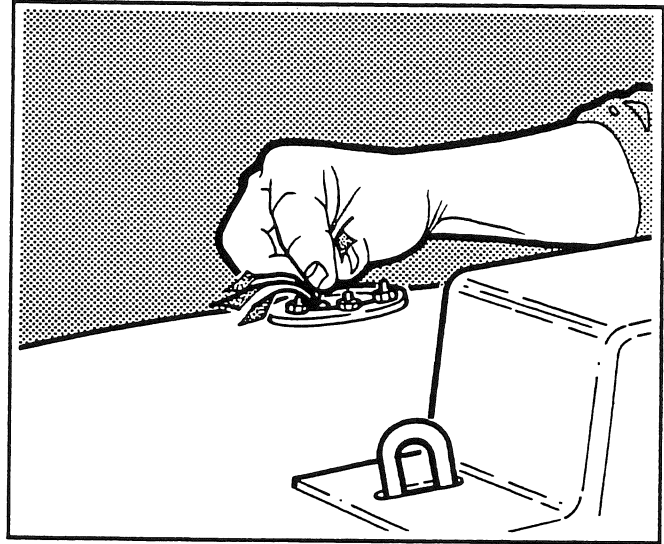


Fig. 59

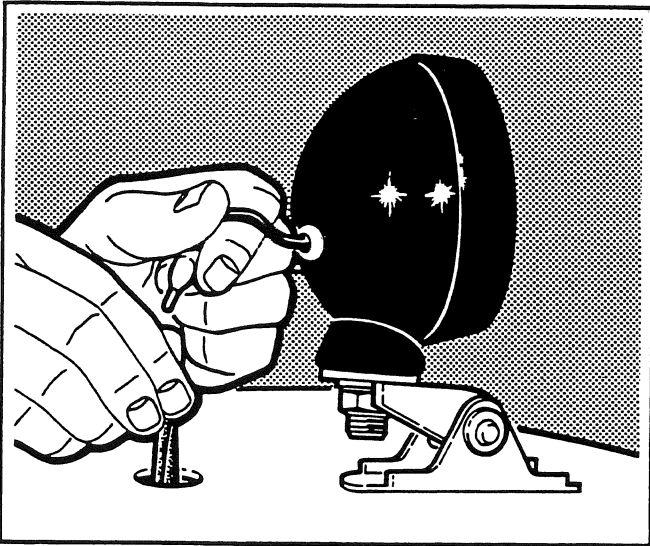


Fig. 57

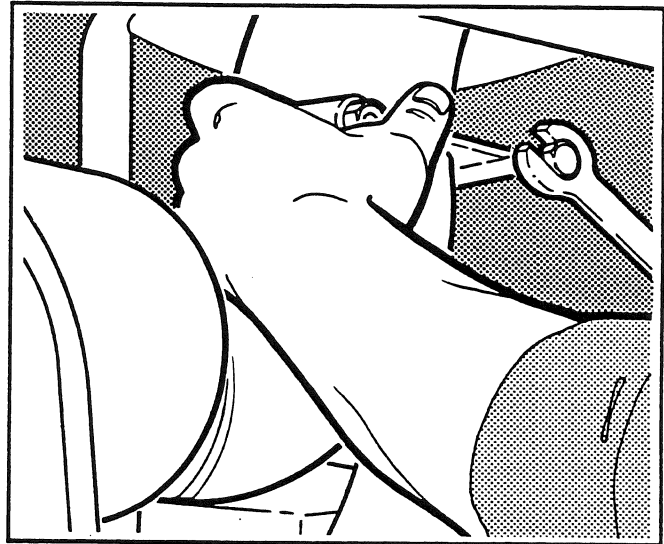


Fig. 60

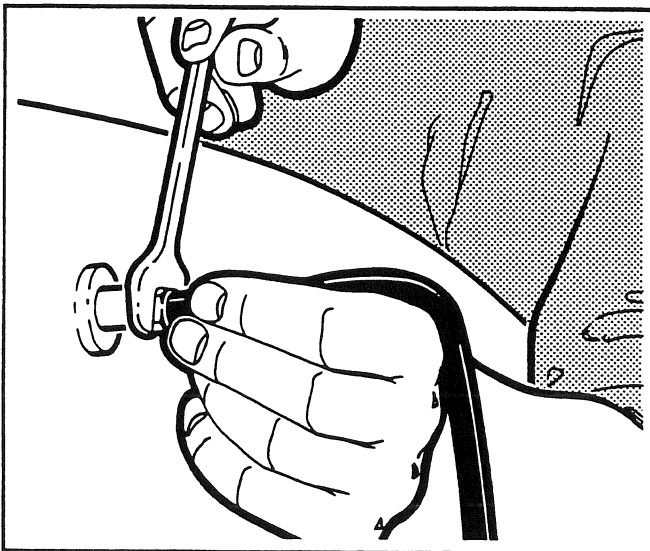


Fig. 58

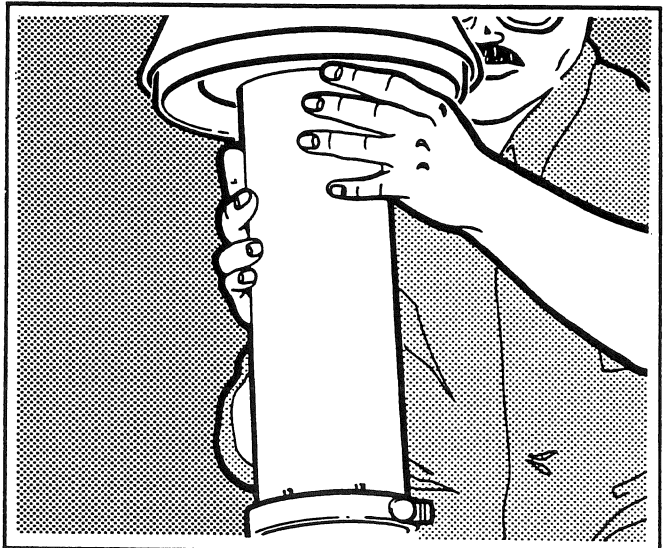


Fig. 61

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**Installation (continued)**

**Fig. 56**

Lightly tap underneath the engine hood to seat it properly in position. Install the hood and secure with the capscrews, lockwashers and plain washers.

**Fig. 59**

Reconnect the fuel level sending wires at the top of the tank.

**Fig. 57**

Reconnect the back-up lights, if so equipped.

**Fig. 60**

Uncap the turbocharger and install the muffler and direct the exhaust outlet towards the rear of the grader. Install the muffler brace and clamp.

**Fig. 58**

Uncap the fitting and fuel return line and reconnect it to the fuel tank.

**Fig. 61**

Uncap the air intake port and install the intake pipe, secure the pipe by tightening the clamp.

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Installation (continued)

**Fig. 62**

Check all connections. Ensure that it is safe to start the grader, turn the isolation switch "ON". Start the grader and with the mode lever in **Neutral**, the oil level should be at the middle of the sight glass.

**Fig. 63**

With the engine off and the isolation switch "OFF", install and secure all side panels.

**Adjustment of the Slave Cylinder**

With the engine shut down adjustments are required for proper engine clutch operation and longevity. On the 16 inch clutch, a power-assist feature requires the engine be idling when bleeding air from the slave cylinder. Put the grader into the **Service Position**.

**Fig. 64**

Ensure the clutch master cylinder fluid is at the full level. Replace the cap.

**Fig. 65**

With an assistant slowly depressing the clutch pedal, open the bleeder screw on the slave cylinder (101). Close the bleeder screw before the clutch pedal is released. Continue the bleeding procedure until all the air bubbles are discharged. Check the reservoir level, add fluid recommended in the Operator's Manual.

**Fig. 66**

16 inch clutch assemblies must have the engine shut down and the isolation switch "OFF". Loosen the jam nut on the slave cylinder (101) and rotate the cross shaft until the release bearing contacts the release levers. The distance traveled by the cross shaft arm must equal 1/8 inch (3,7 mm). If required, rotate the piston shank to move the cross shaft arm until the specified travel is achieved. Tighten the jam nut. Adjustments can also be accomplished at the top of the slave cylinder. For the 13½ inch clutch the distance traveled by the cross shaft arm must be between .040 in. and .100 in. (1,02 mm and 2,54 mm).

**Fig. 67**

Check the pedal free play. The starting point of the clutch disengagement should be 1/3 of the pedal travel. On the 13½ inch clutch the linkage rod between the arm and the master cylinder must have a +.031"/-.000" (0,8 mm/0,0 mm) clearance.

**NOTE**

Clutch settings can be checked by applying the parking brake, blocking the tires and ensuring the area is well ventilated. Indicate you are starting the grader, turn the isolation switch "ON" and ensure the transmission is in "Neutral". Start the engine. Select the highest gear. Fully depress the clutch and brake pedals, shift the mode lever to "Forward". If a lunging motion occurs the clutch is not fully releasing. Shift the mode lever to "Neutral". Shut down the engine and repeat the adjustment procedures.



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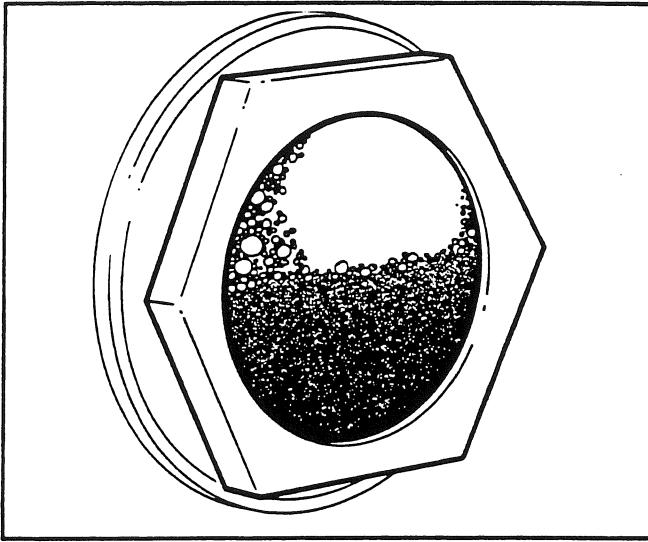


Fig. 62

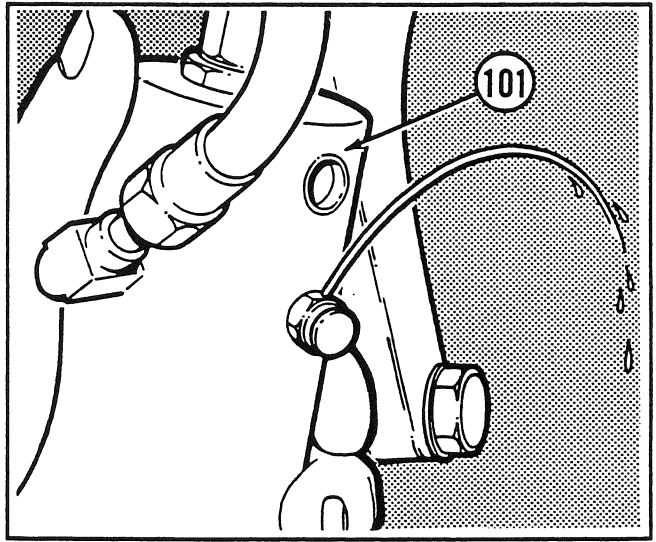


Fig. 65

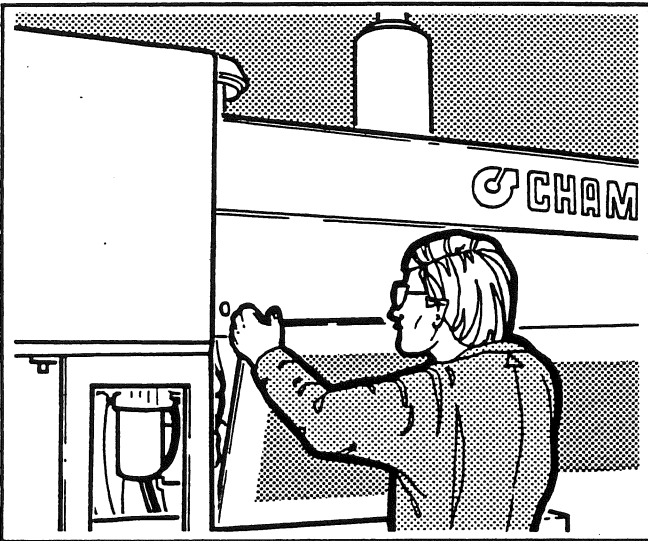


Fig. 63

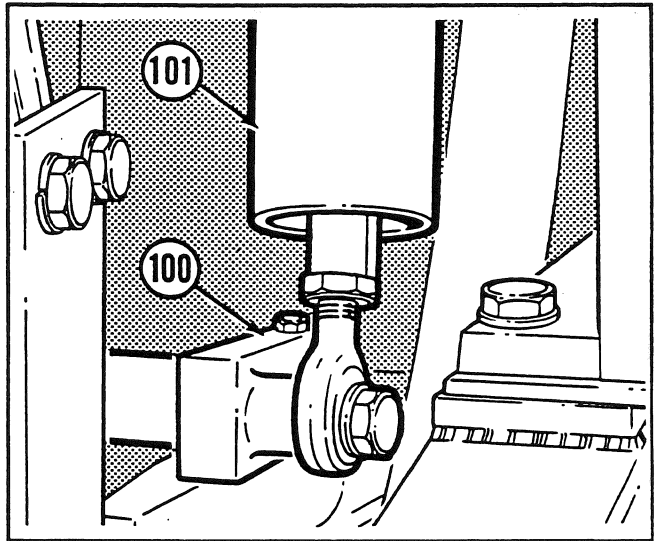


Fig. 66

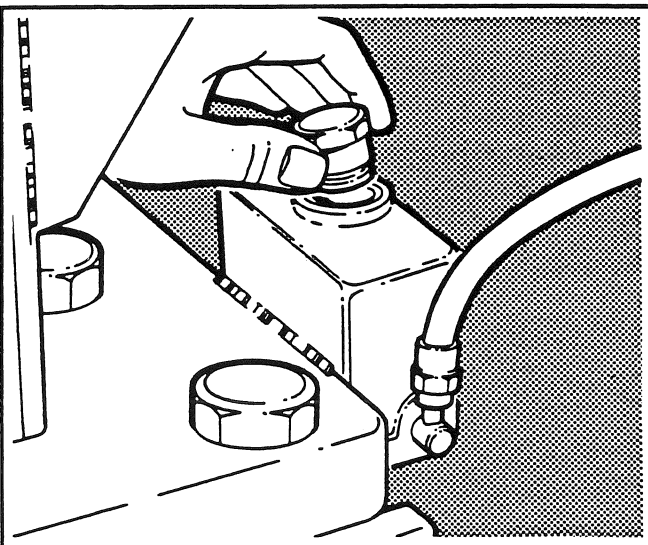


Fig. 64

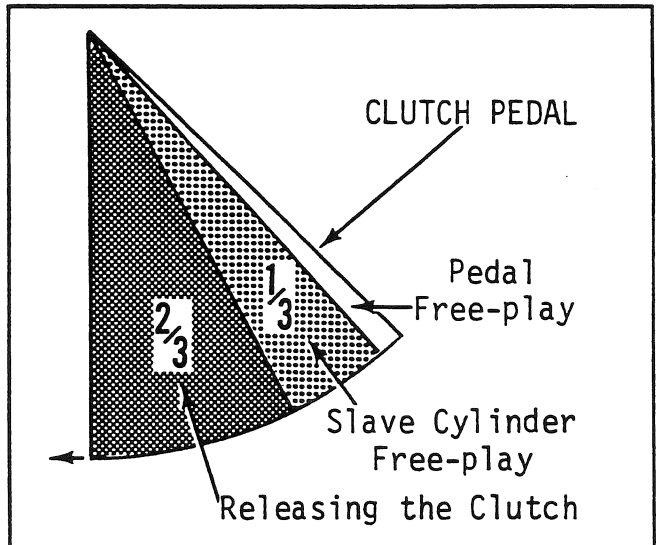


Fig. 67

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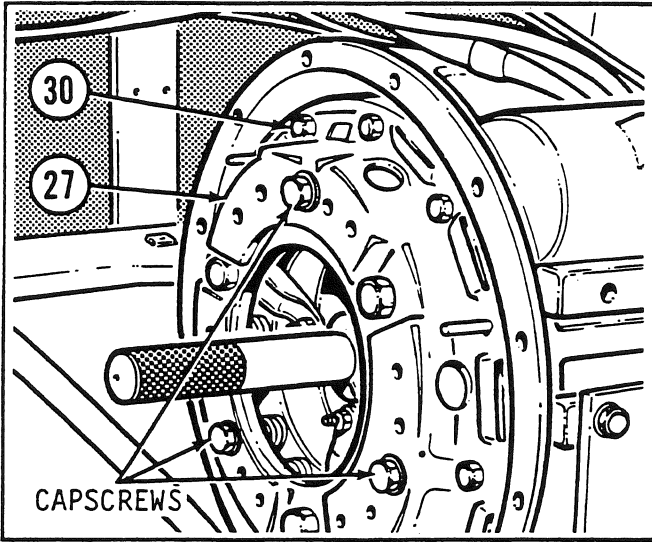


Fig. 68

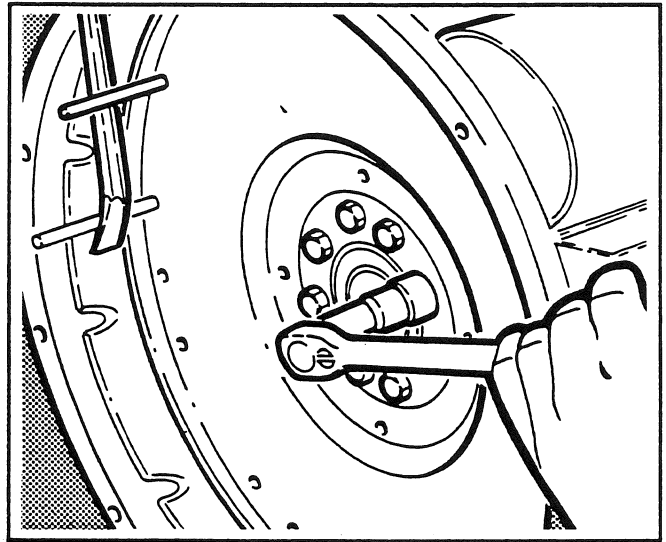


Fig. 71

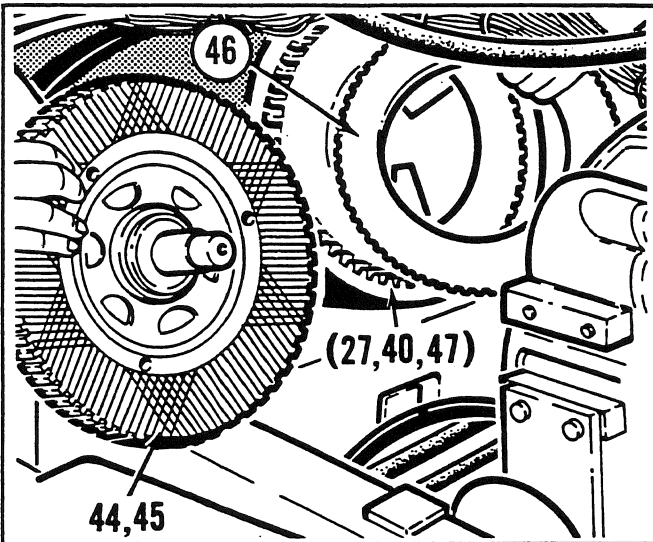


Fig. 69

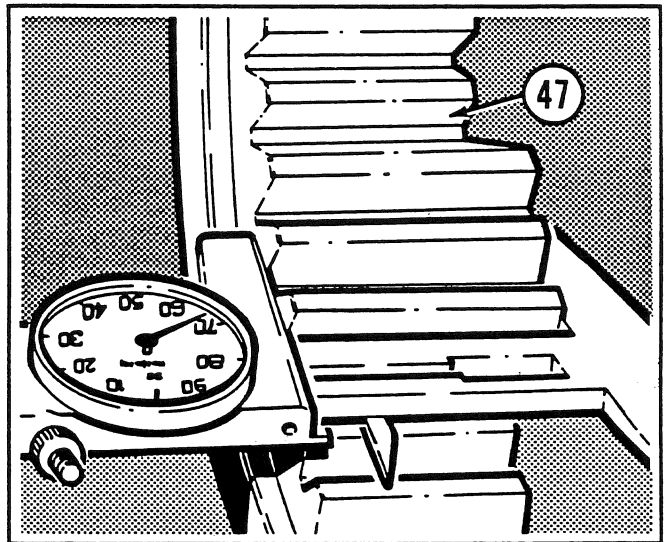


Fig. 72

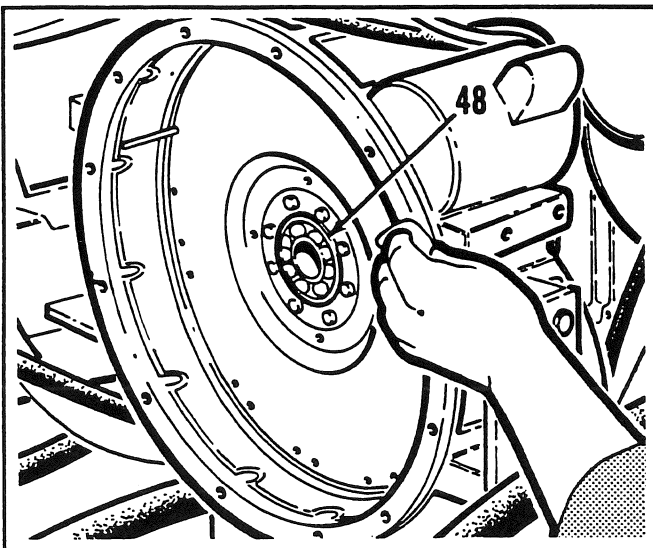


Fig. 70

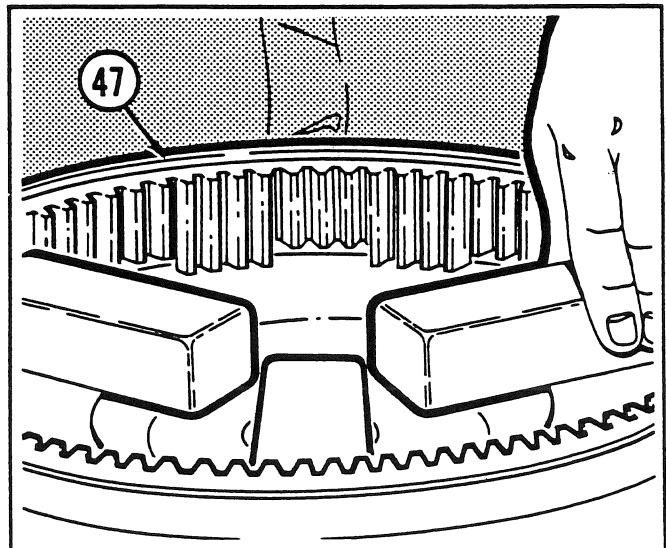


Fig. 73

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13½ Inch Clutch - Disassembly

**Fig. 68**

Park the grader on level ground and place the machine in the **Service Position**. Shift the transmission into **Neutral**. Refer to the beginning of this Shop Manual section to remove the clutch housing. Insert the clutch pilot shaft tool, Champion part number 5629 into the friction pack hub. Using three capscrews and washers, retain the backing plate (27) to the pressure plate (40). Remove two backing plate capscrews (30) at the ten and two o'clock positions and replace them with threaded dowel pins. Remove the remaining capscrews (30) **evenly**, so that the backing plate does not warp or distort.

**Fig. 69 (See "WARNING" Page 1)**

With an assistant, remove the clutch assembly (items 27, 40 and 47). Withdraw the pilot shaft tool and the friction pack (44), (45). Also remove the steel outer disc.

**Fig. 70**

Inspect the pilot bearing (48). Examine the flywheel exterior face for damage. Also refer to the Engine Manual for flywheel information. Clean and inspect the Engine - Clutch Housing mounting surface.

**Fig. 71**

For the 13½ inch clutch the flywheel can be used as a set-up stand. Move the two dowel pins closer together. Use a pry bar between the pins to prevent the flywheel from rotating. Loosen the metric capscrews in a diagonal sequence. Refer to the Engine Manual for removal procedures. The backing plate is a stamped steel component. When using the flywheel as a fixture, you **MUST** retain the backing plate with twelve capscrews to the flywheel. Without retaining the backing plate, the stress on these components will make it impossible to set the release lever height accurately. You **MUST** tighten or loosen these capscrews evenly in sequence (Fig. 74 instructions).

**Fig. 72**

Determine the setup block thickness. Measure the inner thickness of the drive ring (47), subtract the design constant measurement of .724" +/- .001" (18.4 mm). The remainder will be the measurement required to machine the setup blocks from square bar stock 1½" by 5½" long (38,1 x 127,0 mm).

**Fig. 73**

Place the flywheel onto a plywood board on a workbench. Place the drive ring (47) onto the flywheel and align the capscrew holes. Place the setup blocks on the flywheel surface with the smaller ends perpendicular to the drive ring teeth. Place these blocks where each of the release levers (37) will be.

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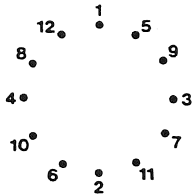
13½ Inch Clutch - Disassembly (continued)

Fig. 74

NOTE

The pressure plate, the backing plate and the drive ring all have stamped markings. These three components MUST be correctly aligned when re-assembled.

Retain the backing plate (27) to the flywheel by installing twelve 3/8" dia. by 3-3/4" long capscrews and tighten them in the sequence as shown.



Remove the three capscrews and washers retaining the backing plate (27) to the pressure plate (40). Remove the three locknuts (28) and washers (29) securing the lever arms (37).

Fig. 75 (See "WARNING" Page 1)

Loosen the twelve 3/8" x 3-3/4" capscrews in sequence (Fig. 74 instructions). Remove the twelve capscrews, the backing plate (27) and the springs (39).

Fig. 76

Place the pressure plate (40) onto a plywood board on a workbench. Remove and discard the cotter pin (34). Remove the washer (35) and the lever pin (38). Note the direction of the lever pins during removal. Lift the lever assembly (37) from the pressure plate (40). From the lever assembly (37), remove the pivot pin (33), the pivot block (32) and anti-rattle spring (36).

Fig. 77

Place the lever (37) in a vise, use soft jaws. Remove the adjusting screw and jam nut from the lever (37). Examine all components for wear or damage, refer to **Cleaning and Inspection**.

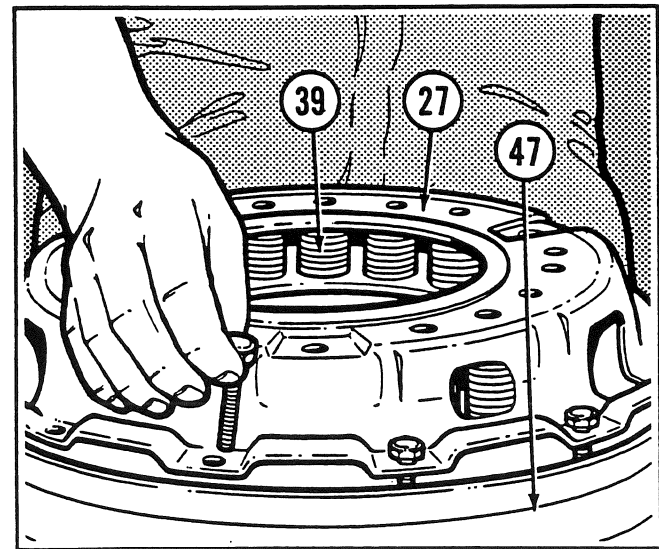
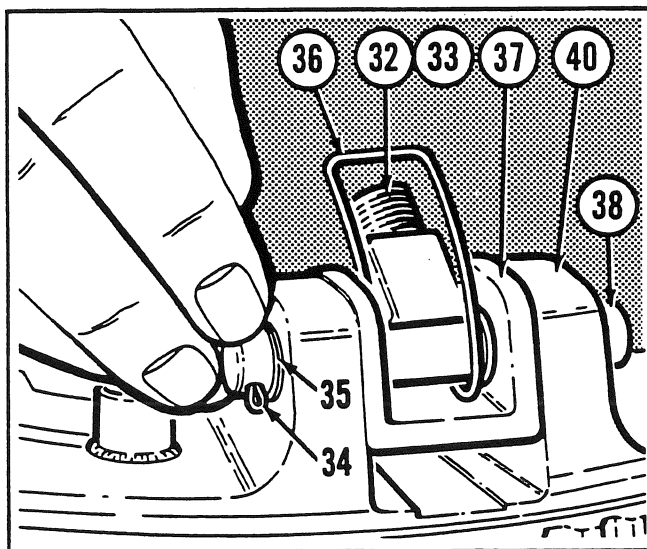
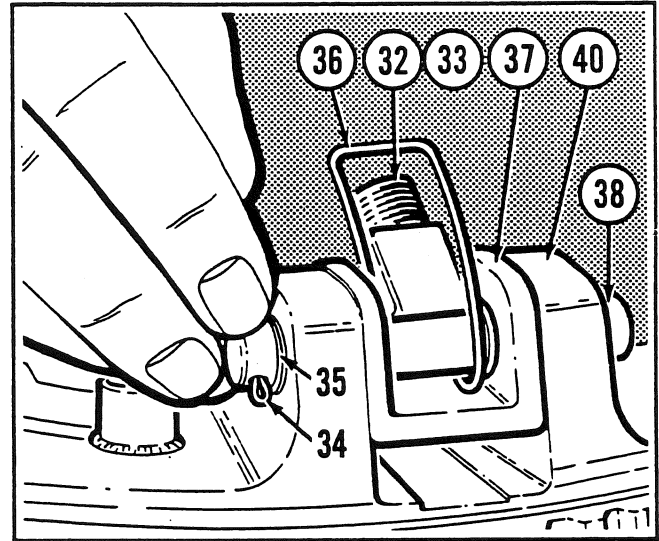
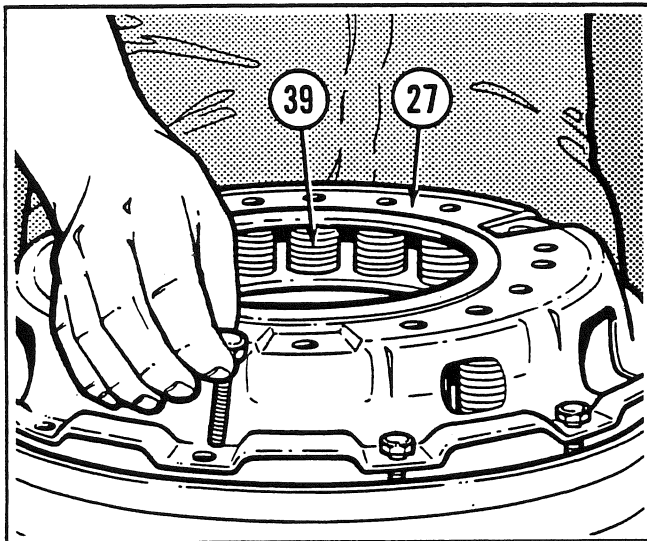
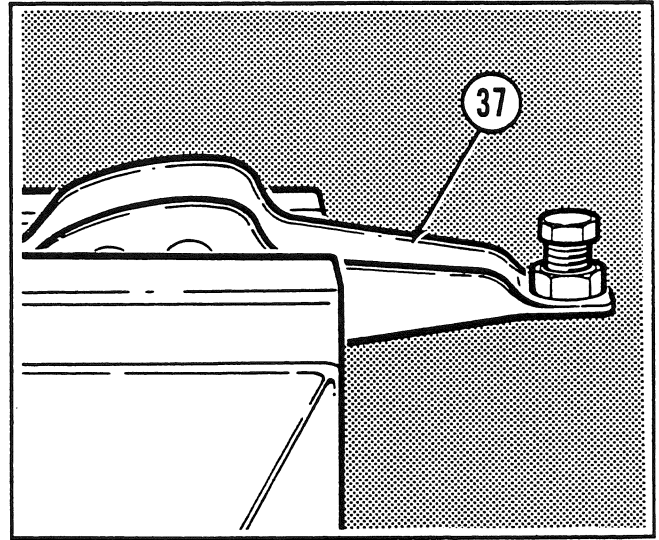
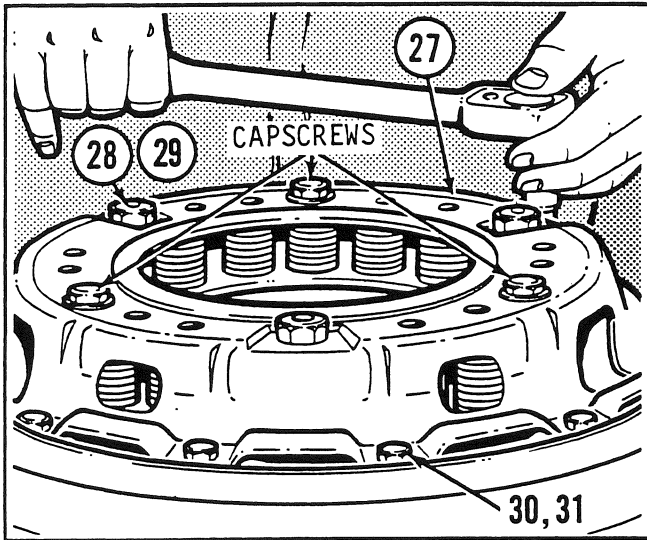
13½ Inch Clutch - Reassembly

Fig. 78

Install the pivot pin (33), pivot block (32) and the anti-rattle spring (36) into the release lever. Place the pressure plate (40) onto a plywood board on a workbench and install the lever assembly. Install the lever pin (38) from the direction it was removed. Install the washer (35) and new cotter pin (34) to retain the pin. Install the adjusting screw and jam nut on the lever (37). **DO NOT** thread the adjusting screws all the way in the lever arms. The adjusting screws are held in the lever by a thread interference fit and jam nut and may become loose if they are turned counter-clockwise.

Fig. 79

With the flywheel, drive ring (47) and setup block set on a workbench, place the pressure plate on top of the block spacers. Position the spacers directly under the release levers (37). Install the springs (39) and the backing plate (27). Ensure that the springs are properly seated on the backing plate. Install twelve 3/8" x 3-3/4" capscrews and draw the backing plate down to install the pivot blocks (32).



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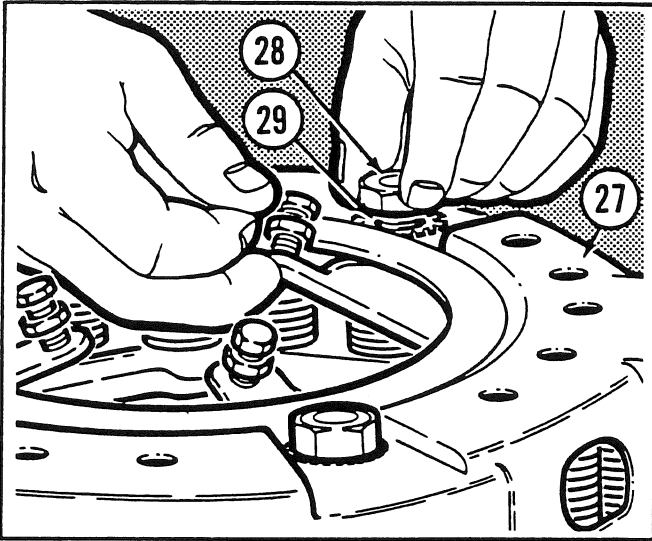


Fig. 80

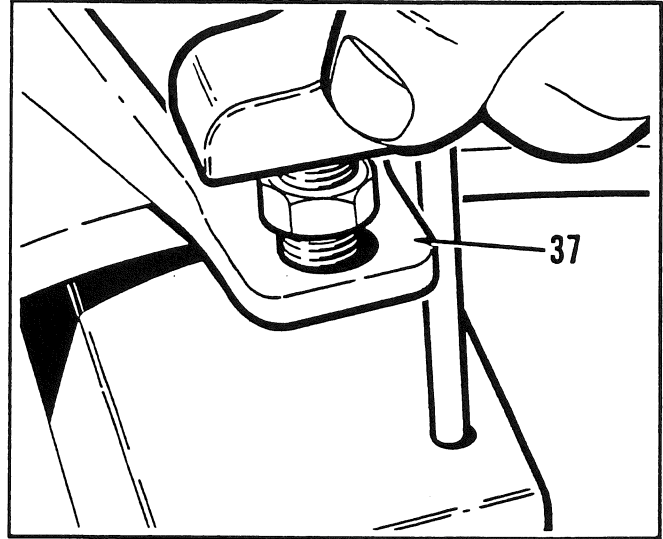


Fig. 83

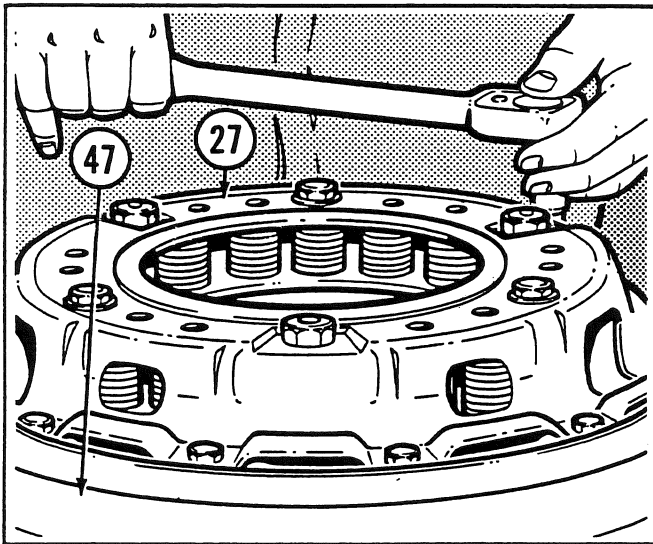


Fig. 81

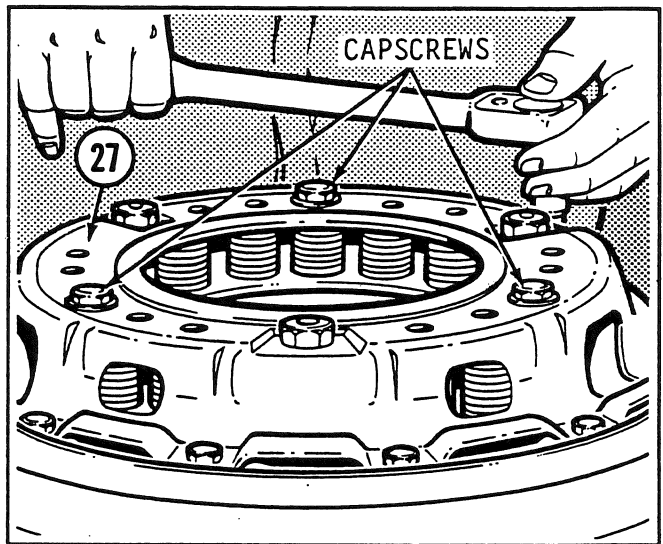


Fig. 84

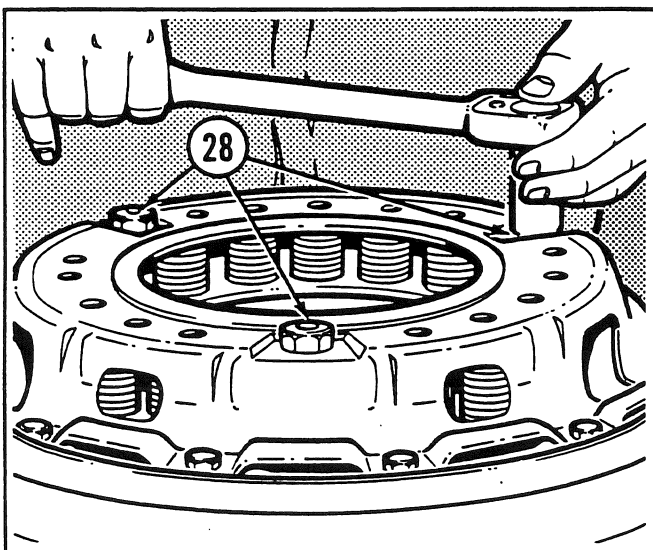


Fig. 82

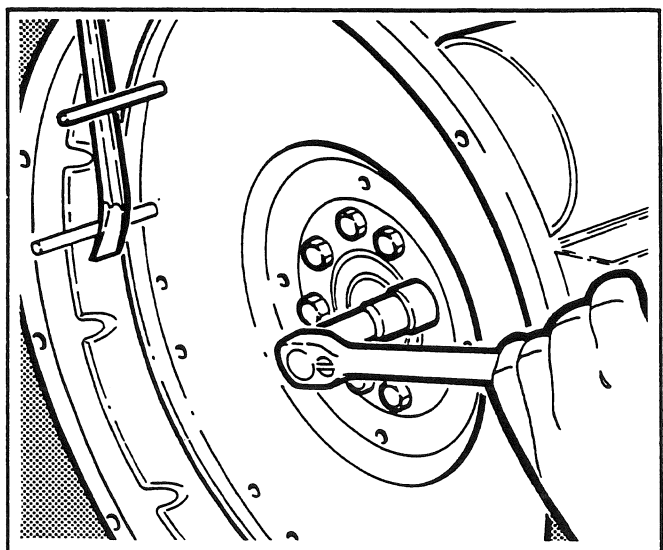


Fig. 85

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13½ Inch Clutch - Reassembly (continued)

**Fig. 80**

If the lever pivot block is not positioned correctly, damage will occur to the lever assembly components. Install the lockwasher (29) and jam nut (28) to finger tightness. Ensure the lever pivot blocks (32) are seated correctly in the corresponding backing plate (27) holes.

**Fig. 81**

Tighten the twelve 3-3/4 in. long capscrews evenly in sequence (Fig. 74 instructions) pull down the backing plate (27) onto the drive ring (47). Ensure the backing plate is properly positioned in the locating counterbore of the drive ring before tightening the capscrews.

**Fig. 82**

Tighten the three pivot block jam nuts (28) to the specified torque.

**Fig. 83**

Using a depth micrometer, measure the perpendicular distance from the top of the setup block to the top of the adjustment screw. The three levers (37) must be of equal height within .020" and set at 2.162" +/- .015 (54,9mm). Tighten the jam nut to the specified torque to retain the lever adjusting screw. Recheck the lever heights.

**Fig. 84**

**NOTE**

**The pressure plate, back plate and the drive ring as an assembly must be dynamically balanced within 1.3 oz. inch before putting the clutch into service.**

Install the three retaining capscrews and washers. Retain the backing plate (27) to the pressure plate (40). Carefully loosen the twelve 3-3/4 in. long capscrews evenly in sequence (Fig. 74 instructions). **DO NOT** allow the backing plate to warp or distort during this procedure.

**Fig. 85**

Install the flywheel and tighten the retaining metric capscrews in the sequence and torque recommended in the Engine Manufacturer's manual.

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ENGINE CLUTCHES

13½ Inch Clutch - Reassembly (continued)

**Fig. 86**

Move the threaded dowel pins to the ten and two o'clock positions in the flywheel housing and install the drive ring (47). Install the steel outer disc (46), hold it against the flywheel.

**Fig. 87**

When installing the friction pack, the cavity of the splined hub must face towards the flywheel.

**Fig. 88**

Place the friction pack on the clutch pilot shaft tool, Champion part number 5629, align the splines. Hold the drive ring (47) in place so that the outer disc (46) does not drop out of position. Install the clutch pilot shaft tool into the pilot bearing (48). Align the teeth of the drive ring.

**Fig. 89**

Align the stamp mark on the drive ring (47) with the mark on the backing plate (27) and install the clutch assembly on the supporting dowel pins. Install the capscrews (30) and lockwashers (31) to retain the clutch assembly to the flywheel and check to see that the steel outer disc (46) has not dropped out of place. Remove the dowel pins and replace them with the remaining capscrews. Tighten the twelve capscrews evenly in sequence (Fig. 74 instructions) to the recommended torque.

Make certain that the backing plate is properly positioned in the locating counterbore of the drive ring.

**Remember to remove the three retaining capscrews.**

Remove the pilot shaft tool from the clutch assembly.

Reinstallation of the 13½ inch clutch is now complete. Refer to instructions called **Clutch Housing - Installation** in this section for installing the clutch housing and performing slave cylinder adjustment.



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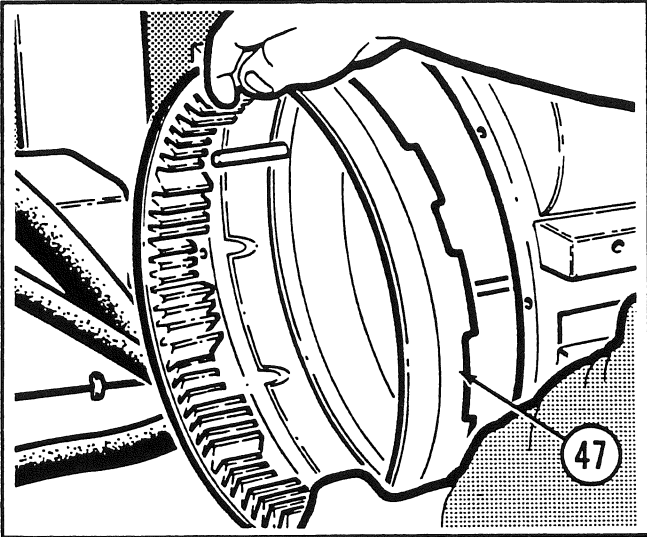


Fig. 86

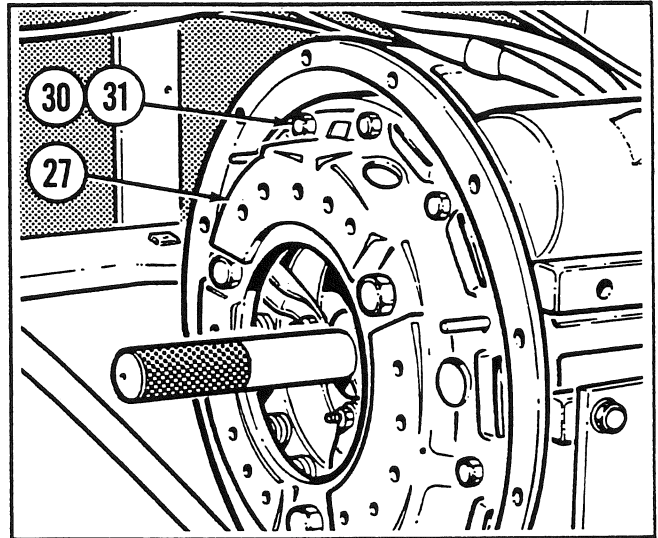


Fig. 89

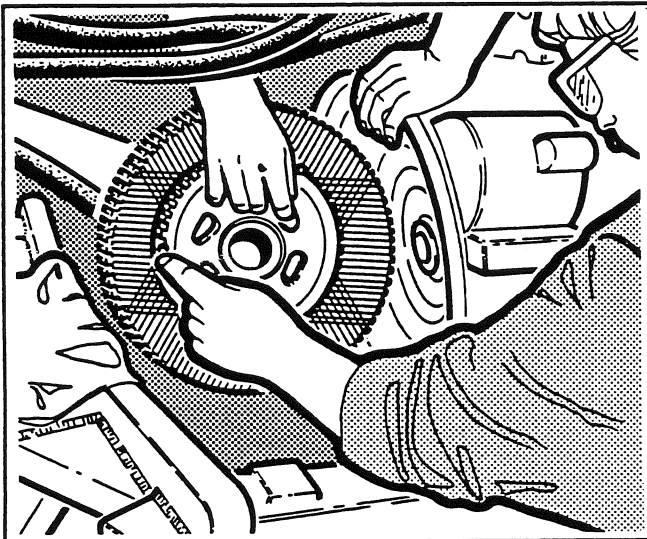


Fig. 87

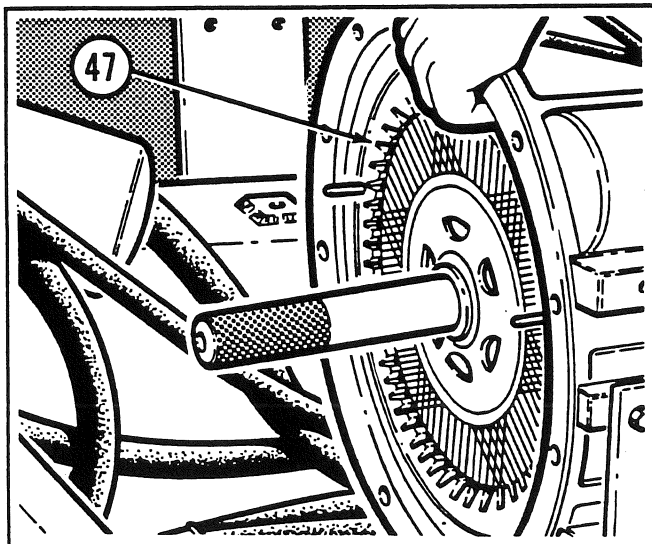


Fig. 88

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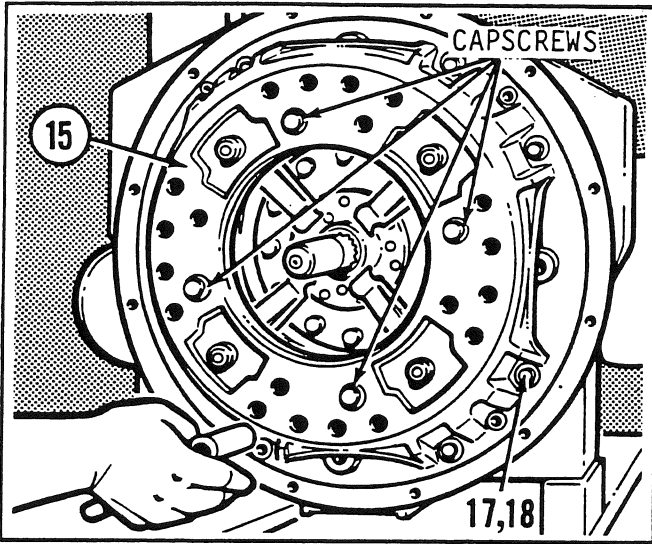


Fig. 90

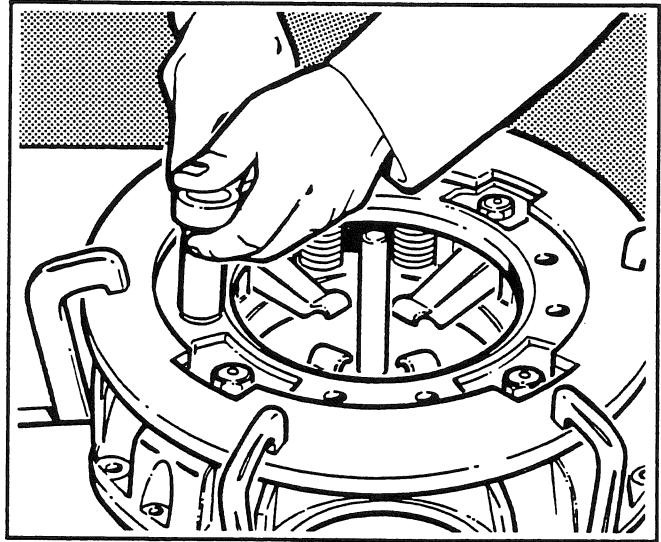


Fig. 93

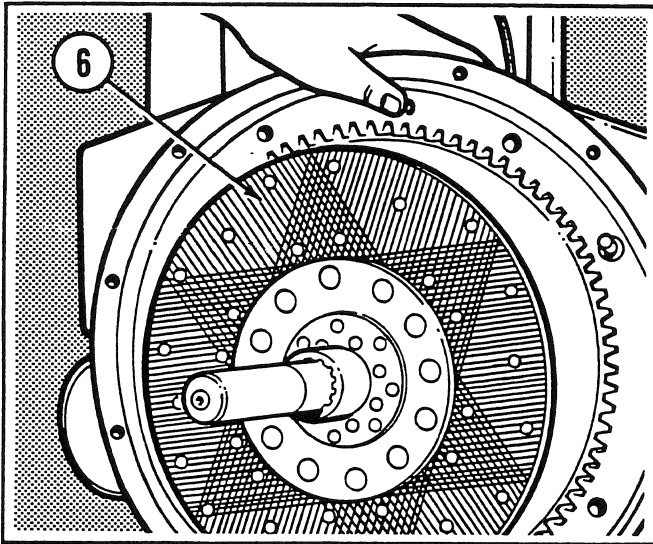


Fig. 91

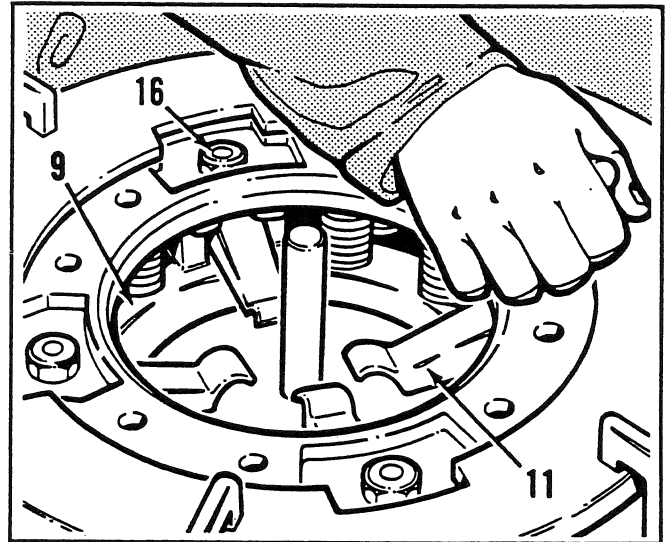


Fig. 94

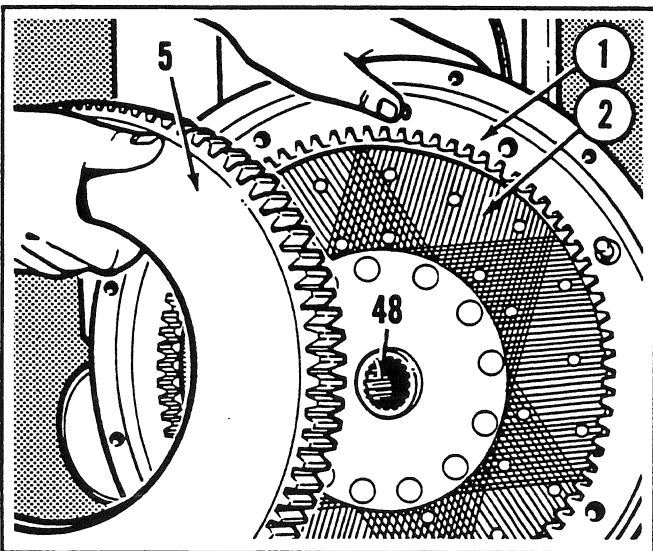


Fig. 92

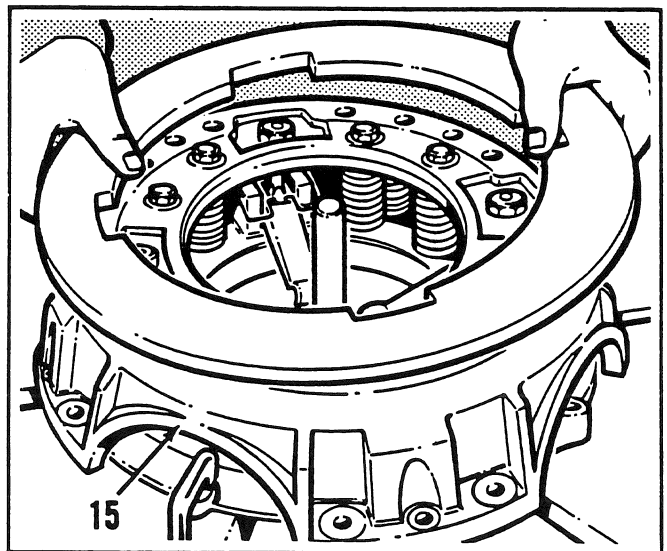


Fig. 95

700 SERIES SHOP MANUAL  
ENGINE CLUTCHES

16 Inch Clutch - Disassembly

**Fig. 90 (See "WARNING" Page 1)**

Park the grader on level ground and place the machine in the **Service Position**. Shift the transmission into **Neutral**. Refer to the beginning of this Shop Manual section to remove the clutch housing. Insert the clutch repair pilot shaft tool, Champion part number **5629** into the friction pack hub. Using four 3/8" x 2-1/2" capscrews and washers, retain the backing plate (15) to the pressure plate (9). Remove two backing plate capscrews (17) at the ten and two o'clock positions and replace them with threaded dowel pins. Remove the re-remaining capscrews (17) evenly in a diagonal sequence. With an assistant, remove the clutch assembly (items 9 and 15). Use caution, this assembly is **very heavy**.

**Fig. 91**

With the pilot shaft tool already inserted, remove the driven member (6).

**Fig. 92**

Remove the spacer (5), the driven member (2) and the drive ring (1). Inspect the pilot bearing (48). Examine the flywheel exterior face for damage. Also refer to the Engine Manual for flywheel information. Clean and inspect the Engine - Clutch Housing mounting surface.

**Fig. 93 (See "WARNING" Page 1)**

Using a decompression fixture, center the clutch assembly on the fixture. Place the hold down ring on the assembly. Adjust the clamps and operate the fixture to secure the assembly to the table. Remove the four 3/8" x 2-1/2" capscrews and washers.

**Fig. 94**

Loosen the adjusting nuts (16) until the release levers (11) almost touch the pressure plate (9). Carefully relieve the fixture pressure, making sure that the assembly is still safely clamped in place. Repeat this procedure until the pressure is completely released and the levers drop freely.

**Fig. 95**

Slowly release the fixture pressure completely to remove the hold down ring and fixture clamps. Remove the backing plate (15).

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16 Inch Clutch - Disassembly (continued)

**Fig. 96**

Remove the springs (26), the insulating washers (25) and the retaining washers (24) from the pressure plate (9).

**Fig. 97**

Place the pressure plate (9) onto a plywood board on a workbench. Remove and discard the cotter pin (23). Remove the washer (22) and lever pin (20). Note the direction of the lever pins during removal, they **MUST** be reinstalled from the same direction. Lift the lever assembly (11) from the pressure plate (9). From the lever (11), remove the anti-rattle spring (13), the pivot pin (12) and the eye bolt (10). Repeat these procedures for the other three levers.

**Fig. 98**

Use a hammer and drift to remove the needle bearings (21) in the pressure plate (9). Also remove the needle bearings (19) from the eye bolts (10). Examine all components for wear or damage, refer to **Cleaning and Inspection**.

16 Inch Clutch - Reassembly

**Fig. 99**

Place a new or reconditioned pressure plate (9) onto a plywood board on the workbench. Lubricate and install new needle bearings (21) in the pressure plate. Install new needle bearings (19) in the eye bolts (10). The lever pin (20) makes an excellent drift for installing the needle bearings.

**Fig. 100**

Install the eye bolt (10) in the lever (11) with the pivot pin (12) and anti-rattle spring (13). Align the holes in the release lever with those in the pressure plate. Install the lever pin (20), washer (22) and a new cotter pin (23) to retain the pin.

**Fig. 101**

Place the pressure plate (9) on the decompression fixture and center it. Use four setup blocks under the pressure plate at the four lever boss positions. These setup blocks **MUST** be .474" +/- .001" (12,04mm) and all four should be of equal thickness within .001".

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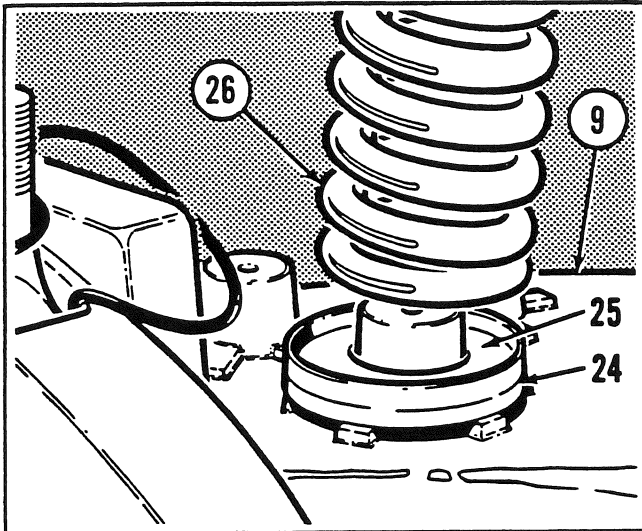


Fig. 96

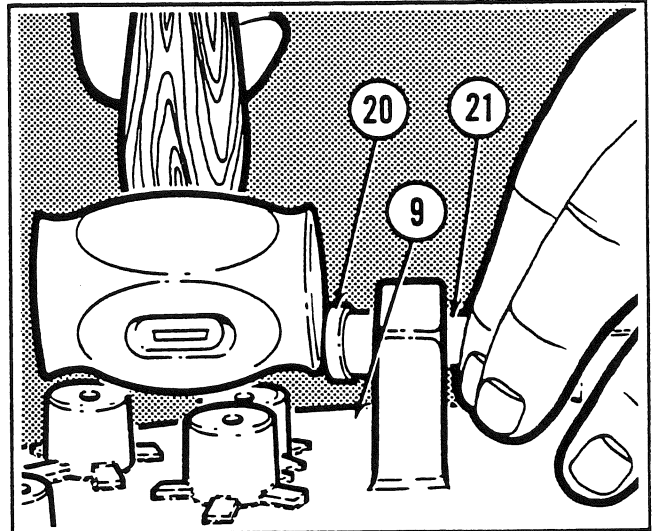


Fig. 99

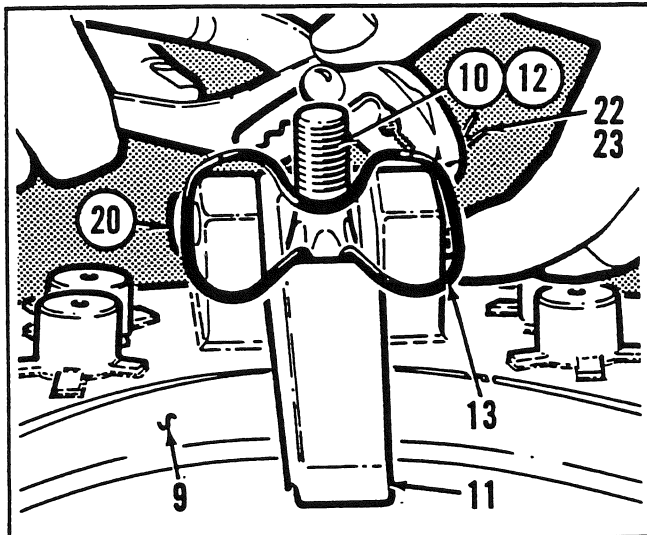


Fig. 97

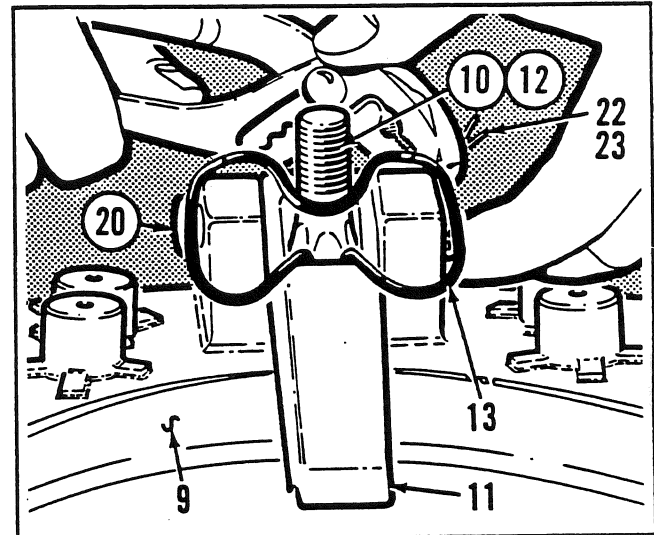


Fig. 100

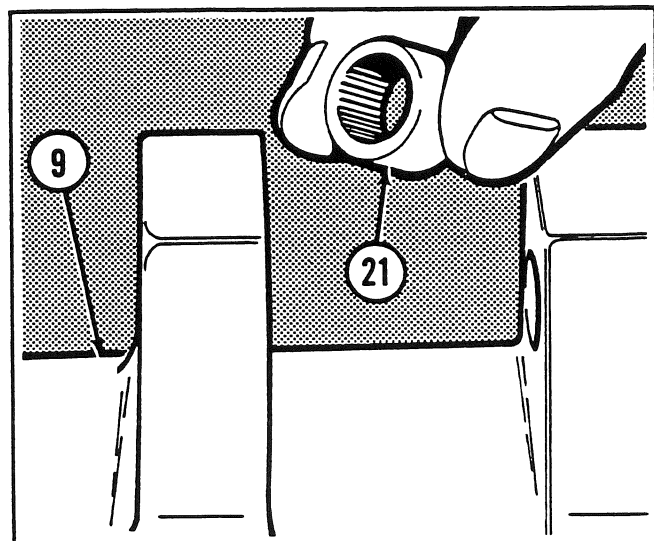


Fig. 98

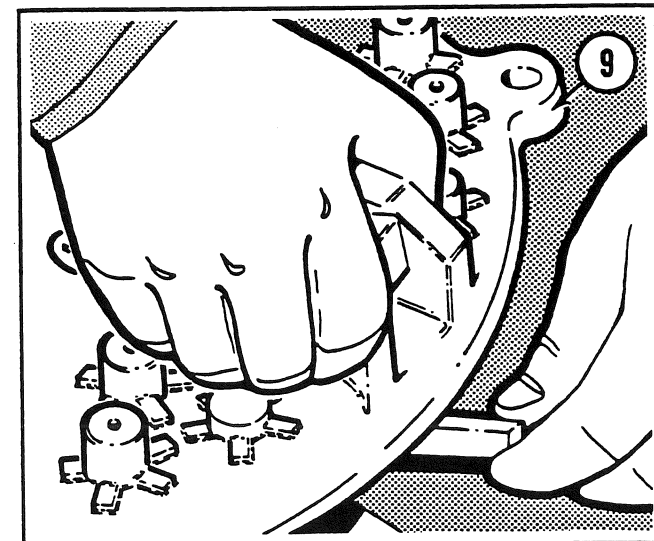


Fig. 101

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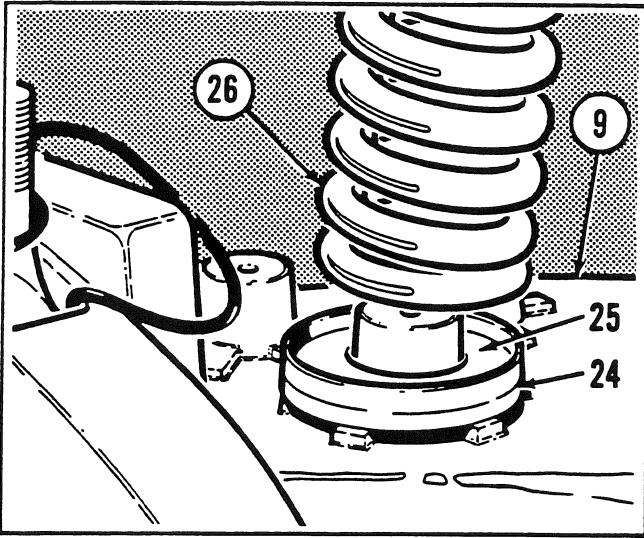


Fig. 102

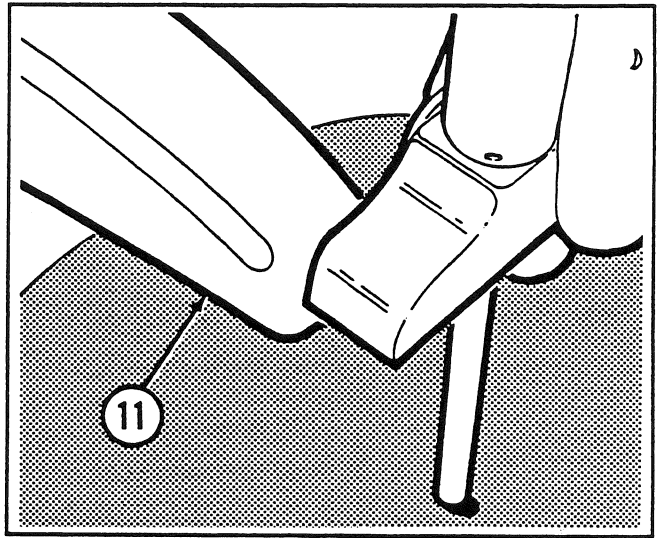


Fig. 105

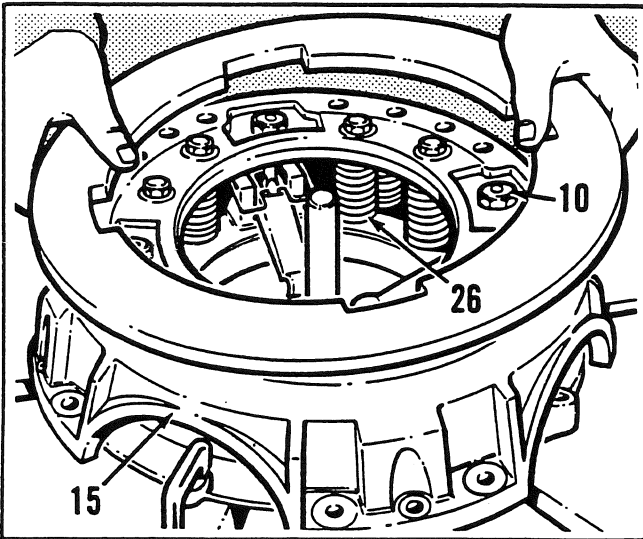


Fig. 103

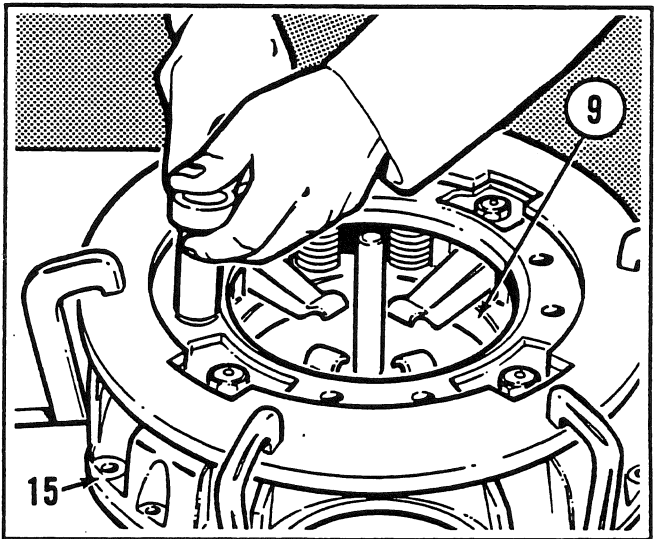


Fig. 106

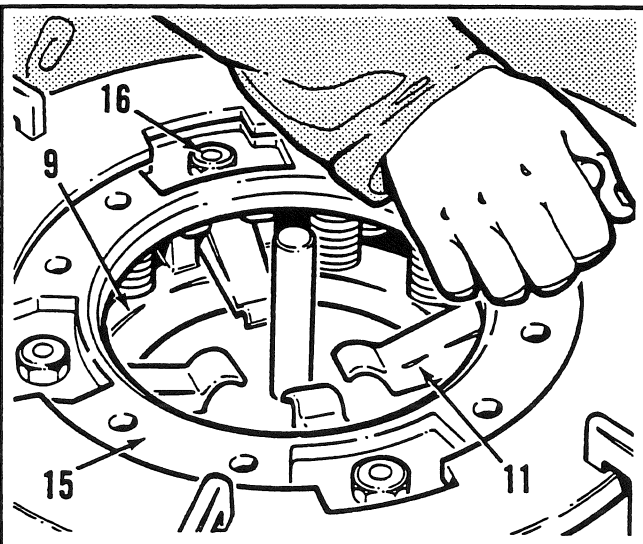


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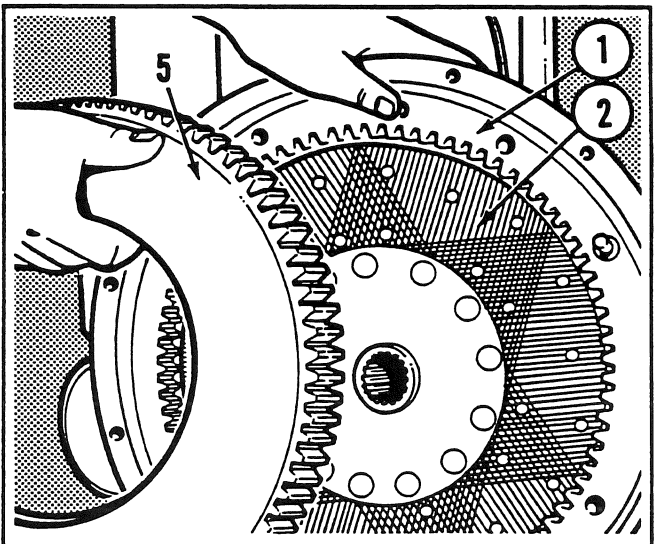


Fig. 107

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ENGINE CLUTCHES

16 Inch Clutch - Reassembly (continued)

**Fig. 102**

Install the spring retainer washers (24), the insulating washers (25) and the springs (26).

**Fig. 103**

Lower the backing plate (15) onto the springs (26), ensure the eye bolt holes in the backing plate align with the eye bolts (10). **Seat** the springs. Place the hold down ring on the backing plate, position the hold down clamps and compress the clutch assembly.

**Fig. 104**

Lift the release levers (11) to thread the adjusting nuts (16), **DO NOT** cross-thread the eye bolts. Tighten each adjusting nut until the levers almost contact the backing plate (15). Compress the backing plate until it contacts the table. A feeler gauge measure of .001 inch should not be able to fit under the backing plate. Tightening the adjusting nuts and compressing the assembly may have to be done more than once.

**Fig. 105**

Using a depth micrometer, measure the perpendicular distance from the top of the fixture surface to the top of the lever (11) end. The four levers **MUST** be of equal height, within .020" and **MUST** be set at 2.687"  $\pm$ .015" (68,25mm) by turning the adjusting nuts (16).

**Fig. 106**

Install and tighten the four retaining capscrews and washers to secure the clutch assembly (9), (15). Carefully release the pressure on the clutch assembly. Remove the hold down ring and clutch assembly. Be careful the clutch assembly is **very heavy**.

**NOTE**

**The clutch assembly must be dynamically balanced within 1.5 oz. inch before putting the clutch into service.**

**Fig. 107**

Install the threaded dowel pins at the ten and two o'clock positions in the flywheel housing and install the drive ring (1). Install the first driven member (2) with the hub towards the flywheel. Install the spacer (5).

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ENGINE CLUTCHES

16 Inch Clutch - Reassembly (continued)

**Fig. 108**

Install the second driven member with the hub away from the flywheel. Hold the assembly in position, insert the clutch pilot shaft tool, Champion part number **5629**, aligning the splines of the two driven members (2), (6).

Installation of the 16 inch clutch is now complete. Refer to instructions called **Clutch Housing - Installation** in this section for installing the clutch housing and performing slave cylinder adjustments.

**Fig. 109**

With an assistant, install the clutch assembly onto the dowel pins and slide the clutch assembly into place. Install the backing plate lockwashers (18) and capscrews (17). Remove the two dowel pins and replace them with the two remaining backing plate capscrews and tighten them in a diagonal sequence to the recommended torque.

**Remember to remove the four retaining capscrews.**

Remove the pilot shaft tool from the clutch assembly and maintain the spline alignment of the two driven members.



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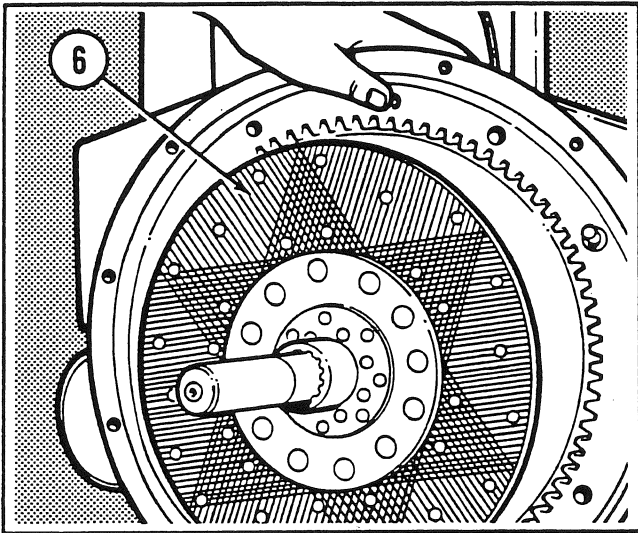


Fig. 108

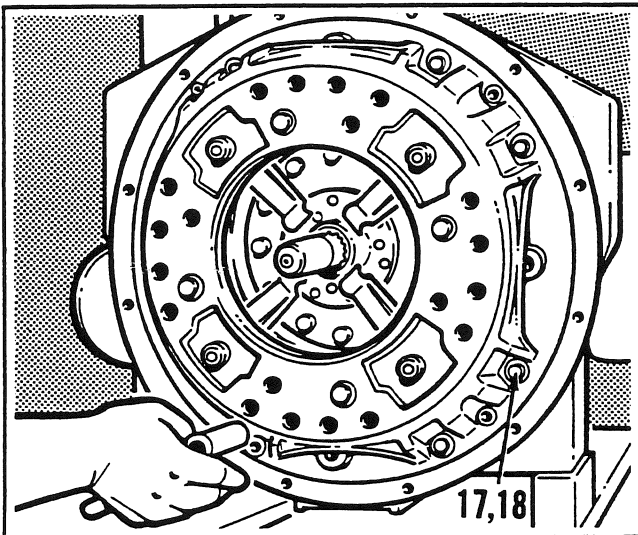


Fig. 109

