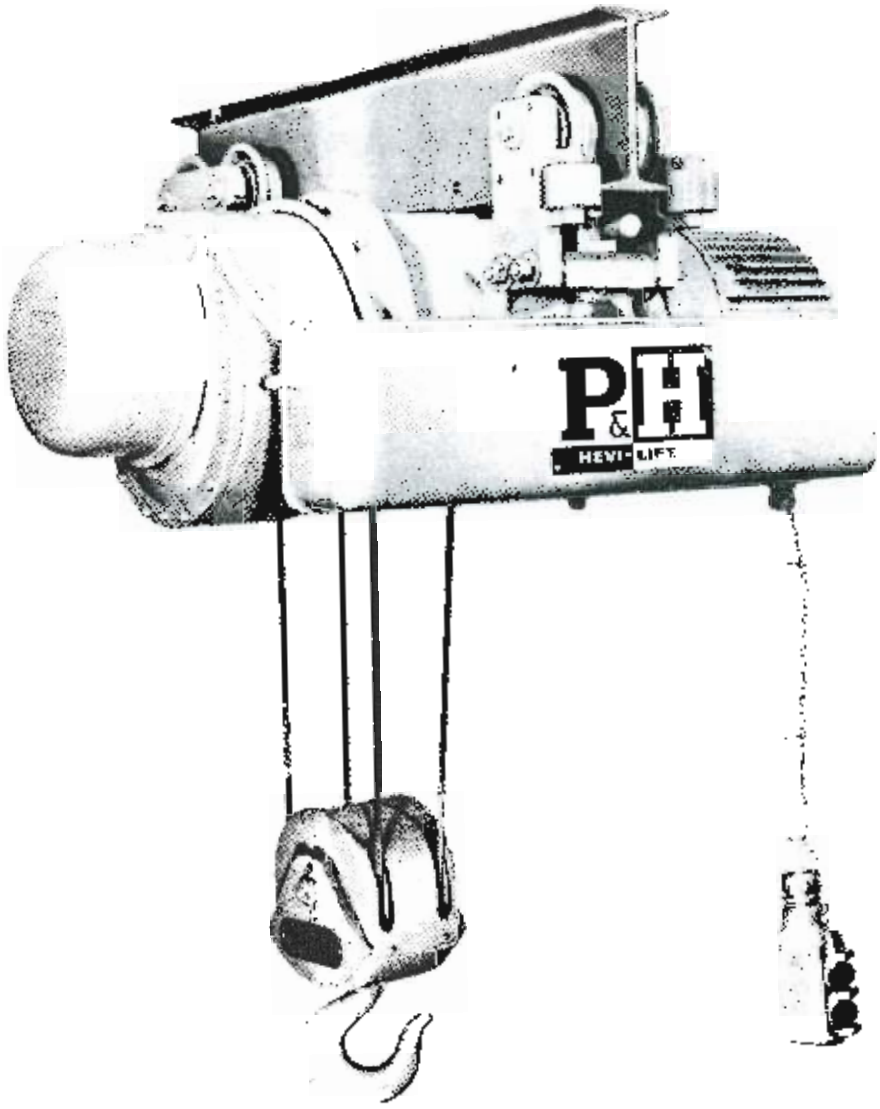
BULLETIN T-100-2

P&H®

ELECTRIC HOISTS

LUBRICATION and MAINTENANCE INSTRUCTIONS



HARNISCHFEGER
Milwaukee 46, Wisconsin, U.S.A.

P&H
QUALITY & SERVICE SINCE 1884

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The P&H HEVI-LIFT Hoist is another in the long line of HARNISCHFEGER CORPORATION achievements. Every part, every assembly, is of first quality, thoroughly tested material, and the finished product represents the ideal combination of company resources and skilled workmanship.

Although we believe this hoist to be the finest of its kind, the life and performance of the unit depends not only upon proper application within the range of its rated capacity, but also upon the attention it receives.

The operating and maintenance instructions which follow have been carefully prepared to provide a simple and understandable guide. Necessary instructions for the ordering of replacement parts are also contained in this manual. The use of Genuine P&H Replacement Parts for your HEVI-LIFT Hoist will assure you long and satisfactory service.

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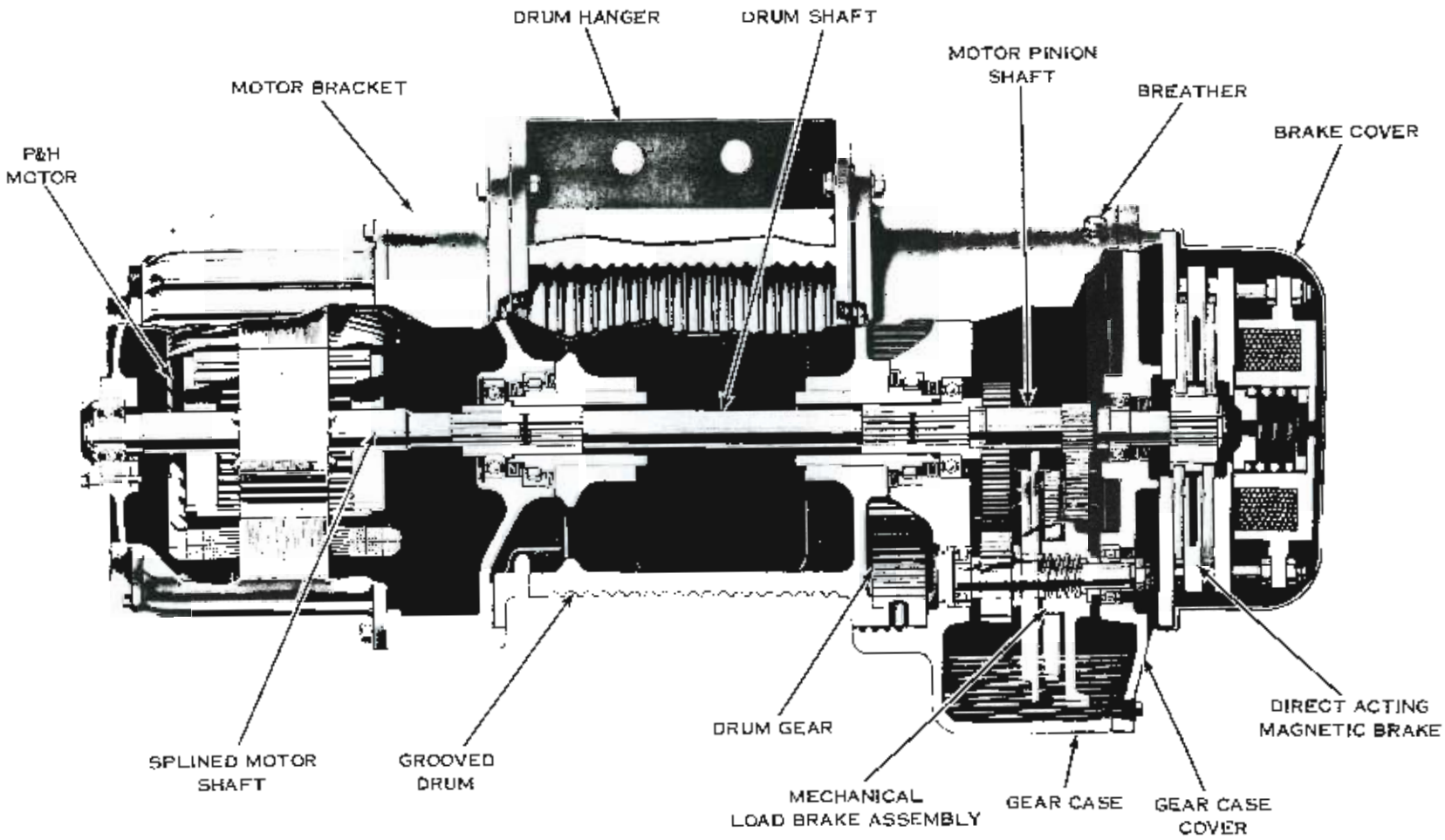


Figure 1. P&H HEVI-LIFT HOIST

INSTALLATION

A wide variety of mounting installations are common to the hoist. Some of the common types of mounting are illustrated in Figure 2.

The reeving on the hoist varies with the application. Before starting the reeving process, lay out the wire rope so there is no possibility of kinking. Refer to Figure 3 for details on the various parts of lines and proper layout.

The P&H Hevi-Lift Hoist is tested under load and adjusted for proper operation before leaving the factory. Before the unit is placed in service, there are several items that must be checked to insure correct application and avoid serious trouble.

1. Check the power supply which is indicated on the hoist serial number plate. If the power supply is direct current, check the voltage; if alternating current, check the voltage, frequency and phase. The voltage supplied to the hoist must be the same as indicated on the hoist serial number plate or overheating of the motor will reduce the lifting capacity and cause improper function of all electrical parts.

2. Refer to the Lubrication Section to determine if the hoist is properly lubricated.

3. The direction of rotation of alternating current motors is impossible to pre-determine. The load block must raise when the RAISE button is operated; The limit switch will not operate if the load block rises when the LOWER button is pressed. If the load block lowers when the RAISE button is operated, the direction of rotation must be changed in accordance with the instructions on the wiring diagram.

4. Connect the hoist to the correct source of power and test the operation of the limit switch. Start the unit in the hoisting direction and slowly lift the limit switch weight by hand. The hoisting circuit should open and the electric motor brake should set. The load block should come to rest. Further lifting of the limit switch weight will temporarily close the lowering circuit and prevent any additional overtravel motion. As soon as the load block has lowered a small amount, the limit switch breaks the lowering circuit and the load block stops. Even though the load block has traveled into the limit switch and opened the hoisting circuit, the lowering circuit is still intact. The load block may be lowered which automatically closes the hoisting circuit.

5. Test the operation of the direct acting magnetic brake to determine if the correct adjustment of the brake is obtained. When the power is cut off, the travel of the load block must also stop. If this condition is not obtained, refer to Direct Acting Magnetic Brake, Figure 4, for adjustment.

6. Attach a load within the capacity of the hoist. Raise and lower the load a few feet to determine if the mechanical load brake is operating properly in holding the load.

When these items have been checked, the hoist is ready for service.

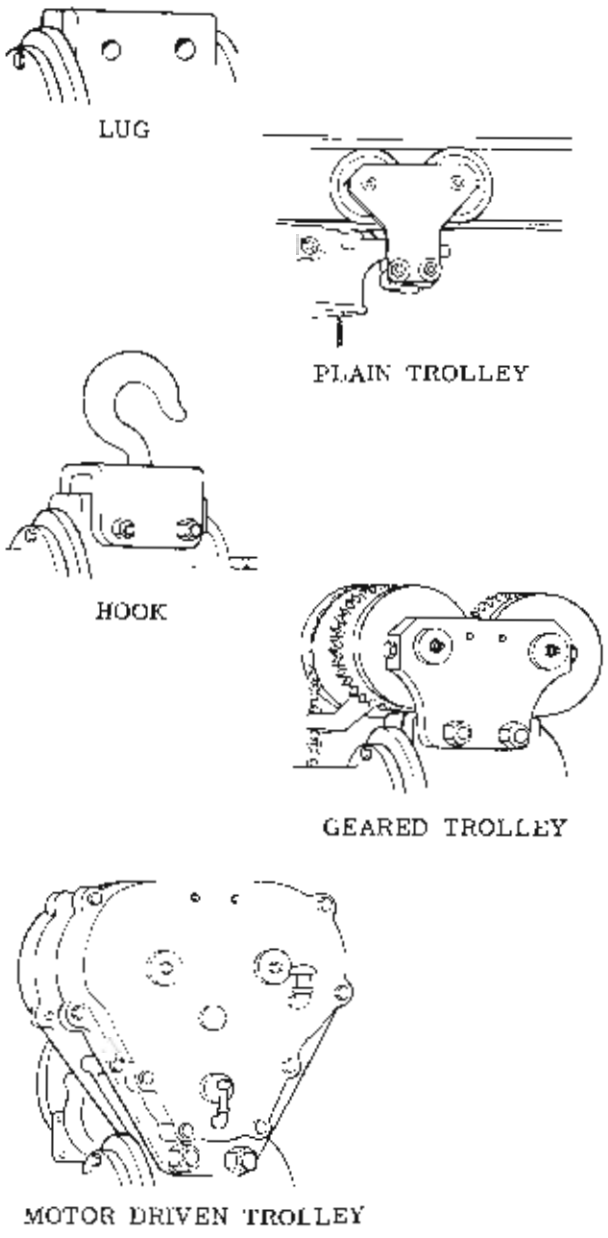


Figure 2. Mounting Installations

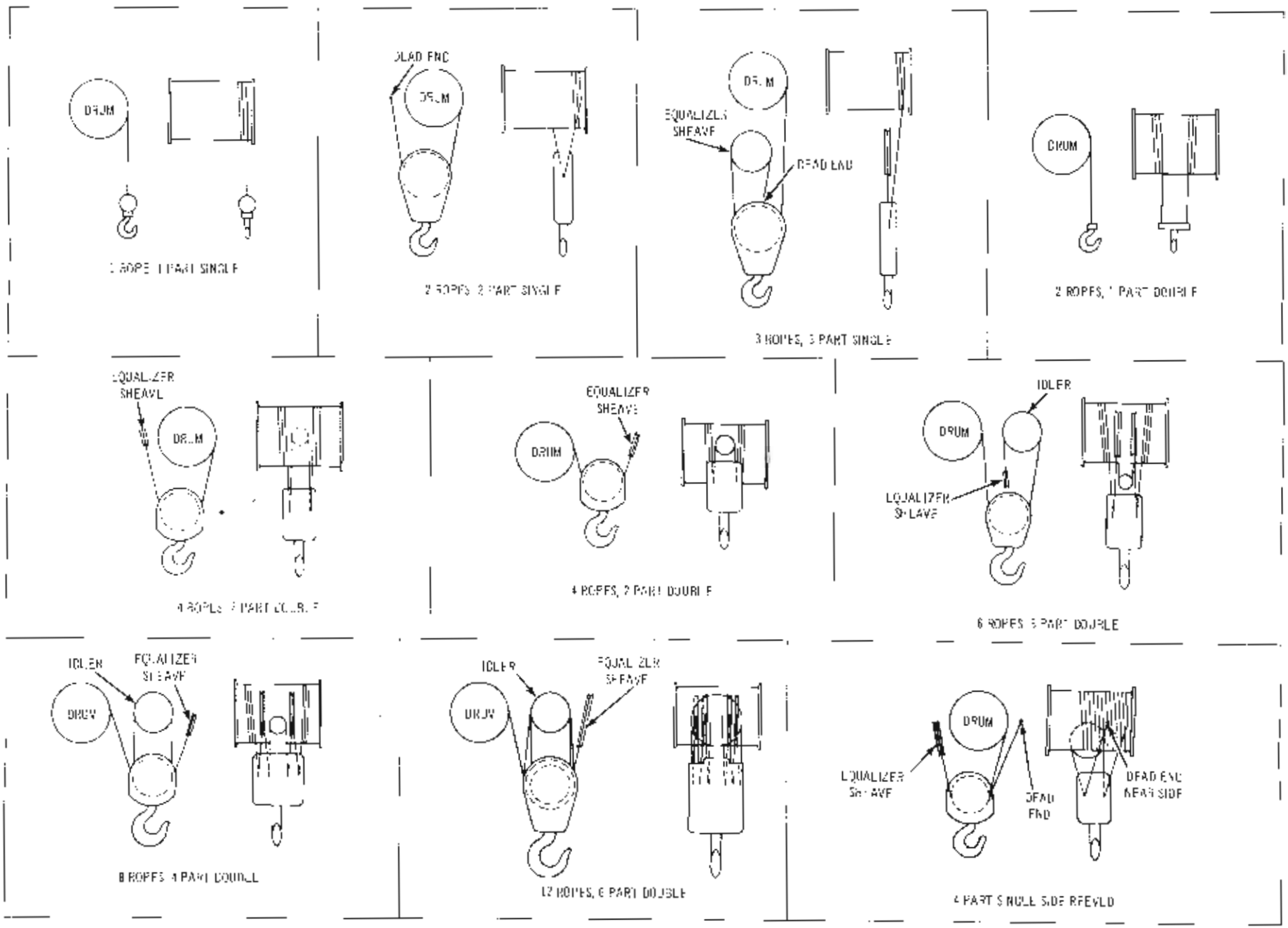


Figure 3. Reeving Diagrams

MAINTENANCE

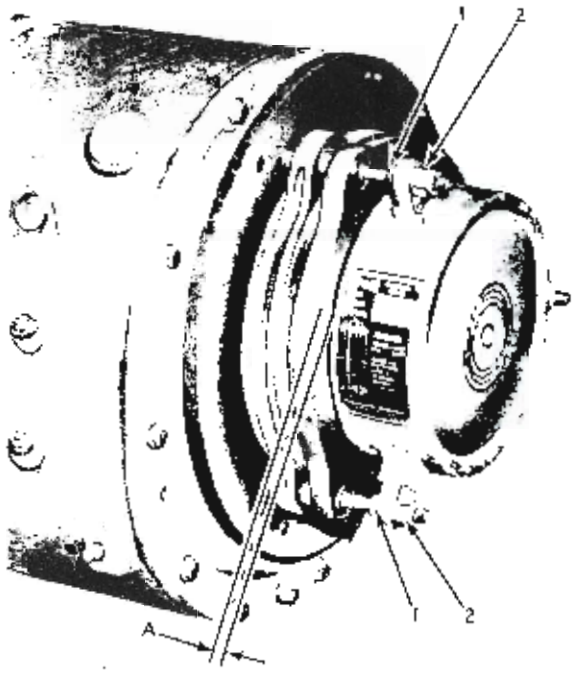
The P&H Hevi-Lift Hoist requires little maintenance and adjustment. The following are the only maintenance and adjustment servicing needed.

Direct Acting Magnetic Brake

The direct acting magnetic brake must be properly adjusted to stop the rotation when the power supply is shut off. A periodic check is necessary to determine if the brake requires adjustment. When distance A, Figure 4, is excessive, the following adjustment procedure is recommended:

Remove the brake cover from the hoist assembly. Back off the lock nuts (1) and turn the adjusting nuts (2) until distance A is 1/16 inch.

The adjustment procedure is also described on the nameplate attached to the side of the brake and in the "Electrical Equipment" section.



1 Lock Nut
2 Adjusting Nut

Figure 4. Magnetic Brake

Mechanical Load Brake

The mechanical load brake holds the load after hoisting as well as controlling the load during lowering. The load brake requires adjustment only when replaced as a complete unit. When a new load brake is purchased, install the assembly into the gear case as described in the "Hoist Assembly" section.

Wire Rope

Pass a rag over the wire rope occasionally to detect broken strands. The rag will snag on the broken strands. If there are a number of broken strands, replace the wire rope.

Use heavy oil or cable compound to keep the wire rope well lubricated.

Motor Removal

Open the main line switch and remove the plate covering the terminal box on the side of the motor. Disconnect the motor terminals. Loosen the conduit lock nuts from the terminal box and pull the leads from the box.

Remove the bolts securing the motor to the motor bracket. Pull the motor straight out from the unit. The rotor and stator will be removed as a unit because of the splined motor shaft. Remove the bearing retainer cover. The armature or rotor and end bearing may now be removed from the assembly.

Motor Replacement

Reverse the series of instructions given for removal. The end bearing must have the proper type and amount of lubricant applied before assembly. The motor must also run in the proper direction or the limit switch will not function. The limit switch will not operate if the load block rises when the Lower button is pressed.

LUBRICATION

Each hoist is tested under full load and properly adjusted before leaving the factory. Each is lubricated and the gear case filled with oil at the factory, but they should be checked before being placed into operation. Become thoroughly familiar with the lubrication specifications as well as the necessary lubrication points before operating the hoist. Refer to Figure 5.

LUBRICATION SPECIFICATIONS

MPG - Multipurpose Grease - (P&H #472). This must be a multipurpose lubricant usable over a temperature range of -25° F. to +350° F. and may be a soap, soap complex, or synthetic organic thickener base. It must contain oxidation and corrosion inhibitors and resist separation, caking, and water washout.

Consistency (NLGI)	No. 2

GO - Gear Oil - (P&H #486 and 494). This must be a high quality, well refined gear lubricant without extreme pressure requirements. It must have chemical and physical stability with excellent properties to resist corrosion and oxidation and possess good demulsibility in service application. The lubricant must conform to the following requirements:

40° F. to 125° F. (P&H 486)	
SAE 90	
Viscosity Index (Minimum)	90
Viscosity S.S.U. at 100° F.	800 to 1000
Below +40° F. (P&H 494)	
Automatic Transmission Fluid	Type A
Viscosity Index (Minimum)	140
Viscosity S.S.U. at 100° F.	150 to 190

GL - Open Gear & Wire Rope Lubricant

Application	Open or exposed gears, rack, ring gears, cable or wire rope - all hand applicated	
	SUMMER	WINTER
P&H =	464	465
Consistency	Very Adhesive	Very Adhesive
Temperature Range	Above 40° F.	Below 40° F.
Water Resistance	Excellent	Excellent

Choose a premium quality product that is adhesive and will perform satisfactorily for the application. In this category fall many products. Some are classed as lubricants, greases and compounds and others as fluids. Select a product that has a proven performance record. Application should be made when machine is idle for a period so that the solvent may have time to evaporate. Gear teeth should be as clean as possible before lubricant is applied.

SPECIAL NOTICE: IT IS EXTREMELY IMPORTANT TO THOROUGHLY CLEAN THE SURFACES THAT ARE TO BE LUBRICATED IF SWITCHING FROM AN ASPHALTIC PRODUCT TO A NON-ASPHALTIC PRODUCT OR THE REVERSE.

NOTE

For continuous operation of machinery at temperatures below 0° F. or above 120° F., please consult Harnischfeger Engineering Department.

AGMA - American Gear Manufacturers Association

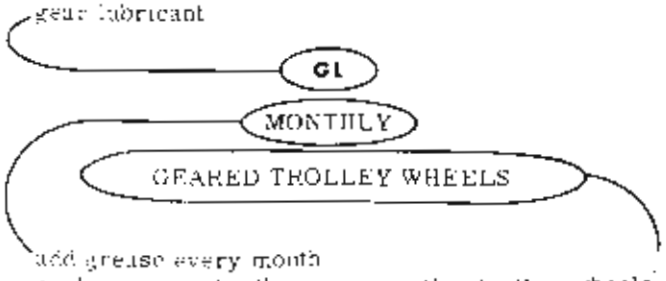
NLGI - National Lubricating Grease Institute

USING LUBRICATION CHART

Each lubrication point or fitting is pointed out in the charts and the following items noted:

1. Type of grease to use by symbol (for example: "GL").
2. Frequency of lubrication.
3. What the fitting lubricates.

Example:



WIRE ROPE LUBRICATION.

Excess lubricant must always be removed from the surface of the wire rope. The wire rope should be clean and dry before applying lubricants. Apply a wire rope compound or the same grease used for open gears. Lubricants may be applied with a paint brush or similar means.

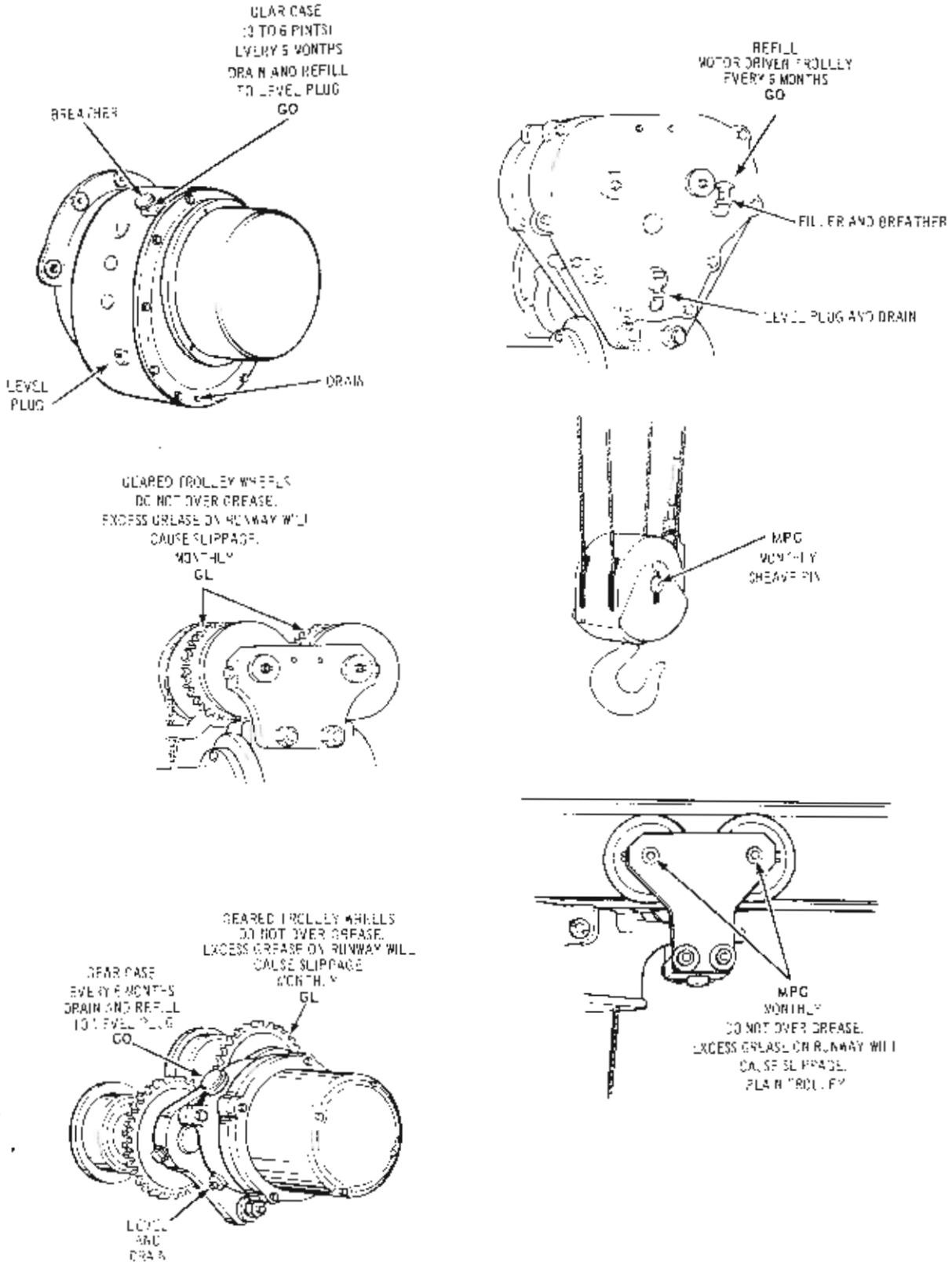


Figure 5. Lubrication

OVERHAUL

GENERAL INSTRUCTIONS

Clean all parts with a suitable solvent cleaner such as kerosene, diesel fuel, or a commercial solvent cleaner. Never use a hot alkaline solution for finished parts or bearings.

Polish the edges of all shoulders on shafts to remove small nicks which may have been caused during handling or shipping.

File the forward edge of all keyways at a slight angle so that the gear will ride over the key and not tend to cut into the key.

Check the fit of keys in keyways. Measure the thickness of the key and compare with the depth of the corresponding keyways in the gear or shaft. File or grind the key if necessary until it is thinner than the total of the combined keyways.

Be sure all threads are clean and free from burrs.

Replace all gaskets and oil seals at the time of overhaul.

Inspect all bearings, cups and cones for pitting or galling.

Inspect all other parts for wear, cracks, distortion or other evidence of failure. Replace all parts about which there is any question. This will avoid failure at a later time.

Never use heat from a torch to assist in removing a part from a shaft unless the part is already damaged beyond repair. The application of heat will change the strength of the metal and make the part worthless for further use.

NOTE

Whenever the hoist unit is overhauled, pack the drum bearings 1/2 full with -MP- multipurpose grease. Apply approximately 1/2 to 3/4 pounds of multipurpose grease to the drum gear. Refer to Lubrication Section for specifications.

DISASSEMBLY

The following is a general disassembly procedure.

Remove the hoist from the trolley. Disconnect the wires from the solenoid pot assembly and remove the conduit from the gear case cover. Disconnect the motor lead wires and remove the conduit from the motor. Remove the control cabinet.

Turn a 1/2-13 UNC x 2-3/4 bolt in the solenoid pot assembly and remove the solenoid pot. Disassemble the brake in the reverse order of assembly. (See paragraphs 12, 13, and 14, "Hoist Assembly".)

Remove the motor and drain the gear case. Remove the gear case cover. Disassemble the gear case cover in reverse order of assembly. (See paragraph 5, "Gear Case Sub-assembly".)

Remove the motor pinion shaft. Disassemble the gear case by removing the load brake pawl pin and the load brake pawl. Remove the load brake shaft assembly or the intermediate gear shaft assembly. Disassemble the load brake shaft in reverse order of assembly. (See paragraphs 1, 2, and 3, "Load Brake Shaft Sub-assembly".) Remove the drum pinion shaft.

Disassemble the gear case in reverse order of assembly. (See paragraph 6, "Gear Case Sub-assembly".)

Remove the motor support. Disassemble the motor bracket in reverse order of assembly. (See paragraph 4, "Motor Support Sub-assembly".)

Remove the drum assembly. Remove the drum hanger from the gear case.

ASSEMBLY

Load Brake Shaft Sub-assembly

1. Tap bearing inner race (1, Figure 6) shoulder first, on load brake shaft (2). Install the keys in the keyways. Press flange (3) on the small diameter end of the shaft until tight against the shoulder. Press intermediate pinion (4) on the large diameter end of the shaft until tight against the shoulder.

2. Install ratchet assembly (5) on the hub of the motor gear (6, and turn the motor gear on the shaft until tight against the flange. This will squeeze the ratchet assembly between the flange and the motor gear.

3. Tap spacer (7), shoulder first, on the shaft until tight against the motor gear. Tap bearing inner race (8), shoulder first, and inner race (9) on the shaft and turn nut (10) on the end of the shaft until tight. Back off the nut 1/2 turn and install a cotter key. When a new load brake is installed in the hoist unit, items 4 through 14 will be purchased as an assembly. Check the adjustment by turning motor gear (6, until tight. Turn nut (10) until tight, then back it off 1/2 turn and install a cotter key.

NOTE

When the hoist unit is not equipped with a load brake assembly, the intermediate shaft assembly must be installed. Refer to the insert, Figure 6 for assembly of the intermediate shaft.

Intermediate Shaft Sub-assembly

Install the keys in the keyways of intermediate shaft (11) and press intermediate pinion (12) on the shaft until tight against the shoulder. Tap bearing inner race (13) on the large diameter end of the shaft until tight against the shoulder. Press motor gear (14) on the small diameter end of the shaft until tight against the shoulder.

Motor Support Sub-assembly

4. Install oil seal (15) and bearing (16) in motor bracket (17) and secure in place with snap ring (18). Install bearing (19) and oil seal (20) in the other end of the motor bracket. Pack bearing (19) half full with MP - multipurpose grease.

Gear Case Cover Sub-assembly

5. Install O-ring (21), bearing cap (22), and bearing (23) in the drum pinion shaft bearing seat in the gear case cover (24). Install O-ring (25), bearing cap (26) and bearing (27), in the drum pinion shaft bearing seat in the gear case cover. Install oil seal (28) and bearing outer race (29) in the lower bearing seat in the gear case cover. Tap oil seal (30) in the center bore in the gear case cover.

Gear Case Sub-assembly

6. Tap bearing (31) in the center bore in gear case (32) and install oil seals and pack bearing (31) half full with MP - multipurpose grease. Press bearing (35) on coupling (36) and install the coupling on the gear case. Install O-ring (37), bearing cap (38), and bearing outer race (39) in the lower bearing seat in the gear case. Tap oil seals (40) and (41) in the drum pinion shaft bearing seats in the gear case. Install bearing outer races (42) and (43) in the gear case.

NOTE

Both right hand drive and left hand drive geared limit switch units are manufactured. If the unit is a left-hand drive, install plug (44) in the right-hand side of the gear case. If the unit is a right-hand drive, install the plug in the left-hand side of the gear case.

Hoist Assembly

7. Install the right drum pinion shaft assembly (45) and the left pinion shaft assembly (46) into the gear case. Be careful to avoid damaging oil seals (40) and (41). The match marks on the drum pinion shafts and gear case must match as shown in Figure 7. When a drum pinion shaft assembly needs replacement, both the right and left assemblies must be replaced.

8. Install the mechanical load brake assembly (or intermediate shaft assembly) into the lower bearing seat of the gear case. Care must be taken not to damage the bearings when installing the shaft assemblies.

9. Install load brake spring cap (47) into load brake pawl (48). Compress the spring cap and insert the load brake pawl between the ears located inside the gear case. Press bearing (50) on motor pinion shaft (51) and install the shaft in the coupling in the center bore in the gear case.

10. Install drum gear (52) on drum (53) and secure in place with dowel pins. Weld the dowel pins in place. Apply 1/2 to 3/4 pounds of MP - multipurpose grease to the drum gear. Install coupling (54) on drum shaft (55) and install the shaft in the drum. Install the drum on the gear case. The end of the drum shaft will mesh with the coupling installed previously in the gear case.

11. Install spacer hanger (56) to drum hanger (57) if the unit is a low head room hoist. Secure the motor support to spacer hanger (56). Secure the motor support to drum hanger (58) if the unit is a standard hoist. Secure the gear case assembly to the drum hanger.

12. Remove the cotter pin and nut from the load brake shaft assembly and cement gasket (59) to the gear case. Install the gear case cover on the gear case. Be careful not to damage oil seals during this operation. Replace the cotter pin and nut on the load brake shaft slide disk hub (60) on the spline of the motor pinion shaft and secure in place with snap-ring (61). Install back plate (62) onto the pins in the gear case cover with the wiring hole at upper right. Position revolving disk (63) on the disk hub. Position disk plate (64) on the pins in the gear case cover.

13. Place revolving disk (65) on the disk hub. Slide armature (66) counterbored side first, on the pins of the gear case cover. Install spring spacer (67) into solenoid pot assembly (68). Insert a 1/2-13 UNC x 2-3/4 inch bolt into the center hole of the pot assembly. Position spring guide (67) and spring (70) into the pot assembly. Compress the spring by turning the bolt inserted into the pot assembly.

14. Secure the solenoid pot assembly over the pins and on the gear case cover. Remove the bolt from the solenoid pot assembly. Install gasket (71) and brake cover (72). Install the oil level plug, drain plug and breather to the gear case. Secure the motor bracket. Refer to Lubrication Section for specifications and lubrication points.

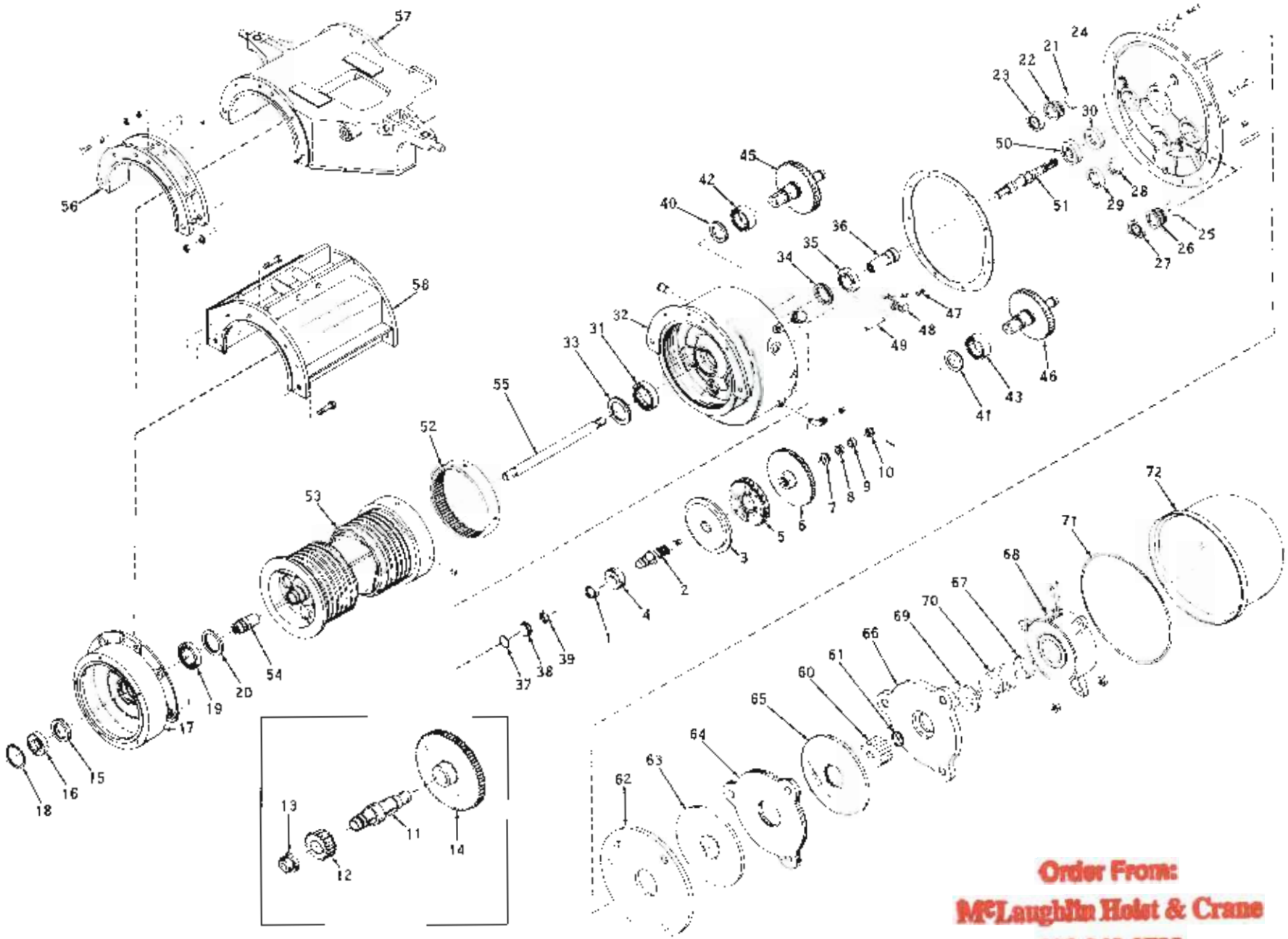


Figure 6. Hevi-Lift Hoist - Exploded View

Legend for Figure 6

1 Bearing inner race
2 Load brake shaft
3 Flange
4 Intermediate pinion
5 Ratchet assembly
6 Motor gear
7 Spacer
8 Bearing inner race
9 Bearing inner race
10 Slotted nut
11 Intermediate shaft
12 Intermediate pinion
13 Bearing
14 Motor gear
15 Oil seal
16 Bearing
17 Motors bracket
18 Snap ring
19 Bearing
20 Oil seal
21 O-ring
22 Bearing cap
23 Bearing
24 Gear case cover
25 O-ring
26 Bearing cap
27 Bearing
28 Oil seal
29 Bearing outer race
30 Oil seal
31 Bearing
32 Gear case
33 Oil seal
34 Oil seal
35 Bearing
36 Coupling
37 O-ring
38 Bearing cap
39 Bearing outer race
40 Oil seal
41 Oil seal
42 Bearing outer race
43 Bearing outer race
44 Plug
45 Right drum pinion shaft assembly
46 Left drum pinion shaft assembly
47 Load brake spring cap
48 Load brake pawl
49 Pawl pin
50 Bearing
51 Motor pinion shaft
52 Drum gear
53 Drum
54 Coupling
55 Drum shaft
56 Spacer hanger
57 Drum hanger (low head room hoist)
58 Drum hanger (standard hoist)
59 Gasket
60 Disk hub
61 Snap ring
62 Back plate
63 Revolving disk
64 Disk plate
65 Revolving disk
66 Armature
67 Spring spacer
68 Solenoid pot assembly
69 Spring guide
70 Spring
71 Gasket
72 Brake cover

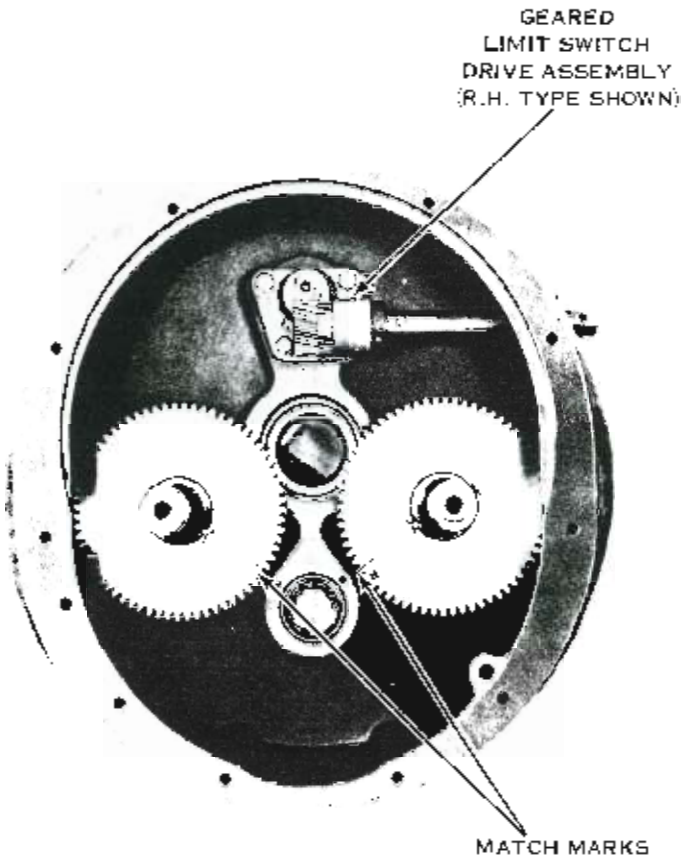


Figure 7. Gear Case Assembly Match Marks

ELECTRICAL EQUIPMENT

Power Supply

The power supply must be the same as indicated on the hoist name plate. If the hoist is operated on a power supply other than that intended serious damage will result to the electrical equipment.

Check hoist for correct operation corresponding with push button markings. When depressing the RAISE push button, the load block must raise. If the load block lowers when the RAISE push button is depressed the direction of rotation must be changed. To reverse the direction of motor rotation for three phase motors interchange any two of the power line leads. For D.C., interchange the two armature leads. If the load block lowers when the RAISE push button is depressed the hoist limit switch will be inoperable and will result in serious damage or injury if the load block runs into the hoist.

Controller

Magnetic control is standard for all bodies. For alternating current, three types of control are available for most hoist sizes: Single Speed, Two Speed, and Five Step Variable Speed. For direct current, two types of control are available for most hoist sizes: Single Speed and Five Step Variable Speed. The reversing switch for all hoists and types of control has mechanically interlocked contactors and manual reset thermal overload protection.

A.C. Controller

All alternating current controllers have a control circuit transformer, to reduce the control circuit to 24 volts. This is an important safety feature for the operator, particularly where the hoist must be operated in wet or damp areas.

The single speed controller consists of a reversing switch and control circuit transformer, as shown in Figure 8.

The two speed controller consists of a reversing switch, low and high speed selector contactors mechanically and electrically interlocked, and a control circuit transformer as shown in Figure 9. A plugging relay is included when a weight-operated or paddle type limit switch is used.

The five step variable speed controller consists of a reversing switch, four accelerating contactors, a set of resistance, and a control circuit transformer as shown in Figure 10.

For a hoist having a motor-powered trolley drive three types of controls are used: reversing single speed, reversing two speed, and reversing five step variable speed.

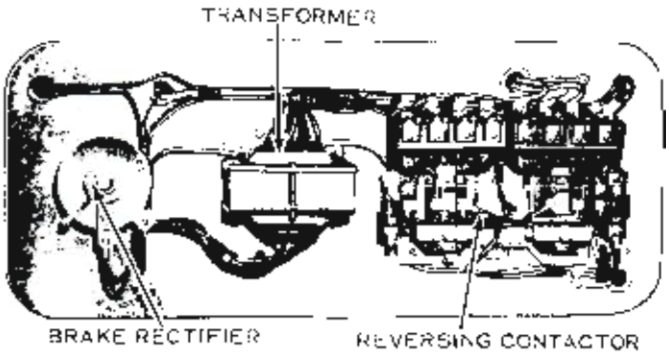


Figure 8. Single Speed A.C. Controller Without Weight Operated Limit Switch

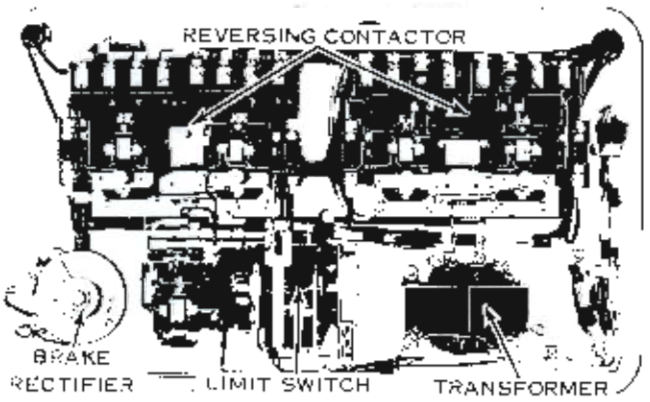


Figure 9. Two Speed A.C. Controller With Weight Operated Limit Switch

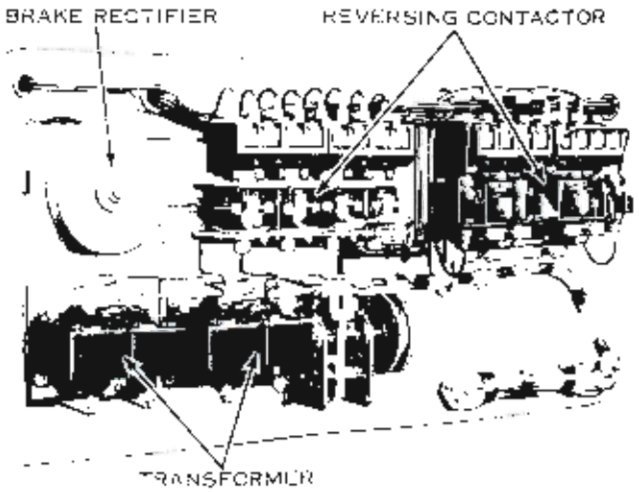


Figure 10. Variable Speed A.C. Controller With Weight Operated Limit Switch

D.C. Controller

For the direct current controller the main power and control circuit operate at supply voltage.

The five step variable speed controller consists of a reversing switch, four accelerating contactors, and a set of resistors. Two types of five step variable speed control are used as standard for the hoist motion. The more popular is series reversing tapered armature shunt control and the other is plain reversing. With tapered armature shunt control on the first three control steps a variable resistor is connected across the motor armature in either direction of travel, to provide slow flat speed-load characteristics for these control steps. The last two control steps are plain series resistance steps.

For the hoist having a motor-powered trolley drive two types of control are used, single speed reversing and five step variable speed plain reversing.

Push Button Station

A two-button push button station marked RAISE and LOWER is used with hoists having a hoist motion only. A four-button push button station marked RAISE-LOWER, RIGHT-LEFT is used with all two-motor hoists have motor-powered hoist and trolley motions. All push button stations have a ground connection from the controller cabinet to the station.

Three types of push button elements are used, depending on the type of control. For single speed control the push button element has both normally open and normally closed contacts (see Figure 8). Usually only the normally open contact is used. This contact is closed by completely depressing the button.

For two speed control a three contact element is used (see Figure 9). By partially depressing the button, direction and slow speed will operate, and by completely depressing the button slow speed drops out and high speed will operate.

For the five step variable speed control a five contact push element is used (see Figure 10). Contact with the five speed points are made by progressively depressing the push button in increments of approximately one-eighth inch.

The wiring between the controller and push button station is a plastic covered multi-conductor control cable. The push button station is suspended from the control cabinet by a chain, which removes the strain in the push button cable. Individual wires in the push button cable are color coded.

Wiring diagrams and color coding charts are packed with the hoist.

Rope Controlled Hoists

Occasionally, on specific request, hoists are furnished with single speed or five step variable speed rope-operated masters.

Limit Switch

A weight-operated limit switch as shown in Figure 11 is used on standard hoists. A paddle type limit switch as shown in Figure 12 is used on low room hoists. Either type limit switch when tripped will open the hoisting circuit, set the motor brake, and stop the load block. If the load block drift exceeds the adjusted limit in case of incorrect brake adjustment or defective operation, a plugging circuit will automatically close and plug the motor in the lowering direction. This prevents the load block from jamming into the hoist drum or frame. Limit switch cam adjustments for plugging vary for the hoist frame sizes.

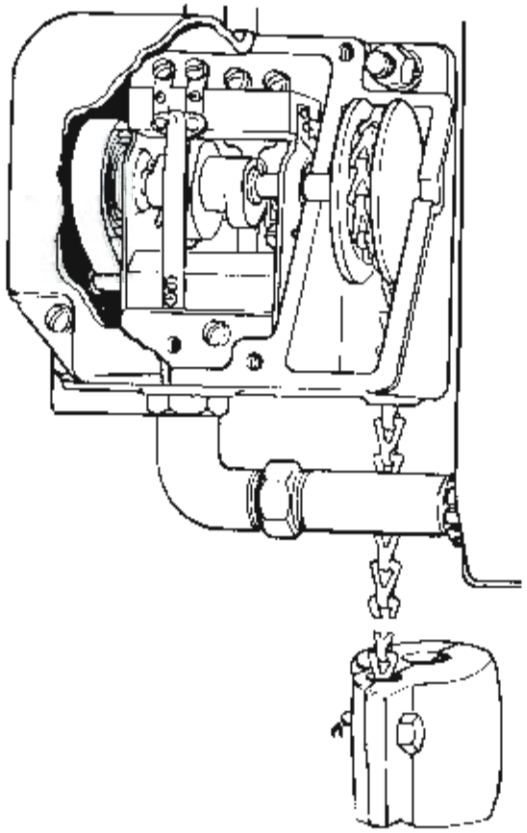


Figure 11. Weight Operated Limit Switch

Geared limit switches are furnished on special order (see Figure 7). Adjustment instructions are furnished with the switch. These switches are usually furnished when the travel distance must be limited in both the hoisting and lowering directions.

All limit switches are so arranged that only the direction of travel is interrupted and are automatically reset by operating in the opposite direction of travel.

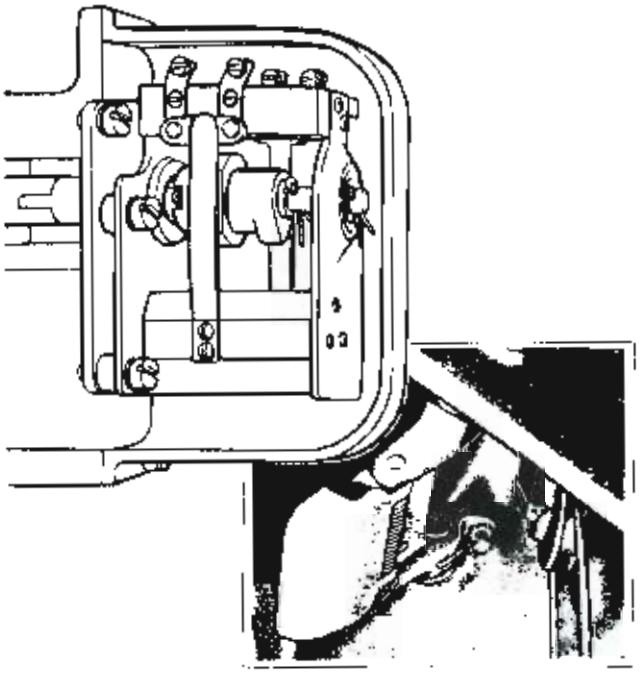


Figure 12. Paddle Operated Limit Switch

Motor Brakes

The motor brake is spring set, electric release, pot type, multi-disk brake as shown in Figure 4. The same basic brake is used for both A.C. and D.C. hoists. All coils are D.C., either series or shunt wound; A.C. hoists have shunt wound rectifier operated coils. All brake coils are wound with Class B insulation and encapsulated in the brake pot with Epoxy insulation material. Brake adjustment procedure is described on the name plate attached to the brake pot.

For proper operation the brake should be adjusted to maintain distance "A" around the entire circumference as close as possible to 1/16 inch. The adjustment is made by backing off lock nuts (1, Figure 4) and taking up adjustment nuts (2) and retightening lock nuts (1).

Motors

All P&H motors are built specifically for rugged hoist service. They are designed for rapid acceleration and frequent reversals. The motors are totally enclosed, with Class A insulation, rated 30 minutes 55° C. rise. Squirrel cage and wound rotor motors for 220 and 440 volt operation are reconnectable. Two-speed motors and other voltages are not reconnectable

TROUBLE SHOOTING CHECK LIST

TROUBLE	CAUSE	HOW TO REPAIR
Excessive hoist cable wear	Lack of lubrication. Excessive side pulling.	Lubricate cable with oil or colloidal graphite. Limit side pull to point where hoist cable wraps smoothly on the drum.
Oil leaks.	Gasket leakage between gear case and cover. Oil seal damage or wear.	Tighten loose bolts. Replace gasket between gear case and gear case cover. Replace oil seals.
Load accelerates during lowering.	Load brake slipping. Load brake not engaging.	Replace worn lining. Check installation of ratchet for proper direction for engagement with pawl. Check for damaged pawl or spring cap assembly. Replace bushing in ratchet if worn.
Hook doesn't raise or lower.	No power. Contactor not operating Limit switch opens circuit. Magnetic brake not releasing. Loose or broken connections.	Check switches, breakers, and power line connections. Check connections in control circuit. Check contactor coils and push button cable for open or short circuit. Check limit switch contacts. Check solenoid coil connections, rectifier, transformer coil for open or short circuit. If repairing, check for correct coil. Disconnect hoist from power. Check connections, especially at line connections and terminals on top of contactor.

TROUBLE SHOOTING CHECK LIST (CON'T)

TROUBLE	CAUSE	HOW TO REPAIR
Hook doesn't raise or lower. (Cont)	Phase failure.	Check for open circuit, grounded or faulty connections in one supply line, leads, breakers, or hoist wiring.
Hook doesn't raise.	Load too great.	Check weight of load and hoist capacity.
	Contactor not operating.	Overload contacts are open. Press RESET button below contactor. Check for overloading or other reason for overheating. Check contactor coil for open or short circuit.
	Open hoist circuit.	Check for loose connections. With counterweight in position, limit switch contacts should be closed.
Hook doesn't lower.	Open lowering circuit.	Check for loose connections. If lower limit switch is used, contacts should be closed.
	Contactor not operating.	Overload contacts are open. Press RESET button below contactor. Check contactor coil for open or short circuit.
	Broken wire in push button cable.	Inspect and replace cable if defective.
Hook moves in wrong direction.	Three phase - phase reversal.	Interchange two power leads. Refer to wiring diagrams.
	Direct current - wiring connections reversed at contactor.	Interchange armature leads. Refer to wiring diagram
	Hoist cable wound on wrong side of drum.	Rewind, check hoist cable for damage.
Hook doesn't stop at extremes of travel.	Limit switch does not open circuit.	Check limit switch for defective spring or contacts.
	Magnetic brake not functioning properly.	Check adjustment and operation.
Hook fails to stop quickly.	Load too great.	Check weight of load and hoist capacity.
	Magnetic brake slips	Revolving disc worn or dirty. Clean or replace revolving disc. Check brake operation and adjustment. Check that armature plate is installed properly with counterbored side towards friction discs.
Motor overheats.	Load too great.	Check weight of load and hoist capacity.
	Wrong voltage or frequency.	Check data stamped on nameplate for proper current conditions.
	High temperature at hoist location.	Limit use above 120° F. Provide special shielding or ventilation as necessary.
	Frequent starting - reversing - excessive inching.	Plan less severe cycling operation.
	Three phase - phase failure or unbalanced current.	Check motor windings for open or short circuits. Check supply lines for balanced voltages.
Magnetic brake overheats.	Brake does not release.	Check adjustment. Replace defective parts as necessary.
Magnetic brake does not release.	Solenoid coil shorted. Open brake circuit defective rectifier or transformer.	Check connections. Check solenoid coil for short circuit. Check rectifier and transformer.
Hoist operates sluggishly.	Low voltage.	Check voltage at connection. Check wire size used.
	Current collector makes poor connection.	Check collector for free movement of spring loaded arm, weak spring, connections, and free movement of shoe or roller. Replace worn or damaged parts.