Group 25
SEPARATION

SEPARATING ENGINE FROM CLUTCH HOUSING

Remove right-hand cowl. Disconnect battery cable





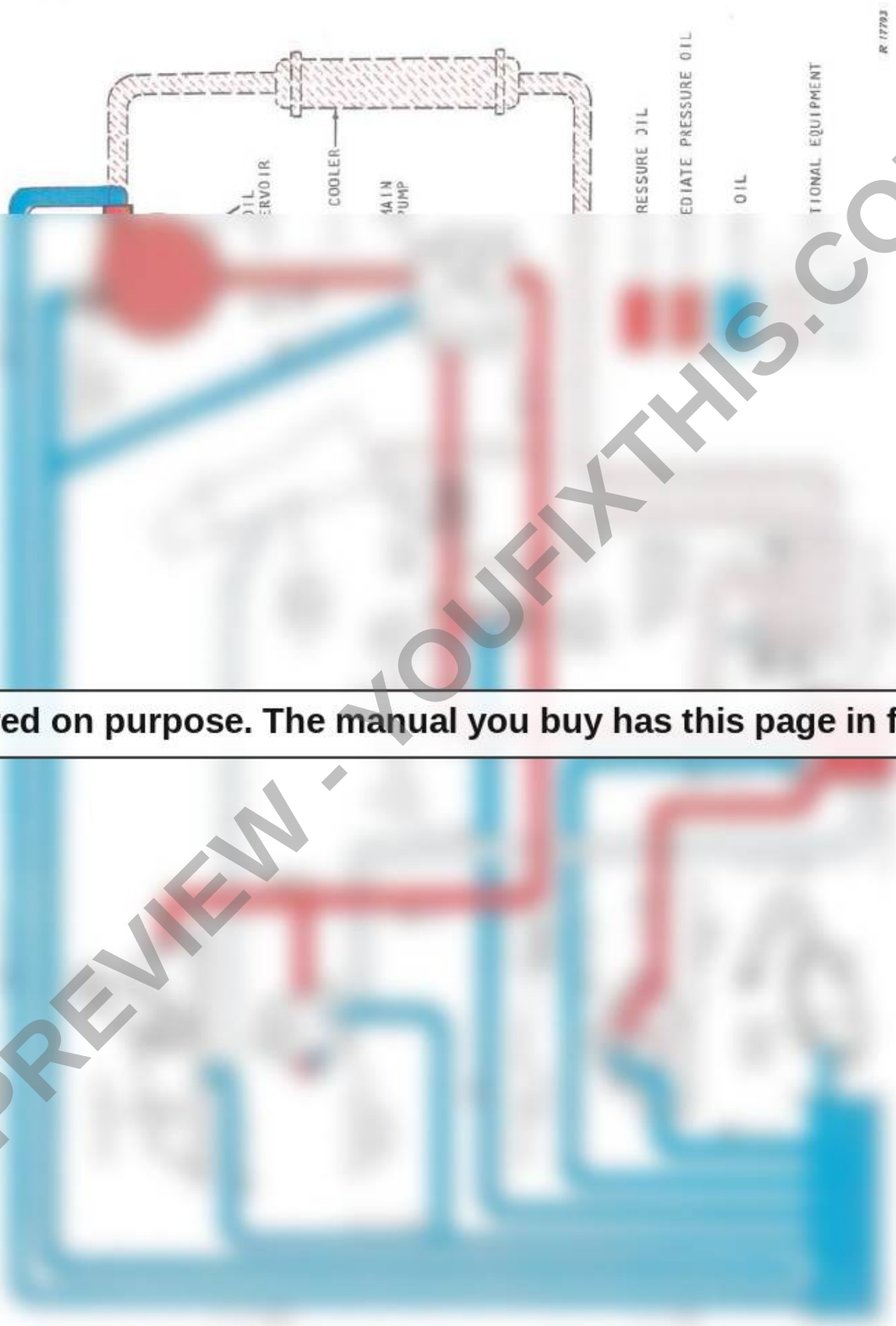


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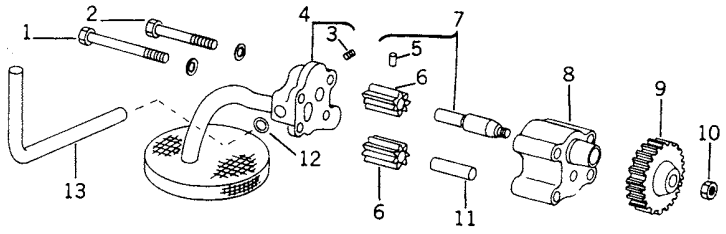
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1—Cap Screw
2—Cap Screw
3—Plug
4—Pump Cover and Filter Screen
5—Spring Pin
6—Pump Gear
7—Drive Shaft
8—Pump Body
9—Pump Drive Gear
10—Hex. Nut
11—Idler Shaft
12—O-Ring
13—Outlet Tube

Fig. 2-Exploded View of Oil Pump

REMOVAL

Oil Pump

Remove oil pan and timing gear cover.

Turn the engine until No. 1 piston is at "TDC" on compression stroke and insert timing pin.

To remove drive gear, turn nut out flush with end of shaft. Tap nut with hammer to free shaft from gear.

INSPECTION AND REPAIR

Check clearance height of gears with a feeler gauge and a straightedge placed across housing above gears. Replace gears or housing, if necessary.

Check clearance between gear teeth and housing. Replace gears if necessary.

Remove drive shaft and pump gear. Inspect pump shaft for scoring or wear. Check gear for wear, broken teeth or damage. Be sure that drive shaft groove pin has not sheared. Replace parts as necessary.

NOTE: If pump drive shaft (7, Fig. 2) must be replaced, it must be replaced as an assembly with gear and spring pin.

Remove idler gear. Press idler gear shaft from housing, if necessary. Inspect and replace parts as necessary.

ASSEMBLY

If idler shaft (11, Fig. 2) was removed, press shaft into pump body (8) until flush with outer surface.

Install drive shaft with gear and idler gear. Both gears must rotate freely.

Install O-ring (12) in oil pump cover.

INSTALLATION

Install oil pump assembly in engine.

Install oil pump drive gear, tighten nut to specified torque, and stake nut to shaft.

Install engine oil pan, using new gasket.

Oil Filter

Install sealing ring in bottom of element and coat with thin film of oil. Turn element by hand until sealing ring contacts mounting pad and tighten to specification.

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Group 5
GENERAL INFORMATION AND DIAGNOSIS

GENERAL INFORMATION

The engine is a 4-cylinder valve-in-head, vertical in-line four cycle engine. Two types of fuel each with the appropriate fuel delivery device are available—gasoline, and diesel.



For basic theory of engine operation see the FOS Manual 30—ENGINES.

DIAGNOSING MALFUNCTIONS

Will Not Start

Fuel System Malfunction—See Section 30
- Foreign matter in fuel
- Improper fuel
- Faulty fuel pump
- Fuel shut off at tank
- Restricted air intake system
- Faulty injection nozzles
- Plugged fuel filter
- Carburetor malfunction
- Sticking choke

Electrical System Malfunction—See Section 40
- Corroded or loose battery connections
- Faulty or loose wiring
- Weak battery
- Faulty key switch
- Faulty safety start switches
- Faulty ignition system

Uneven Running or Frequent Stalling

Basic Engine Problem—See This Section
- Improper valve clearance.
- Cylinder head gasket leaking
- Valves sticking or burned
- Worn or broken compression rings
- Low compression
- Incorrect timing
- Coolant temperature below normal
- Engine overheating

Fuel System Malfunction—See Section 30
- Low fuel supply
- Restricted fuel lines or filters
- Faulty fuel pump
- Faulty injection pump
- Faulty injection nozzles
- Exhaust system restricted
- Carburetor adjusted incorrectly
- Leaking carburetor or intake manifold gaskets

Electrical System Malfunction—See Section 40
- Faulty ignition system

Engine Misses

Basic Engine Problem—See This Section
- Worn camshaft lobes
- Weak valve springs
- Incorrect valve clearance
- Burned, warped, pitted or sticking valves
- Low compression
- Incorrect timing
- Engine overheating
- Faulty governor
- Detonation or pre-ignition

Fuel System Malfunction—See Section 30
- Air in fuel
- Faulty injection nozzles
- Faulty injection pump
- Water in fuel
- Mixture of gasoline and diesel fuels
- Faulty fuel pump
- Faulty carburetor

Electrical System Malfunction—See Section 40
- Incorrect type spark plugs (pre-ignition)
- Leaks in wiring
- Faulty ignition system

Lack of Power

Basic Engine Problem—See This Section
- Blown cylinder head gasket
- Worn camshaft lobes
- Incorrect valve clearance
- Burned, warped, pitted or sticking valves
- Weak valve springs
- Incorrect timing
- Low compression
- Wrong oil viscosity
- Coolant temperature above or below normal
- Engine overheating
- Incorrect throttle linkage
- Governor binds

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All information, illustrations and specifications contained in this technical manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

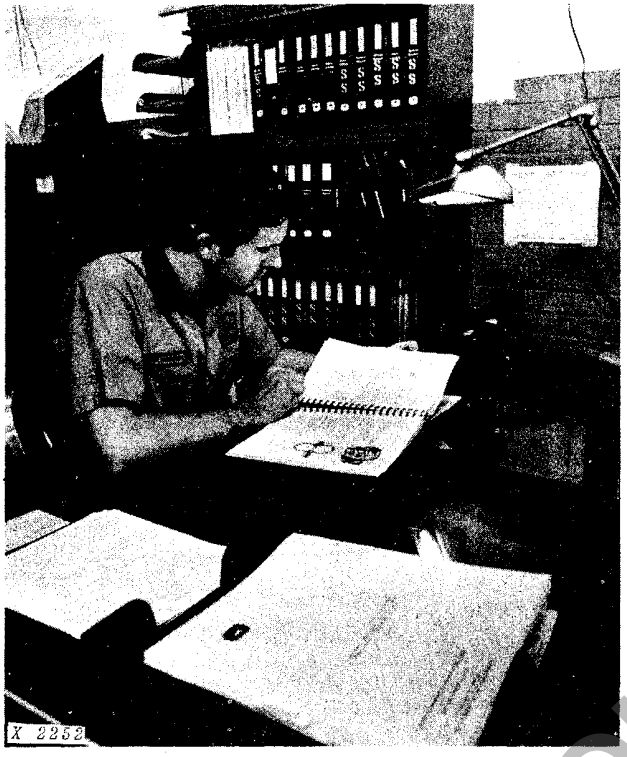
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INTRODUCTION



Use FOS Manuals for Reference



Use Technical Manuals for Actual Service

This technical manual is part of a twin concept of service:

- **FOS Manuals—for reference**
- **Technical Manuals—for actual service.**

The two kinds of manuals work as a team to give you both the general background and technical details of shop service.

Fundamentals of Service (FOS) Manuals cover *basic* theory of operation, *fundamentals* of trouble shooting, *general* maintenance, and *basic* types of failures and their causes. FOS Manuals are for training new men and for reference by experienced men.

Technical Manuals are concise service guides for a *specific* machine. Technical Manuals are on-the-job guides containing only the vital information needed by a journeyman mechanic.



When a serviceman should refer to a FOS Manual for more information, a FOS symbol like the one at the left is used in the TM to identify the reference.

Some features of this technical manual:

- *Table of contents at front of whole manual*
- *Contents at front of each Section*
- *Specifications at end of each Group*
- *Special tools at end of each Group*

This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

This technical manual was planned and written for you—a journeyman mechanic. Keep it in a permanent binder in the shop where it is handy. Refer to it whenever in doubt about correct service procedures or specifications.

Using the technical manual as a guide will reduce error and costly delay. It will also assure you the best in finished service work.

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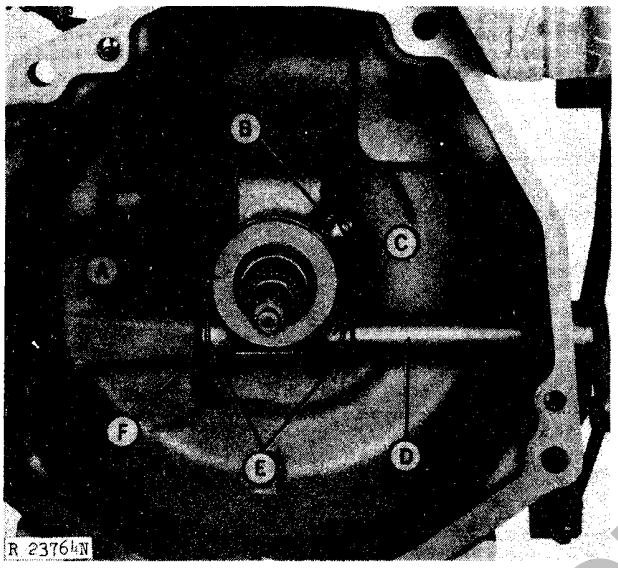
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CLUTCH HOUSING AND CONTROLS

Repair

Separate engine from clutch housing as instructed in Section 10, Group 25.

Clutch Throw-Out Bearing and Bearing Carrier

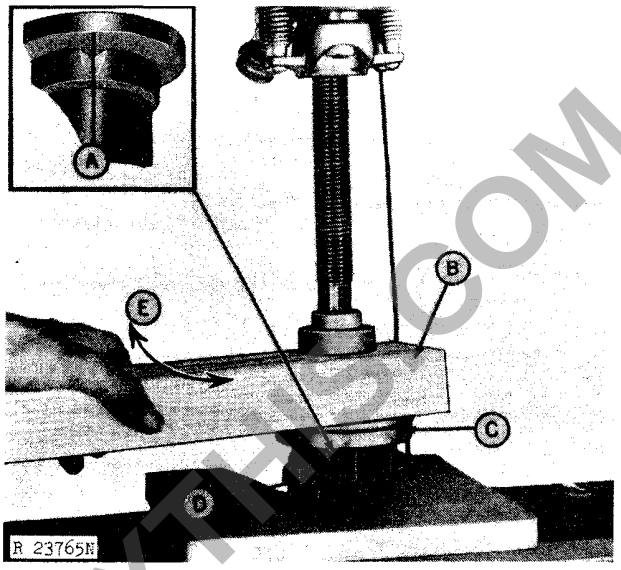


A—Throw-Out Bearing
B—Return Spring
C—Clutch Fork
D—Clutch Shaft
E—Spring Pins
F—Lock Wire

Fig. 15-Clutch Controls in Clutch Housing

Check throw-out bearing (A, Fig. 15) for evidence of overheating. If bearing appears to have been overheated or is rough, replace it.

Throw-out bearing should not be soaked in solvent as it is pre-packed with grease. Wipe clean with cloth dampened in solvent. NEVER attempt to oil the bearing.



A—Indexing Mark
B—Wooden Block
C—Throw-out Bearing
D—Bearing Carrier
E—Rotation of Bearing

Fig. 16-Replacing Throw-out Bearing

If throw-out bearing (C) requires replacing, press new bearing onto carrier with the highly polished surface out. Index scribe mark with notch on carrier (A, Fig. 16).

Prevent damage to bearing balls by inserting a block of wood (B) between bearing and arbor or similar means to rotate bearing while installing (E). Do not use excessive pressure.

Refer to Fig. 17 for a proper relationship of parts when repairing clutch controls.

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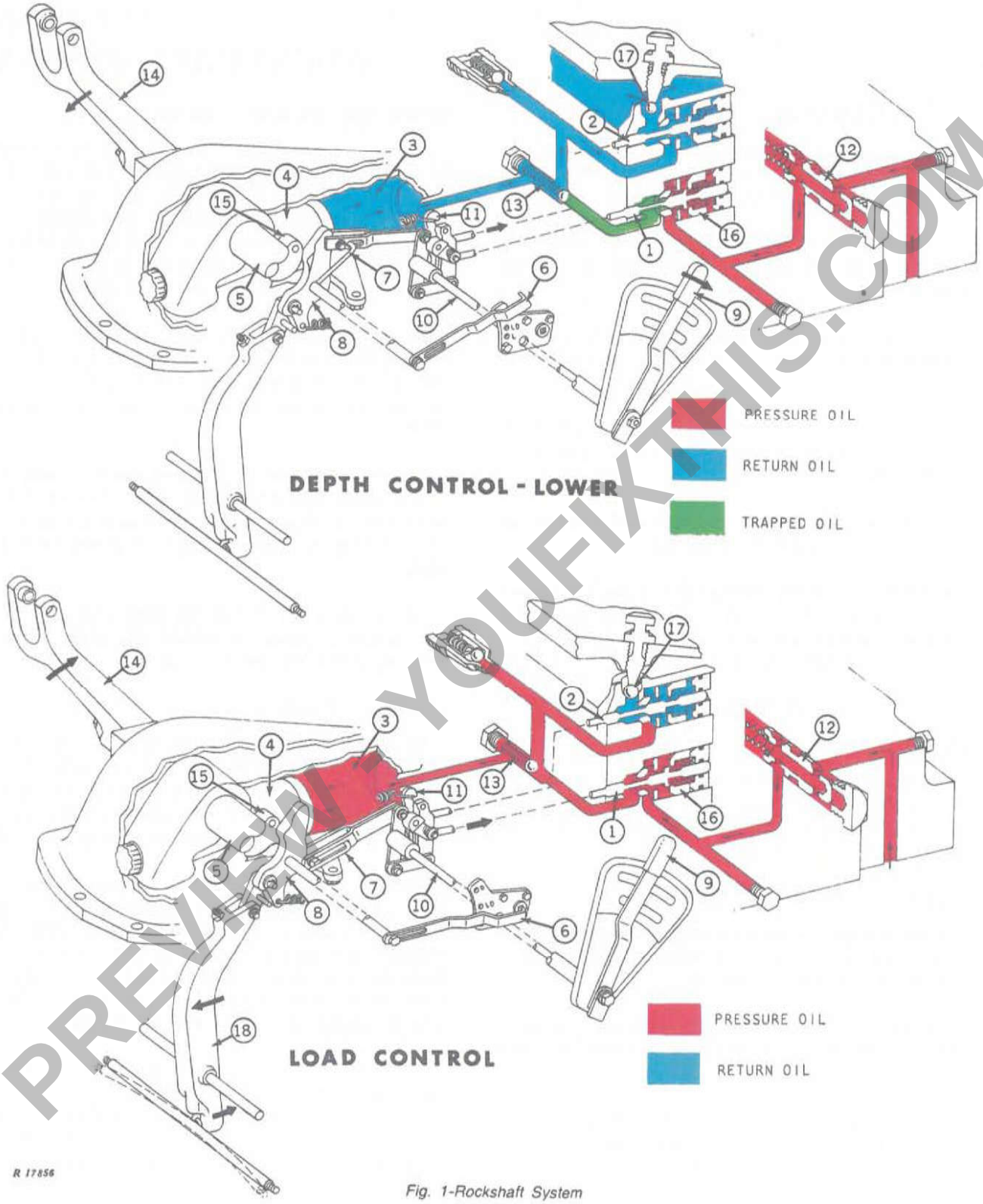


Fig. 1-Rockshaft System

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