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MANUAL PREVIEW

Hough Operator's Manual H-90 Payloader Gas & Diesel

Operator's Manual

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HO-O-H-90G&D

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PRINCIPLES OF OPERATION

pumping element, closest to the transmission, pumps oil to the main control valve assembly. The smaller pump, furthest from the transmission, pumps oil to the steering control valve assembly in the steering gear. Between the two pumps is a common inlet body which has one port connected by hose to the hydraulic reservoir and forms a common suction for the large and small pumps.

MAIN CONTROL VALVE.

The main control valve is mounted on the right side of the reservoir and consists basically of a valve housing, two mechanically actuated control plungers and an integral pilot-type relief valve that regulates the pressure of the main hydraulic system. A preset relief valve that protects one side of the bucket circuit is screwed into the back of the valve body and protrudes into the reservoir. The flow of oil to and from the double acting hydraulic cylinders is controlled by the two control plungers.

STEERING BOOSTER CONTROL VALVE.

The steering control valve is mounted on the end of the steering gear and is actuated by a force differential between the integral centering springs of the valve and the torque exerted on the steering cam. The purpose of the valve is to direct the flow of oil to and from the double acting steering booster cylinder.

HYDRAULIC CYLINDERS.

The steering booster, bucket and boom cylinders are double acting. They consist primarily of a piston and rod assembly, a cylinder cap assembly and a cylinder. Two ports are provided so that oil, under pressure, may be forced against either side of the cylinder piston. The side of the piston acted upon by the pressurized oil is determined by the position of the control valve plungers in the system.

In addition to the basic components of the cylinder assemblies, the cylinders contain suitable packing and seals both on the circumference of the piston and around the piston rod to prevent leakage of the hydraulic oil through the clearances between the stationary and moving parts of each cylinder assembly.

ACCUMULATOR (Accessory).

The accumulator is a hydro-pneumatic separator type unit that acts as a shock absorber in the boom circuit of the hydraulic system. It consists of a cylinder that contains a free floating piston. The piston acts as a separator between the gas precharged end of the cylinder and the portion of the cylinder that connects to the hydraulic system.

ENGINE.

Power to operate the Model H-90 "PAYLOADER" is developed by either a gasoline or diesel type in-line, liquid cooled, internal combustion engine. Both engine types are similar in operation but differ chiefly in the method of fuel induction and ignition. The fuel-air mixture in gasoline engines is ignited by an electrical spark. In diesel type units the fuel is ignited by heat generated during compression of the air intake charge.

Each type of engine requires four elements of operation to complete a cycle. The four elements of a cycle are: Intake, Compression, Power and Exhaust.

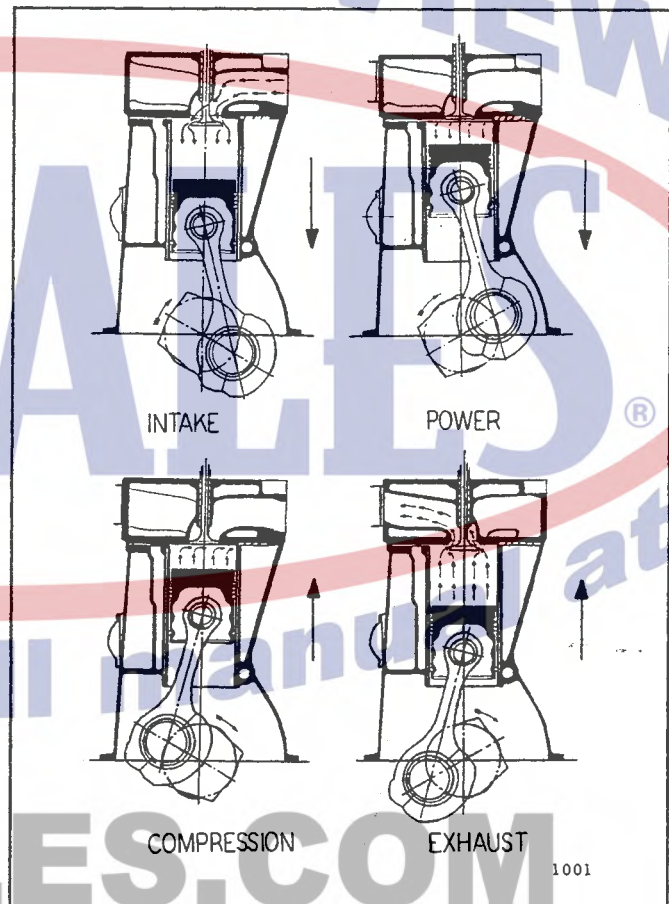


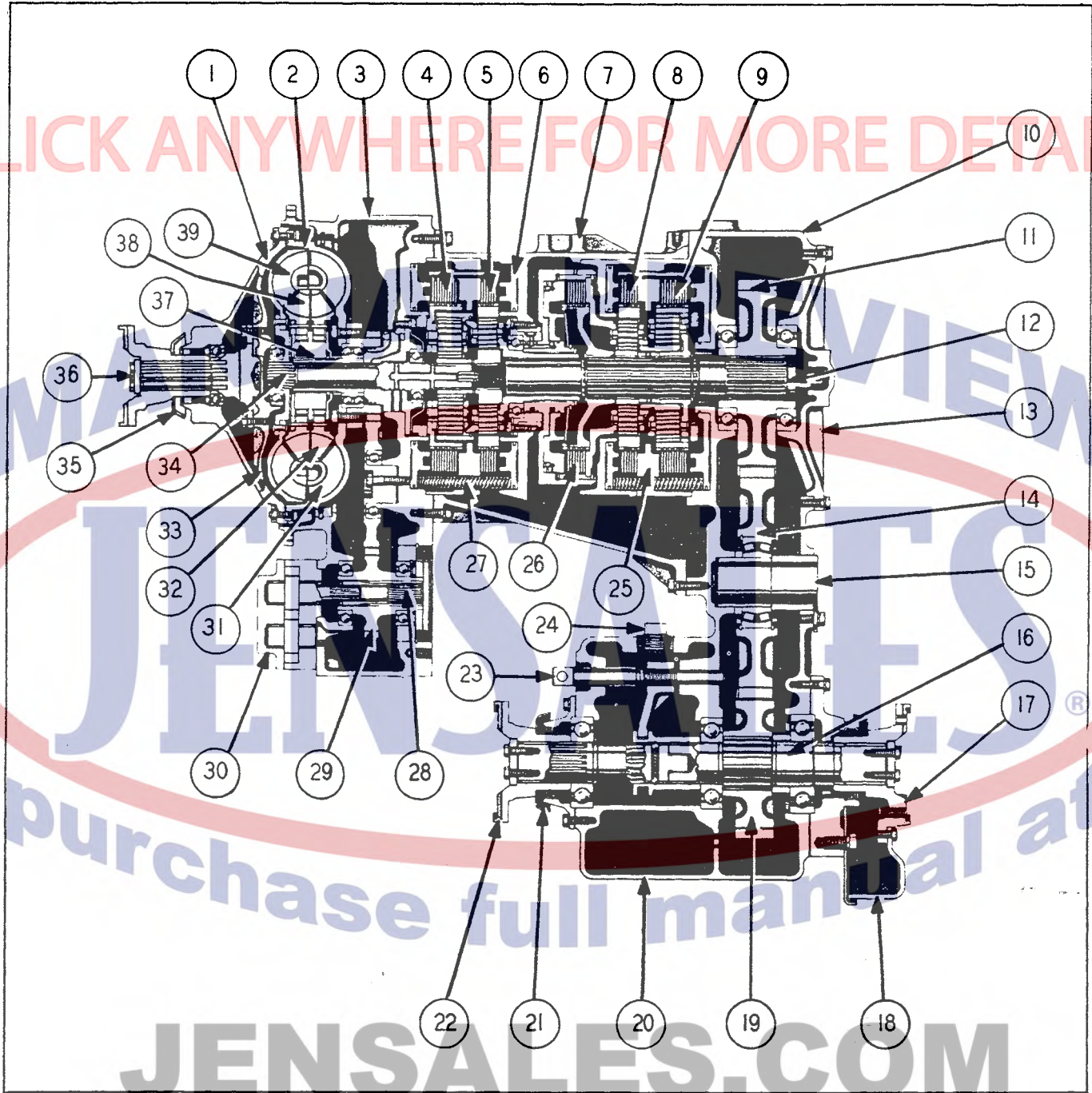
Figure 2. Engine Operating Cycle

INTAKE.

During the intake portion of the cycle, the intake valve (or port) is open and the piston travels downward. The exhaust valve is closed.

The downstroke of the piston causes a decrease of pressure in the air volume above the piston and permits atmospheric or compressed air to be forced through the intake manifold and through the open intake port. In gasoline engines, the intake charge consists of a mixture of fuel and air. The intake charge of diesel engines consists of air only.

PRINCIPLES OF OPERATION



- | | | |
|-------------------------|--------------------------|--------------------------|
| 1. Transmission Cover | 14. Transfer Idler Gear | 27. Piston Return Spring |
| 2. Converter Assembly | 15. Spindle | 28. Hydraulic Pump Drive |
| 3. Converter Housing | 16. Output Shaft | 29. Pump Drive Gear |
| 4. Reverse Clutch | 17. Front Output Yoke | 30. Transmission Pump |
| 5. Forward Clutch | 18. Brake | 31. Converter Pump |
| 6. Clutch Piston | 19. Transfer Driven Gear | 32. Second Stator |
| 7. Transmission Housing | 20. Sump | 33. Converter Cover |
| 8. High Range | 21. Dust Shield | 34. Turbine Shaft |
| 9. Low Range | 22. Rear Output Yoke | 35. Dust Shield |
| 10. Transfer Housing | 23. Disconnect Shaft | 36. Transmission Input |
| 11. Transfer Drive Gear | 24. Fill Plug | 37. Turbine Race |
| 12. Transmission Shaft | 25. Hi-Low Anchor | 38. First Stator |
| 13. Transfer Cover | 26. Intermediate Clutch | 39. Converter Turbine |

Figure 3. Transmission

PRINCIPLES OF OPERATION

CLUTCH PACKS.

The transmission contains five clutch packs; one for reverse, one for forward, one for intermediate speed, one for high and one for low. In order for the transmission to transmit power to its output shafts, one directional (forward or reverse) and one range pack must be hydraulically engaged. The flow of oil used to engage the clutch packs is controlled by the control valve assembly.

TORQUE CONVERTER.

A multi-phase, four element torque converter unit is used in the transmission to act as a coupler and torque multiplier between the engine and the transmission planetary gearing. The converter consists of a pump, a turbine and two stator assemblies. A drive shaft connects the engine to the converter pump.

Power transmitted to the converter pump by means of the drive shaft causes the pump to turn and move the oil supply contained within the converter unit. The movement of oil is toward the outer perimeter of the pump because of the centrifugal force imparted to it by the rotary motion of the pump. At the perimeter of the pump, the direction of oil flow is changed so that the centrifugal force of the oil acts against the vanes of the turbine and causes it to turn. The turbine is splined to the transmission planetary gearing.

The flow of oil in the turbine portion of the converter is toward the center of the assembly. This flow is known as "vortex" flow. When the oil reaches the center of the turbine, its direction of flow is again changed so that it flows through the two stator assemblies to the pump portion of the converter.

Vortex flow in the converter turbine is greatest when the turbine is stopped and the pump speed is high. This phase of converter operation is known as converter stall. In this phase, the unit acts as a torque multiplier and exerts maximum available torque on the planetary gearing. As turbine speed increases and approximates the speed of the pump, the vortex flow is decreased and a minimum amount of torque multiplication takes place. This is called the converter coupling phase.

FINAL DRIVES.

The final drives consist primarily of a single reduction and differential assembly, an axle housing and axles, and a planetary gear set at the end of each axle. Primary reduction of the final drives is accomplished in the carrier housing by means of a hypoid pinion and a bevel ring gear. The secondary reduction takes place in the wheel hubs. By making the final reduction at the wheel hubs, less strain is imposed on the differential assembly and axle shafts

because a majority of the working stresses are carried by the planetary gearing in the wheel hubs.

The hub assembly of each final drive consists of a sun gear which is splined to the axle, a planetary gear spider and a hub and brake drum assembly. The hub contains an internal ring gear that meshes with the planetary gear spider and the spider assembly meshes with the sun gear on the axle. When torsional force is applied to the axles by the differential assembly, the sun gear in the wheel hub turns and transmits the force to the hub gear through the planetary spider and causes the wheel hub to turn.

The gears and bearings in the wheel hubs and the carrier housing are lubricated by running in a supply of oil contained in each assembly. Check plugs are provided in the hub caps and carrier housing of each final drive for the purpose of checking that a sufficient supply of oil is available for safe operation of the drive.

When it is necessary to inspect or service a set of brake linings, it is necessary to remove the planetary gearing and the hub and brake drum assembly. The complete final drive should be removed from the vehicle when it is necessary to disassemble and service the carrier housing and replace axle seals.

ELECTRICAL SYSTEM.

The electrical system consists basically of six circuits; starting, instrument, lighting, charging, horn and ignition. All circuits but the charging are connected in series with the ignition switch and a bi-metal type circuit breaker mounted on the rear of the dash panel.

The components of each circuit are precision-built and their operation must be kept within close tolerances. To adequately service these electrical devices requires a thorough understanding of the units themselves and of the equipment with which they operate. If faulty operation of an electrical device such as a voltage regulator or generator is suspected, it is recommended that a dealer of THE FRANK G. HOUGH CO. be contacted.

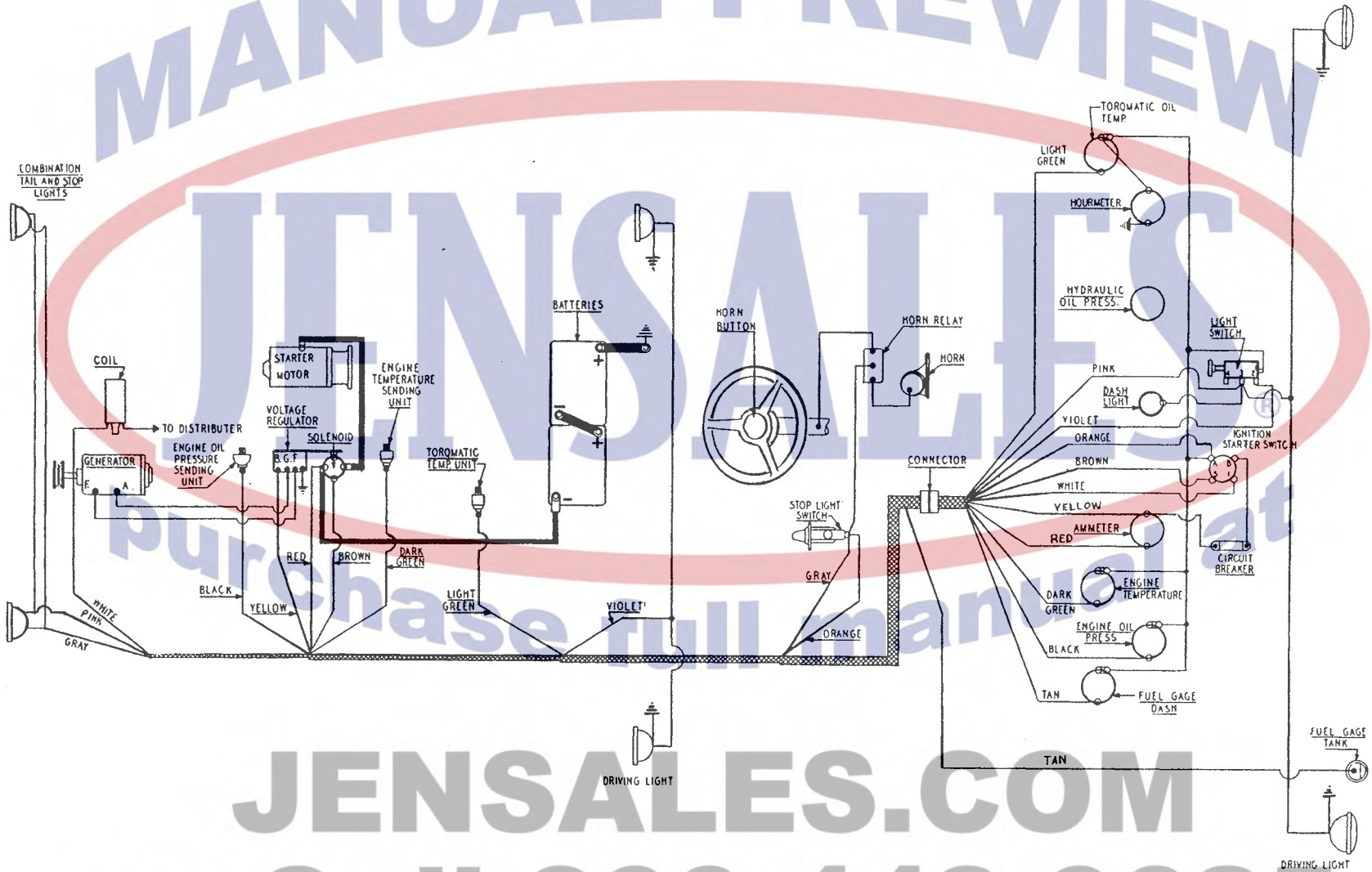
STARTING CIRCUIT.

The starting circuit includes the battery, ignition-starter switch, starter solenoid, starting motor, wiring and the loader frame. It provides electrical power for cranking the gasoline or diesel internal combustion engine and converts the electrical power into mechanical energy by means of the starter motor. Mechanical energy developed by the starter is transmitted to the engine through a drive pinion gear and the engine flywheel ring gear. The starting switch controls operation of the starter motor by breaking the circuit between the battery and motor.

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Figure 4. Gas Wiring Diagram



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