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Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

If this product contains a gasoline engine:

 **WARNING**

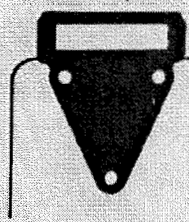
The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

The State of California requires the above two warnings.

**Worldwide Construction
And Forestry Division**

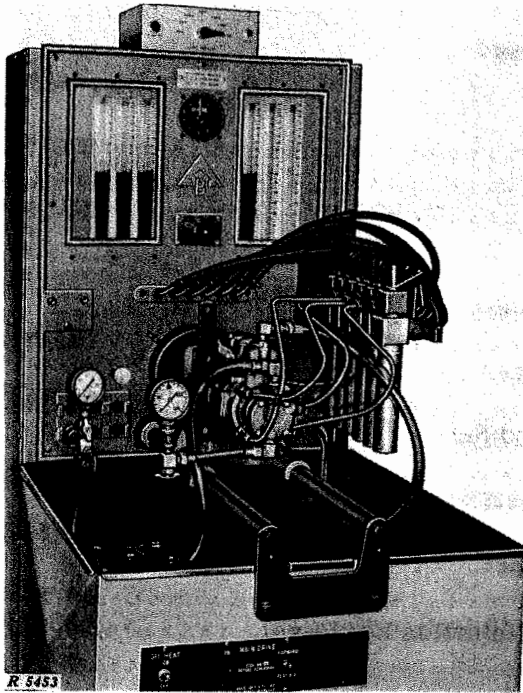
FUEL INJECTION
PUMPS & NOZZLES

FUEL INJECTION
PUMPS & NOZZLES



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SERVICE MANUAL FOR JOHN DEERE DEALERS



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PURPOSE OF MANUAL

This manual is expressly intended to provide sufficient information for qualified technicians, experienced in diesel engines and diesel injection equipment, to test and service the fuel injection pumps and nozzles used on John Deere tractors and power units and to make such adjustments and parts replacements as may be needed. Inexperienced persons should never make adjustments and repairs to diesel injection equipment as such action may result in very extensive damage to the equipment or to the engine.

NOTE: No service should be performed on injection equipment before making a careful study of the manual and becoming familiar with the principles and instructions which follow:

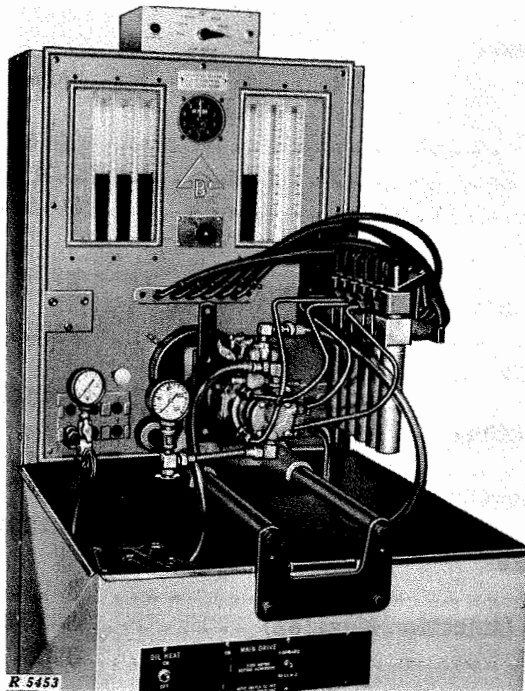
This manual completely describes the operating principles of the various mechanisms of the pump and nozzles. Only through a thorough knowledge of the principles of the various mechanisms can the serviceman locate and correct possible operational faults.

 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.

 **CAUTION:** Escaping fluid under pressure can have sufficient force to penetrate the skin, causing serious personal injury. Before applying pressure to the system, be sure all connections are tight and that lines, pipes and hoses are not damaged. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than hands, to search for suspected leaks.

If injured by escaping fluid, see a doctor at once. These injuries are best treated by immediate surgical removal of as much of the foreign material as possible.

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Section 5 DIAGNOSIS-ALL ROOSA MASTER PUMPS

Group 5 DIAGNOSING PUMP MALFUNCTIONS

Pump Affected				
D	J	J	C	C
B	D	D		B
B	C			

Pump Affected				
D	J	J	C	C
B	D	D		B
B	C			

FUEL NOT REACHING PUMP

X	X	X	X	X	Tank valve closed. Open valve.
X	X	X	X	X	Filters or inlet strainer clogged. Remove and replace clogged elements. Clean strainer.
X	X	X	X	X	Fuel too heavy at low temperatures. Drain fuel. Refill with correct fuel.
X	X	X	X	X	Transfer pump blades worn or broken. Replace.
X	X	X	X	X	Fuel supply lines clogged, restricted, wrong size, or poorly located. Blow out all fuel lines with filtered air. Replace if damaged. Remove and inspect all flexible lines.
X	X	X	X	X	Regulating piston sticking. Remove piston and sleeve and inspect for burrs, corrosion, or varnishes. Replace if necessary.
X	X	X	X	X	Air leaks on suction side of system. Trouble shoot system for air leaks.
X	X	X	X	X	Transfer pump liner locating pin in wrong hole for correct rotation. Install properly.
X	X	X	X	X	Seizure of distributor rotor. Check for cause of seizure. Replace hydraulic head and distributor rotor assembly.

FUEL DELIVERED FROM TRANSFER PUMP BUT NOT TO NOZZLES

X	X	X	X	X	Metering valve incorrectly assembled to metering valve arm. Reassemble correctly.
X	X	X	X	X	Cam backwards in housing. Reassemble correctly.
X	X	X	X	X	Plunger missing. Install new plunger.

FUEL DELIVERED FROM TRANSFER PUMP BUT NOT TO NOZZLES (Cont.)

X	X	X	X	X	Head plug screws loose or missing. Install as indicated in assembly instructions.
X	X	X			Hydraulic head vent wires missing. Install as indicated in assembly instructions.
X	X	X			Metering valve spring shim missing. Install as indicated in assembly instructions.
X	X	X	X	X	Failure of electric shut-off. Remove, inspect, and adjust parts. Replace parts as necessary.
X	X	X	X	X	One or more connector screws obstructed. Replace.
X			X	X	Shut-off device at "stop" position. Move to "run" position.
X	X	X	X	X	Metering valve sticking or closed. Check for governor linkage binding, foreign matter, burrs, etc.
X	X	X	X	X	Governor spring worn or broken. Remove and replace.
X	X	X			Governor linkage broken. Remove, replace, and adjust per specifications.
X	X	X	X	X	Governor not operating; parts or linkage worn, sticking or binding or incorrectly assembled. Disassemble, inspect parts, and replace if necessary.
X	X				Torque screw incorrectly adjusted. Adjust to specifications.
X	X	X	X	X	Fuel supply lines clogged; restricted, wrong size, or poorly located. Blow out all fuel lines with filtered air. Replace if damaged. Remove and inspect all flexible lines.
X	X	X	X	X	Cam roller shoes sticking. Remove shoes and check for size and burrs.

Pump Affected				
D	J	J	C	C
B	D	D		B
B	B	C		B
FUEL DELIVERED FROM TRANSFER PUMP BUT NOT TO NOZZLES (Cont.)				
X	X	X	X	X
Plungers sticking. Disassemble and inspect for burrs, corrosion, or varnishes.				
X	X	X	X	X
Passage from transfer pump to metering valve clogged with foreign matter. Disassemble and flush out hydraulic head.				
X	X	X	X	X
Rotor badly scored. Replace hydraulic head and rotor assembly.				
FUEL REACHING NOZZLES BUT ENGINE WON'T START				
X	X	X	X	X
Wrong cam hole cover (incorrect cam position). Install correct cover.				
X	X	X	X	X
Head plug screws loose or missing. Install as indicated in assembly instructions.				
X	X	X	X	X
Cranking speed too slow. Charge or replace batteries.				
X	X	X	X	X
Engine engaged with load. Disengage load.				
X	X	X	X	X
Pump timed incorrectly to engine. Correct timing.				
X	X	X	X	X
Throttle arm travel not sufficient. Check installation and adjust throttle linkage.				
X	X	X	X	X
Intake air temperature low. Provide starting aids.				
X	X	X	X	X
Water in fuel. Drain fuel system and pump housing. Provide new fuel and prime system.				
X	X	X	X	X
Fuel lines incorrect, leaking, or connected to wrong cylinders. Relocate lines for correct engine firing sequence.				
X	X	X	X	X
Fuel lines clogged, restricted, wrong size or poorly located. Blow out all fuel lines with filtered air. Replace if damaged. Remove and inspect all flexible lines.				
X	X	X		
Shut-off device interfering with governor linkage. Check and adjust governor linkage dimension.				

Pump Affected				
D	J	J	C	C
B	D	D		B
B	B	C		B
FUEL REACHING NOZZLES BUT ENGINE WON'T START (Cont.)				
X	X			
Torque screw incorrectly adjusted. Adjust to specifications.				
X	X	X	X	X
Nozzles faulty or sticking. Replace or correct nozzles.				
X	X	X	X	X
Automatic advance faulty or not operating. Remove, inspect, correct and reassemble.				
X	X	X	X	X
Maximum fuel setting at low limit or too low. Reset to pump specifications.				
X	X	X	X	X
Low cetane fuel. Provide fuel per engine specifications.				
X	X	X	X	X
Cam, shoes, or rollers worn. Remove and replace.				
X	X	X	X	X
Excessive fuel leakage past plungers (worn or badly scored). Replace rotor and hydraulic head assembly.				
X	X	X	X	X
Rotor badly scored. Replace hydraulic head and rotor assembly.				
X	X	X	X	X
Engine compression poor. Correct compression.				
X	X	X	X	X
Crankcase oil too heavy at low temperature. Change to lighter viscosity oil.				
ENGINE STARTS HARD				
X	X	X	X	X
Delivery valve sticking, missing or assembled backwards. Remove, clean, or replace as necessary.				
X	X	X	X	X
Wrong cam hole cover (incorrect cam position). Install correct cover.				
X	X	X	X	X
One or more connector screws obstructed. Replace.				
X	X	X	X	X
Engine engaged with load. Disengage load.				
X	X	X	X	X
Cranking speed too low. Charge or replace batteries.				
X	X	X	X	X
Intake air temperature low. Provide starting aids.				
X	X	X	X	X
Pump timed incorrectly to engine. Correct timing.				

Pump
Affected
D J J C C
B D D C B

ENGINE STARTS HARD (Cont.)

X	X	X	X	X	Fuel supply lines clogged, restricted, wrong size, or poorly located. Blow out all lines with filtered air. Replace if damaged. Remove and inspect all flexible lines.
X	X	X	X	X	Air leaks on suction side of system. Inspect the system for air leaks.
X	X	X	X	X	Fuel too heavy at low temperature. Drain fuel system. Refill with correct fuel for prevailing temperature.
X	X	X	X	X	Crankcase oil too heavy at low temperature. See operator's manual.
X	X	X	X	X	Water in fuel. Drain fuel system and pump housing. Provide new fuel and bleed system.
X	X	X	X	X	Engine compression poor. Correct compression.
X	X	X	X	X	Low cetane fuel. Provide fuel per engine specifications.
X	X	X	X	X	Transfer pump blades worn or broken. Replace.
X	X	X	X	X	Pressure regulating piston sticking in its bore. Remove piston and sleeve. Inspect for burrs, corrosion, or varnishes. Replace if necessary.
X	X	X	X	X	Metering valve sticking or closed. Check for governor linkage binding, foreign matter, burrs, etc.
X	X	X			Shut-off device interfering with governor linkage. Check and adjust governor linkage.
X	X	X	X	X	Governor linkage out of adjustment. Adjust governor.
X	X	X	X	X	Governor not operating; parts or linkage worn, sticking or binding, or incorrectly assembled. Disassemble, inspect parts, and replace if necessary.
X	X	X	X	X	Maximum fuel setting at low limit or set too low. Set pump to specifications.
X	X	X	X	X	Cam shoes or rollers worn. Remove and replace.

Pump
Affected
D J J C C
B D D B C B

ENGINE STARTS HARD (Cont.)

X	X	X	X	X	Plungers sticking. Disassemble and inspect for burrs, corrosion, or varnishes.
X	X	X	X	X	Excessive fuel leaking past plungers (worn or badly scored). Replace head, rotor, and pump housing.
X	X				Torque screw incorrectly adjusted. Adjust to specifications.
X	X	X	X	X	Automatic advance faulty or not operating. Remove, inspect, correct and reassemble.
X	X	X	X	X	Delivery valve retainer screw loose and leaking or incorrectly installed. Inspect delivery valve stop seat for erosion, tighten retainer screw, or replace head and rotor assembly as needed.
X	X	X	X	X	Nozzles faulty or sticking. Replace or correct nozzles.
X	X	X	X	X	Rotor badly scored. Replace hydraulic head and rotor assembly.
X	X	X	X	X	Engine valves faulty or out of adjustment. Correct valves or valve adjustment.
X	X	X	X	X	Return fuel line or fittings restricted. Remove line, blow clean with filtered air, and assemble. Replace if damaged.
X	X	X	X	X	Engine cold. Check thermostats. Warm to operating temperature.
ENGINE STARTS AND STOPS					
X	X	X	X	X	Failure of electric shut-off. Remove, inspect, and adjust parts. Replace parts as necessary.
X	X	X	X	X	Fuel supply lines clogged, restricted, wrong size or poorly located. Blow out all fuel lines with filtered air. Replace if damaged. Remove and inspect all flexible lines.
X	X	X	X	X	Water in fuel. Drain fuel system and pump housing, provide new fuel and bleed system.

Pump Affected				
D	J	J	C	C
B	D	D	B	B
ENGINE STARTS AND STOPS (Cont.)				
X	X	X	X	X
Air intake restricted. Check.				
X	X	X	X	X
Return oil line or fittings restricted. Remove line, blow clean with filtered air, and assemble. Replace if damaged.				
X	X	X	X	X
Engine overheating. See tractor's manual.				
X	X	X	X	X
Filters or inlet strainer clogged. Remove and replace clogged elements. Clean strainer.				
X	X	X		
Restriction of AT16522T fuel return fitting. Remove and clean fitting.				
X	X	X	X	X
Air leaks on suction side of system. Inspect system for leaks.				
X	X	X	X	X
Metering valve sticking or closed. Check for governor linkage binding, foreign matter, burrs, etc.				
X	X	X	X	X
Transfer pump blades worn or broken. Replace.				
X	X	X	X	X
Cam roller shoes sticking. Remove, check for size and burrs, and assemble.				
X	X	X	X	X
Plungers sticking. Disassemble and correct for burrs, corrosion, or varnishes.				
ERRATIC ENGINE OPERATION—SURGE, MISFIRING, POOR GOVERNOR REGULATION				
X	X	X	X	X
Wrong cam hole cover (incorrect cam position). Install correct cover.				
X	X	X	X	X
Metering valve assembled incorrectly. Install as indicated in assembly instructions.				
X	X	X	X	X
Idling spring missing or incorrect. Assemble as indicated in assembly instructions.				
X	X	X	X	X
Delivery valve sticking, missing or assembled backwards. Remove, clean, or replace as needed.				
X	X	X	X	X
Head plug screws loose or missing. Install as indicated in assembly instructions.				

Pump Affected				
D	J	J	C	C
B	D	D	B	B
ERRATIC ENGINE OPERATION—SURGE, MISFIRING, POOR GOVERNOR REGULATION (Cont.)				
X	X	X	X	X
Fuel lines incorrect, leaking, or connected to wrong cylinders. Relocate lines for correct engine firing sequence.				
X	X	X	X	X
Fuel supply lines clogged, restricted, wrong size, or poorly located. Blow out all fuel lines with filtered air. Replace if damaged. Remove and inspect all flexible lines.				
X	X	X	X	X
Filters inlet strainer clogged. Remove and replace clogged element. Clean strainer.				
X	X	X	X	X
Pump timed incorrectly to engine. Correct timing.				
X	X	X	X	X
Water in fuel. Drain fuel system and pump housing. Provide new fuel and bleed system.				
X	X	X	X	X
Low cetane fuel. Provide proper fuel.				
X	X	X	X	X
Pump housing not full of fuel. Operate engine for approximately 5 minutes until pump fills with fuel.				
X	X	X	X	X
Air leaks on suction side of system. Inspect for air leaks.				
X	X	X	X	X
Nozzles faulty or sticking. Replace or correct nozzles.				
X	X	X	X	X
Engine valves faulty or out of adjustment. Correct valves or valve adjustment.				
X	X	X		
Plugged AT16555T vent fitting. Clean fitting and check metering wire for free movement.				
X	X	X		
AT16552T return fitting check ball held open by foreign matter. Clean fitting.				
X	X	X	X	X
Nozzle return lines clogged. Remove lines, blow out, inspect, and assemble.				
X	X	X	X	X
Automatic advance faulty or not operating. Remove, inspect, correct, and assemble.				
X	X	X	X	X
Metering valve sticking or closed. Check for governor linkage binding, foreign matter, burrs, etc.				

Pump Affected					
D	J	J	C	C	
B	D	D		B	
B	B	C			
					ERRATIC ENGINE OPERATION—SURGE, MISFIRING, POOR GOVERNOR REGULATION (Cont.)
X	X	X	X	X	Governor not operating; parts or linkage worn, sticking or binding, or incorrectly assembled. Disassemble, inspect parts, replace if necessary, and assemble.
X	X	X	X	X	Governor spring worn or broken. Remove and replace.
X	X	X	X	X	Governor linkage out of adjustment. Adjust.
X	X	X	X	X	Wrong governor spring. Remove and replace with proper spring.
X	X	X	X	X	Transfer pump blades worn or broken. Replace.
X	X	X	X	X	Transfer pump faulty; pressure too low. Remove and inspect parts.
X	X	X	X	X	Pressure regulating piston sticking. Remove piston and sleeve. Inspect for burrs, corrosion, or varnishes. Replace if necessary.
X	X	X	X	X	Delivery valve retainer screw loose and leaking or incorrectly installed. Inspect delivery valve stop seat for erosion, tighten retainer screw, or replace head and rotor assembly.
X	X	X	X	X	Cam roller shoes sticking. Remove, check for size and burrs, and assemble.
X	X		X	X	Tang drive worn. Remove and install new head and rotor assembly and drive shaft.
X	X	X	X	X	Plungers sticking. Disassemble and inspect for corrosion or varnishes.
X	X	X			Variable speed droop device incorrectly adjusted or faulty. Replace as necessary.
X	X	X	X	X	One or more connector screws obstructed. Replace.
X	X	X	X	X	Engine compression poor. Correct.
X	X	X	X	X	Air intake restricted. See operator's manual.
X	X	X	X	X	Fuel too heavy at low temperature. See operator's manual.

Pump Affected					
D	J	J	C	C	
B	D	D		B	
B	B	C			
					ENGINE IDLES IMPERFECTLY
X	X	X	X	X	Metering valve incorrectly assembled. Assemble correctly.
X	X	X	X	X	Idling spring missing or incorrect. Assemble as indicated in assembly instructions.
X	X	X	X	X	Wrong cam hole cover (incorrect cam position). Install correct cover.
X	X	X	X	X	Head plug screws loose or missing. Install as indicated in assembly instructions.
X	X	X	X	X	Delivery valve sticking, missing, or assembled backwards. Remove, clean, or replace as needed.
X	X	X	X	X	Water in fuel. Drain fuel system and pump housing, provide new fuel and bleed system.
X	X	X	X	X	Pump housing not full of fuel. Operate engine for approximately 5 minutes until pump fills with fuel.
X	X	X	X	X	Air leaks on suction side of system. Inspect the system for leaks.
X	X	X	X	X	Pump timed incorrectly to engine. Correct timing.
X	X	X	X	X	Transfer pump blades worn or broken. Replace.
X	X	X	X	X	Governor not operating; parts or linkage worn, sticking or binding, or incorrectly assembled. Disassemble, inspect parts, and replace if necessary.
X	X	X	X	X	Metering valve sticking or closed. Check for governor linkage binding, foreign matter, burrs, etc.
X	X	X	X	X	Governor linkage out of adjustment. Adjust.
X	X	X	X	X	Nozzles faulty or sticking. Replace or correct nozzles.
X	X	X	X	X	Automatic advance faulty or not operating. Remove, inspect, correct and assemble.
X	X	X	X	X	Pressure regulating piston sticking. Remove piston and sleeve and inspect for burrs, corrosion, or varnishes. Replace if necessary.

Pump
Affected
D J J C C
B D B C B

**ENGINE IDLES IMPERFECTLY
(Cont.)**

X	X	X	X	X	Fuel supply lines or connectors clogged, restricted, wrong size, or poorly located. Blow out all fuel lines with filtered air. Replace if damaged. Remove and inspect all flexible lines.
X	X	X	X	X	Low cetane fuel. Provide proper fuel.
X	X	X	X	X	Governor spring worn or broken. Remove and replace.
X	X	X	X	X	Engine valves faulty or out of time. Correct valves or valve adjustment.
X	X	X			Governor linkage broken. Remove, replace, and adjust.
X	X	X	X	X	Excessive fuel leakage past plungers. Replace rotor and hydraulic head assembly.
X	X	X	X	X	Plungers sticking. Disassemble and inspect for burrs, corrosion, or varnishes.
X	X	X	X	X	Return oil line or fittings restricted. Remove, blow clean with filtered air, and reassemble. Replace if damaged.
X	X	X	X	X	Engine compression poor. Correct cause of poor compression.
X	X	X	X	X	Filters clogged. Remove and clean or replace as necessary.
X	X	X	X	X	Wrong governor spring. Replace with correct spring.
X	X	X	X	X	Engine cold. Check thermostats.
			X	X	Vent hole clogged in air separator. Disassemble and flush out hydraulic head.

**ENGINE DOES NOT DEVELOP FULL
POWER OR SPEED**

X	X	X	X	X	Wrong cam hole cover (incorrect cam position). Install correct cover.
X	X	X	X	X	Delivery valve sticking, missing, or assembled backwards. Remove, clean, or replace as necessary.

Pump
Affected
D J J C C
B D B C B

**ENGINE DOES NOT DEVELOP FULL
POWER OR SPEED (Cont.)**

X	X	X	X	X	Head plug screws loose or missing. Install as indicated in assembly instructions.
X	X	X			Hydraulic head vent wires missing. Install as indicated in assembly instructions.
X	X	X	X	X	One or more connector screws obstructed. Replace.
X	X	X	X	X	Throttle arm travel not sufficient. Check installation and adjust throttle linkage.
X	X	X			Shut-off device interfering with governor linkage. Check and adjust governor linkage.
X	X	X	X	X	Governor high-idle adjustment incorrect. Adjust to pump specifications.
X	X	X	X	X	Fuel supply lines clogged, restricted, wrong size, or poorly located. Blow out all fuel lines with filtered air. Replace if damaged. Remove and inspect all flexible lines.
X	X	X	X	X	Air leaks on suction side of system. Inspect the system for air leaks.
X	X	X	X	X	Filters or inlet strainer clogged. Remove and replace clogged elements. Clean strainer.
X	X	X	X	X	Pump timed incorrectly to engine. Correct timing.
X	X	X	X	X	Return oil line or fittings restricted. Remove line, blow clean with filtered air. Replace, if damaged.
X	X	X	X	X	Governor not operating; parts or linkage worn, sticking or binding, or incorrectly assembled. Disassemble, inspect parts, replace, if necessary, and assemble.
X	X	X	X	X	Metering valve sticking or closed. Check for governor linkage binding, foreign matter, burrs, etc.
X	X	X	X	X	Automatic advance faulty or not operating. Remove, inspect, correct, and assemble.
X	X	X	X	X	Transfer pump blades worn or broken. Replace.

Pump Affected				
D	J	J	C	C
B	D	D		B
B	B	C		B
ENGINE DOES NOT DEVELOP FULL POWER OR SPEED (Cont.)				
X	X	X	X	X
Maximum fuel setting at low limit or too low. Reset to pump specifications.				
X	X	X	X	X
Cam, shoes, or rollers worn or sticking. Remove and replace.				
X	X	X	X	X
Plungers sticking. Disassemble and inspect for burrs, corrosion, or varnishes.				
X	X	X	X	X
Excessive leakage past plungers (worn or badly scored). Replace rotor and hydraulic head assembly.				
X	X		X	X
Tang drive worn. Remove and install new head and rotor assembly and drive shaft as necessary.				
X	X	X	X	X
Rotor badly scored. Replace hydraulic head and rotor assembly.				
X	X	X	X	X
Low cetane fuel. Provide proper fuel.				
X	X	X	X	X
Delivery valve retainer screw loose and leaking or incorrectly installed. Inspect delivery valve stop seat for erosion, tighten retainer screw, or replace head and rotor assembly as needed.				
X	X			
Torque screw incorrectly adjusted. Adjust to specification.				
X	X	X	X	X
Water in fuel. Drain fuel system and pump housing. Provide new fuel and bleed system.				
X	X	X	X	X
Engine compression poor. Correct compression.				
X	X	X	X	X
Air intake restricted. Check.				
X	X	X	X	X
Wrong governor spring. Remove and replace with proper spring.				
X	X	X	X	X
Fuel lines incorrect, leaking or connected to wrong cylinders. Relocate lines for correct firing sequence.				
X	X	X	X	X
Transfer pump liner locating pin not in place. Install locating pin.				
X	X	X	X	X
Metering valve incorrectly installed. Install correctly.				

Pump Affected				
D	J	J	C	C
B	D	D		B
B	B	C		B
ENGINE DOES NOT DEVELOP FULL POWER OR SPEED (Cont.)				
				X
Metering valve shims missing or wrong size. Install as indicated in assembly.				
X	X	X	X	X
Pressure regulating valve sticking. Remove and inspect. Replace if necessary.				
X	X	X	X	X
Governor control spring worn or broken. Remove and replace.				
X	X	X	X	X
Nozzles faulty or sticking. Replace or correct nozzles.				
X	X	X	X	X
Engine valves faulty or out of adjustment. Correct valves or valve adjustment.				
X	X	X	X	X
Return line or fittings restricted. Remove line, blow clean with filtered air and reassemble. Replace if necessary.				
X	X	X	X	X
Pump housing not full of fuel. Operate pump for approximately 5 minutes to fill with fuel.				
X	X	X	X	X
Metering valve binding. Remove, inspect for dirt, burrs, etc. Correct and reassemble.				
			X	X
Vent hole clogged in air separator. Disassemble and flush hydraulic head.				
ENGINE SMOKES BLACK				
X	X	X	X	X
Wrong cam hole cover (incorrect cam position). Install correct cover.				
X	X	X	X	X
Exceeding rated load. Reduce load on engine.				
X	X	X	X	X
Air intake restriction. Check.				
X	X	X	X	X
Engine overheating. Locate cause and correct.				
X	X	X	X	X
Pump timed incorrectly to engine. Correct timing.				
X	X	X	X	X
Nozzles faulty or sticking. Replace or correct nozzles.				
X	X	X	X	X
Engine valves faulty or out of adjustment. Correct valves or valve adjustment.				

Pump
Affected
D J J C C
B D D B B

ENGINE SMOKES BLACK (Cont.)

X	X	X	X	X	Automatic advance faulty or not operating. Remove, inspect, correct, and re-assemble.
X	X	X	X	X	Low cetane fuel. Provide proper fuel.
X	X	X	X	X	Engine compression poor. Correct compression.
X	X	X	X	X	Cam, shoes, or rollers worn. Remove and replace.
X	X	X	X	X	Maximum fuel setting too high. Reset pump to specifications.
X	X				Torque screw incorrectly adjusted. Adjust to specifications.
X	X	X	X	X	Transfer pump liner locating pin not in place. Install locating pin.
X	X	X	X	X	Transfer pump blades worn or broken. Replace.
X	X	X	X	X	Housing pressure regulator valve sticking. Remove and inspect. Replace if necessary.

ENGINE SMOKES BLUE OR WHITE

X	X	X	X	X	Wrong cam hole cover (incorrect cam position). Install correct cover.
X	X	X	X	X	Engine cold. Check thermostats.

Pump
Affected
D J J C C
B D D B B

ENGINE SMOKES BLUE OR WHITE (Cont.)

X	X	X	X	X	Excess oil in engine air cleaner. Remove, check, and replace oil quantity to specified level.
X	X	X	X	X	Pump timed incorrectly to engine. Correct timing.
X	X	X	X	X	Automatic advance faulty or not operating. Remove, inspect, and correct.
X	X		X	X	Tang drive worn. Remove and install new head and rotor assembly and drive shaft as necessary.
X	X	X	X	X	Oil pumping past valve guides or piston rings in engine. Correct.
X	X	X	X	X	Cranking speed too low. Charge or replace batteries.
X	X	X	X	X	Engine compression poor. Correct compression.
X	X	X	X	X	Engine valves faulty or out of adjustment. Correct valves or valve adjustment.
X	X	X	X	X	Housing pressure regulating valve sticking. Remove and inspect. Replace if necessary.
X	X	X	X	X	Transfer pump faulty. Pressure too low. Remove and inspect parts.

Section 10

ROOSA MASTER MODEL DB AND JDB PUMPS

Group 5

DESCRIPTION AND OPERATION

INTRODUCTION

Roosa Master Model DB fuel injection pumps, for John Deere three-, four-, and six-cylinder diesel engines, are of the single cylinder, opposed plunger, inlet metering, distributor type.

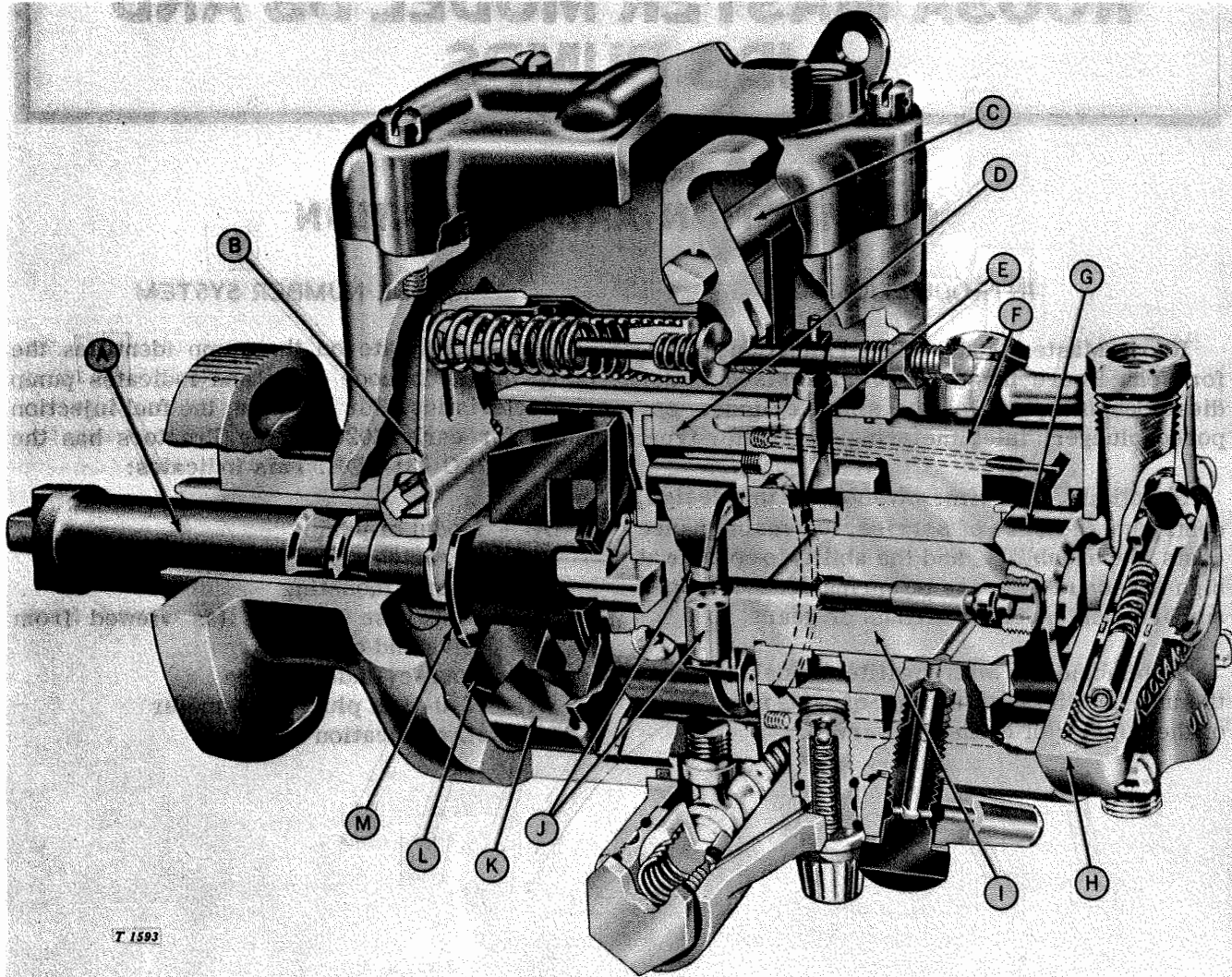
Simplicity, the prime advantage of this design, contributes to ease of service, low maintenance costs, dependability, and the ability to operate at high speeds. There are no spring-loaded, lapped surfaces and no ball bearings or gears.

Self-lubricated with the filtered fuel it pumps, the unit has the same number of parts regardless of the number of cylinders served.

MODEL NUMBER SYSTEM

The name plate on the pump identifies the pump model in code form and indicates pump characteristics. For example, the fuel injection pump for early 2020 Series Tractors has the code DBGFC 431-2DH. This indicates:

- DB - Model of pump
- G - Flyweight-type governor
- F - Flange mounting
- C - Clockwise rotation (as viewed from drive end of pump)
- 4 - Four-cylinder engine
- 31 - .310-inch plunger diameter
- 2DH - JD application number



T 1593

- | | |
|-----------------------|-----------------------|
| A - Drive Shaft | H - End Plate |
| B - Governor Arm | I - Distributor Rotor |
| C - Shut-Off Lever | J - Pumping Plungers |
| D - Internal Cam Ring | K - Weight Retainer |
| E - Metering Valve | L - Governor |
| F - Hydraulic Head | M - Sleeve |
| G - Transfer Pump | |

Fig. 10-5-1 -- Cutaway View of Roosa Master Model DB Fuel Injection Pump (Advance Type Illustrated)

COMPONENTS AND FUNCTIONS

To understand the basic operating principles of the Roosa Master pump, it is necessary to become familiar with the function of the main components. See the cutaway view in Figure 10-5-1 for construction details.

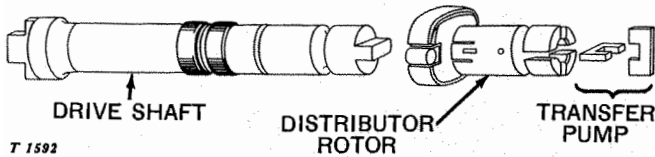


Fig. 10-5-2 -- Main Rotating Parts

The rotating members which revolve on a common axis are shown in Figure 10-5-2.

With reference to Figure 10-5-1, the drive shaft (A) engages the distributor rotor (I) in the hydraulic head (F). The drive end of the rotor has a diametric bore containing two pumping plungers (J).

The plungers are actuated toward each other simultaneously by an internal cam ring (D) through rollers and shoes which are carried in

guide slots in the flanged end of the rotor (Fig. 10-5-2). There are as many lobes as there are engine cylinders to be served.

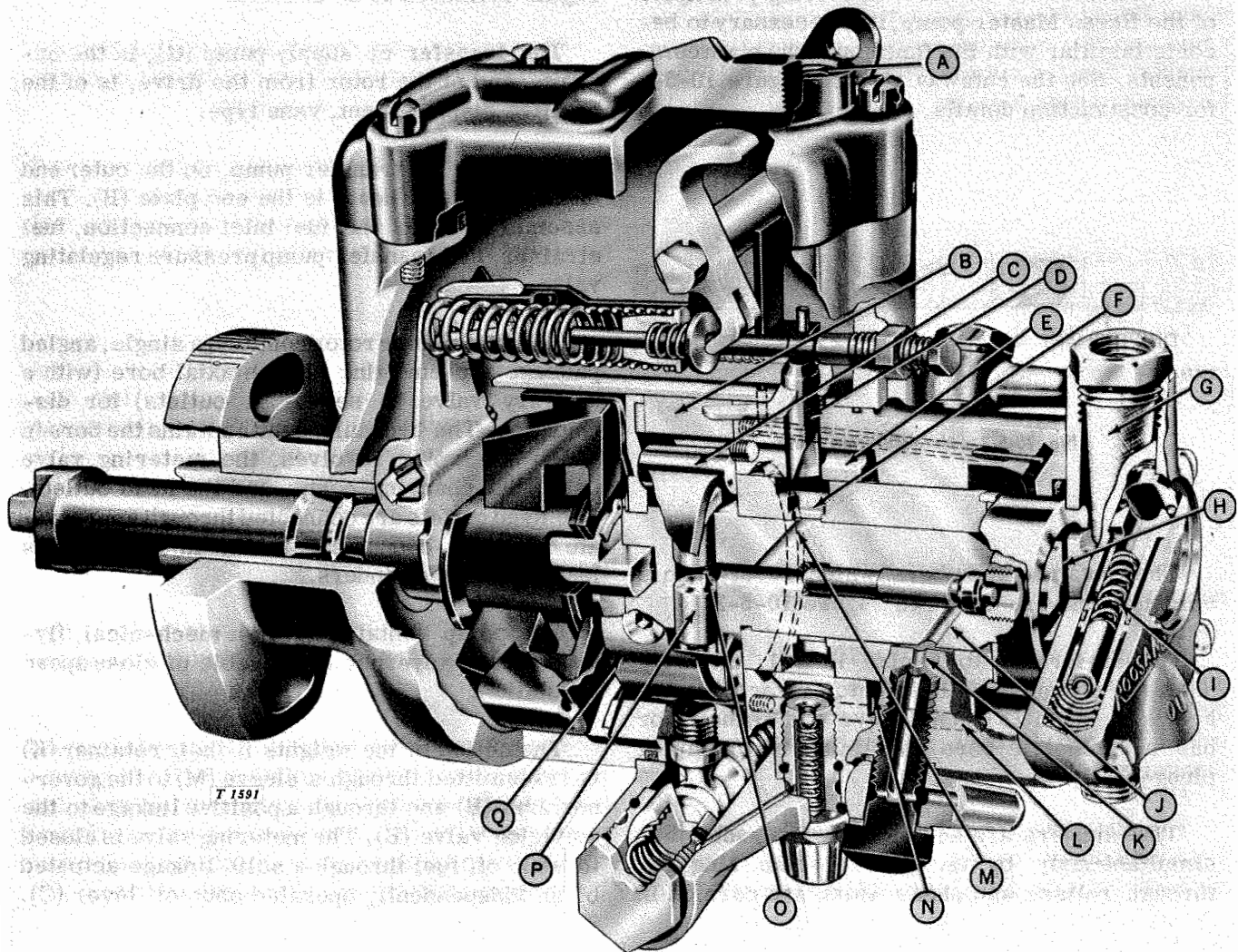
The transfer or supply pump (G), in the opposite end of the rotor from the drive, is of the positive displacement, vane type.

Covering the transfer pump, on the outer end of the hydraulic head, is the end plate (H). This assembly houses the fuel inlet connection, fuel strainer, and transfer pump pressure regulating valve.

The distributor rotor contains a single, angled passage for charging and an axial bore (with a delivery valve to serve all outlets) for discharging. The hydraulic head contains the bore in which the rotor revolves, the metering valve bore, the charging ports, and the head outlets. The head outlets are connected through appropriate fuel line connectors to the injection pipes leading to the cylinders.

The pump contains its own mechanical, fly-weight-type governor (L) capable of close speed regulation.

The action of the weights in their retainer (K) is transmitted through a sleeve (M) to the governor arm (B) and through a positive linkage to the metering valve (E). The metering valve is closed to shut off fuel through a solid linkage actuated by an independently operated shut-off lever (C).



- | | |
|------------------------|--------------------------|
| A - Fuel Return Line | J - Rotor Discharge Port |
| B - Internal Cam Ring | K - Head Outlet Port |
| C - Roller | L - Drilled Passage |
| D - Metering Valve | M - Rotor Charging Port |
| E - Connecting Passage | N - Annulus |
| F - Head Charging Ring | O - Pumping Cylinder |
| G - Inlet Strainer | P - Pumping Plunger |
| H - Transfer Pump | Q - Leaf Spring |
| I - Regulating Valve | |

Fig. 10-5-3 -- Fuel Flow in Roosa Master Model DB Fuel Injection Pump (Advance Type Illustrated)

FUEL FLOW

The operating principles of the Roosa-Master pumps can be understood by following the fuel flow during a complete pump cycle (Fig. 10-5-3).

Fuel is drawn from the supply tank into the pump through the inlet strainer (G) by the vane-type fuel transfer pump (H). Since transfer pump displacement greatly exceeds the injection requirements, a large percentage of fuel is bypassed through the regulating valve (I) back to the inlet side. The quantity of fuel bypassed increases with an increase in pump speed, and the regulating valve is designed so that transfer pump pressure also increases with an increase in pump speed.

Fuel, under transfer pump pressure, is forced through the drilled passage (L) in the hydraulic head into the annulus (N). It then flows around the annulus to the top of the sleeve and through a connecting passage (E) to the metering valve (D). The rotary position of the metering valve, controlled by the governor, regulates the flow of fuel into the charging ring (F) which contains charging ports.

As the rotor revolves, its single charging hole (M) registers with one of the charging ports in the hydraulic head, and fuel, at transfer pump pressure, flows through the angled passage to the pumping cylinder (O). The in-flowing fuel forces the plungers (P) outward a distance proportionate to the quantity of fuel admitted by the position of the metering valve.

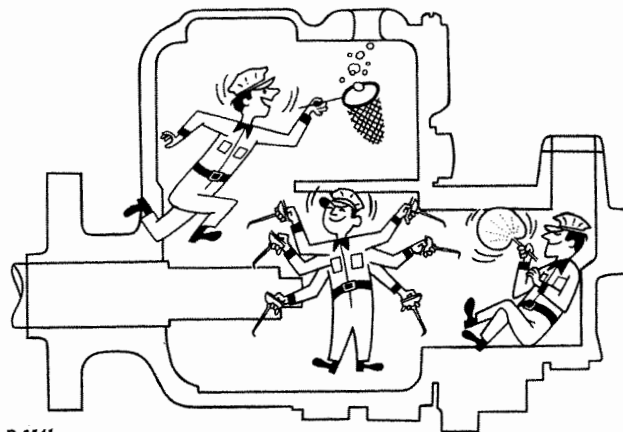
If the metering valve is opened slightly only a small amount of fuel is admitted into the pumping cylinder, as at idling; the plungers move out very little. As additional fuel is admitted, the plunger stroke increases to the maximum quantity as limited by the adjustment of the leaf spring (Q).

At this point of the charging cycle, the rollers (C) are in the "valley" or relieved part of the cam (B) between lobes. The fuel is trapped in the pumping cylinder for a very slight interval after charging is complete.

This is due to the fact that the rotor charging port (M) has passed out of register with the head port (F).

Further rotation of the rotor brings its discharge port (J) into register with an outlet port (K) of the head. At this point, the rollers simultaneously contact the opposing cam lobes, and the plungers are forced toward each other. The fuel trapped between the plungers is forced from the pump through the delivery valve and out one of the head outlet ports to an injection nozzle.

Lubrication of the pump is an inherent characteristic of its design. As fuel, at transfer pump pressure, reaches the charging ring, slots on the rotor shank allow fuel and any trapped air to bleed to a reduced diameter on the shank. This fuel fills the pump housing cavity and acts as a coolant as well as a lubricant, since it is allowed to return to the supply tank via the oil return connection in the pump housing cover. This return line also permits any air present in the fuel, which may have been originally contained in the pump, to be carried out.



In addition, an air bleed arrangement is incorporated in the hydraulic head which connects the outlet side of the transfer pump with the pump housing cavity. This allows air, which for any reason is carried into the end plate; to bleed back to the fuel tank via the return line (A).

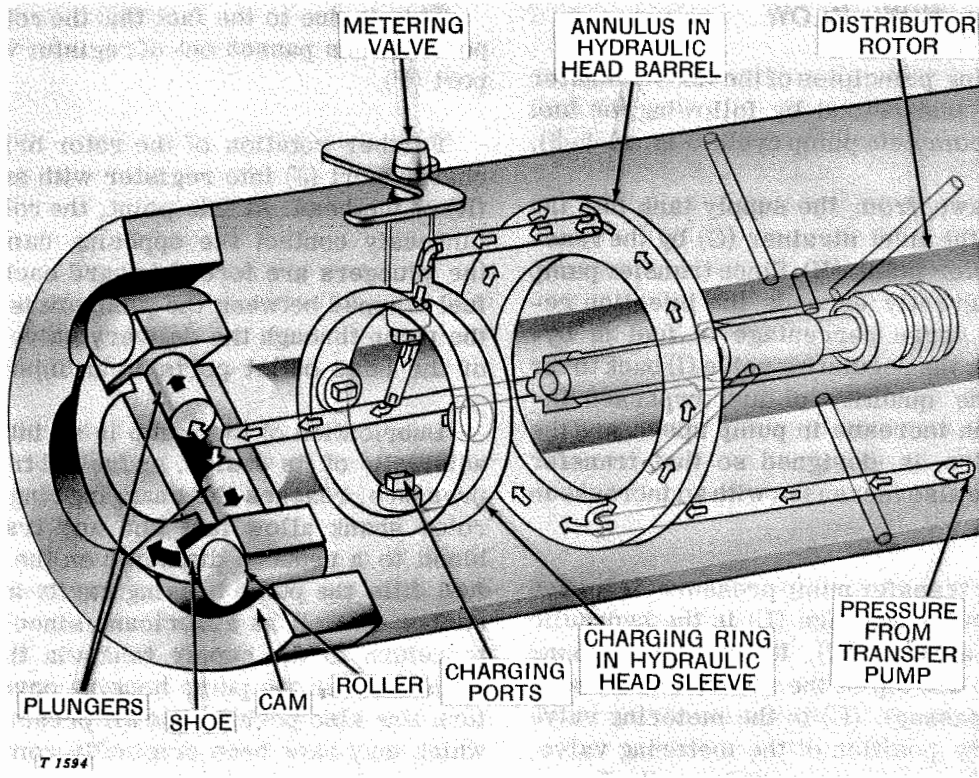


Fig. 10-5-4 -- Charging Cycle (Hole Plug-Type Illustrated)

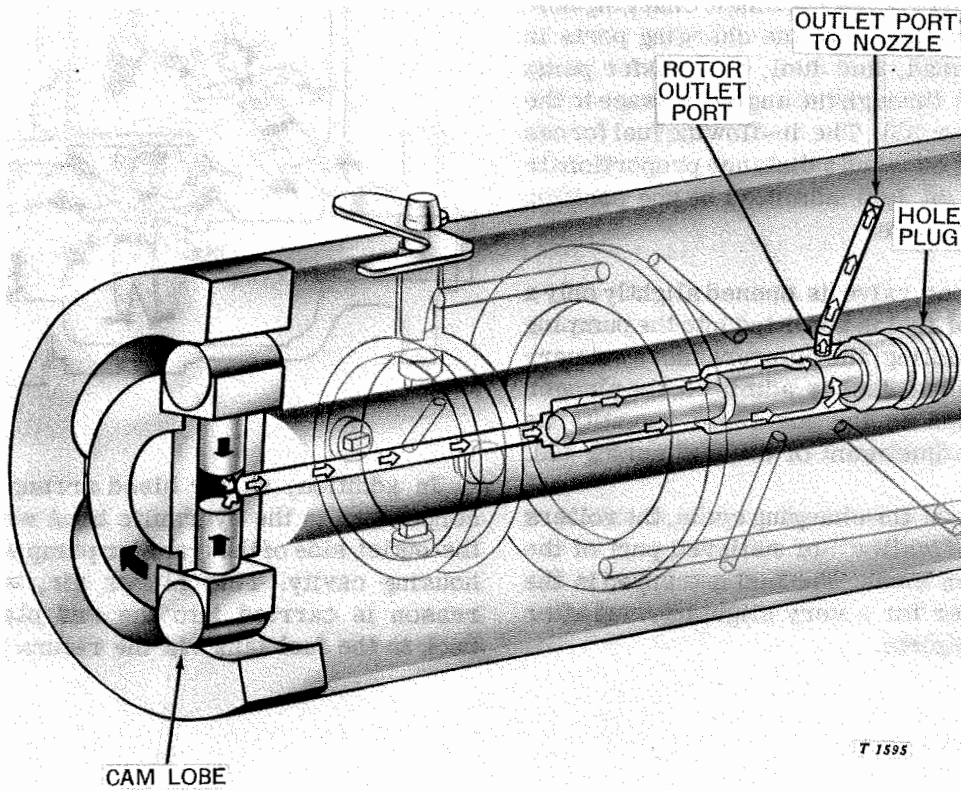


Fig. 10-5-5 -- Discharging Cycle (Hole Plug-Type Illustrated)