

OPERATOR MANUAL

P40 & P60

Book No. O-142



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INDUSTRIAL TRUCK DIVISION



SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

Powered industrial trucks may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, personnel and procedures should be provided.

Maintenance and inspection of all powered industrial trucks should be performed in conformance with the recommendation in this manual and the following practices.

1. A scheduled preventive maintenance, lubrication, and inspection system should be followed.
2. Only qualified and authorized personnel should be permitted to maintain, repair, adjust, and inspect industrial trucks.
3. Before Leaving The Truck:

- A. Stop truck.
- B. Fully lower the load engaging means.
- C. Place directional controls in neutral.
- D. Apply the parking brake.
- E. Stop the engine or turn off power.
- F. Lock the control or ignition circuit.
- G. Block the wheels if truck is on a ramp, or being worked on.

4. Before Working On Truck:

- A. Raise wheels free of floor or disconnect power source.
- B. Use chocks or other positive truck positioning devices.
- C. Block load engaging means, innermast(s), or chassis before working under them.

Before working on engine fuel system of gasoline powered trucks with gravity feed fuel systems, be sure fuel shutoff valve is closed.

Before working on engine fuel system of LP gas powered trucks, close LP gas cylinder valve and run engine until fuel in system is depleted and engine stops running.

Operation to check performance of the truck or attachments should be conducted in an authorized, safe clearance area.

5. Before Starting To Operate The Truck:

- A. Be in operating position.
- B. Depress clutch (or brake pedal on automatic transmission and electric trucks).
- C. Place directional controls in neutral.
- D. Start engine or turn on power.
- E. Before operating truck, check functioning of lift and tilt systems, directional and speed controls, steering, warning devices, brakes, and any attachment. (If used)
- F. Release parking brake.

- continued -

SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

6. Avoid fire hazards and have fire protection equipment present. Do not use an open flame to check level, or for leakage, of fuel, electrolyte or coolant. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.
7. Properly ventilate work area, vent exhaust fumes and keep shop clean and floor dry.
8. Handle LP gas cylinders with care. Do not drop, dent, or damage in any way.
9. Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, guards and safety devices should be inspected regularly and maintained in a safe operating condition.
10. All parts of lift and tilt mechanisms and frame members should be carefully and regularly inspected and maintained in a safe operating condition.
11. Special trucks or devices designed and approved for hazardous area operation should receive special attention to ensure that maintenance preserves the original, approved safe operating features.
12. Fuel systems should be checked for leaks and condition of parts. Extra special consideration should be given in the case of a leak in the fuel system. Action should be taken to prevent the use of the truck until the leak has been corrected.
13. All hydraulic systems should be regularly inspected and maintained in conformance with good practice. Tilt cylinders, valves, and other similar parts should be checked to assure that "drift" has not developed to the extent that it would create a hazard.
14. Capacity, operation and maintenance instructions plates, tags, or decals should be maintained in legible condition.
15. Batteries, motors, controllers, limit switches, protective devices, electrical conductors and connections should be inspected and maintained in conformance with good practice. Special attention should be paid to the condition of electrical insulation.
16. Industrial trucks should be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.
17. Modifications and additions which affect capacity and safe truck operation should not be performed by the customer or user without manufacturers prior written approval. Capacity, operation and maintenance instruction plates, tags or decals should be changed accordingly.
18. Care should be taken to assure that all replacement parts are interchangeable with the original parts and of a quality equal to that provided in the original equipment.



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SPECIFICATIONS

POWRORKER® PALLET TRUCK

SPECIFICATIONS — MODELS P40 AND P60

CAPACITY

Model P40 — 4000 lbs.
Model P60 — 6000 lbs.

WEIGHT*

	P40	P60
Without battery	1090 lbs.	1120 lbs.
With lead-acid battery	1455 lbs.	1485 lbs.
With Edison battery	1400 lbs.	1430 lbs.

*Based on 48" long pallet forks

BATTERY

12 volt battery is standard. Choice of KW hour capacities available to suit operation.

Battery and truck provided with standard type "SB" connector with interchangeable, identical halves.

POWRORKER "26" Single Row layout — 6 cells 11 to 13 plate Lead-Acid or comparable Nickel-Alkaline battery.

POWRORKER "32" Double Row layout — 6 cells 17 to 23 plate. Lead-Acid or comparable Nickel-Alkaline battery.

POWRORKER "33" for Ready Power Unit.

SPEEDS

Travel — no load — 3.2 M.P.H.
full load — 2.3 M.P.H.

DIMENSIONS

Pallet Forks — overall spread 27".
Pallet Fork Lengths — 30" to 72" in 6" increments.
Pallet Fork Width — 9 1/4".
Pallet Fork Lift — 4" vertical.

WHEELS AND TIRES

Drive, 10 1/2" x 6" x 5" I.D. pressed-on type cushion rubber tire.
Rear wheels, steel, mounted in pairs, each pair 6" wide x 3 1/4" diameter.

Urethane tires 3 3/8" diameter are available for rear wheels at extra cost.

The drive wheel is mounted on ball bearings; trailing wheels both steel and urethane are mounted on Timken tapered roller bearings, and heavy alloy steel shafts.

HYDRAULIC LIFT

The heavy duty motor, pump, hydraulic fluid reservoir, sealed relief valve and control valve are assembled into one compact, horizontally-mounted unit.

The 4" vertical lift and lower of forks is regulated by push buttons built into the control head mounted on the end of the steering handle.

Two heavy-duty ram-type, self-aligning hydraulic cylinders with pressurized packing are used to raise the forks supported by four 2 3/8" diameter rollers traveling in vertical guide channels.

Positive fork return assured by return springs internal within cylinders.

STEERING

The truck is guided easily by turning the drive wheel assembly which is mounted within the frame on widely-spaced self-aligning roller thrust bearings and rollers for radial load. Bearings are sealed and lubricated for life. The tubular steel steering handle is mounted on the drive assembly. Ninety degrees of turn are available in each direction.

DRIVE

The series-wound drive motor is of the high torque type, horizontally mounted and equipped with sealed ball bearings. Electrographitic brushes provide proper commutator lubrication resulting in long brush and commutator life.

Power from the motor is transmitted through a 22 to 1 double reduction of spur gears to the drive wheel axle. All gears are drop forged alloy steel, heat treated and crown shaved for quietness and long life. The complete gear train is mounted on ball and roller bearings and operates in a totally enclosed housing in a bath of oil.

The drive wheel is provided with a standard 10 1/2" x 6" x 5" I.D. cushion tire. The quickly demountable tire makes replacement possible with simple mechanic's tools.

BRAKE

Smooth and positive braking is assured by the 5" diameter x 1 1/2" wide brake drum mounted on the drive motor shaft. Braking effort is transmitted from the source of power through the 22 to 1 gear ratio to the drive wheel. The brake is spring applied when the steering handle is in the vertical or horizontal position. As the brake is applied a dead man switch is actuated which automatically breaks the power circuit. It is impossible to operate the truck when the handle is either vertical or horizontal. The steering handle automatically returns to the vertical, brake applied position when released by the operator.

The security of loads is further insured by electric braking which is possible by the reversal of power in first speed through the full value of resistance.

CONTROLS

Two speeds, forward and reverse, provide smooth, safe and efficient operations. A fingertip walking beam actuates electric switches built into the control head at the end of the steering handle permitting selection of desired speeds and direction. The walking beam makes it impossible to direct both forward and reverse current to the drive motor simultaneously. To reverse direction, the control must pass through neutral to permit movement in the newly selected direction. The lift and lowering switches are mounted in the handle for easy operation while moving truck.

Smooth progression to top speed is assured by definite notched control positions. All wiring between control and motors is directed to the power source. Commutators and long flexing wires have been eliminated for maximum electrical efficiency.

FRAME

The POWRWORKER chassis frame and load forks are fabricated from plate and bar steel, formed to shape and electrically welded into a unit structure, providing great strength and rigidity with minimum weight. The fork elevating channels are integral with the frame. Load wheel rollers are mounted under the ends of the forks and are connected to the elevating linkage. This linkage is so arranged that with the vertical lift to the forks the wheelbase is shortened and under-clearance is increased.

Pallet forks are heavy steel plate formed to shape with continuous integral formed tubular section for rigidity, all electrically welded into a unit section.

The toe of each fork is provided with a pallet entry disc for smooth, easy entry into double faced pallets.

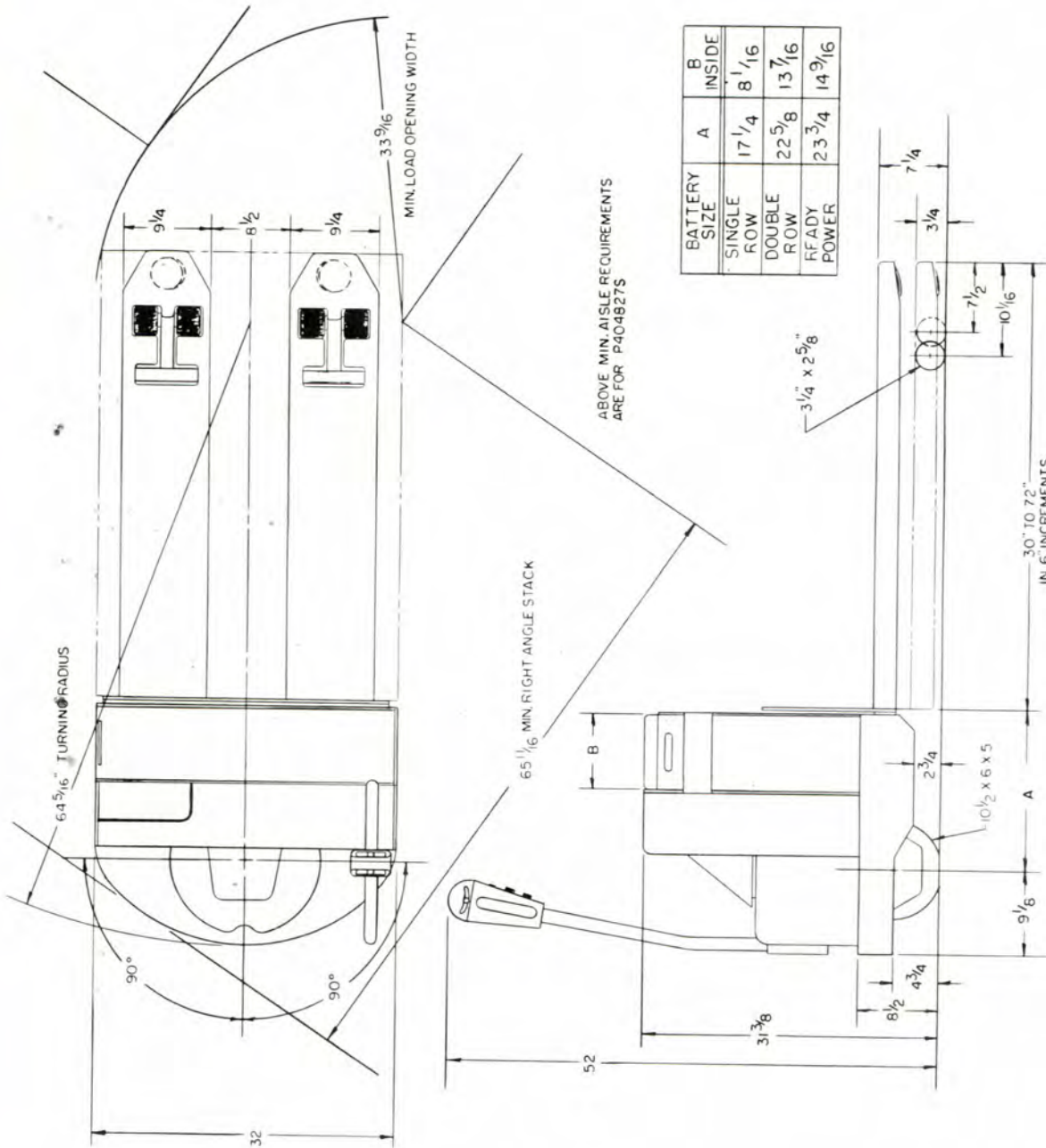
GENERAL

High pressure lubrication through standard automotive fittings. All bolts and nuts are cadmium plated for protection against corrosion.

Standard equipment includes electric horn and lock against unauthorized operation.

Truck painted yellow.

NOTE: Clark products and specifications are subject to improvements and changes without notice.



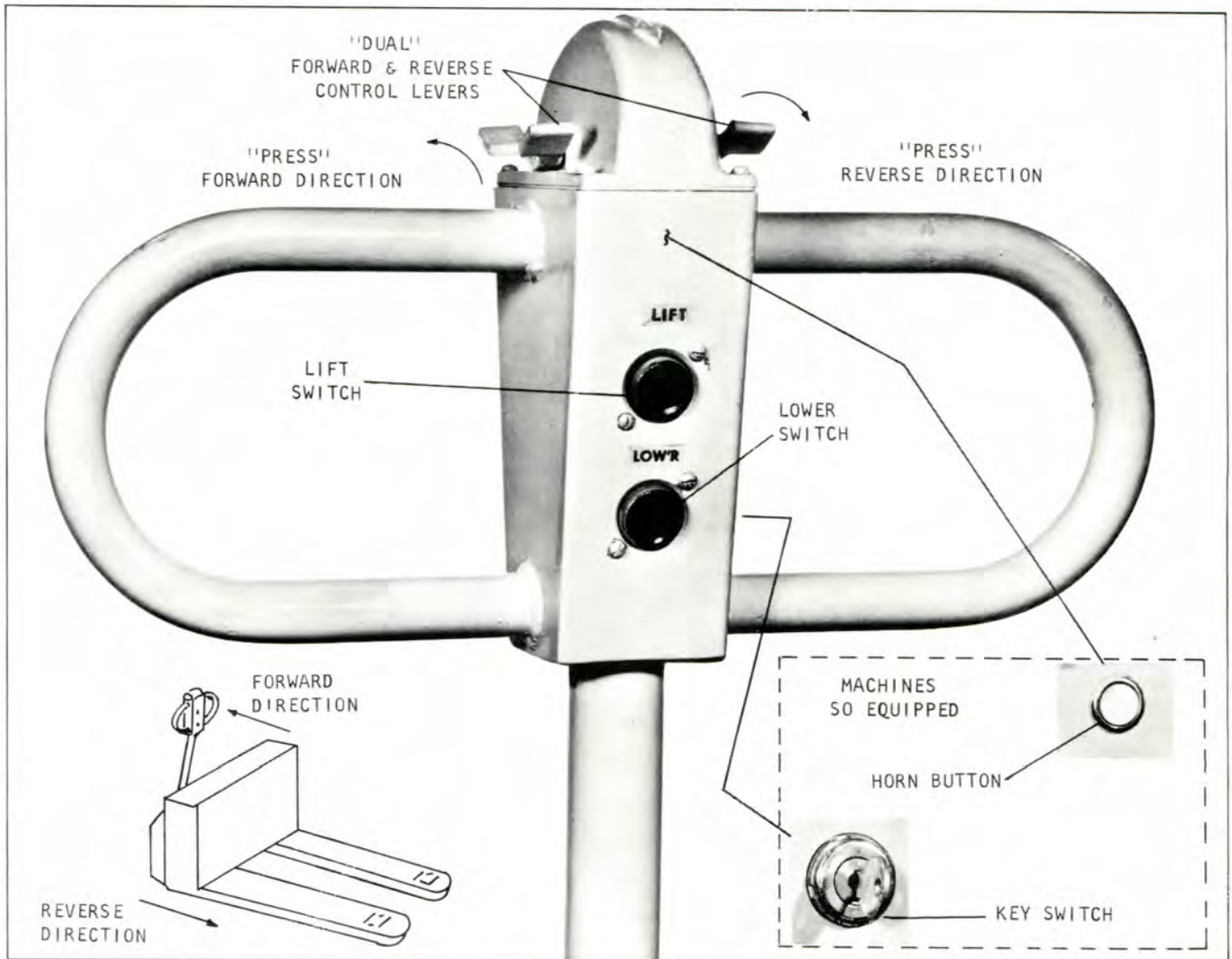


Plate 9911. Steer Handle and Controls

OPERATING INSTRUCTIONS
SAFETY
AND OPERATION SUGGESTIONS
PREVENTIVE MAINTENANCE INSTRUCTIONS

It is not essential that the prospective operator have experience with this type of hand truck, but it is important that he be thoroughly instructed as to the use and operation of the various controls.

1. Connect battery to the truck. The battery connector is located to the left of the machine just beneath the top cover.

2. Lower steering (control) handle to release the brake. The brake is applied when

the control handle is in a vertical or horizontal position.

3. Press the dual directional control lever gently to the indexed notch in the direction desired, see Plate 9911.

4. Press the dual directional lever beyond index position for second point of power.

5. Normal Stop: Move control handle to vertical or horizontal position. As the brake is applied, a deadman switch is actuated which automatically breaks the travel power control



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circuit. It is impossible to operate the truck in either forward or reverse when the control handle is in a vertical or horizontal position.

6. **Emergency Stop:** Press the dual directional lever in opposite direction **MOMENTARILY** to reverse power. If the truck is in a forward point of power and an emergency stop is necessary, press the dual directional lever to reverse position **MOMENTARILY**. This will reverse electrical current through the drive motor bringing the truck to a stop.

LIFT — LOWER CONTROL OPERATION

1. Depression of the lift switch button on the control handle will operate the pump motor and hydraulic pump for lifting the forks and load.

2. Gently depressing the lower switch button will lower the forks and load. This button is located directly below the lift switch button, refer to Plate 9911.

SAFETY AND OPERATION SUGGESTIONS

The use of Industrial Power Trucks is subject to certain hazards that cannot be overcome by purely mechanical means. The exercise of intelligence, care, and common sense by the truck operator is necessary to eliminate hazards of overloading, slipping, or falling of the load; obstruction in the path of travel, or the use of equipment for which it is not intended or designed.

The following are a few suggestions that should be followed in the operation of the machine.

1. Avoid sudden stops or starts.
2. Operate the hand truck carefully at all times. Take caution at cross aisles.
3. Be sure loads are safe to move. Be sure loads are properly centered on forks. Full capacity loads **MUST** be centered on forks.
4. An operator should be assigned to a truck.
5. The operator should be qualified and operate the truck in accordance with Government safety rules and no one should operate the truck except the assigned operator.
6. If the truck does not respond immediately, check Trouble Shooting Chart.
7. Do not transport riders or hitchhikers.
8. Operate the machine at safe distances behind other vehicles.

9. Do not operate machine with wet or greasy hands.

10. Observe highway traffic laws in the operation of the vehicle in the plant.

11. Operate the hand truck carefully on wet or slippery floors.

12. Observe the Operating Rules and Preventive Maintenance Instructions ASA B56.1 Safety Code for Powered Industrial Trucks.

13. Avoid overloading the truck - this is a safety measure against possible injury to the driver and fellow workmen. Overloading shortens the life of the truck and increases maintenance.

14. Be sure the brakes are in proper working condition. Be sure all mechanical and electrical components are working correctly.

15. The operator should walk with and not ride on the hand truck. This is designed as a walking type unit only and should not be used to transport the operator from point to point (loaded or unloaded)

PREVENTIVE MAINTENANCE

1. Arrange for systematic inspection and lubrication. See that the truck is kept properly lubricated and in good repair at all times. Refer to the Lubrication Chart for proper lubrication instructions.

2. Avoid overloading the truck - this is a safety measure against possible injury to the driver and fellow workmen. Overloading shortens the life of the truck and increases maintenance.

3. Proper maintenance means more continuous hours of service at lower operating costs.

4. Take proper care of your battery. Check the height of electrolyte solution daily. Never allow water level to drop below top of plates. When replacing evaporation, fill cells to proper level only - overfilling causes loss of acid and therefore reduces capacity. Use only water approved for battery use. Keep top of battery clean and dry at all times. Normally, wiping top of battery with a damp cloth is sufficient. A light coating of vaseline or a light cup grease on the battery terminals will help prevent corrosion. If terminals have become corroded, wash off corrosion with a soda solution and rinse thoroughly. See that the battery is properly charged after each day or shift.



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5. Wiring should be checked periodically to make certain all connections are tight and intact.

6. The hydraulic system should be checked periodically for worn hoses, loose fittings and/or leaks, and security of mountings.

7. A periodic check of the brake system should be made for lining wear. Proper brake adjustment should be maintained at all times, refer to the brake section.

8. Charging equipment should be carefully maintained. Maintenance, operation, and service of charging equipment should be carried out in accordance with the instructions attached to each charger.



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Troubles which might occur in your truck and probable causes are listed below to aid you in keeping it in service.

SYMPTOMS	PROBABLE CAUSE
Will not operate.	<ol style="list-style-type: none">1. Battery plug not making proper contact.2. Battery not properly charged.3. Open Circuit in control wiring.
Will not run but the lift system works.	<ol style="list-style-type: none">1. Deadman switch broken or inoperative.2. Open circuit in main power lead to drive unit.
Runs in second point of power only in both directions.	<ol style="list-style-type: none">1. First speed resistor open or short-circuited.2. 1-A contactor welded closed.3. Control circuit to 1-A coil not opening.
Runs in first point of power only in both directions.	<ol style="list-style-type: none">1. 1-A contactor fails to close. This can be caused by an open 1-A coil.2. 1-A switch does not make circuit.3. 1-A flexible shunt broken or open.
Runs normally, but in one direction only.	<ol style="list-style-type: none">1. Forward or reverse directional switch does not make circuit.2. Forward or reverse coil open.
Little or no power	<ol style="list-style-type: none">1. Truck operating in first speed continuously.2. Brakes improperly adjusted.3. Drive motor brushes worn to the point where one or more brushes do not make good contact. Check brushes, replace if necessary. If commutator is rough turn it down in a lathe to clean it up.4. Poor connection at some power lead terminal. Check all connections.5. Short or break in wiring system.6. Worn out or dead battery.7. Trail wheel bearing tight.8. Flexible shunt on contactor shows signs of overheating due to poor connection, replace shunt.



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SYMPTOMS

PROBABLE CAUSES

Excessive battery drain.

1. Truck continually operating in first point of power.
2. Brake improperly adjusted and dragging.
3. Flexible shunt on contactor loose or damaged.
4. Truck overloaded.
5. Insufficient battery capacity. Battery may be worn out.
6. Trail wheel bearings tight.

Pump motor will not run.

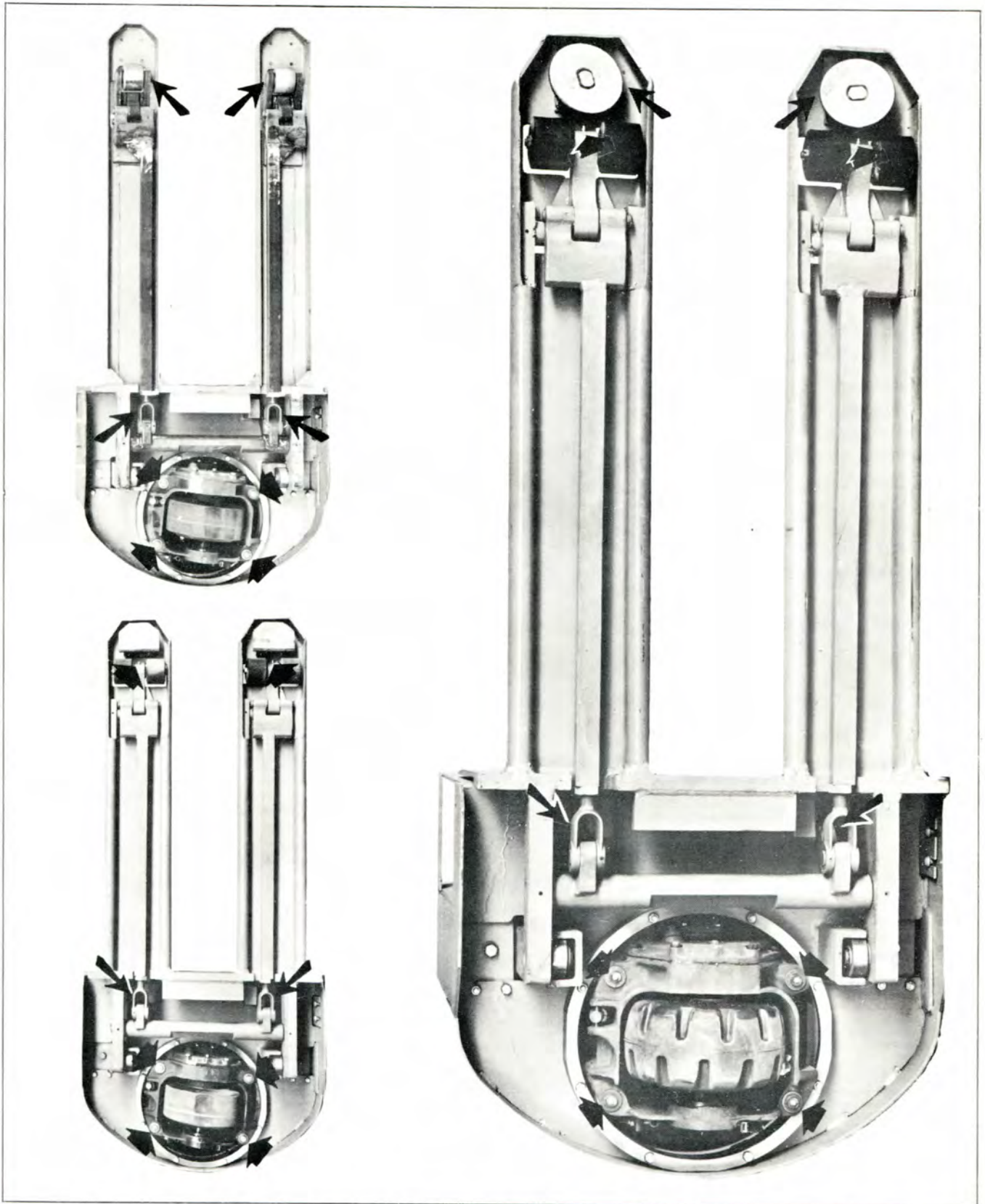
1. Pump solenoid is open.
2. Pump switch is inoperative
3. Lift Limit switch may be inoperative.
4. Dirt in hydraulic system may have jammed pump preventing it from running.

Load drifts down from raised position.

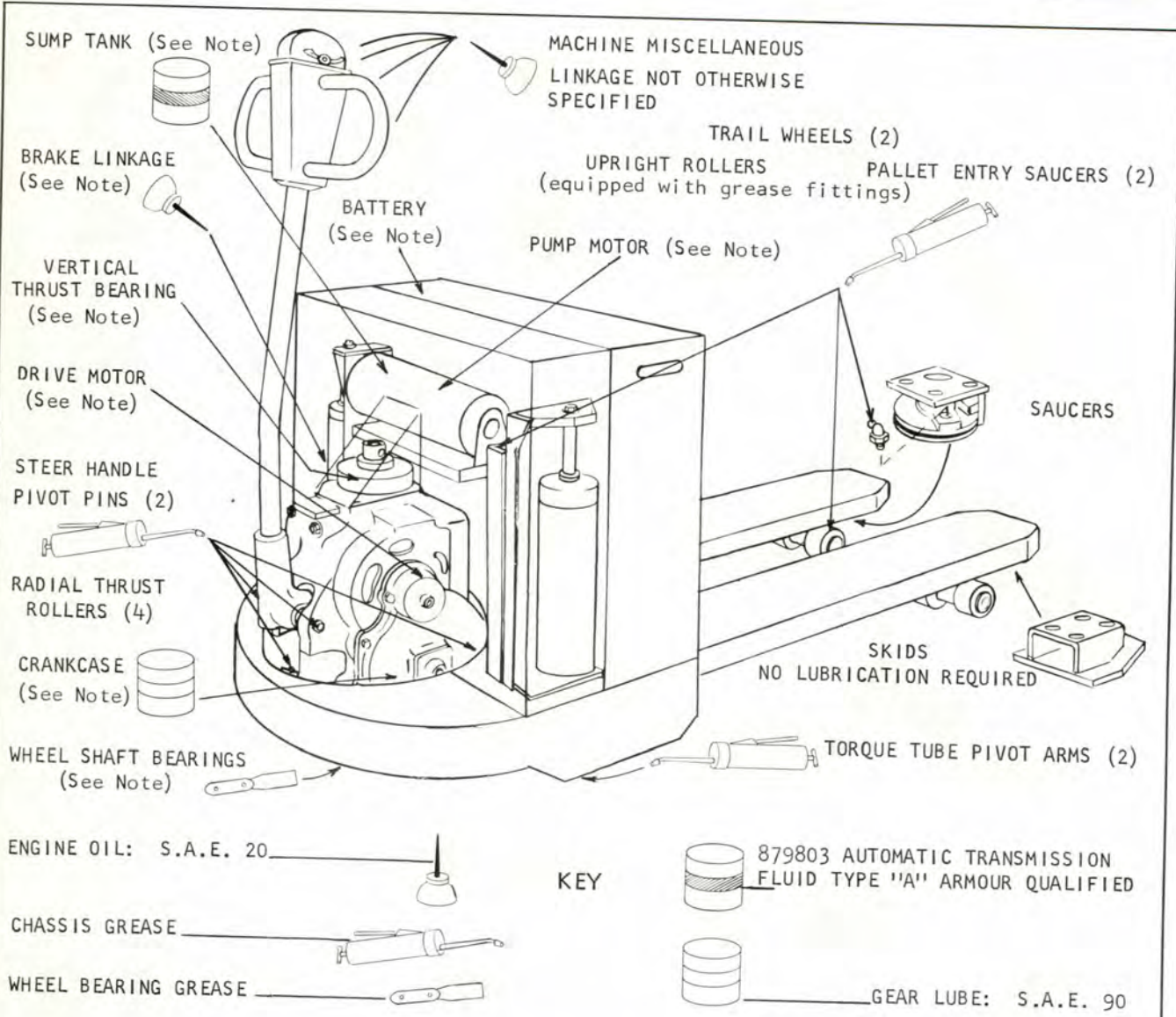
1. Manual auxiliary release valve stem not seating properly.
2. Lowering control solenoid defected.

Load does not raise evenly and smoothly.

1. Elevating linkage not adjusted properly.



Lubricate Fittings every 100 Operating Hours



INSTRUCTIONS ON USE OF LUBRICATION CHART

The purpose of the chart is to show lubrication points, types of lubricant recommended and frequency of lubrication service in hours of machine operation.

Brackets () after a lubrication point indicate the number of similar points to be lubricated.

Where a lubrication point is accompanied by a (SEE NOTE) a corresponding note below will give further instructions.

Battery: Keep electrolyte solution 3/8 inch above plates using distilled water. Check battery solution level and general condition every 8 operating hours. NEVER allow solution level to drop below top of plates. Fill cells to proper level only - overfilling causes loss of acid and therefore reduces capacity. Keep top of battery clean and dry at all times. Normally, wiping top of battery with a damp cloth is sufficient. A light coating of vaseline or a light cup grease on battery terminals will help prevent corrosion. If terminals have become corroded, wash off corrosion with soda solution and rinse thoroughly. The vent plugs should be in place at all times when using, cleaning and charging the battery. They should be cleaned periodically. Check the vent holes in the plugs to be sure they are not plugged. Follow instructions

**POWRWORKER
PALLET TRUCK**

included with the battery charger. Battery should be recharged in accordance with battery manufacturer's instruction sheet which comes with the battery.

Brake Linkage: Apply engine oil to all moving parts of the brake linkage. CAUTION should be exercised to prevent oil from getting on the brake linings at time of lubrication. Lubricate every 100 operating hours.

Crankcase: Check oil level every 100 operating hours and drain when hot following every 1,000 operating hours. Use SAE 90 Gear Lube.

Drive Motor: The drive motor bearings do not require lubrication. Under normal conditions the bearings should last 6,000 operating hours. During overhaul periods the bearings should be rotated by hand to check for further serviceability.

Pump Motor: The pump drive motor does not require lubrication. During overhaul periods, apply engine oil to the bearings and rotate them by hand to check for further serviceability DO NOT SOAK BEARINGS IN CLEANING SOLVENT.

Miscellaneous Linkage: Every 100 operating hours, miscellaneous linkage (all moving parts subject to wear that are not called out in the above chart) should be lubricated with engine oil.

Sump Tank: Keep system filled with Type "A" Automatic Transmission Oil. Drain and flush sump tank when oil becomes dirty. When changing oil, remove and clean strainer screen. Check every 100 operating hours.

Vertical Thrust Bearing: Clean and repack bearing with Medium Bodied High Temperature Wheel Bearing Grease - melting point 250° or higher. This is to be done every 1,000 operating hours. Check bearing for further serviceability at each lubrication period.

Wheel Shaft Bearing: Clean and repack bearing with Medium Bodied High Temperature Wheel Bearing Grease - melting point 250° or higher. This is to be done every 1,000 operating hours. Check bearing for further serviceability at each lubrication period.

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DESCRIPTION

Braking is accomplished with the use of a brake drum 5 inches in diameter and 1 1/2 inches wide. The drum is directly connected to the drive motor shaft. Two brake shoes (C) with bonded linings are connected to two brake shoe arms. Braking power is supplied by a brake spring which may be set by adjusting nut (D) until torque reading to turn brake drum is 210 inch pounds minimum or 17 foot pounds minimum. The brakes are applied when the steer control handle is in a vertical or horizontal position. When the control handle is in either of these positions, the brake spring is allowed to apply brake shoes against brake drum thus stopping drive motor and truck. When the brakes are applied, a dead-man switch automatically breaks the power circuit to the drive motor. It is impossible to operate the truck when the control handle is in a vertical or horizontal position.

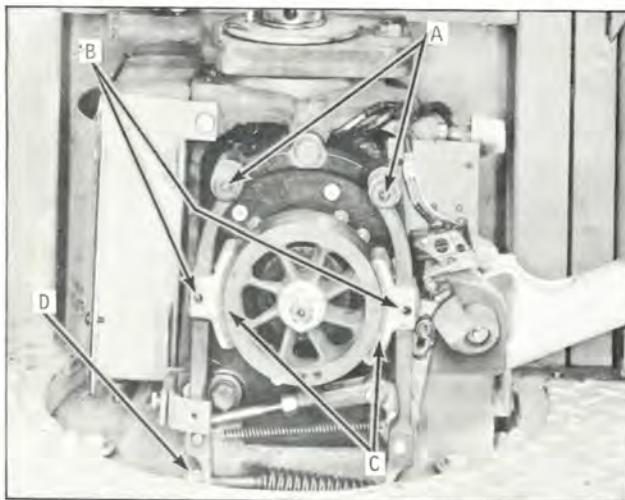


Plate 9308. Brake Lining Replacement

1. Remove Shoulder Bolts (A).
2. Pull arm and shoe assembly away from brake drum so pins (B) can be driven out.
3. Remove shoe/lining assembly.
4. Replace with rebuilt shoe/lining assembly in reverse order of disassembly.

NOTE

IT IS RECOMMENDED THAT NEW PINS (B) BE USED.

Deadman Switch. The brake switch should be adjusted so that when the brake is applied, the brake switch is released, thus cutting electrical power to the drive motor. When the brake is released (brake shoe away from brake

drum), the brake switch should actuate (turn on) thus allowing electrical current to flow to the drive motor.

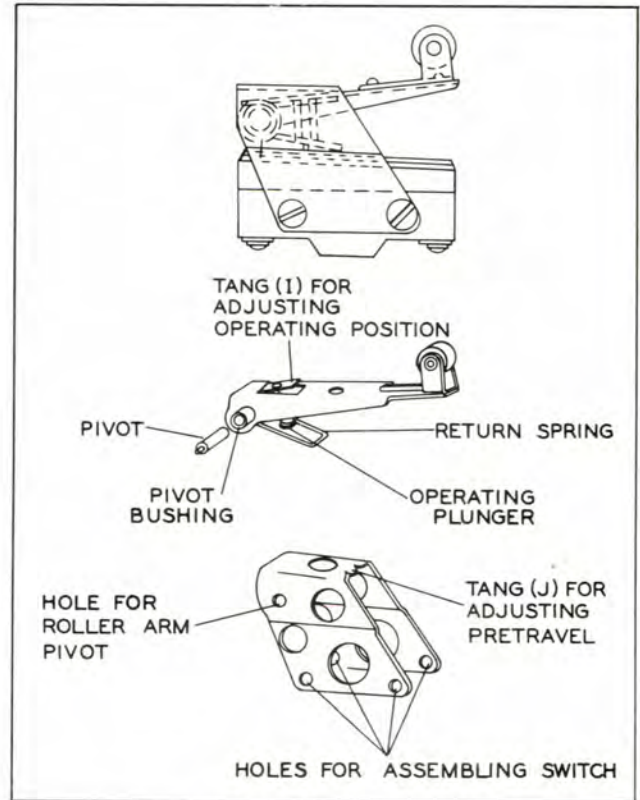


Plate 6058. Brake Switch Adjustment

Adjustment of the switch is made by bending two tangs on the switch actuator. The deadman switch MUST be adjusted so the electrical power shuts off when the control handle is from 5 to 6 inches forward of vertical position. Adjustment of the switch is made by bending two tangs on the switch actuator. One on the lever arm (Tang I), and the other on the switch actuator frame (Tang J) to raise or lower the handle operating position. The (Tang I) on the actuator is bent downward or upward respectively. To adjust the free position, the (Tang J) on the top of the frame is bent downward.

BRAKE ADJUSTMENT

1. Position steer handle in operating range and hold.
2. Adjust set screw stop for brake shoe clearance of .010 to .015 on left hand shoe.
3. Adjust clevis rod between brake arms to .010 to .015 on opposite shoe.
4. Take steer handle from operating range and position it 10° from vertical and hold.
5. Loosen cam follower and position on cam surface and tighten.
6. Set micro switch to make contact just after brake shoe on switch side has released.
7. Adjust brake holding torque by raising (***) drive tire from floor and adjusting nut "A" until torque wrench "T" reads **175 Pound-Inches**

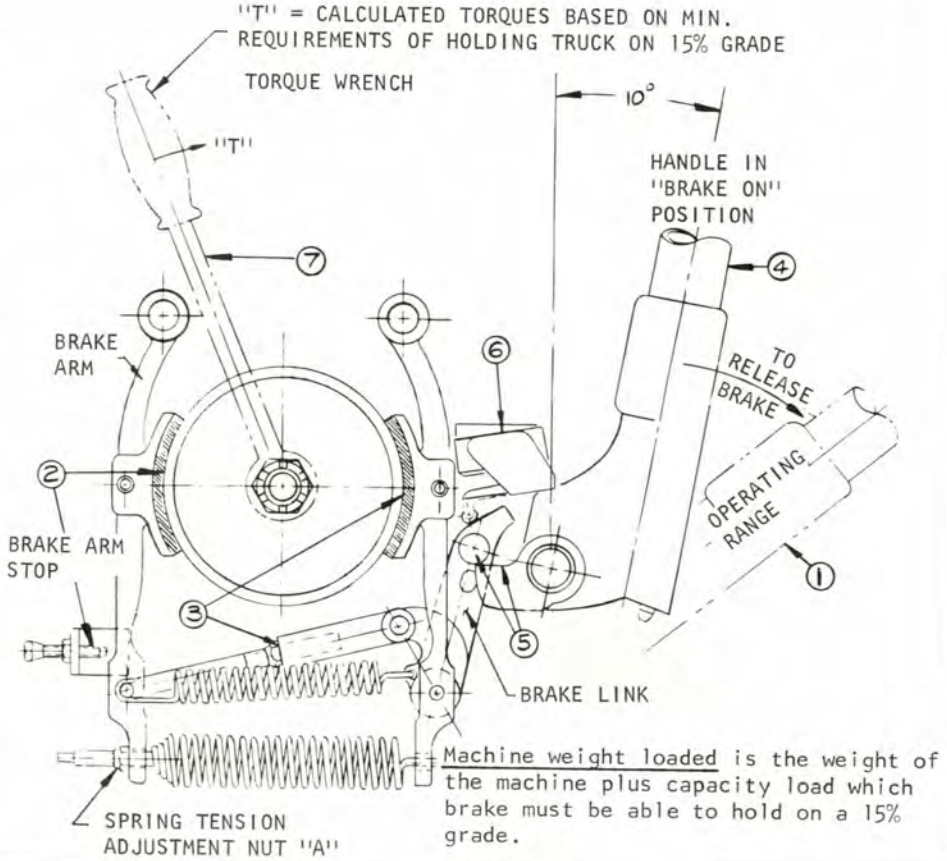


Plate 9309. Brake Adjustment

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X X X X X X X X X X X X X X X X X X X X X X X X
X
X           W A R N I N G
X
X AFTER RAISING MACHINE AND BEFORE MAKING
X ANY ADJUSTMENTS, ADJUSTMENT CHECKS OR
X BEFORE PERFORMING ANY MAINTENANCE, PLACE
X ADEQUATE BLOCKING (SUFFICIENT TO SUPPORT
X THE MACHINE) UNDER THE FRAME TO PREVENT
X ACCIDENTAL LOWERING OR FALLING OF THE
X VEHICLE, THIS PREVENTING PERSONAL IN-
X JURY TO MECHANIC OR BYSTANDERS.
X X X X X X X X X X X X X X X X X X X X X X X X
  
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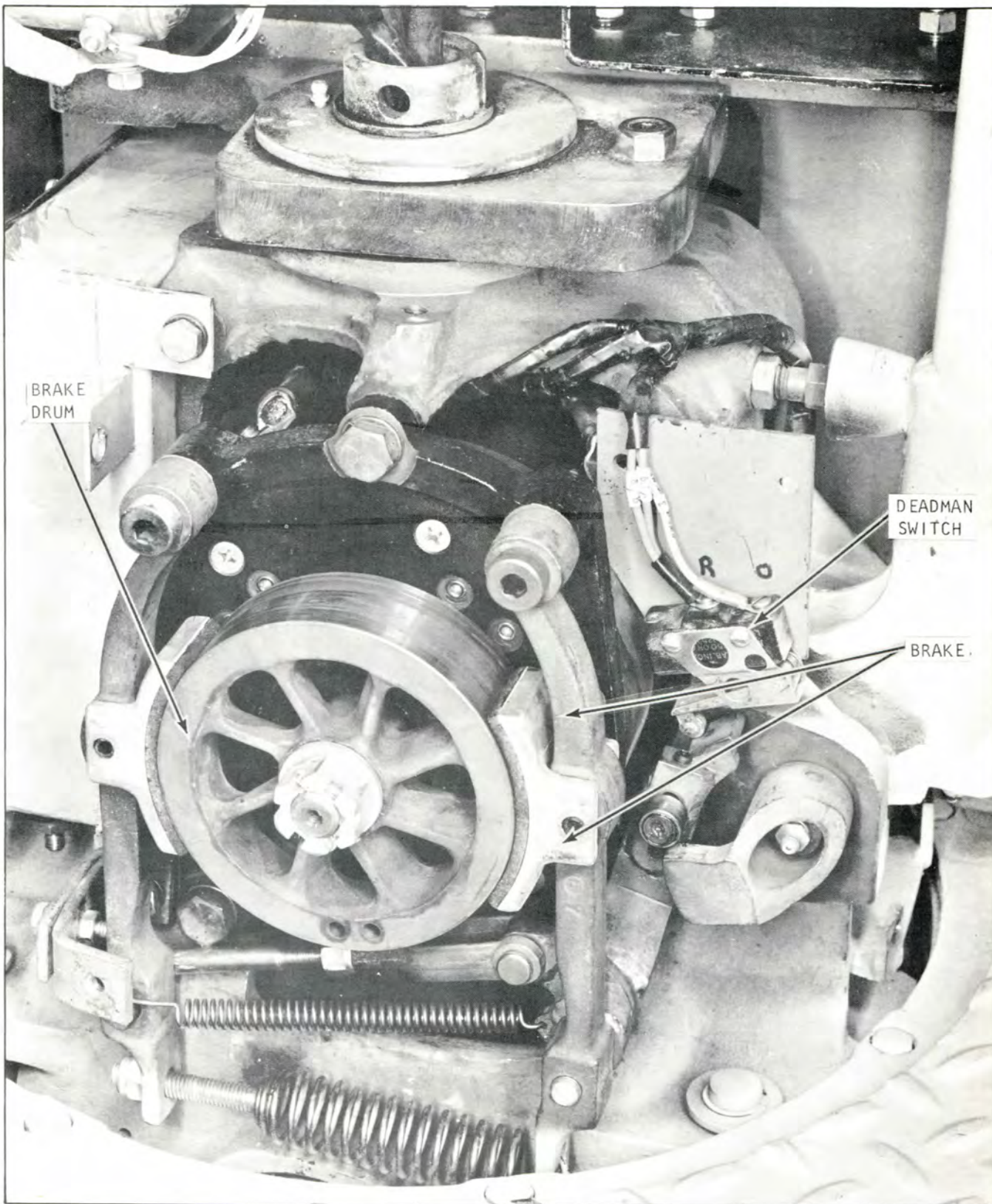



Plate 9319. Drive Unit Assembly

DRIVE UNIT

DESCRIPTION

Power from the drive motor is transmitted through a 22 to 1 double reduction of spur gears to the drive wheel axle. The complete gear train is mounted on ball and roller bearings in an enclosed housing in a bath of oil.

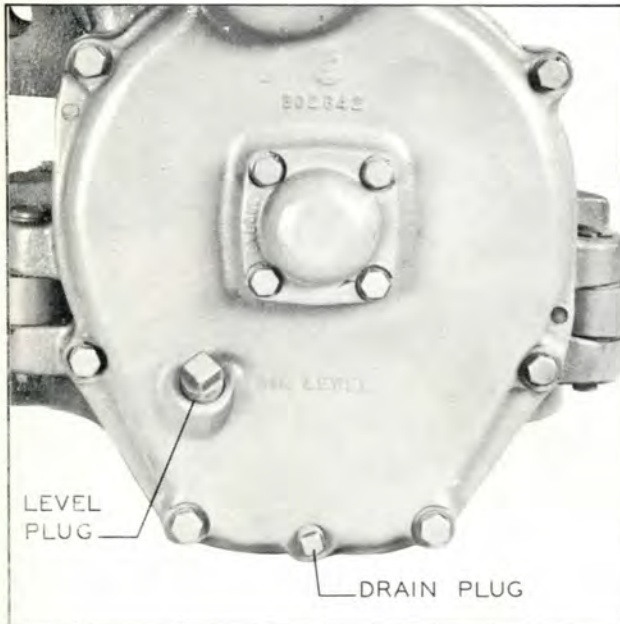


Plate 4274.

Drive Unit Assembly

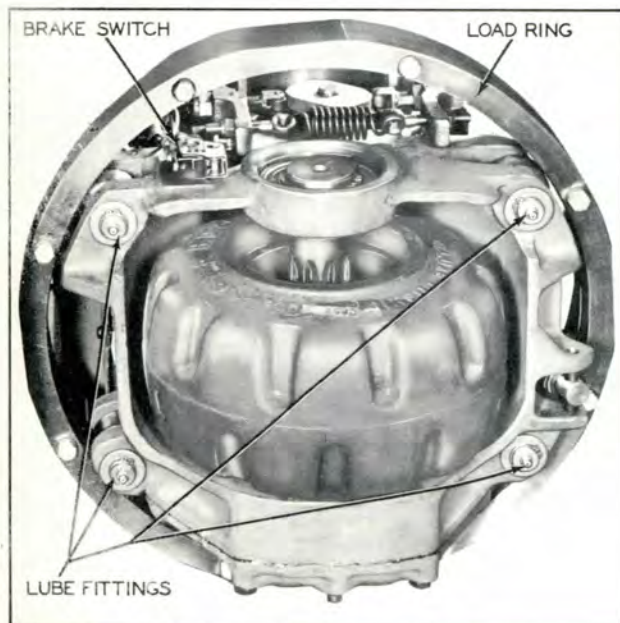


Plate 6225.

Radial Roller Lubrication

Lubrication The drive unit is supported by four shaft mounted self-centering rollers which provide constant contact with the radial load ring in the frame. Each roller shaft has a lube fitting at the bottom which is to be greased every 100 operating hours with chassis grease.

Capacity Approximately 1/2 pint. Drain when hot and refill with SAE 90 gear lubricant every 1,000 operating hours.

DRIVE UNIT REMOVAL

1. Remove hydraulic compartment cover and both halves of drive unit cover.

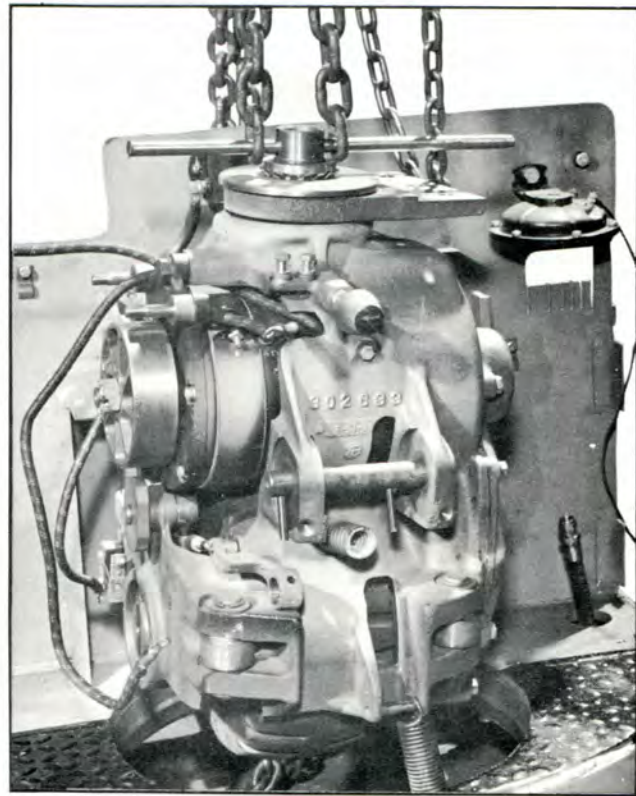


Plate 4012.

Drive Unit Removal

2. Disconnect drive unit wires at terminal board or at pump motor, horn, and switch. Be sure to tag wires to insure proper connection at reassembly.

3. Raise front of vehicle slightly off floor and securely block in this position.

4. Remove bolts securing drive unit to frame. Attach chain hoist and remove assembly as shown in plate 4012.

DRIVE UNIT DISASSEMBLY

1. Disconnect wires, remove retainer pins from control handle and bracket and remove the control handle with wiring harness from drive unit. Be sure to tag wires to insure proper connection at reassembly.

2. Remove mounting nuts and remove contactor or control panel.

3. Remove drive wheel as described in Wheel section at back of manual.

4. Remove brake assembly and attaching parts.

5. Drain lubricant from gear case by removing drain plug.

4. Press bearing from spindle if unserviceable.

5. Remove dust seal from groove at top of housing.

Reduction Gear Case

1. Remove capscrews and remove gear housing cover and gasket.

2. Unscrew four capscrews and remove end cap from cover. Remove nut and bearing from pinion.

3. Remove bull gear, reduction pinion and spacer from cover.

4. Remove snap ring and remove reduction gear from drive unit housing.

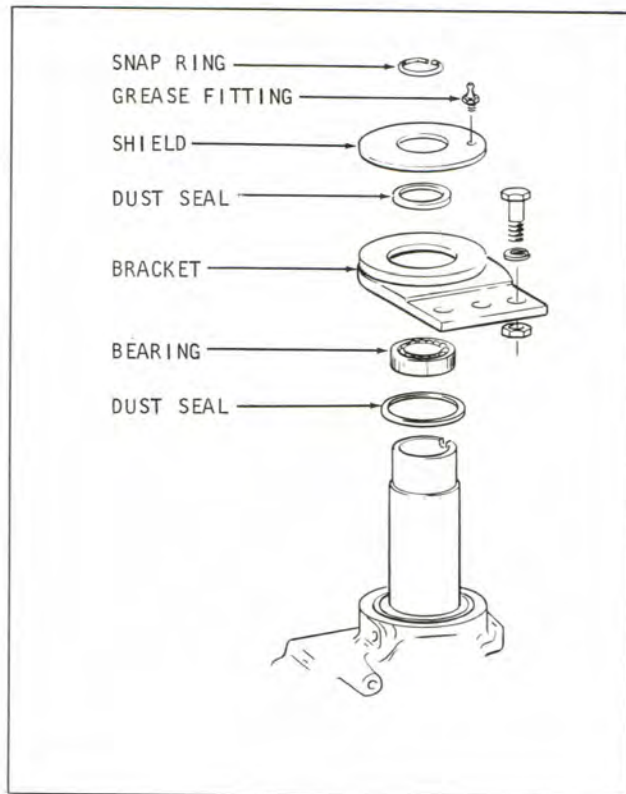


Plate 9310. Spindle Bearing and Bracket

Spindle Bearing and Bracket Removal

1. Remove the bolts attaching the drive unit housing to the frame and remove housing.

2. Remove snap ring, dust shield and dust seal from spindle.

3. Remove drive unit bracket. If damaged, drive bearing cup from support.

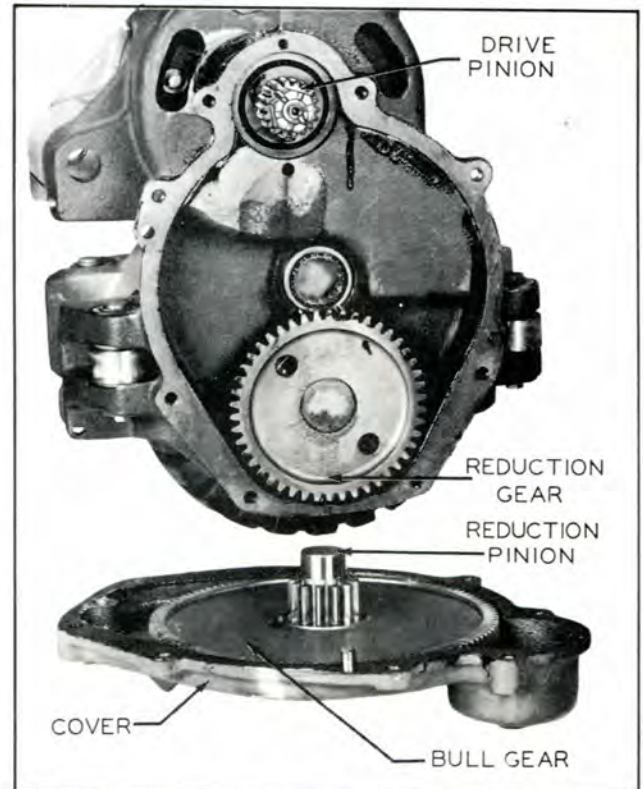


Plate 4006. Reduction Gear Case Assembly

Axle Shaft Bearing

1. Remove the outside locating ring. Tap bearing lightly until free and remove. Remove the sleeve located behind bearing.

2. Replace the oil seals if damaged or worn.

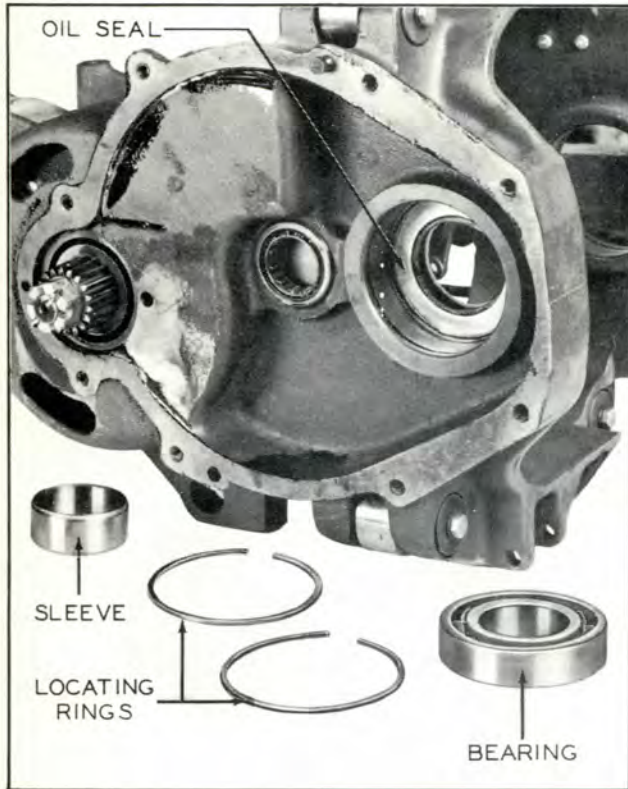


Plate 4007. Axle Shaft Bearing and Sleeve Removal

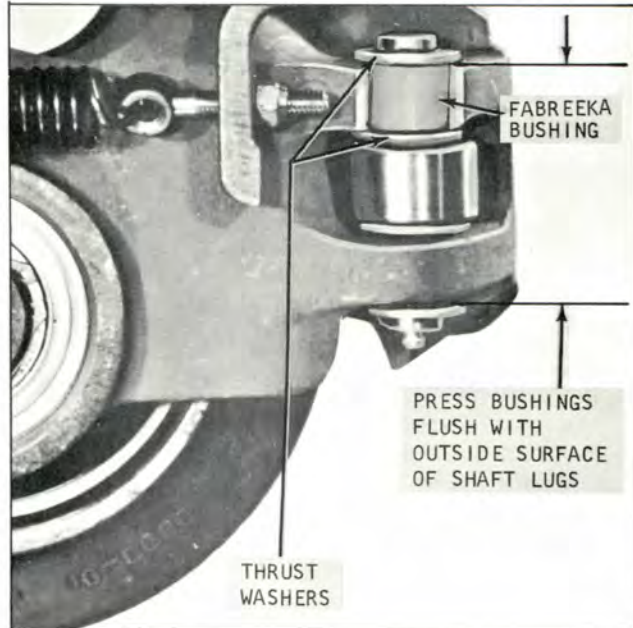


Plate 7753. Radial Thrust Rollers

RADIAL THRUST ROLLER REPLACEMENT

1. Remove snap ring and flat washer from thrust roller shafts. Using a punch and hammer, drive shaft down out of housing.
2. Examine condition of rollers, seals, bearings, and shaft bushings to determine further serviceability.
3. When installing thrust roller shaft (fabreeka) bushings, press bushing into housing flush with outside surface of shaft lugs, see Plate 7753.
4. To install new rollers, press the bearing in center of roller. Install a seal at top and bottom of roller. Place roller in housing making sure roller is correctly lined up with the shaft holes in the housing. Drive the shaft (with lube fitting hole down) into position and install flat washers and snap rings.

DRIVE UNIT INSTALLATION

To install the drive unit, follow the removal procedures in reverse.

CLEANING AND INSPECTION

Immerse all parts except bearings in cleaning solution and clean thoroughly.

Clean bearings thoroughly in a separate cleaning solution. Apply light coating of engine oil and test for worn spots and pits. Lubricate bearings properly before reinstalling.

DRIVE UNIT REASSEMBLY

To reassemble the drive unit follow the disassembly procedures in reverse. Install new gaskets where removed, and tighten capscrews of reduction gear housing cover to a torque of 16 to 18 lb. ft.

DRIVE TIRE CHANGE

1. Using a chain hoist, raise front of truck to expose drive tire and to make accessible the drive shaft.
2. Unclinch lock washer at inner face of bearing on end of axle shaft opposite gear train.
3. Remove lock nut and washer from axle shaft and maneuver components inward as shown in Plate 4019.
4. Insert a 1/2 x 13 bolt into exposed end of shaft.
5. Pull splined shaft through wheel hub and bearings to permit wheel to drop, see Plate 4019. The bearing will remain in place.

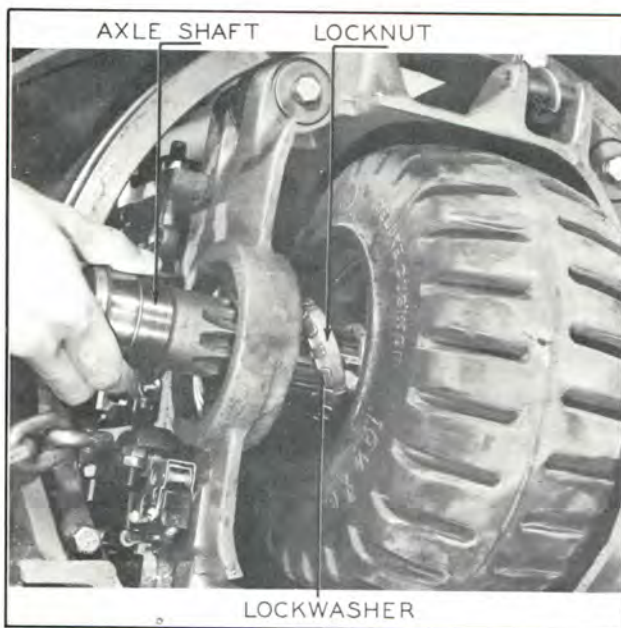


Plate 4019. Drive Wheel Removal

PRESSED-ON TYPE WHEEL

6. The drive wheel incorporates a pressed-on type solid rubber tire, see Plate 6053. At least a 30-ton press is needed to remove and replace a new rubber tire on the wheel hub. Upon installing a new tire, the tire must be centered in relation to the hub.

REMOVABLE TYPE WHEEL

7. Remove four bolts in the tire hub and disassemble tire hub and expanding segments, see Plate 2694.

Reassemble with new tire laying flat. Insert hub section with tapped bolt holes in tire. Assemble both expanding segments and second hub section. Insert bolts and tighten.

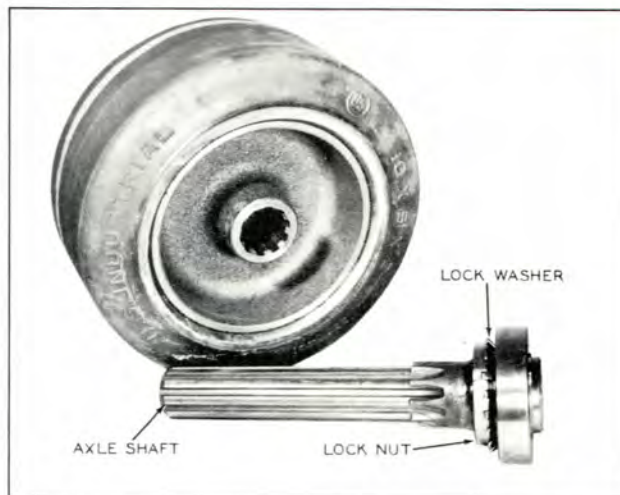


Plate 6053. Pressed-on type Wheel and Tire Assembly

8. To reassemble the drive wheel to truck, hold wheel in place, tap the axle shaft in position against the exposed snap ring. Lock nut and washer should be in place before tapping shaft into wheel hub.

9. Install lock washer against the inner face of bearing and screw the lock nut firmly against it. Tighten lock nut securely and bend up two tabs of the lock washer to secure in position.

10. Now lower truck to floor.



Plate 7343. Removable type Wheel and Tire Assy.



ELECTRICAL SYSTEM

BATTERY

Two types of 12 volt batteries are used in Powrworker vehicles, lead acid and alkaline. Either type will give long satisfactory service if given proper care.

Batteries should be charged in accordance with battery manufacturer's instructions.

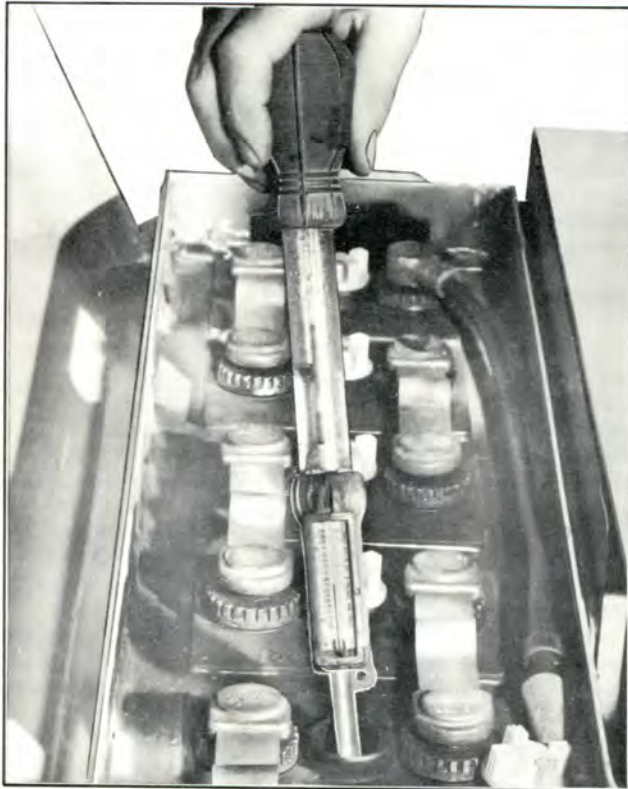


Plate 4018. Testing Specific Gravity of Cells

Lead-Acid Battery Maintenance

The lead-acid battery has a lead peroxide positive plate, a sponge lead negative plate and the electrolyte is a solution of sulphuric acid.

Distilled or approved water should be added to all cells of the battery at sufficiently frequent intervals to keep the electrolyte level above the top of the splash cover. During cold or freezing weather, water should be added just before the battery is placed on charge so that the water will be thoroughly mixed with the electrolyte during the charge and thus avoid any danger of the water freezing.

Keep tops of batteries clean and dry

at all times. Normally, wiping the top with a wet cloth is sufficient. If any electrolyte is accidentally spilled or if any parts are damp with acid, apply a solution of bicarbonate of soda (baking soda) using one pound to one gallon of water, then rinse with water and dry.

The vent plugs should be in place at all times when using, cleaning, and charging the battery. They should be cleaned periodically. Check the vent holes to be sure they are not plugged.

Specific gravity readings should be taken to determine the charge of the battery (Plate 4018). Draw up just enough electrolyte to float the hydrometer stem freely. The reading on the stem at the surface of the liquid will indicate the specific gravity. Refer to the battery manufacturer's instructions for specific gravity values. (In most cases a fully charged battery will have a reading of 1.265 to 1.285). Periodically test voltage of each cell with a test fork as shown in Plate 4008. Each cell should register two volts.



Plate 4008. Test Voltage of Cells

Alkaline Battery Maintenance

The alkaline storage battery is known as the nickel iron-alkaline type because nickel oxide is used in the positive elements and iron in the negative elements while the electrolyte is an alkaline solution containing potash and lithia.



INDUSTRIAL TRUCK DIVISION



A charge test fork is used to determine the state of charge of an alkaline battery. This is accomplished by a key voltage reading which, upon reference to charts supplied with the instrument, will indicate the amount of charge necessary to restore the battery to a fully charged condition.

Specific gravity readings have no value in determining the state of charge of an alkaline battery, as the specific gravity does not change during the charging periods. NEVER put lead battery acid into an alkaline battery, or use utensils that have been used with acid.

BATTERY CHARGER

Battery chargers should be stored in a clean, dry, well-ventilated place away from possible heat, damage or abuse. When using charger, follow instructions supplied by the charging equipment manufacturer. DO NOT disconnect charger from battery without first shutting charger off.

BATTERY CONNECTORS

The positive and negative battery cables are secured in a plug in such a manner that the battery may be disconnected from the vehicle circuit by pulling the plug out of the receptacle. NOTE: Only in cases of emergency should the plug be disconnected while the vehicle circuit is in operation. When connecting plug to receptacle, make sure plug is fully inserted in receptacle.

BATTERY CAUTIONS AND WARNINGS

NEVER bring a lighted match or any open flame near a battery as this may result in an explosion.

NEVER lay a tool or any piece of metal on a battery.

ALWAYS keep the filler caps closed except when necessary to have them open for filling. The battery solution is harmful to the skin and clothing and must be handled carefully. Solution spilled on the person should be immediately washed away with plenty of water.

DO NOT fill cells while battery is charging.

ALWAYS shut down charger before dis-

connecting charging equipment from battery.

ALWAYS, when repairing a damaged or dirty plug or receptacle which is connected to a battery, remember that the leads are "hot". Before removing terminal lugs from receptacle, the battery circuit must be opened or broken. If this is not done, and terminal lugs are touched together, a short circuit and arcing will occur which will damage the equipment.

WIRING

Inspect wiring every 200 operating hours and remove accumulated dust, dirt and oil. Check for deterioration and breakage which may cause shorts. Make sure flexing portions of wires are free from restriction and kinking when vehicle steer handle is placed in the extreme positions.

HORN ADJUSTMENTS

1. The horn must cut in at 7 volts or less, must have proper tone with 11.5 to 14 volts at the horn, and a line resistance of approximately 0.11 ohms. (Open circuit voltage approximately 1/2 volt higher than operating voltage at horn).

2. Adjust the current and test for tone until an adjustment is found where the tone is loud and clear as possible throughout the above voltage range. Make sure the locknut is tight and the adjustment should be complete. The nominal current is 3.5 amperes.

3. If it is impossible to obtain a satisfactory tone with the above current adjustment, it may be necessary to change the air gap. The air gap is adjusted by means of a 3/8 inch stud through the center of the diaphragm. If horn tone is harsh at high voltage, very sensitive to current adjustment, and is lacking in disc note, open air gap by loosening lock nut and rotating stud slightly to the left. Note the position of the slot in the stud before loosening the locknut. If tone is weak at low voltage and lacking in disc tone, close air gap.

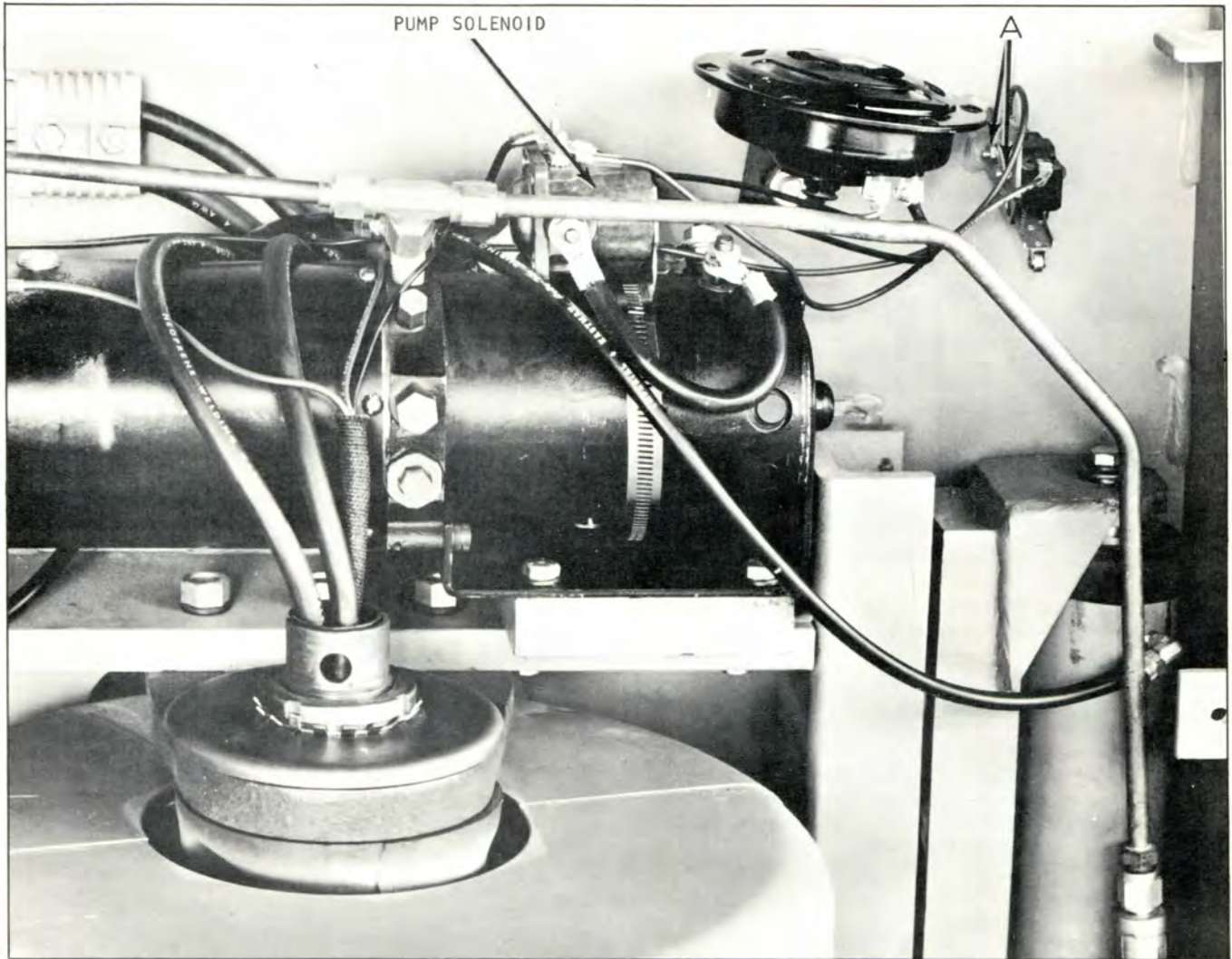


Plate 7245. Lift Limit Switch Adjustment

SWITCHES

It is not recommended that the switches (switchettes) used in Powerworker vehicles be disassembled for repair or adjustment. In cases where adjustment may be necessary, provisions have been incorporated in the switch mounting or actuating mechanism for the adjustment.

There are two screws and nuts which hold the Limit Switch to its bracket, see Plate 7245. Loosen the two nuts (A) and move switch in direction necessary so that the switch will actuate just as the Lift Mechanism reaches the upper limit. This is easily accomplished by raising upright to the top limit. Lower switch until it contacts the Upright. Move or lower switch enough further so switch actuates, now tighten both retainer nuts being careful switch does not move when tightening. Check adjustment. Lower and then raise the upright. The

switch should shut off the pump motor just as the upright reaches the upper limit. This adjustment is necessary to prevent excessive operation of the pump relief valve. **DO NOT OVER-TIGHTEN SWITCH RETAINER NUTS AS THIS COULD CAUSE DAMAGE TO THE SWITCH.** Tighten only enough to secure switch in position.

PUMP SOLENOIDS

If the pump solenoid becomes inoperative, check leads for tightness. If the solenoid is found to be open-circuited, welded closed or having a high resistance, it must be replaced as a unit.



Plate 4011. Checking Forward and Reverse Switches

Forward and Reverse Switches

Occasionally remove cover from end of handle and examine condition of the forward and reverse switches. If they should become defective, they are to be replaced. Do not press direction control levers with more force than require to operate them.

Brake Switch

The deadman switch is located on the drive unit housing at the lower part of the brake assembly. Refer to 'Brake System' for adjustment procedure.

Lift and Lower Switches

The steer handle lift/lower switches are used to activate the hydraulic pump motor and hydraulic system release valve respectively and must be replaced if defective.

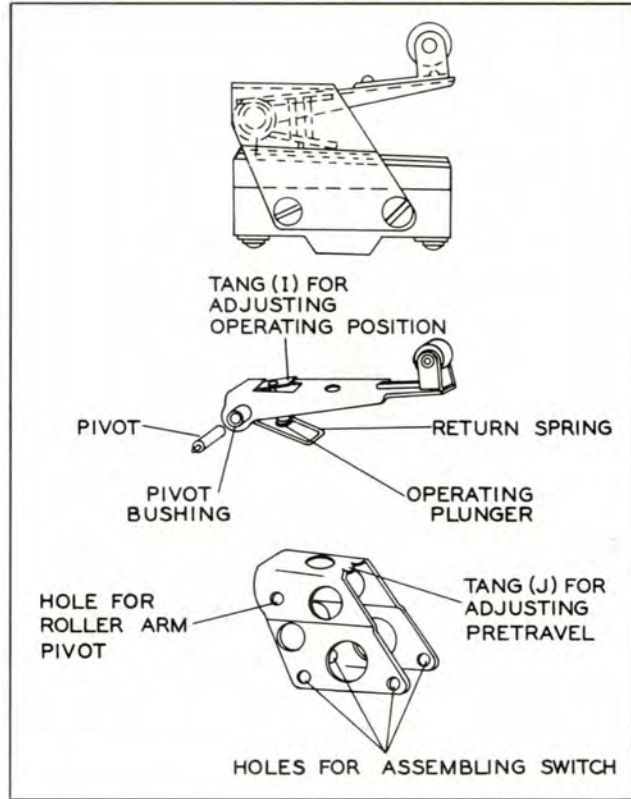


Plate 6058. Switch Arm Adjustment

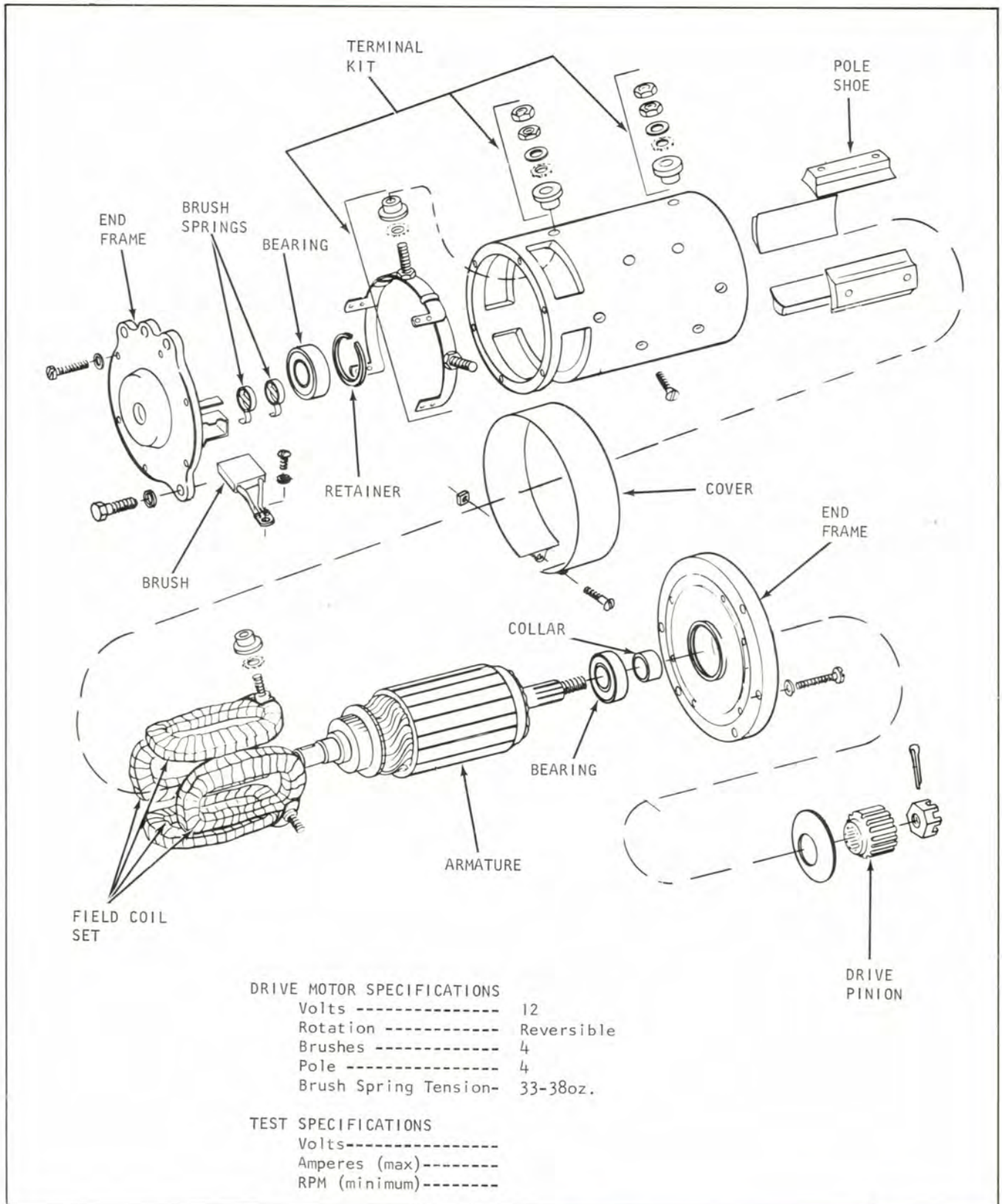
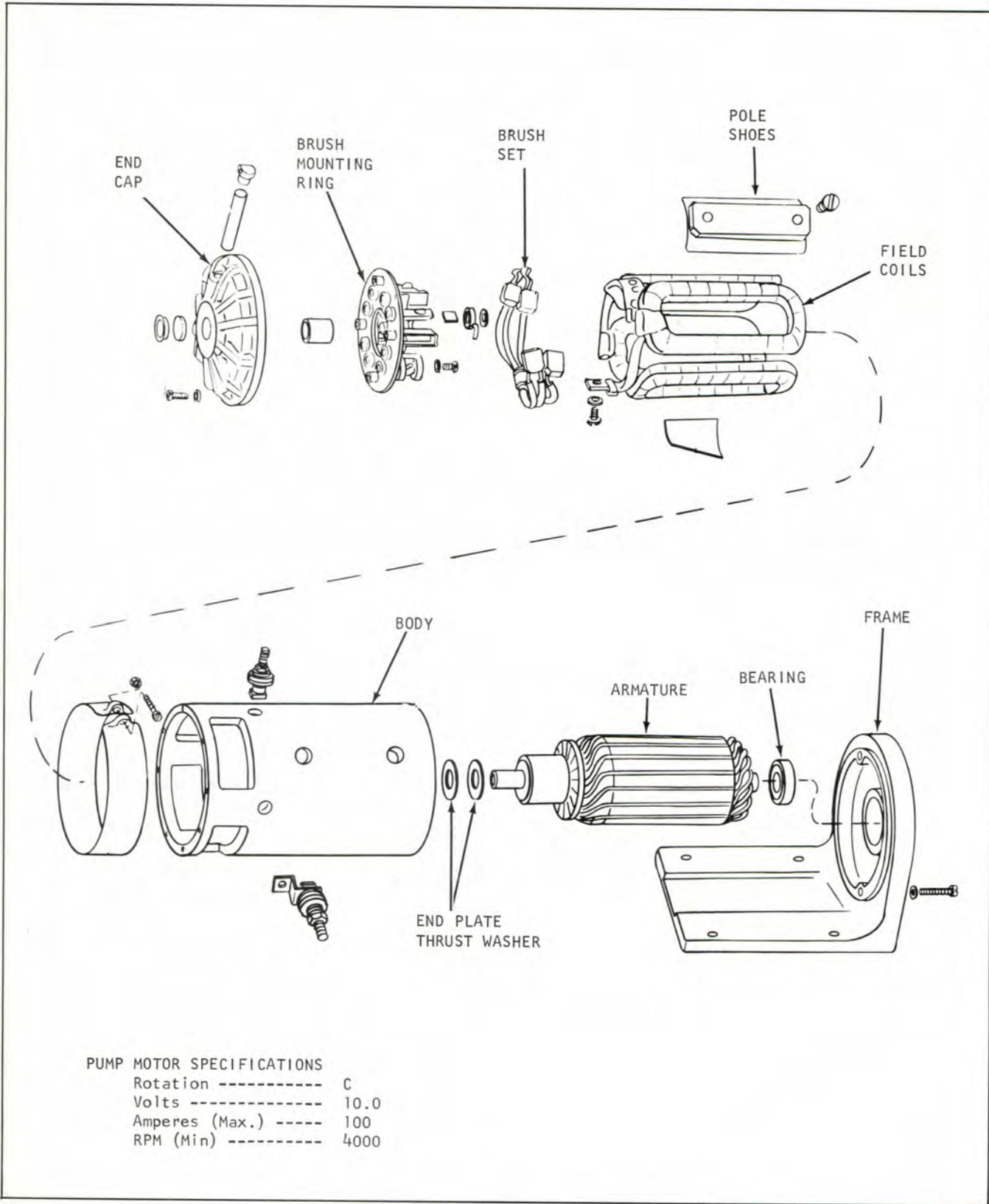


Plate 9906. Drive Motor



PUMP MOTOR SPECIFICATIONS

Rotation -----	C
Volts -----	10.0
Amperes (Max.) -----	100
RPM (Min) -----	4000

Plate 9907. Pump Motor

PUMP AND DRIVE MOTORS

Preliminary Tests

Remove motor cover band. Place motor on a "V" Block and connect in series with a fully charged battery of correct voltage. Also connect an ammeter capable of indicating several hundred amperes, a variable resistance, and a voltmeter. An r.p.m. indicator is necessary to measure armature speed. Obtain the specified voltage by varying the resistance, read the current draw and the armature speed and compare these readings with the values listed in the test specifications.

NOTE

Test the Drive Motor in both directions of rotation.



Plate 6450. Checking Brush Spring Tension

Brushes

Inspect brushes for wear. If the brushes are oil soaked or worn to less than half their original length, when compared to a new brush, they should be replaced. Make sure brush holders are

clean and the brushes are not binding in the holders. The full brush surface should ride on the commutator with proper spring tension (see specifications) to give good firm contact.

Armature

Visually inspect armature for mechanical defects, such as; a worn or bent shaft, worn commutator, scored core laminations, and to see that all windings are properly in place in the core slots. Check to see that all windings are properly staked and soldered to the commutator bars.

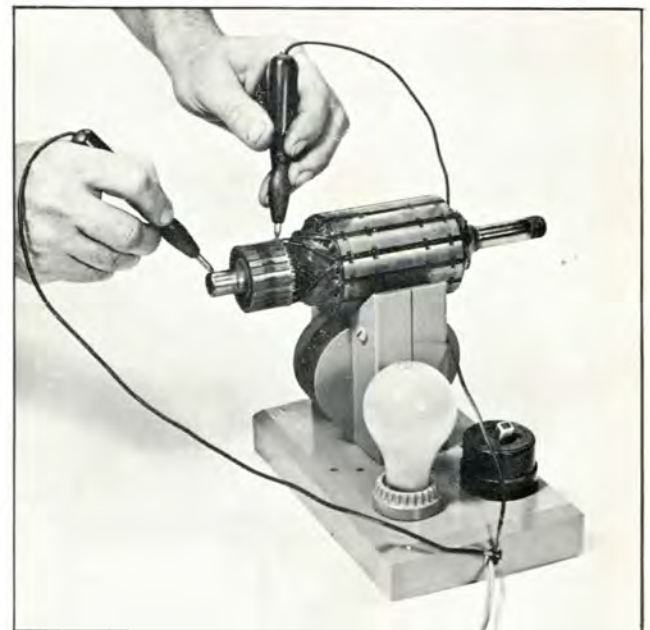


Plate 7222. Testing Armature for Grounds

Check the armature for grounds with test probes (Plate 7222) by touching the shaft with one probe and the commutator with the other. If the lamp lights the armature is grounded and should be replaced.

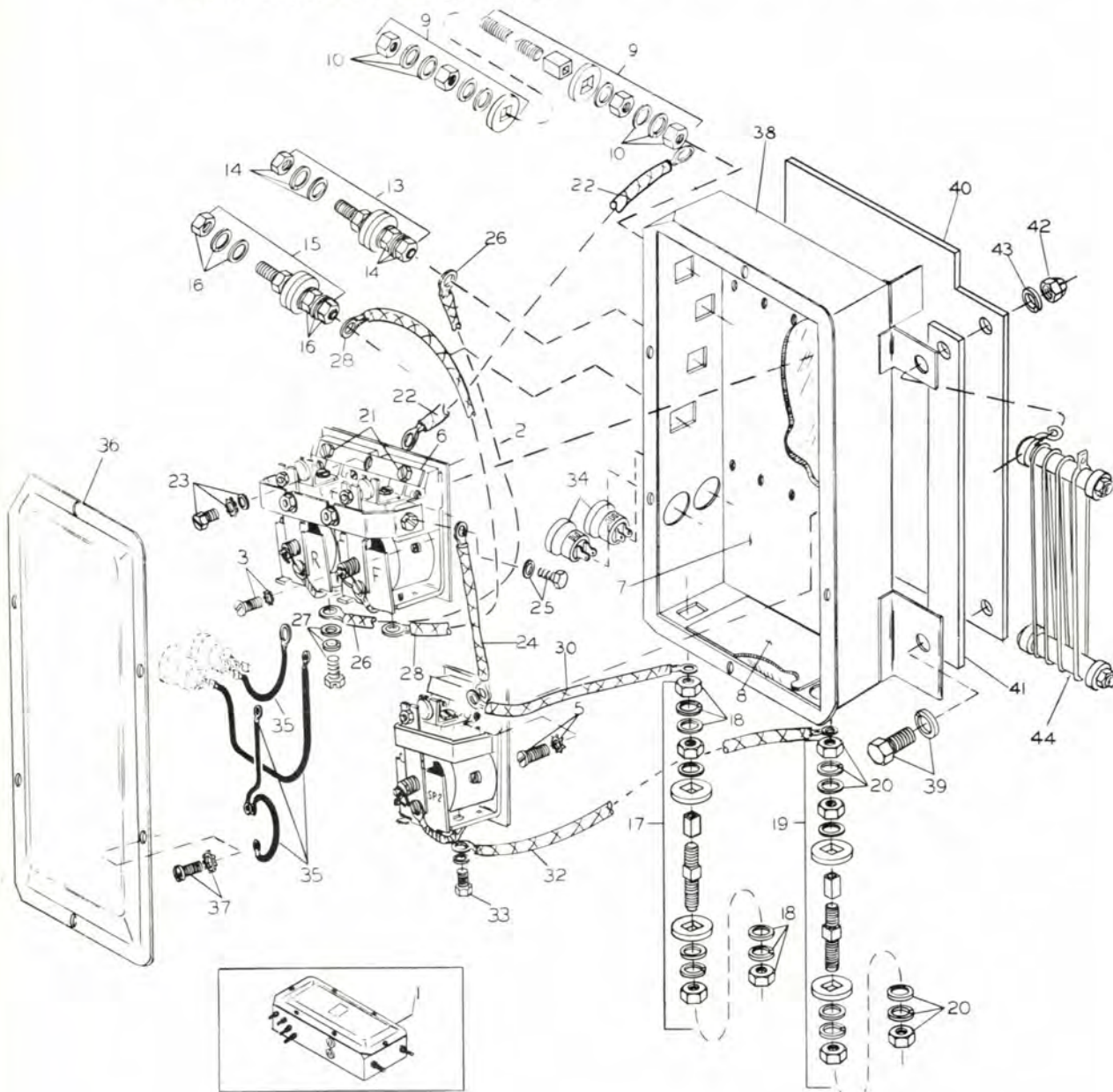
CAUTION

DO NOT TOUCH BEARING OR BRUSH SURFACES WITH TEST PROBES AN ARC WILL BURN THE SURFACE.

Clean the commutator with 00 or 000 sandpaper and remove all dirt from between armature bars. Turn commutator down on a lathe if commutator is rough, burned, or if the mica extends above the surface of the copper.

Keep the contactor as free from dust and dirt as possible, this can be accomplished by periodically blowing off with low air pressure or wiping with a clean dry cloth, DO NOT LUBRICATE. Contact tips are of silver alloy and require no cleaning. Replace with a new contact tip when maximum contact wear (approximately 3/32") is reached.

NOTE: If contact tip carrier and/or springs are discolored as from heat, replace them as well.



There are no adjustments necessary on these contactors. The normally open contact gap will be 5/16" plus or minus 1/16" and the normally closed gap is 7/32" plus or minus 1/16".

CONTACTOR PANEL BOX

5639-P



Plate 7222. Testing Armature for Shorted Coils
FIELD COILS (ALL MOTORS)

Using test probes, check the field coils for grounds. To test for grounds, place one probe on the motor frame or pole piece and touch the other probe to the field coil terminals. If a ground is present the lamp will light.



Plate 7223. Testing Field Coils for Grounds

Inspect all connections to make sure they are properly clinched and soldered. Inspect the insulation for evidence of damage.

Brushes

Brush Spring Tension should be checked with a spring scale. To check tension of reaction type brush springs, hook the scale under the "brush arm" near the brush and pull on a line with the side of the brush. If the brush spring tension is too low, there will be a loss of efficiency due to proper brush contact. If the tension is too great, the commutator and brushes will wear excessively and have short life. It is therefore important that the spring tension be kept within the limits specified for new brushes. To assist in telling the exact instant that the pressure is relieved, a small strip of paper can be placed under the brush. Pull slightly on the paper and the paper will slip out at the correct instant for reading the spring scale.

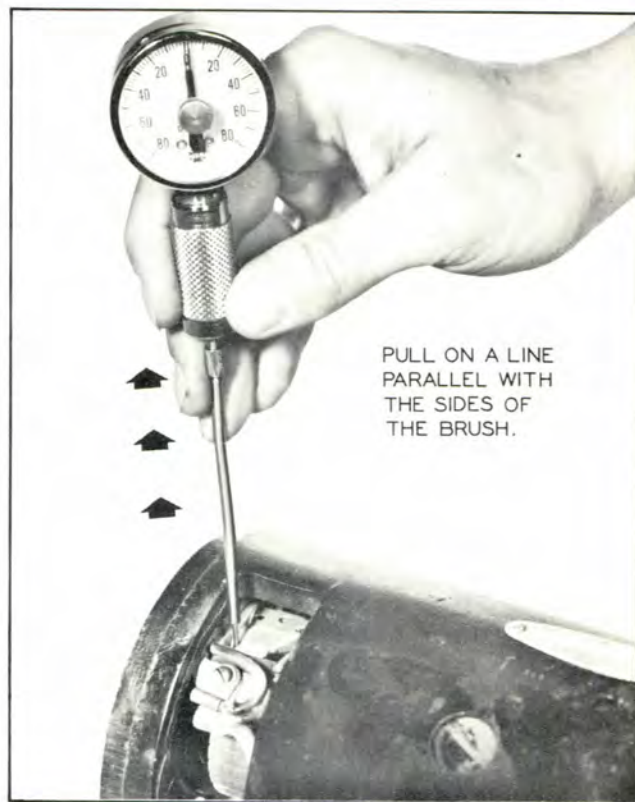


Plate 6450. Checking Brush Spring Tension

CAUTION

NEVER ALLOW SPRING TO SNAP DOWN ON BRUSHES.

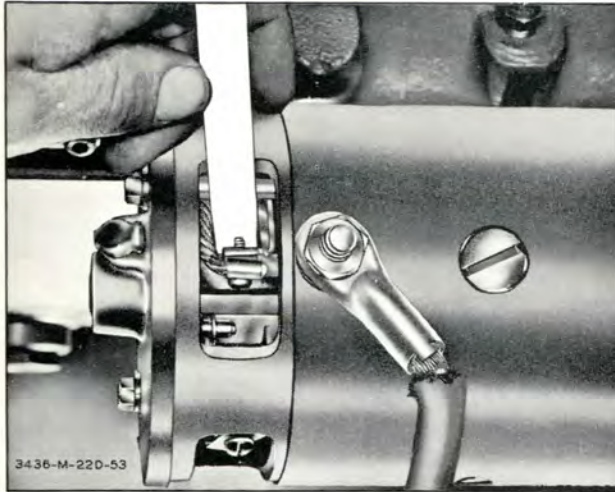


Plate 3436. Seating Brushes

Brushes should be checked every six months or after every 1000 operating hours, whichever occurs first.

Brushes should slide freely in their holders. Drive Motor: Brushes worn to $5/8$ inch, measured from top of brush on longest edge, should be replaced.

Pump Motor: Brushes worn to $1/4$ of an inch, measured from top of brush on longest edge, should be replaced.

Brushes that are oil soaked, chipped or broken should be replaced.

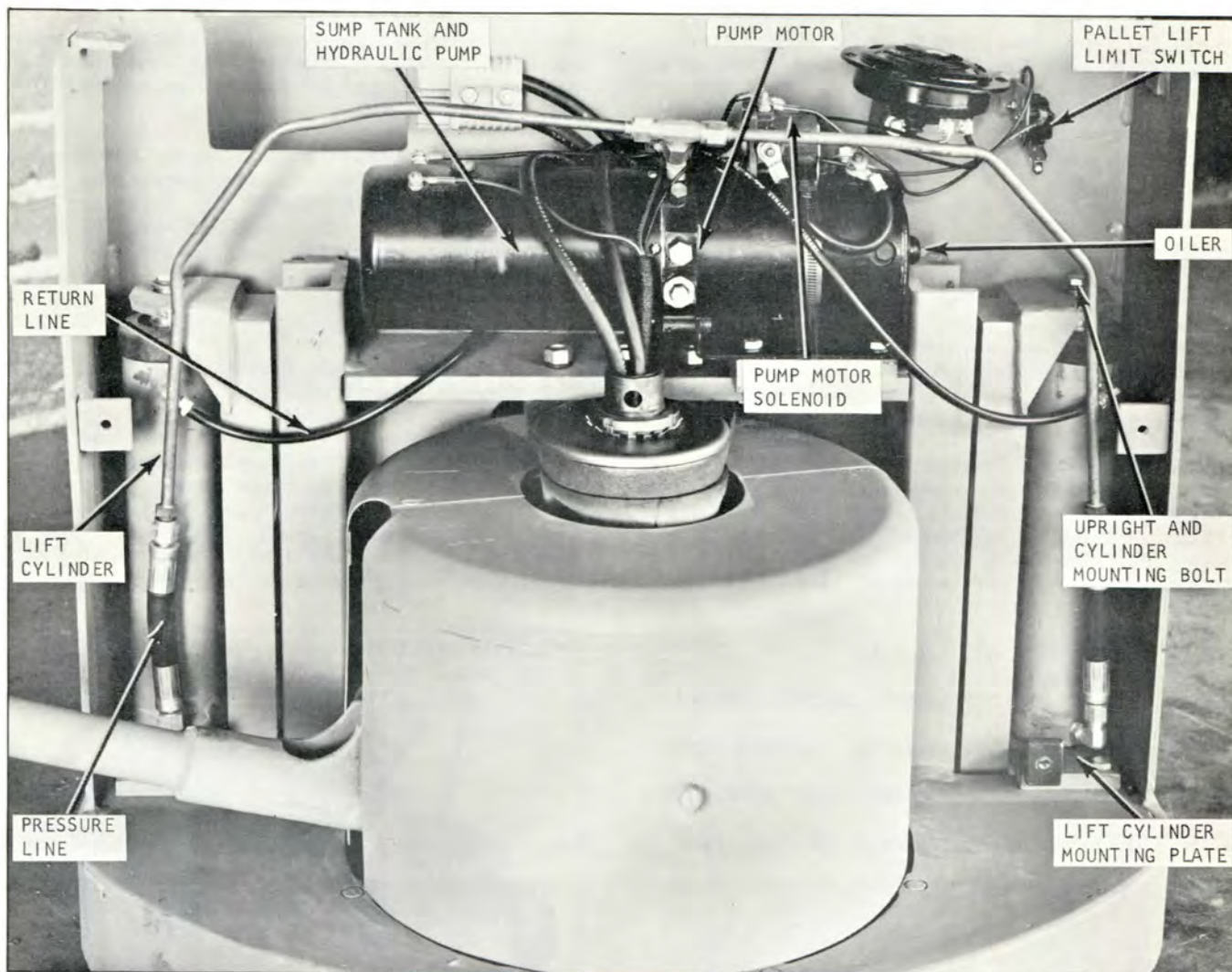


Plate 7249. Hydraulic System (Lift limit switch located beneath battery compartment and lift cylinders located beneath the platform on RPF models).

The Hydraulic System consists of a Sump Tank, Hydraulic Pump and Pump Motor, Lift Cylinders, Hose Lines and Connections, refer to Plate 7249.

HYDRAULIC FLUID

Fill sump to within 1/2 to 1 inch of the filler plug hole (located in top of sump tank).

Selection of a good quality hydraulic oil is very important as all internal parts of the hydraulic system are lubricated by the hydraulic oil. Therefore, the use of proper oil is necessary to insure long and efficient operation of the system. Refer to the Lubrication Chart for specifications.

CAUTION

ONLY HYDRAULIC OIL SHOULD BE USED IN THE SYSTEM. NEVER USE BRAKE FLUID OR ANYTHING OTHER THAN HYDRAULIC OIL.

The hydraulic system MUST be kept clean in the same manner as the engine crankcase. If there is evidence of dirt, sludge, or other foreign matter in the system, the sump tank and the entire system must be drained and cleaned. Thoroughly clean the sump tank. When it is necessary to drain the system, always work the machine until the hydraulic oil is warm. Warm oil will flow more freely and

will carry more dirt out of the tank upon draining. The best way to completely clean the system is to disassemble and blow out all lines and cylinders, but a fair cleaning job can be done by refilling the sump tank with clean oil and operating the system several times and then redraining system.

When refilling or adding oil to the system, care should be exercised to keep the oil clean, free of dirt, water, etc., this is important. The oil should be poured through a clean wire strainer screen which can be conveniently placed or soldered into the large end of a funnel. Never use a cloth strainer when adding or refilling reservoir. Cloth strainers contain lint which is harmful to the hydraulic system. When the system has been cleaned by disassembly, operating the control mechanism will force oil into the system which will in turn force air in the lines back into the sump where it can escape. Recheck the sump fluid level and fill to proper level.

CAUTION

NEVER OPERATE THE HYDRAULIC CONTROL MECHANISM (LIFT AND LOWER SWITCHES) WITHOUT FLUID IN THE SUMP. THE SUMP TANK MUST BE FILLED WITH FLUID OR THE COMPONENTS OF THE PUMP WILL BE SEVERELY DAMAGED.

Remember that a clean hydraulic system will operate longer before requiring maintenance than will a system that is neglected. Prolong the life of the components in this system by keeping the fluid free of foreign materials and using only the specified hydraulic fluid listed in the Lubrication Chart.

HYDRAULIC UNIT

The following information is intended to describe the construction, operating principles and characteristics of the unit so that by its understanding, satisfactory performance and increased trouble-free operation and life expectancy may be had.

Minor malfunctions may be pin-pointed and corrected in the field, thereby minimizing unnecessary returns to the factory. Disassembly of the pump beyond that

described in the following paragraphs, is not recommended in that satisfactory performance of the unit is dependent on the closely-machined parts being factory assembled with special equipment.

If the hydraulic unit does not operate properly, refer to the paragraphs listed under "MAINTENANCE" in this section. One, or more of the troubles may be causing improper operation and should be remedied.

General Information

Please refer to Plates 7214 and 7215. The hydraulic unit consists of a positive displacement rotary gear pump (2) with a reservoir mounted directly to the end head of the pump motor (1). An adjustable relief valve (3), a solenoid operated release valve (5) and (13) with lowering speed adjustment, and a manually operated auxiliary release valve (12) are built into the pump assembly.

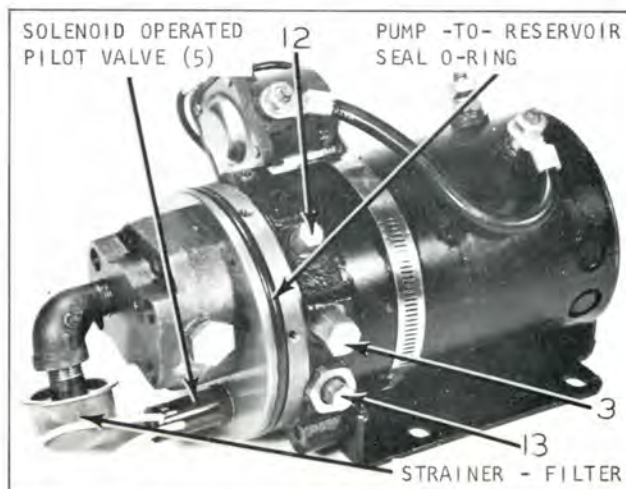


Plate 7250. Hydraulic Pump and Motor

How the unit operates

In order to cycle the unit, the lift switch (11) is closed, energizing the solenoid switch (9), closing electrical circuit to the pump motor (1); thereby starting the pump (2). Fluid is pumped over the check valve (4) and out the pressure port to the lift cylinder. The adjustable relief valve (3) prevents the cylinder pressure from building up beyond 1500 P.S.I.

Opening the lift switch (11) de-energizes solenoid switch (9) breaking the electrical circuit to motor (1) and the pump (2) will stop. The check valve (4)

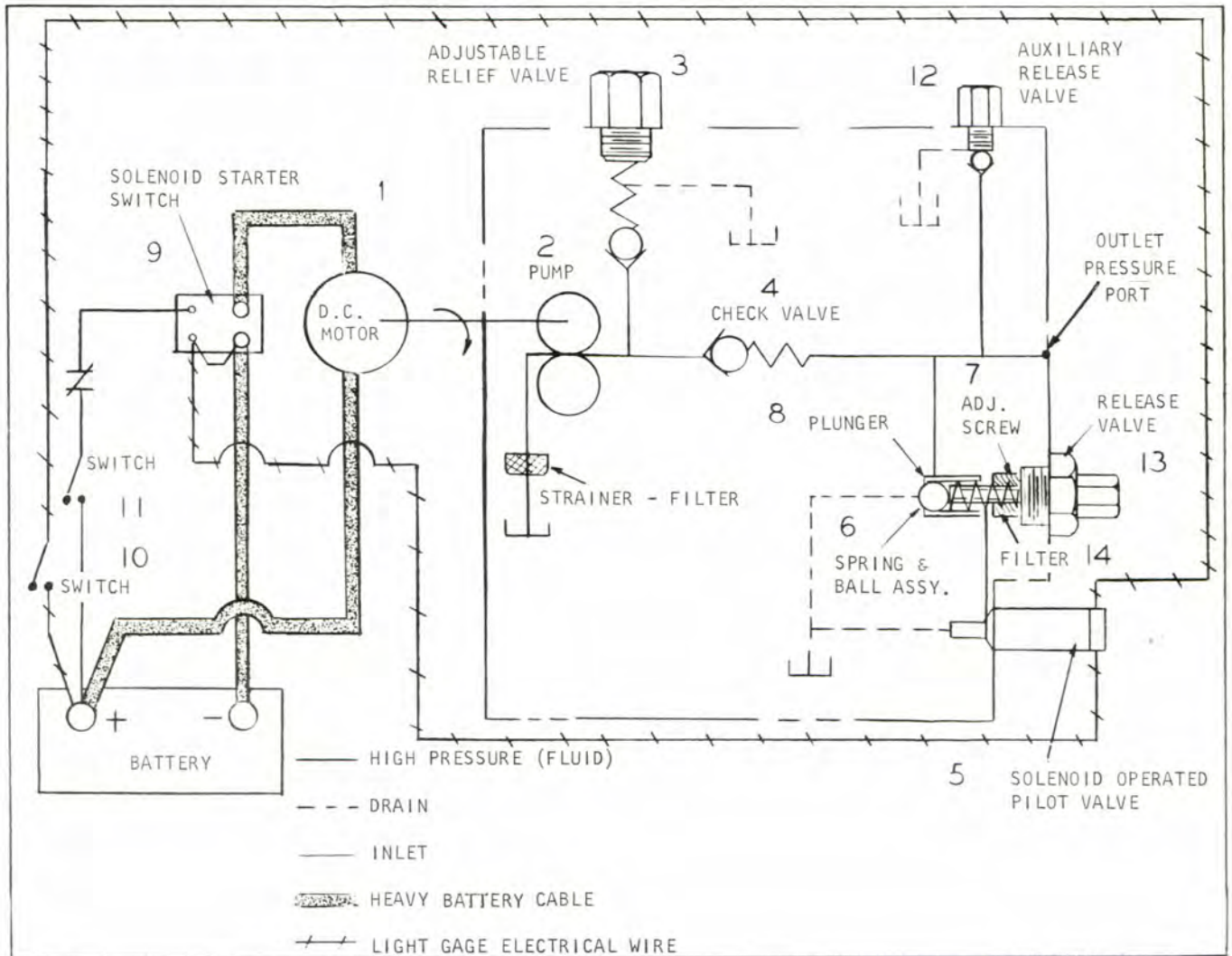


Plate 7214. Hydraulic Unit Schematic

prevents the fluid from leaking back. The lift cylinder is in the "hold" position.

Closing switch (10) energizes the solenoid operated pilot valve (5). When the pilot valve (5) is energized, it relieves the pressure in back of the release valve plunger (8) to reservoir. The pressure drop thus induced across the plunger (8) causes the plunger to move backwards, lifting the ball (6) off the valve seat and allowing the main flow of fluid from the cylinder to flow to the reservoir and the load is lowered. The adjusting screw (7) determines how far off the seat the ball (6) is lifted and is used to adjust the lowering speed. For faster lowering, screw adjusting screw (6) out (counterclockwise). For slower

lowering, screw the adjusting screw (6) in (clockwise).

Emergency Lower

In the event of a mechanical or electrical failure preventing the load from being lowered through normal operating procedures, an auxiliary release valve (12) has been provided for emergency lowering use. Remove the valve cap and back off the set screw approximately 1/2 turn. This releases a ball against a seat so that the ram oil can be returned to sump and allows the load to lower. CAUTION: BE CERTAIN TO RESET THE AUXILIARY VALVE AFTER LOWERING HAS BEEN COMPLETED, AS THE UNIT WILL NOT WORK PROPERLY IF THE VALVE IS NOT RESET.



INDUSTRIAL TRUCK DIVISION



Recommended Equipment for Normal Servicing

1. 5/16 allen wrench (reservoir pipe plug).
2. Screw driver (reservoir screws - relief valve adjustment).
3. 1/8 allen wrench -- set screw on release valve and lowering speed adjusting screw.
4. 1 inch opening adjusting Crescent wrench and/or open end wrenches:
 - 7/16 -- auxiliary release and lowering speed caps.
 - 5/8 -- adjustable relief valve cap.
 - 11/16 -- solenoid operated pilot valve.
 - 7/8 -- release valve cap.
 - 13/16 -- check valve cap.
5. 0-2000 P.S.I. pressure gauge with 1/4 NPT end.
6. 1/4 pipe nipple, 1/4 tee (fittings to install pressure gauge).
7. Ball peen hammer.
8. 3/16 diameter drive pin punch (for setting auxiliary release valve seat).
9. 1/4 diameter drive pin punch (for setting valve seats).
10. Suitable grease (for preparing O-rings for assembly -- a good cup or chassis grease is recommended).

NOTE

PROPER CARE AND CLEANLINESS SHOULD BE OBSERVED IN SERVICING SO AS TO INSURE THE FLUID DOES NOT BECOME CONTAMINATED WITH DIRT OR OTHER FOREIGN MATERIAL WHICH CAN BE DRAWN INTO THE PUMP SO AS TO STICK OR SCORE THE PUMP WHICH WILL CAUSE FAILURE OF THE UNIT.

Use only Automatic Transmission Fluid Type "A", Armour qualified, and keep system filled to proper level.

NOTE

FILL SUMP TO WITHIN 1/2 TO 1 INCH OF THE FILLER PLUG HOLE (LOCATED IN TOP OF SUMP TANK).

The fluid should be kept clean and changed at established intervals, refer to the Lubrication Chart.

MAINTENANCE

If the unit does not operate properly, a few preliminary checks should be made as follows:

1. Proper fluid level.
2. All electrical connections tight.
3. Battery fully charged.

After preliminary checks are made, install a 0-2000 P.S.I. pressure gauge in pressure line near the 1/4 NPT outlet pressure port in the pump. (Make sure no pressure is in the system by opening the auxiliary release valve (12). After pressure is released, reset valve. The installation of the pressure gauge is required to insure proper observation of what is occurring in the unit during trouble shooting.

1. Short out lift limit switch, or loosen and move switch so it will not actuate.
2. Depress and hold lift button. This will raise pallet forks to the upper limit allowing maximum pressure to develop and dump over the relief valve (3). Pressure gauge should read 1500 P.S.I. Remove pressure in system by actuating solenoid operated pilot valve (5) or by unscrewing slightly the auxiliary relief valve (12).

NOTE

DO NOT UNSCREW THE ADJUSTABLE RELIEF VALVE (3) BY MISTAKE. RESET VALVE.

The auxiliary release valve (12) is located nearest the top, see Plate 7215.

The normal troubles that may occur with the unit have been grouped under three headings:

Failure to (I) RAISE, (II) HOLD, and (III) LOWER the load.

One or more of the listed trouble sources may be causing improper operation. Refer to the proper heading (i.e., auxiliary release valve) for detailed instructions for disassembly, check, and adjustment of the parts to remedy the trouble.

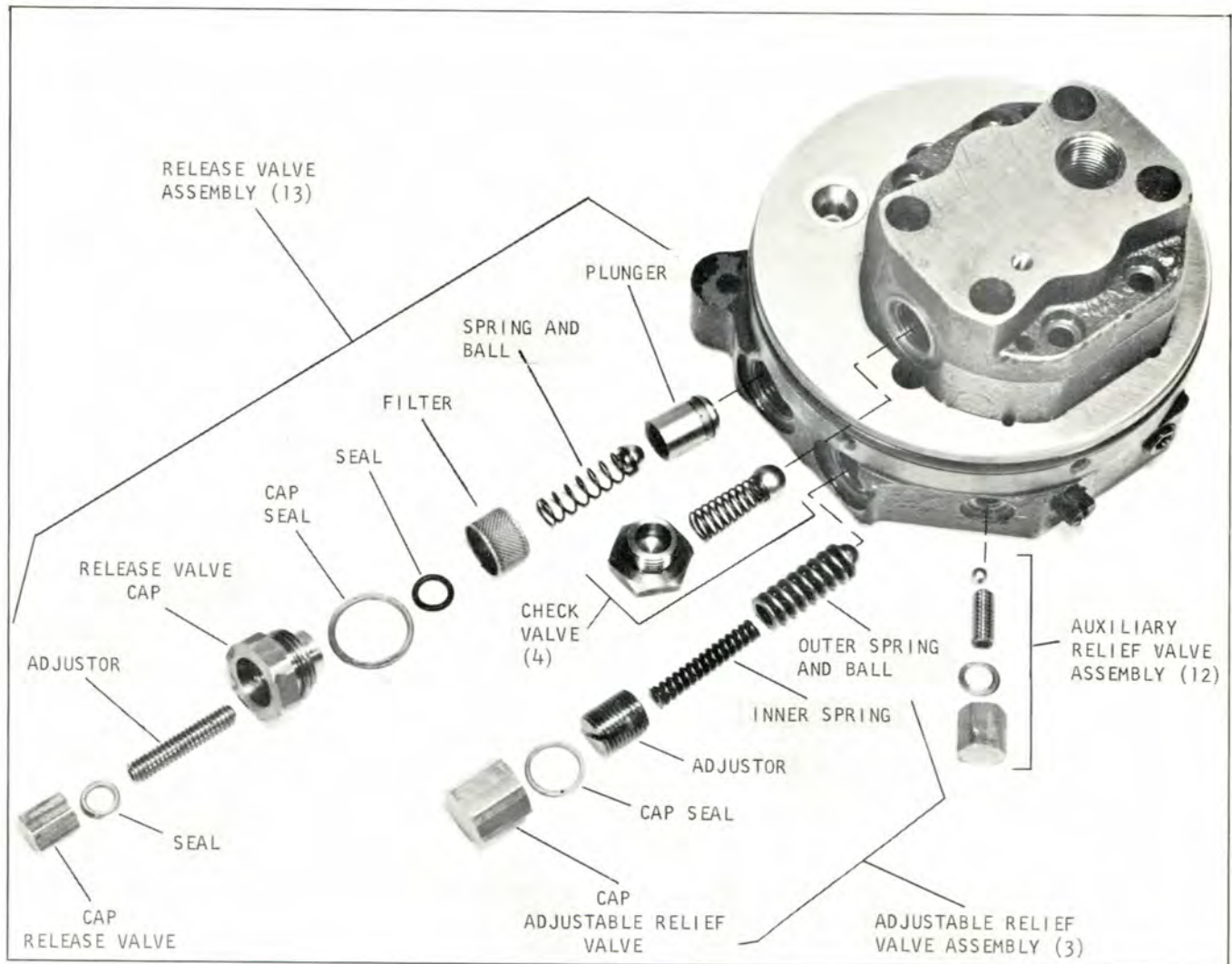


Plate 7215. Hydraulic Unit Check, Release, and Relief Valves

(I) If pump operates but will only develop some pressure or slow lift:

1. Auxiliary release valve ball (12) not seated.
2. Relief valve seat (3) scored, foreign particles under ball, or relief valve out of adjustment.
3. Dirt in solenoid operated pilot valve (5) or in release valve (13).
4. Pump worn -- replace pump.

(II) If pump develops pressure but will not hold load:

1. Auxiliary release valve ball (12) not seated.

2. Dirt in solenoid operated pilot valve (5) or in release valve (13).

3. Check valve seat (4) scored, foreign particles under ball.

(III) If pump develops pressure but will not lower load:

1. No electrical contact to solenoid operated pilot valve (5).
2. Solenoid in solenoid operated pilot valve (5) burned out.
3. Relief valve (3) bottomed causing pressure to go beyond the unloading limit of the release valve (5) and (13).

AUXILIARY RELEASE VALVE (12)

Remove cap on auxiliary release valve (12). Check if socket set screw can be turned in clockwise. If so, turn in to bottoming. Recycle pump and if pressure is still low or not holding, remove adjustment screw and ball and check to see that valve seat is clean and not scored. Replace adjustment screw and turn it in until the ball bottoms. Recycle pump to see whether low pressure has been corrected or that load can be held.

RELIEF VALVE (3)

Remove cap on pump relief valve (3). If relief valve is causing the low pressure condition, the pressure setting can be increased by screwing in on the adjusting screw, recycling pump and noting pressure gauge reading. Be sure that final adjustment on screw is at least 1/2 turn from the bottoming position. If trouble is not remedied by the relief valve adjustment, remove adjustment screw and check that spring is still attached to ball. Valve seat should be clean and not scored. Replace spring and ball in cavity. Insert a 1/4 diameter drive pin punch down through spring coils and hold ball against valve seat. Tap gently on drive pin punch with ball peen hammer to seat ball. Reassemble relief valve parts. Adjusting relief valve and recycle pump per preceding procedure. Do not operate motor/pump at relief valve setting any longer than is necessary (no longer than 10 seconds at any one period).

RELEASE VALVE ASSEMBLY (13)

Remove cap (7/8 open end wrench), copper gasket, spring and ball assembly (6), plunger (8), and filter (12). Check valve seat in adapter and remove any dirt or chips. Clean filter (12). Wash in suitable solvent, blow out with air hose outside to inside. Check to see that spring is still attached to the ball.

When replacing the assembly, first install the plunger into the adapter and then the filter, making sure that the filter is all the way down into the pilot step. With the gasket on the cap, the O-ring on the cap pushed back into its corner location, and the spring and ball over the lowering speed adjusting screw, screw the complete assembly into position. Care should be taken so that the gasket does not come out of position and is cut when the cap is tightened. The gasket can best be held in place by putting a small amount of grease between it and the cap.

If the pallet does not hold the load, screw the lowering speed adjusting screw (7) in tight and then back off about 1/2 turn. If pallet still does not hold load, remove assembly and set the ball. See instructions for setting ball in Relief Valve Section.

NOTE

REMOVE PLUNGER WHILE SETTING BALL.

REMOVING AND INSTALLING RESERVOIR

It is necessary to remove the reservoir for access to the solenoid operated pilot valve and the check valve.

Removing Reservoir

1. Clamp foot of motor mounting bracket in vise with motor in the horizontal up position.

2. Remove six #10-32 x 1/4 round head screws. Reservoir can usually be worked off by cradling the reservoir in the left hand while alternately prying with a large bladed screw driver inserted between the edge of the reservoir and the raised ears of the adapter. Wiggling the reservoir sideways while pulling at the same time, will complete the operation. Be careful not to cut the rubber O-ring.

3. Pull off and hold the reservoir to the left of the pump/motor assembly while disconnecting the two lead wires leading from the solenoid terminals in the reservoir to the solenoid-operated pilot valve. The two V-shaped spring lugs easily disconnect from the terminals in the cap of the valve by squeezing the lug ears and pulling out at the same time.

4. Check the V-shaped spring lugs (connectors) on the end of lead wires. They should spring back when squeezed and released. The open end should be about 5/32 inch away from the straight side. If it doesn't spring back, replace lead wire.

5. Check strainer-filter for clogging. Wash in a Stoddard type cleaning solvent. Blow out with air hose from inside out.

Installing Reservoir

1. Examine inside leading edge of reservoir for any burrs, projections or sharp edges around the screw holes that may cut the O-ring on installation. Wipe the inside of the reservoir clean. Use a lint-free cloth.

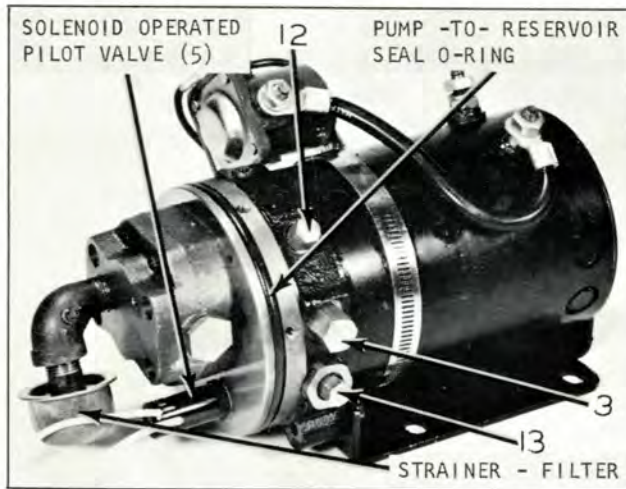


Plate 7250. Hydraulic Pump and Motor

2. Grease the O-ring in the groove on the adapter.

3. While holding the reservoir assembly in your left hand, connect the two lead wires leading from the solenoid terminals to the terminals in the solenoid-operated pilot valve. Squeeze the V-shaped spring lugs and insert them into opposite side openings under the top cap on the valve. (The long straight side on the lug fits against the long center bar on the valve cap.)

CAUTION

THE LUG CAN BE INSERTED TOO FAR AND NOT FUNCTION.

Insert the lug all the way in, then pull back on the soldered end of the connection. It should snap and hold in place.

4. Start the reservoir over the flange on the adapter up to the O-ring. Make sure it is aligned with the holes properly as well as not cocked.

5. Rest a block of wood on the back of the reservoir and strike it squarely -- a somewhat sharp blow in the center of reservoir end. The reservoir should move into position.

6. Fasten round head screws in position.

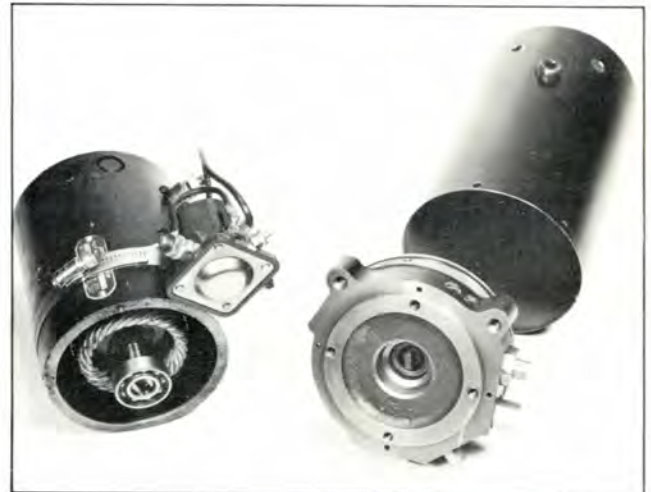


Plate 7251. Reservoir, Pump and Motor

SOLENOID OPERATED PILOT VALVE

Loosen (11/16 inch open end wrench), (do not use pliers on round extension of valve) and remove valve. Dunk pump end only (not motor) in clean solvent and blow out valve cavity with air hose. Dunk valve (thread end down) in clean solvent and swish around and up and down for several seconds. Check teflon washer that it has not extruded. Replace if necessary. Reassemble valve in place (REQUIRES SNUGGING ONLY) -- TIGHTENING WILL EXTRUDE TEFLON WASHER AND MAY DISTORT AND BIND SOLENOID VALVE HOUSING.

NOTE

THIS CLEANING MAY NOT CLEAR THE MALFUNCTIONING OF THE VALVE IN WHICH EVENT THE VALVE WILL HAVE TO BE REPLACED.

CHECK VALVE (4)

Remove check valve cap. Check that copper gasket is properly seated and not deformed or nicked. Check that spring is still attached to the ball. Valve seat is to be cleaned and not scored. If necessary, seat ball as per instructions in Relief Valve (3) Section.

After unit has been reassembled, it is necessary to bleed the pressure line of all air this is done by slightly loosening the outlet pressure port fitting and turning on the motor until oil starts to seep through the fitting.

N O T E

CLEANLINESS IS OF EXTREME IMPORTANCE, AS EVEN THE SMALLEST OF PARTICLES: LINT DUST, WATER, SEALING COMPOUND ETC., IS HARMFUL TO THE HYDRAULIC SYSTEM.

THOROUGHLY CLEAN OUTSIDE PORTION OF CYLINDER TUBE BEFORE DISASSEMBLING UNIT WITH A STODDARD TYPE CLEANING SOLVENT.

BE SURE O-RING SEALS ARE NOT SCRATCHED, NICKED ETC. REPLACEMENT IS NECESSARY IF SUCH A CONDITION EXISTS.

BEFORE REASSEMBLING UNIT, BE SURE ALL COMPONENTS, INCLUDING THE RETURN SPRING ARE ABSOLUTELY CLEAN, FREE OF DUST, LINT ETC.

LUBRICATE ALL COMPONENTS WITH CLEAN HYDRAULIC FLUID BEFORE REASSEMBLY.

LUBRICATE O-RING SEALS WITH CLEAN CHASSIS GREASE BEFORE REASSEMBLY.

CHECK CYLINDER MAKING CERTAIN THAT THE SEALING AREAS ARE FREE OF NICKS, BURRS, OR SHARP EDGES THAT MIGHT DAMAGE O-RING SEALS BEFORE REASSEMBLING UNIT.

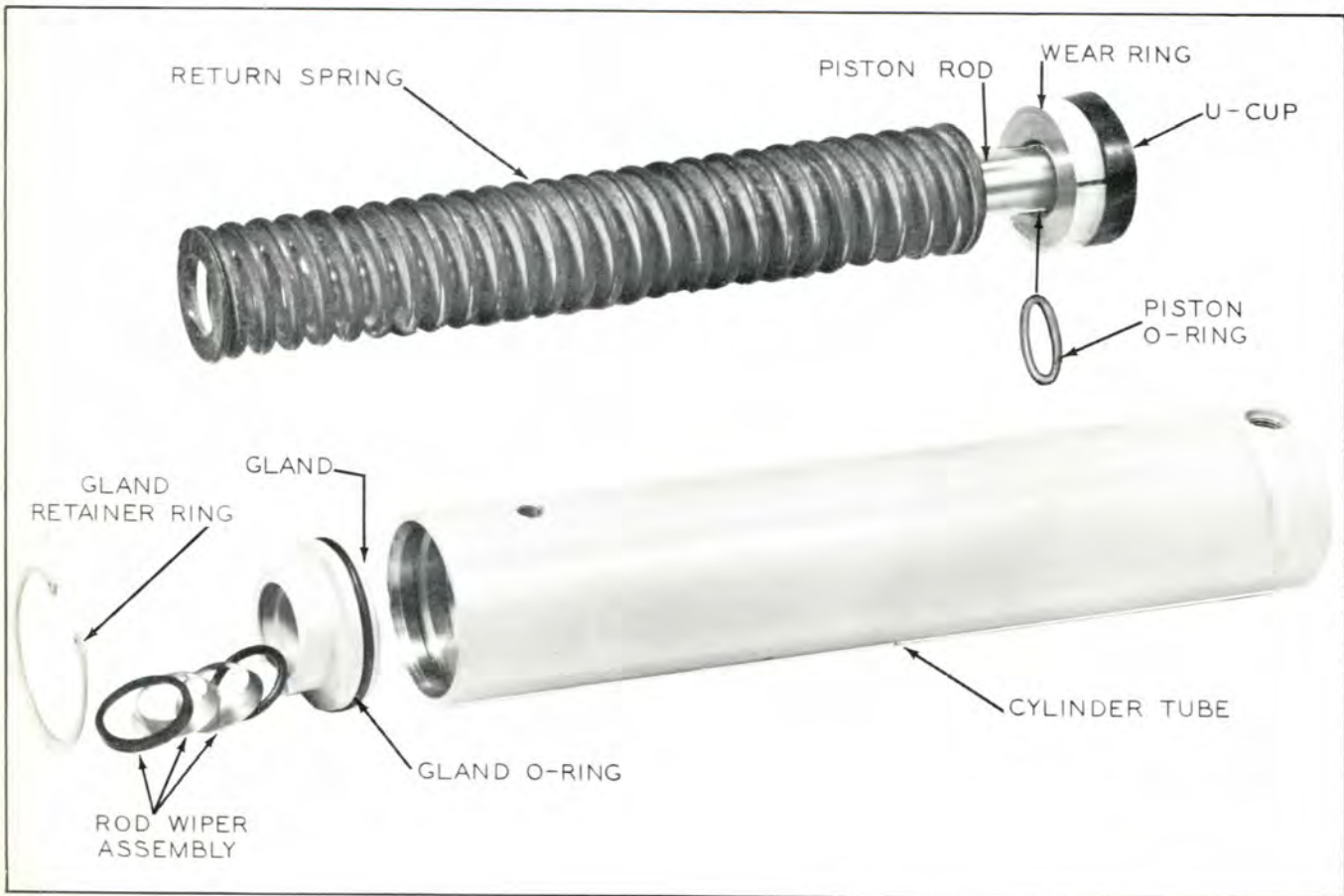


Plate 6252. Lift Cylinder Assembly
(Pallet Models)

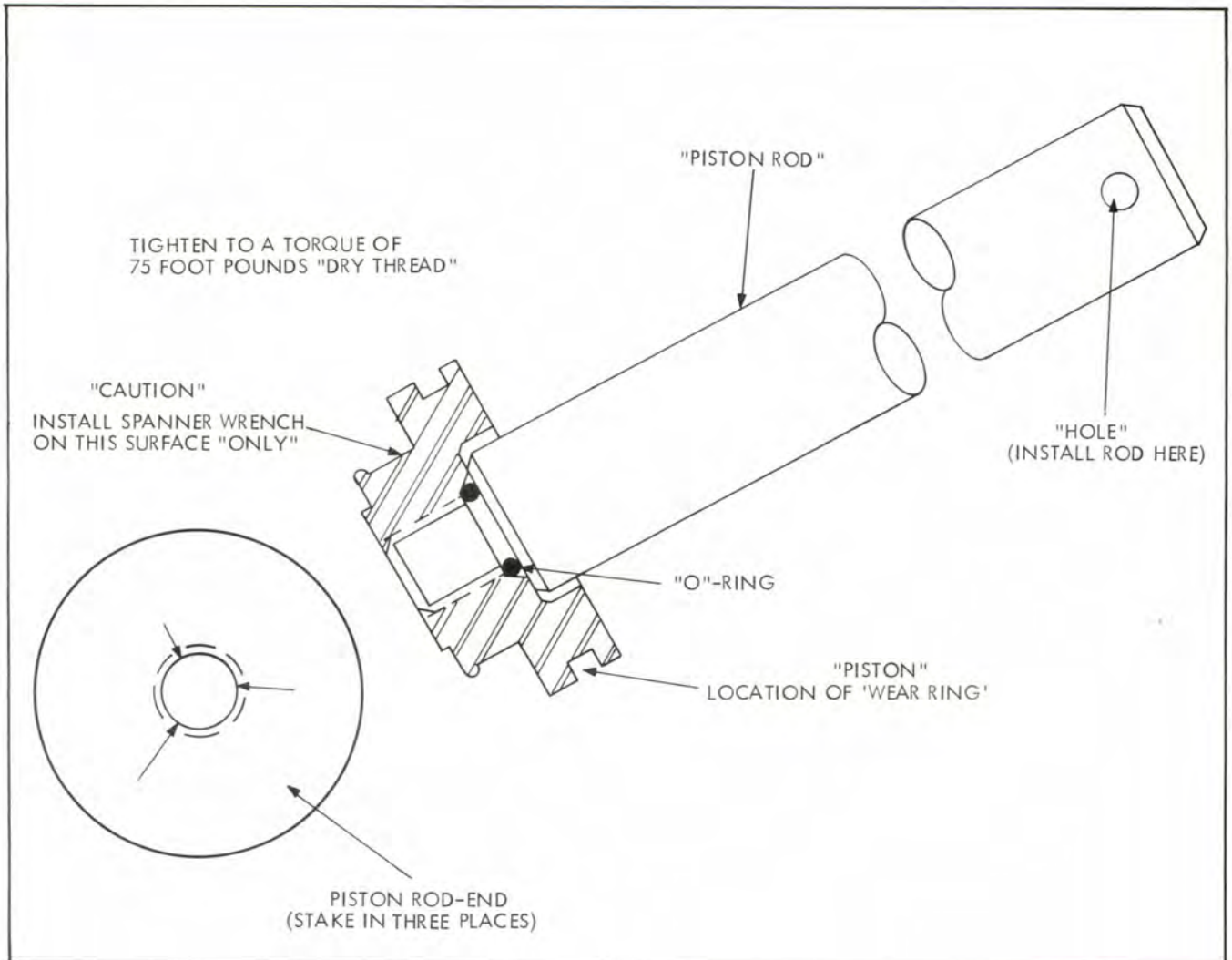


Plate 6064. Piston and Piston Rod (Pallet Models)

LIFT CYLINDER

N O T E

LINT, DUST, DIRT, WATER, SEALING COMPOUND ETC., IS HARMFUL TO THE HYDRAULIC SYSTEM. THOROUGHLY CLEAN OUTSIDE PORTION OF CYLINDER TUBE BEFORE DISASSEMBLING UNIT.

1. Raise upright to the upper limit.
2. Block Pallet Forks in this position by placing blocks at both the front and back of the forks, see Plate 6251 (next page).

3. Remove a retainer screws from upright assembly and piston rods, see page 1, Plate 7249 in this section.

4. Push the lower switch button on the control handle to relieve hydraulic pressure in the cylinders and pressure lines at same time force cylinder pistons down by pressing on rod.

5. BE SURE SYSTEM IS NOT SUBJECT TO HYDRAULIC PRESSURE by following "Step 4", and then disconnect the pressure lines located at base-end of lift cylinders. Using an offset wrench, remove pressure line fitting located at base-end of cylinder.

6. Disconnect return line at top-end of lift cylinder.

7. Pull lift cylinder from upright and place on a clean surface for disassembly.

Disassembly and Reassembly

Push piston rod into cylinder allowing oil to drain. Remove gland lock ring with a pair of snap ring pliers. This will allow the removal of the gland assembly equipped with rod wiper. The rod wiper will need to be removed in the event of replacement for wear or damage only, or in the event the O-ring (located between rod wiper and gland) is worn allowing hydraulic oil to leak. **NOTE: IF THE ROD WIPER IS DISASSEMBLED, PAY PARTICULAR ATTENTION TO THE POSITION OF THESE COMPONENTS.** The flat side of the rubber retainer ring must face upward while the beveled side of the ring will mate or properly seat with the bottom components (support rings). As mentioned, beneath the rod wiper next to the gland is one O-ring and on the outside portion of the gland there is one large O-ring; check for damage and replace if necessary. Pull piston rod from cylinder. Remove spacer and return spring from piston rod. Check wear ring and U-cup for damage or wear and replace if necessary.

HYDRAULIC OIL ONLY. Lubricate all parts with clean hydraulic oil and reassemble to reverse procedure of disassembly. **NOTE: UPON REASSEMBLING PISTON ROD EQUIPPED WITH WEAR RING AND U-CUP, TAKE CAUTION TO NOT DAMAGE, SCRATCH, OR NICK U-CUP UPON ASSEMBLING COMPONENTS INTO CYLINDER TUBE. BE CAREFUL TO NOT DAMAGE O-RINGS WHEN ASSEMBLING GLAND ASSEMBLY - LUBRICATE O-RINGS WITH CLEAN CHASSIS GREASE TO FACILITATE ASSEMBLY. AGAIN MAY WE EMPHASIZE CLEANLINESS IN THE REPAIR OF THE UNIT AS EVEN THE SMALLEST OF PARTICLES; LINT, DUST, WATER, ETC., IS HARMFUL TO THE HYDRAULIC SYSTEM.**

PISTON ROD AND PISTON

If for same reason the piston needs replacement, or the piston rod is replaced and the piston is in good condition, or the O-Ring located in its groove between piston and piston rod needs to be replaced - if for any reason it is necessary to disassemble piston and piston rod assembly, then the following **CAUTIONS** MUST be exercised.

1. The piston and piston rod are equipped with threads and must be torqued to 75 foot pounds when correctly assembled. To further secure the two units together, the rod-end is staked in three places to the piston - this is a must.
2. The top-end of the piston rod is provided with a hole in which a rod of the proper diameter should be inserted. Then the piston rod should be placed upside down in bronze or wood protected jaws of a vise. (This procedure must be used when disassembling or reassembling the piston and piston rod as it will prevent rod from being scored, scratched or nicked and provide the necessary leverage for removing or replacing piston.
3. When removing or replacing piston, a proper spanner wrench should be used and the wrench should be installed on the piston nearest the staked end of the piston (smallest diameter of piston) - **MUST NEVER** be installed on the outer diameter of the piston where the wear ring is located. Install wrench on portion indicated with arrows in Plate 6064 (previous page).
4. Whenever the piston and piston rod is disassembled, always replace the O-Ring with a new one. **CAUTION MUST BE EXERCISED** when installing O-Ring to not scratch, nick or damage O-Ring as this will allow leakage.
5. **ALWAYS TORQUE PISTON TO PISTON ROD TO A TORQUE OF 75 FOOT POUNDS ('DRY THREAD'). BE CERTAIN TO STAKE THE PISTON ROD IN THREE (3) PLACES TO SECURE COMPONENTS.**

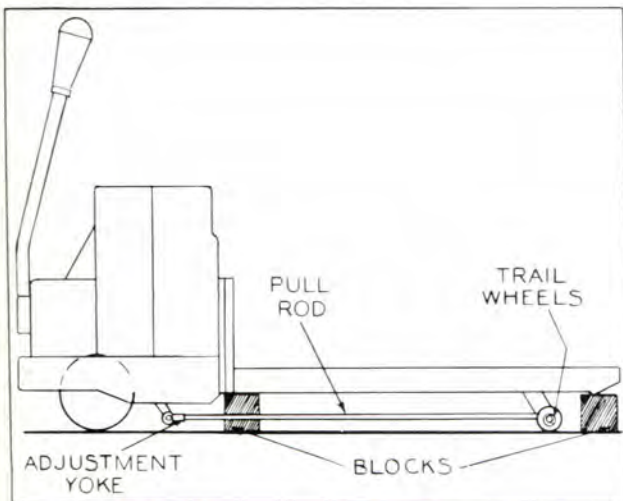


Plate 6251. Block Pallet Forks Securely

Upon reassembly of the lift cylinder take care not to damage, scratch or nick O-rings. Check cylinder carefully to be sure the sealing areas are free of nicks, burrs, or sharp edges that might damage O-ring seals. Clean all parts including cylinder tube thoroughly in a Stoddard type cleaning solvent. **CLEAN O-RINGS IN CLEAN**

TRAIL TIRE REPLACEMENT

1. Lift forks until they are at their upper limits. Then block forks in this position, depress "Lower" button on control handle to lift trail wheels off the floor.
2. Remove the adjustor from end of trail wheel.
3. Drive out roll pin that retains head of axle shaft in position.
4. Remove "shaft" from bracket and wheel. This will allow the trail wheel to drop free of bracket.
5. Refer to Plate 7202 (page 3 of this section) for disassembly of the Trail Wheel Assembly. NOTE: TRAIL WHEELS ON A FEW OF THE EARLIER MACHINES ARE EQUIPPED WITH RETAINER SNAP RINGS REGARDING BEARING CONES, CUPS AND SEALS. ON LATER MACHINES, THE TRAIL TIRE HAS A MACHINED SURFACE ON THE INSIDE PORTION OF THE ASSEMBLY WHICH ACKS AS A RETAINER FOR THE CUP, CONE AND SEAL.
6. Install new trail tire and adjust per following instructions.

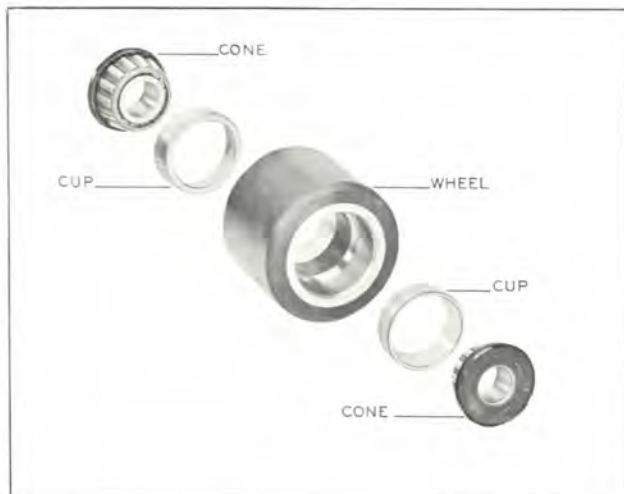


Plate 6247. Trail Tires

TRAIL TIRE ADJUSTMENT

This adjustment is made similar to that given wheel bearings in an automobile.

1. Tighten the adjustor until the trail tire is snug, then back off the screw 1/8 to 1/4 turn, see Plate 6247.

2. Using a mallet, tap tire in both directions as indicated with arrows in Plate 7252. This is to correctly position the bearing cups located in trail tire hub.

When the adjustor was tightened, it pressed the bearing cup against the tire assembly making it snug. Therefore, upon backing off adjustor 1/8 to 1/4 turn (making the required adjustment) it is necessary to tap the trail tire in both directions to correctly position the bearing cups and free the trail tire for correct rotation.

Pallet Entry Saucer Lubrication

Refer to Lubrication Chart located in the front of this manual.

NOTE

PALLET ENTRY SAUCERS OR SKIDS DO NOT REQUIRE ADJUSTMENT.

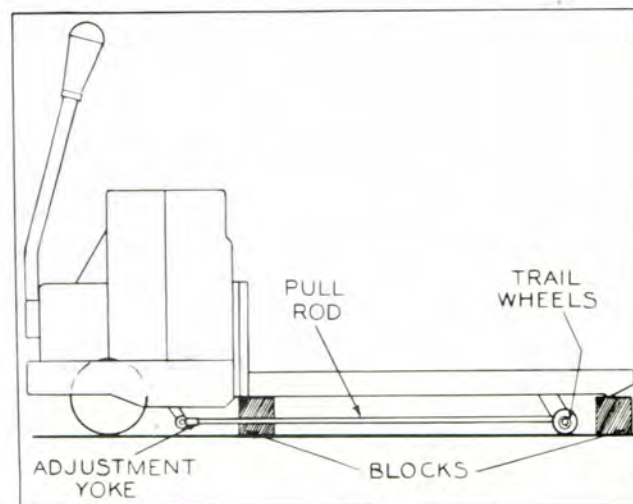


Plate 6251. Pull Rod Adjustment

TRAIL WHEEL LINKAGE ADJUSTMENT

To adjust pull rods on this truck, you must raise forks, place two by four blocks under nose of forks and then lower assembly all the way down. With forks resting on blocks, adjust pull rods by removing roll pins, pulling clevis pins from rod yokes, loosening yoke lock nuts and rotating yokes in direction necessary so that trail wheels retract all the way and the top of the lift brackets should just touch the forks. Replace roll pin with a new one when reassembling linkage. Clark Part Number 675351.

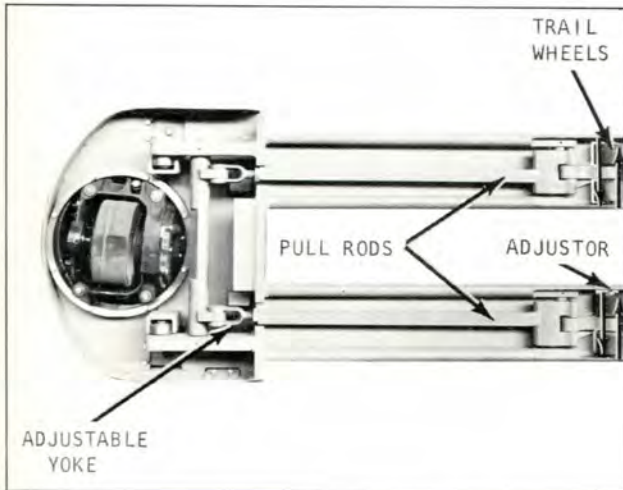


Plate 7252. Trail Wheel and
Lift Linkage Adjustments

LIFT LINKAGE D.U. BUSHINGS

If the Lift Linkage is removed for any reason; upon reassembly, the inner diameter of all bushings should be lubricated with graphite grease before installation.

After these bushings have been in use for a period of time, they will take on the appearance of having a grayish brown cast, which is natural and does not mean the bushings should be replaced. The only time these bushings need to be replaced is when they are damaged or if the steel backing shows through the inner diameter of the bushing itself. The bushings are made with a steel case (backing) having an inner diameter made of teflon and bronze material. Bushings having a grayish brown color do not have to be replaced, only bushings that are damaged, out-of-round or if the steel backing can be seen through the inner diameter of teflon and bronze material will need to be replaced.

If the linkage is disassembled for any reason, inspect for the preceding; and at time of installation, grease the inside diameter of each bushing with graphite grease only. **DO NOT REAM THESE BUSHINGS FOR ANY REASON, TO DO SO WILL PERMANENTLY RUIN THE BUSHING.** After applying graphite grease to the inside diameter of the bushing, the shaft will easily slip through.

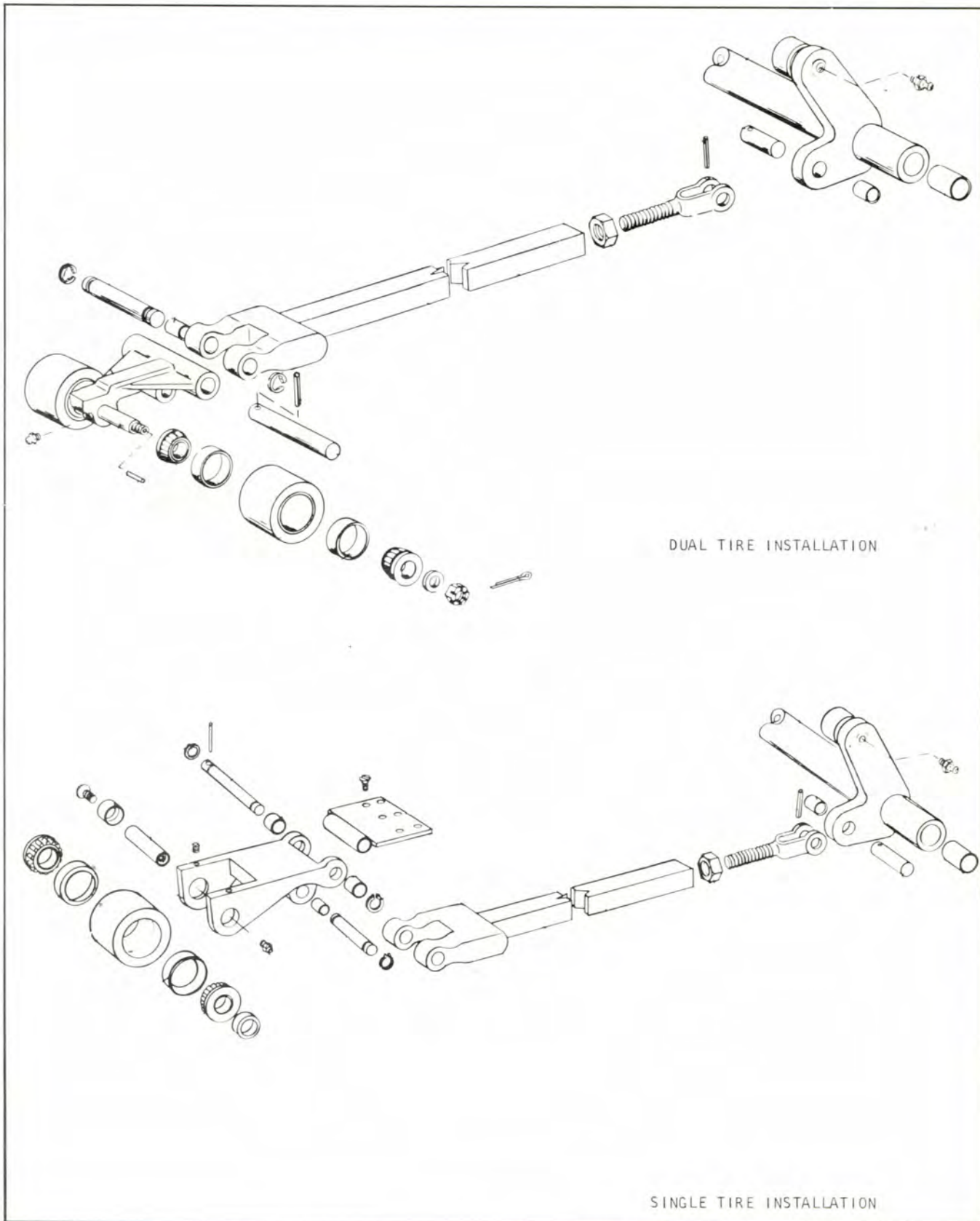


Plate 7202. Trail Wheels and Lift Linkage

**ALWAYS GIVE MACHINE
SERIAL NUMBER WHEN
ORDERING PARTS**