SECTION V
MAINTENANCE

PERIODIC INSPECTION AND PREVENTIVE MAINTENANCE

Perform periodic inspection and preventive maintenance procedures as outlined in Table 5-1. Instructions for performing the actual procedures are covered in following topics in this section. These are minimum requirements and both the intervals and operations are based on intermittent operation of the hoist eight hours each day, five days per week. Depending on the activity, severity of service and environment of the hoist, more frequent inspections and maintenance may be required. The operator of the hoist must be responsible for determining the severity of service and operating conditions.

Table 5-1. Periodic Inspection and Preventive Maintenance

TIME INTERVAL	INSPECTION OR MAINTENANCE TO BE PERFORMED
Start of each shift	Check operation of upper limit switch, motor brakes and controls. Visually inspect running wire rope for twists, kinks, distortion, excessive wear and improper dead-ending. Visually inspect the hook for a throat opening in excessive of 15 degrees or a twist in excess of 10 degrees from the plane of an unbent hook.
Monthly	Make a thorough inspection of wire rope as instructed elsewhere in this section. Remove and inspect magnetic brake disc plate and linings. Clean or replace them as required. Adjust brake operating clearance. Check oil level in hoist and trolley gear cases. Add oil as required.
1-3 Months	Inspect contacts of control contactors. All contacts are silver alloy and are not harmed by discoloratron and slight pitting. Do not file these contacts. Replace them only when silver has worn thin or they are severly pitted. Check all wiring for evidence of damage and check security of all electrical connections. Clean hoist and trolley gear case breathers in solvent. Lubricate exposed teeth on geared trolley wheels. Lubricate trolley wheel bearings and guide rollers.
3-6 Months	Drain and refill hoist gear case. Lubricate sheave bearings in upper block, equalizer and bottom block. Apply a small amount of oil to the shaft bearings of the plugging upper limit switch.
6 Months	Drain and refill trolley gear case.
Annually	Inspect hook using a magnetic particle, penetrant or other method capable of detecting cracks. Inspect the safety latch and test its operation (if applicable).

LUBRICATION

GENERAL. To ensure continuing good operation of the hoist, all points requiring lubrication must be serviced with the correct lubricant at the proper time interval as indicated for each assembly.

The lubrication intervals recommended in this manual are based on intermittent operation of the hoist eight hours each day, five days per week. If the hoist is operated almost continually or on more than one shift, more frequent lubrication will be required. Also, the lubricant types and change intervals are based on operation in an ambient temperature range of 0^{o} to 100^{o}F and in an environment relatively free of dust, moisture and corrosive fumes. Consult the Harnischfeger Corporation for specific lubrication recommendations if environmental conditions are other than those described.

HOIST GEAR CASE. Drain and refill the hoist gear case at least once every six months. Remove the breather and magnetic drain plug (Figure 5-1) to drain the oil. Clean the magnetic drain plug, and then reinstall it in the gear case. Remove the oil level plug and add oil through the breather opening until oil reaches the oil level plug opening.

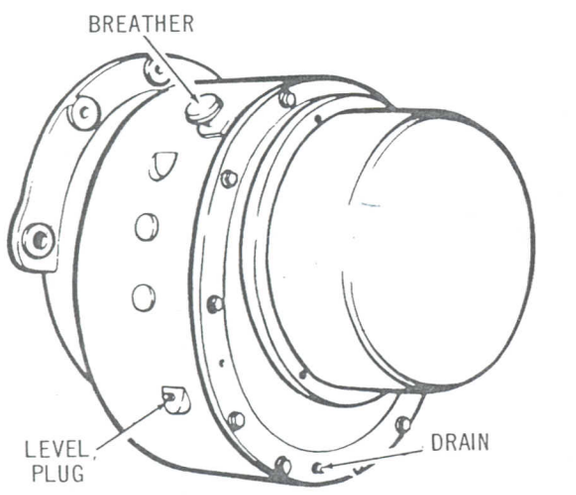


Figure 5-1. Hoist Gear Case Lubrication

NOTE

Oil capacities vary from 3 to 16 pints depending on the size of the gear case. The oil capacity of your hoist is cast in raised letters on the gear case just below the breather opening.

Replace the oil level plug. Clean and reinstall the breather.

NOTE

Remove the oil level plug and check the oil level at least once every three months.

Use a high quality gear oil without EP additives for indoor service and outdoor summer service (ambient temperatures above $+40^{o}$F). Use a high quality automatic transmission fluid, type "A", for outdoor winter service (ambient temperatures below $+40^{o}$F). The following products meet these requirements:

AGMA No. 5 Gear Oil P&H Specification No. 486	Automatic Transmission Fluid, Type "A" P&H Specification No. 494
AMOCO - Industrial Oil 95 Atlantic Richfield - Hytherm S-1000, Duro Oil 900 "Sinclair", Eagle Oil R&O Heavy Continental Oil Co. - Dectol R&O Lubricating Oil, Grade 92 EXXON - Teresstic 85 Mobil Oil Co. - Vactra Oil BB Shell Oil Co. - Hydraulic Oil, Grade 71 Sun Oil Co. - DX Ottawa 2085 Texaco - Regal R&O Lubricating Oil, Grade G Union Oil Co. of Calif. - Union 76 Division - Union Turbo RX (Puropale RX Extra Heavy or Red Line Turbine)	Continental Oil Co. - Dexron EXXON - Enco ATF Mobil Oil Co. - Mobil ATF 220 Shell Oil Co. - Shell Donax T-6 Sun Oil Co. - DX ATF Dexron Texaco - Texamatic Fluid 6673 Sinclair Refining Co. - ATF-Dexron AMOCO - American Dexron ATF NOTE: This specification covers a petroleum power transmission fluid and lubricating oil properly described as Dexron fluid.

CAUTION

Use only lubricants listed. Other lubricants may affect the safe performance of the hoist and can result in hoist failure and cause injury or property damage. Approval for the use of other lubricants should be obtained from the Harnischfeger Corporation to assure safe operation.

PLUGGING UPPER LIMIT SWITCH. Apply a small amount of SAE-30 motor oil to the shaft bearings of the limit switch at least every six months.

The control cabinet cover must be removed for access to the switch on standard headroom hoists. The switch cover must be removed for access to the switch on low headroom hoists.

WIRE ROPE. Wire rope is a machine. Each time a rope bends over a sheave or straightens from a slack position, many strands move or slide against each other. Lubrication is a necessity to prevent wear as a result of movement. An equally important reason for correct lubrication is to prevent corrosion of wires and deterioration of the fibre core.

CAUTION

Rusty rope is dangerous, since there is no known method of inspecting such rope to determine the remaining strength.

No set rule can be given concerning the frequency of lubrication. This will depend on the conditions to which the rope is subjected. The severity of the duty and the amount of corrosive elements to which the rope is subjected will have to serve as an index in determining the need for relubrication.

Proper lubricant should be used (open gear and wire rope lubricant, P&H Specification No. 464 or equal). Oils or greases used for wire rope lubricant should have the following physical properties:

1. They should contain no acids or alkalies.

2. They should have sufficient adhesive strength to stay on the rope.

3. They should be able to penetrate between the wires and strands.

4. They should be insoluble under the conditions of application.

5. They should have high film strength.

6. They should resist oxidation.

Correct methods should be used in applying the lubricant. Wire ropes that have been in service should always be cleaned thoroughly before they are relubricated. Use wire brushes, scrapers, or compressed air to clean the rope. All possible foreign material and old lubricant should be removed from the valleys between the strands and the spaces between the outer wires.

The lubricant should be thin enough to penetrate the strands to the core, but not so thin that it will run off the rope. It must not be so thick that it merely coats the outside of the rope. The best lubricant is a fairly thick, semiplastic type, which is applied hot, in a thinned condition. This type of lubricant will penetrate while hot and then cool off to form a plastic filler and coating, which will then resist the penetration of water.

ELECTRIC MOTOR LUBRICATION. In all hoist and trolley motors, a sufficient amount of grease is packed and sealed into the motor shaft bearing chamber to last for the normal operating life of the bearing.

ADJUSTMENTS

DIRECT ACTING MAGNETIC BRAKE ADJUSTMENT. The direct acting magnetic brake must be properly adjusted to stop rotation when the power supply is shut off. This adjustment compensates for disc type brake lining wear. At least once a month inspect the magnetic brake to determine if adjustment is necessary. Air gap "S" should be 1/32 inch. (Figure 5-5.)

For adjustment, shut off the power, then remove the brake cover from the hoist. Back off the lock nuts and turn the adjusting nuts until air gap "S" is 1/32 inch around the entire brake pot. Retighten the lock nuts.

This adjustment procedure is also described on the nameplate attached to the side of the brake pot.

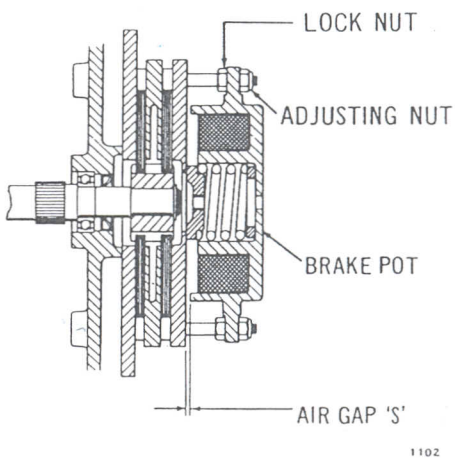


Figure 5-5. Magnetic Brake Adjustment

MECHANICAL LOAD BRAKE PAWL ADJUSTMENT. During raising, the ratchet is rotating counterclockwise. The engaging end of the pawl should be clear of the ratchet teeth by 1/32 to 1/16 inch (see Figure 5-6).

If a rapid clicking sound occurs in the gear case when raising, the pawl is touching the tips of the ratchet teeth. Remove the locking set screw with an Allen wrench. Operate the hoist in the raising motion and slowly turn the adjusting set screw counterclockwise until the clicking sound disappears. Then stop the hoist and give the adjusting set screw an additional one half turn. The pawl will then be the proper distance from the ratchet teeth. Insert the locking setscrew and tighten.

Then check the lowering motion to be sure the pawl engages the ratchet firmly at the start of the lowering motion. If the pawl noisily hammers into the ratchet teeth, the clearance is more than 1/16" and should be adjusted accordingly.

If the gear case is disassembled and in a vertical position, install the load brake shift assembly and the pawl assembly in their normal operating positions. Rotate the load brake shaft assembly by hand and adjust the setscrew so the clearance is 1/32 to 1/16 inch with the ratchet rotating counterclockwise.

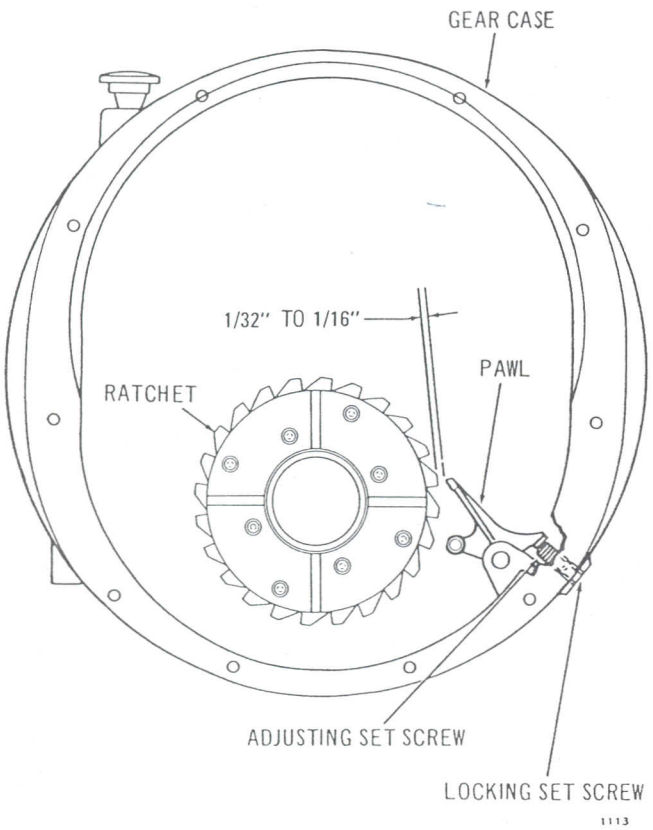


Figure 5-6. Load Brake Pawl Adjustment

UPPER LIMIT SWITCH CAM POSITIONING. The actuating cams which open the RAISE circuit and close the LOWER circuit are two separate moldings. The cams are matched and held together by internal and external gear teeth. The gear arrangement provides an adjustment to vary the plugging time (the distance the bottom block moves between opening the RAISE circuit and closing the plugging circuit). The cams are indexed together by a reference line on the hoisting cam and index numbers equally spaced on the exposed face of the plugging cam. The cams are secured to the shaft with cotter pins.

CAUTION

The position of the hoisting cam on the shaft must never be changed.

To change the plugging time, proceed as follows: (See Figure 5-6).

1. Remove the cotter pin at the end of the plugging cam.

2. Slide the plugging cam axially along the shaft until the teeth are disengaged.

3. Rotate the plugging cam to the desired setting.

4. Return the plugging cam to the position where the gear teeth are engaged.

5. Insert the cotter pin in the shaft at the end of the plugging cam.

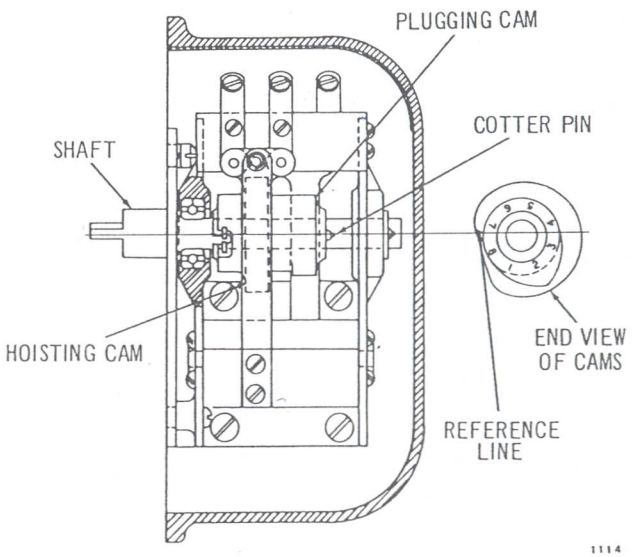


Figure 5-7. Paddle Operated Upper Limit Switch Cam Positioning

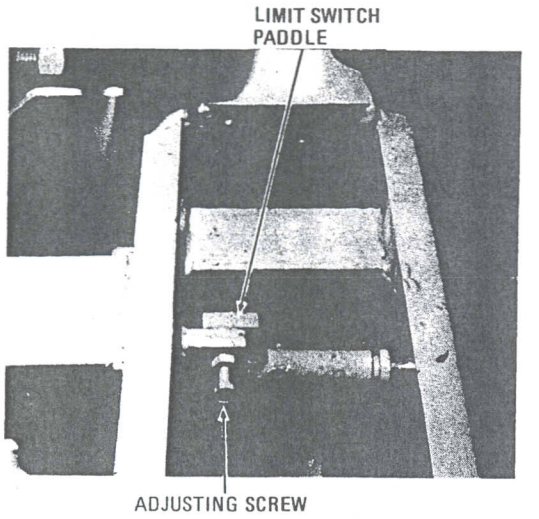


Figure 5-8. Upper Limit Switch Paddle

PADDLE ADJUSTMENT - UPPER LIMIT SWITCH. If it is necessary to adjust the operation of the paddle operated limit switch, loosen the adjusting screw (Figure 5-8) so the paddle is set in its lowest position. Retighten the adjusting screw. Reposition the cams to correct the plugging time as described in the previous paragraph.

GEARED LIMIT SWITCH ADJUSTMENT (OPTIONAL EQUIPMENT). Both the RAISE and LOWER circuits are connected through sets of normally closed contacts in the geared limit switch. Both the upper and lower limits of bottom block travel are preset at the factory.

NOTE

The lower limit of the geared limit switch should be set so that, when the LOWER circuit opens, one full wrap of cable remains on the drum. The upper limit should be set so that the bottom block stops a minimum of 6 inches before contacting the hoist drum, after allowing for normal drift. Normal allowable drift is one inch/10 FPM of hoist speed, which is governed by the motor brake response. If plugging contacts are provided in the geared limit switch, they must be set to close at a point just above the point where the hook block should have drifted to a stop.

Two types of geared limit switches are used on these hoists, and the adjustment procedure for each is described below. The first procedure is for the 79Z976 limit switch and the second is for the 479Q34 limit switch.

Adjust the 79Z976 limit switch as follows (see Figure 5-9):

1. Remove the cover from the geared limit switch.

2. Operate the hoist to raise the bottom block to the desired upper limit of travel.

3. Loosen the two cam clamping screws 1/4 turn each.

4. Depress the upper limit switch adjusting pinion with a screwdriver until it meshes with the adjustable upper limit cam.

5. Rotate the cam in the direction to open the normally closed contacts. The white marker on the gear teeth of the cam is directly over the nylon roller which actuates the switch. Continue to rotate the cam until the contacts have just opened.

6. Retighten the two clamping screws.

7. To adjust the optional plugging contacts, short out the upper limit switch contacts and, under power, raise the hook block to a point just above the normal drift point. Then, repeat steps 3 through 6 to actuate the normally open plugging contacts.

8. Operate the hoist to lower the bottom block to the desired lower limit of travel.

9. Adjust the lower limit switch cam in a sequence similar to that used in steps 3, 4, 5, and 6.

10. Operate the hoist to check both upper and lower limit settings and readjust if necessary.

11. Replace the switch cover.

Adjust the 479Q34 limit switch as follows (see Figure 5-9):

1. Remove the cover from the geared limit switch.

2. Operate the hoist to raise the bottom block to the desired upper limit of travel.

3. Loosen cam screw (A).

4. Move white cam wheel (B) to desired position. Approximate operating position of the snap switch is indicated when black line (E) shows in the notch.

5. Tighten cam screw (A). DO NOT OVERTIGHTEN.

6. To adjust the optional plugging contacts, short out the upper limit switch contacts and, under power raise the hook block to a point just above the normal drift point. Then, repeat steps 3 through 5 to actuate the normally open plugging contacts.

7. Operate the hoist to lower the bottom block to the desired lower limit of travel.

8. Adjust the lower limit switch cam in a sequence similar to that used in steps 3, 4, and 5.

9. Operate the hoist to check both upper and lower limit settings, and readjust if necessary.

10. Replace the switch cover.

HOIST DISASSEMBLY

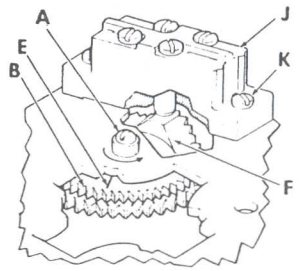
GENERAL. The following points should be kept in mind during the disassembly of any component.

1. Disassembly should be limited to that required for specific repairs. Never disassemble beyond the point necessary to fix the trouble.

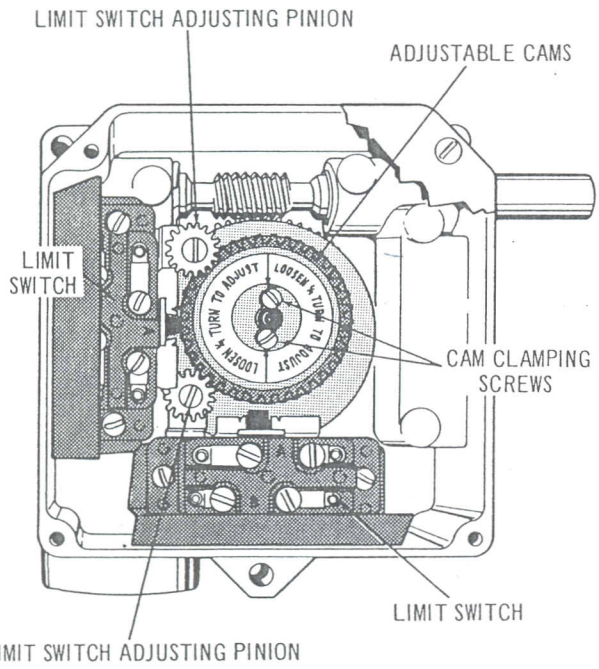
2. Never use heat from a torch to assist in removing parts unless the parts to be heated are already damaged beyond repair. Excessive heat will damage parts beyond repair.

3. Prepare a clean area to place the parts which are removed. Prevent foreign matter from entering the bearings, motor, brake and gear case.

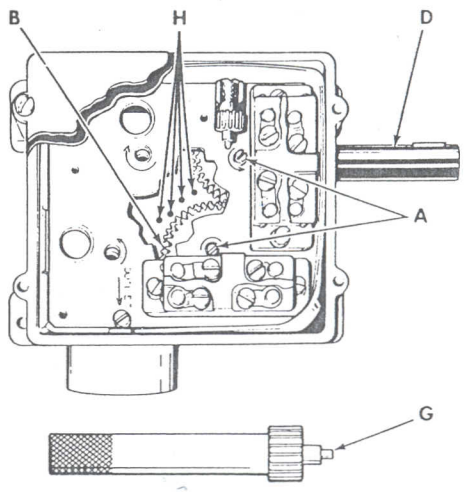
4. Use care that parts are not nicked or otherwise damaged so that fits and performance are not affected.



SNAP SWITCH PUSH WILL BE DEPRESSED BY CAM (F) WHEN BLACK LINE (E) IS IN NOTCH.



79Z976 LIMIT SWITCH



CAM ADJUSTER MAY BE USED TO ADJUST CAM WHEEL (B). ADJUSTER TIP (G) IS PLACED IN GUIDE HOLE CLOSEST TO CAM WHEEL (B).

479Q34 LIMIT SWITCH

Figure 5-9. Geared Limit Switch Adjustment

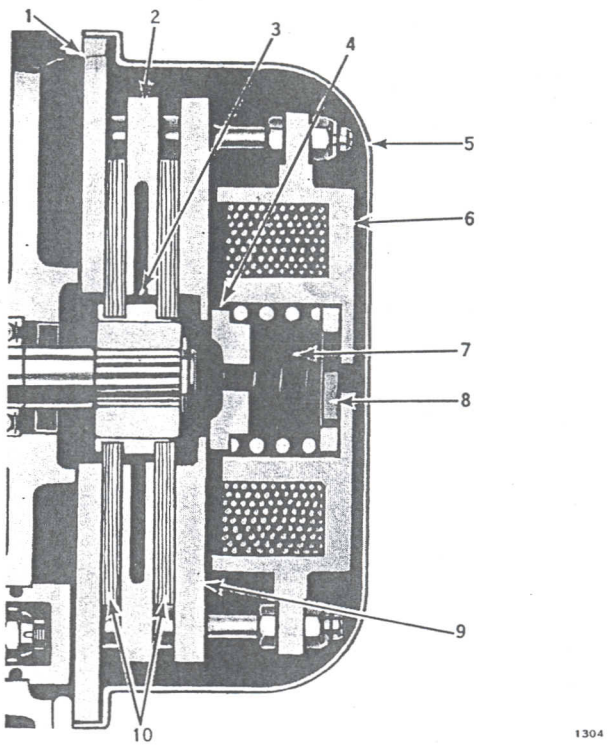


Figure 5-10. Magnetic Brake Assembly

NOTE

All gaskets, o-rings and oil seals removed during disassembly should be discarded and replaced with new parts.

5. Tag electrical wires when disconnecting them to facilitate proper connections when reconnecting them. Also, refer to the wiring diagram secured to the inside of the control cabinet cover.

WARNING

Before starting any disassembly of the hoist, lower the bottom block to the floor, if possible. If the bottom block cannot be lowered to the floor, secure it to the beam or other mounting support to relieve tension on the wire rope. If the hoist is being removed from its mounting, shut off the power supply and disconnect the power connections to the hoist. If the hoist is to be worked on while still mounted in place, shut off the power and pull the power supply fuses or place the power supply circuit breakers in the off position.

DISASSEMBLY OF MAGNETIC BRAKE. To disassemble the magnetic brake, proceed as follows (see Figure 5-10):

1. Remove the brake cover (5).

2. Disconnect the leads to the magnetic brake pot (6).

3. Insert a 1/2-13 UNC bolt through the opening in the end of the brake pot and thread it into the spring guide (4). Tighten the bolt a few turns to relieve spring pressure on the armature (9) and to ensure that the spring guide is firmly retained by the bolt.

4. Remove the three adjusting nuts and lockwashers from the brake pins and slide the magnetic brake pot off of the pins.

5. Remove the armature (9), the disc type brake linings (10), the disc plate (2) and the back plate (1).

NOTE

If it is necessary to remove the spring guide (4), the compression spring (7) and the spring spacer (8) from the brake pot, set the brake pot on a work bench with the spring guide towards the bench. Hold the brake pot down with one hand while slowly removing the bolt which was inserted in step three. Slowly allow the brake pot to rise as the spring extends.

DISASSEMBLY OF GEAR CASE AND GEARING. To disassemble the gear case assembly, proceed as follows (see Figure 5-21):

1. Remove the magnetic brake parts as described under DISASSEMBLY OF MAGNETIC BRAKE.

2. Remove the breather and drain plug. Drain the oil into a suitable container.

3. Remove the snap ring (13) and the disc hub (14).

4. Disconnect the conduit from the gear case cover (15).

5. Remove the cap screws and lockwashers to detach the gear case cover from the gear case. Grasp the gear case cover by the brake pins for easy removal. It is advisable to replace all the oil seals in the gear case cover. The bearings do not have to be removed unless they will require replacement. The brake pins are pressed into the cover and are secured with snap rings. Remove the snap rings and press out the pins if replacement is necessary.

6. If the motor pinion shaft did not come out with the gear case cover, withdraw the motor pinion shaft (10) by pulling it straight out from the splined coupling (9). Leave the coupling in place.

7. Remove the pawl pin (27). Slide out the pawl (26) with the load brake spring cap assembly (28).

8. Remove the load brake shaft assembly intact. (If a mechanical load brake is not used, remove the intermediate shaft assembly).

9. If it is necessary to disassemble the load brake shaft assembly (Figure 5-11), firmly secure the intermediate pinion (1) in a vise with protective jaws. Remove the cotter pin (10) and nut (9). Remove the motor gear (4) by unthreading it, clockwise, from the shaft, as viewed from the motor gear end of the shaft. The motor gear will serve as a jack screw for removal of items 6, 7, and 8. The bearing inner race (11) and pinion are pressed on to the shaft and must be pulled if they are to be removed for replacement.

CAUTION

Be careful not to damage bushing (5) when removing ratchet (2) from the motor gear. Also, do not remove flange (3) from the shaft because the flange and shaft are machined after they are assembled together. If replacement of either is necessary, they must be replaced as an assembly.

10. Remove the left and right drum pinion shaft assemblies (see Figure 5-20). The bearing inner races and the spacer ring may be pulled from the shaft, if necessary, but the shaft and the intermediate gear are serviced ONLY as an assembly.

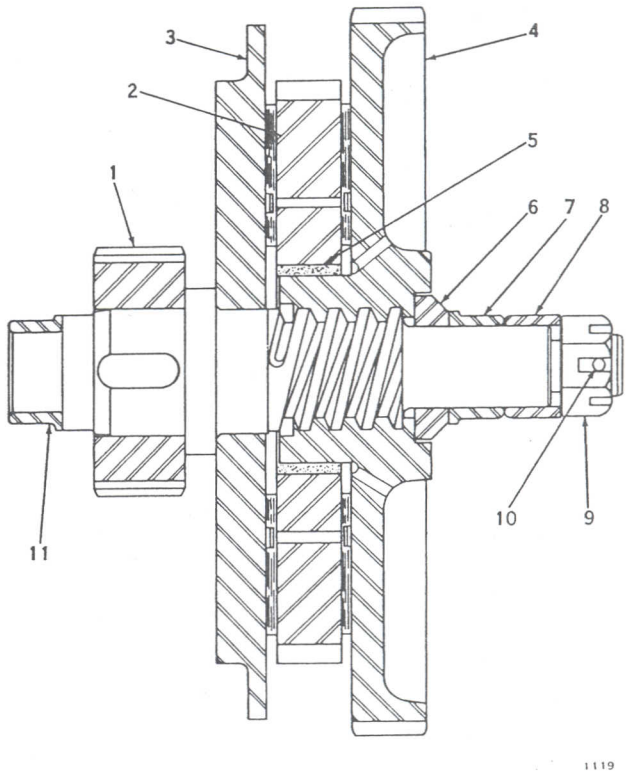


Figure 5-11. Load Brake Shaft Assembly

11. The bearings and oil seals (Figure 5-12, items 1 and 2) for the left and right hand drum pinion shaft assemblies and the bearing (3) for the load brake shaft are pressed into the gear case and should not be removed unless they are to be replaced. It is advisable to replace the oil seals.

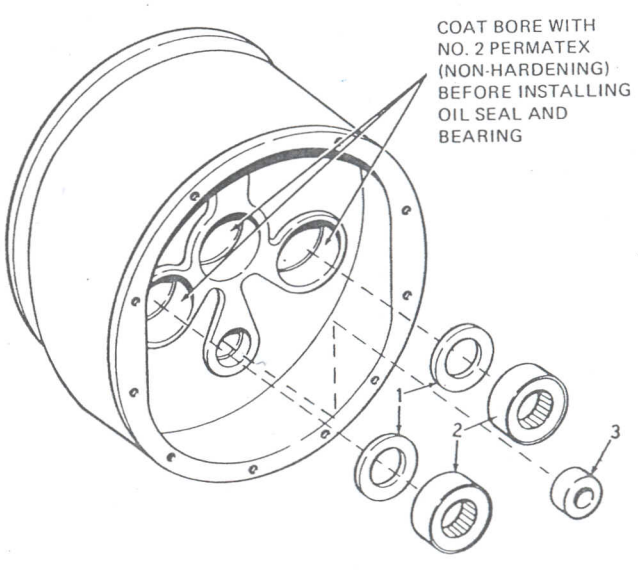


Figure 5-12. Hoist Gear Case

12. The splined coupling (Figure 5-21, 9) ball bearing (8), roller bearing (6) and oil seals (5 and 7) cannot be removed from the gear case unless the gear case is removed as described under REMOVING HOIST DRUM.

REMOVING HOIST MOTOR. To remove the hoist motor, proceed as follows (Figure 5-21):

1. Remove the terminal box plate on the side of the motor.

WARNING

If the motor is being removed with the hoist still mounted, be sure to shut off the power supply. Pull the power supply fuses or put the power supply circuit breakers in the off position.

2. Disconnect and mark the motor terminals.

3. Disconnect the conduit from the terminal box.

4. Firmly support the motor and remove the bolts and lockwashers securing it to the motor bracket (1).

5. Pull the motor straight out from the motor bracket. The splined motor shaft fits into the coupling (2) in the motor bracket.

REMOVING HOIST DRUM. To disassemble the hoist drum, first remove the bottom block and the wire rope from the hoist. Remove the hoist from its mounting so the disassembly can be done on a bench. Then proceed as follows (see Figure 5-21):

1. Remove the magnetic brake assembly, gear case cover, gearing and the hoist motor.

2. Remove the snap ring (3) from the bore of the motor bracket.

3. Using a hardwood rod and a hammer, tap the end of the drum shaft (20) at the gear case end so it can be taken out at the motor bracket end. As the shaft is pulled out with the coupling (2), the bearing (25) will also come out.

NOTE

Seven, eight and nine foot long drum shafts are an integral part of the drum and cannot be removed.

4. Block the drum to hold its position within the drum hanger. Remove the hardware which attaches the gear case to the hanger. Slide the gear case back to clear the drum bearing (6) and remove it from the hanger.

5. To remove the coupling (9) from the gear case, tap the coupling from the drum side of the gear case. It can then be removed with the bearing (8) from the gearing end of the gear case. If necessary, press the coupling out of the bearing.

6. The remaining bearings and oil seals in the gear case are press fitted and should not be removed unless they are to be replaced. Here again, it is advisable to replace the oil seals.

7. Slide drum away from the motor bracket to clear drum bearing (23). Lift drum out of the hanger.

8. Remove bearing (23) and oil seals (22 and 24) from the motor bracket.

9. The two drum sleeves (19) are pressed into the drum and should not be removed unless replacement is necessary.

10. The drum gear (18) is press fitted and doweled in the drum. The ends of the dowel pins are tack welded to the drum. To remove the drum gear, grind off the tack weld from the dowel pins. Drill and tap dowel pins and pull the pins out. Pry out the drum gear.

CLEANING OF REMOVED PARTS

Clean all parts thoroughly, using kerosene, diesel oil or a suitable commercial solvent. Never use a hot alkaline solution on finished parts or bearings. Use a low pressure jet (15 psi) of dry compressed air to dry parts.

CAUTION

Do not immerse prelubricated bearings in cleaning solvent. Never allow a bearing to spin when drying it with compressed air.

INSPECTION OF REMOVED PARTS

All parts should be inspected for wear and damage. Particular attention should be given to the following items:

1. Inspect all gearing for excessively worn, cracked or broken teeth.

2. Inspect all bushings for excessive wear, out-of-round, scoring or galling. Replace worn bushings.

3. Inspect all oil seals for cuts, nicks or loss of elasticity. Replace any that are damaged or appear to be damaged.

4. Inspect all bearings for excessive play, distortion or pitting. Also inspect the balls and rollers for wear or damage. Replace worn or defective bearings.

5. If ridges caused by wear are apparent on a shaft, replace the shaft. Be especially careful to inspect all surfaces on

which seal lips seat. A surface that is not perfectly smooth will result in rapid wear to the seal lips, which in turn causes oil leaks.

6. Inspect all threaded parts and replace those with damaged threads.

7. Inspect the magnetic brake disc plate and disc type brake linings for flatness within 0.005 inch. Linings can be sanded flat and the disc plate can be ground flat. If the linings have become oil soaked, they should be replaced and the source of the oil leak repaired.

8. Inspect the load brake friction disc assembly. Replace it if the linings are worn down to the rivet heads. If the friction disc linings are highly glazed, clean them in a solvent such as kerosene. Allow them to dry and sand them lightly with sandpaper backed up by a flat surface. Coat the friction disc assembly in clean gear oil before reassembly.

9. Carefully inspect the gasket used between the gear case and gear case cover. If it is brittle or torn, oil leaks will very likely occur. If the proper gasket is not available, use a suitable 1/32 inch thick gasket material and cut it to size, using the gear case cover as a template.

10. Inspect all other parts for evidence of damage. Repair or replace any part which is in questionable condition. The cost of the part is often minor compared to the cost of redoing the job if the part should fail.

REASSEMBLY

GENERAL. The following good practices should be considered when reassembling any portion of the hoist.

1. Provided the parts are in sufficiently good condition to reuse, file smooth any nicks, burrs or galled spots on shafts, bores, pins and bushings.

2. All grease passages should be open and clean.

3. Permatex the bearing bores as noted on Figures 5-12 and 5-18.

4. Carefully file any nicks or burrs from gear teeth.

5. Polish the edges of all shoulders on shafts to remove small nicks resulting from handling prior to assembly.

6. File all nicks and burrs caused by lockwashers.

7. Replace all gaskets, oil seals and O-rings which have been removed. Apply No. 2 permatex to the cover and gear case mating faces before installing the gasket.

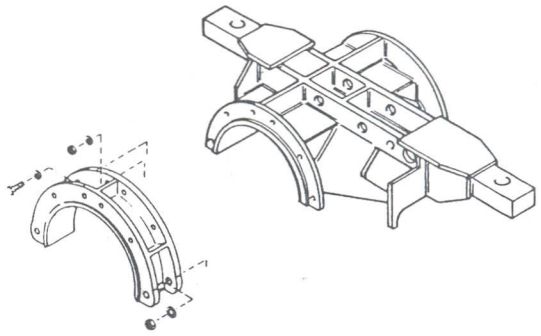
8. File the forward edge of all gearing keyways at a slight angle so that the gear will ride over the key and not tend to cut into the key.

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

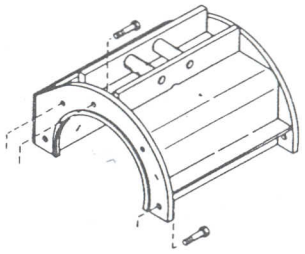
10. When reconnecting the power supply to the hoist, always check the direction of bottom block travel as described in CHECKING DIRECTION OF ROTATION in the ORIGINAL OPERATING CHECK portion of this manual.

HOIST ASSEMBLY. The assembly procedures here will describe the sequence of assembly for a hoist that has been completely disassembled. If repairs were made to only part of the hoist, refer to the portion of these procedures which apply to the area of the hoist that was worked on. Unless otherwise indicated, all references will be to Figure 5-21.

1. Lay the drum hanger down on its back. Subassemble the motor bracket with drum bearing (23) and oil seal (22). Pack the bearing half full of multipurpose grease. Install oil seal (24). Press bearing (25) onto coupling (2). Install bearing and coupling in motor bracket and secure with snap ring (3). If the hoist is a standard headroom model, bolt the motor bracket directly to the drum hanger (Figure 5-13). If the hoist is a low headroom model, bolt the motor bracket to the spacer hanger, and then the two parts to the drum hanger.



LOW HEADROOM DRUM HANGER WITH SPACER HANGER



STANDARD HEADROOM DRUM HANGER

1121

Figure 5-13. Drum Hangers

2. Press drum gear (18) in drum so that the four predrilled (but not reamed) holes in the drum gear line up with the original four holes in the drum. Ream the four holes and insert dowels. Plug weld the dowels on the outside of the drum. Grind the welded surface smooth. Apply 1/2 to 3/4 pounds of Shell Darina No. 2 grease (P&H Spec. No. 476) to the teeth of the drum gear. Slide the drum into the motor bracket being careful not to damage bearing (23) with the drum sleeve. Block the drum so it is level in the hanger.

3. Tap bearing (6) into the center bore of the gear case (4). Pack the bearing half full with multipurpose grease and install oil seals (5 and 7). Tap bearing (17) in the lower bearing seat (blind bore) of the gear case. Install the two oil seals and two bearings in the two side bores of the gear case for the right hand and left hand drum pinion shaft assemblies. Bolt the gear case to the drum hanger.

4. Press bearing (8) onto coupling (9) and install coupling on splined end of drum shaft (20). Insert drum shaft and coupling through center bore of gear case into splined coupling (2).

NOTE

It is helpful to insert the motor pinion shaft (10) into coupling (9) so it can be used as a lever while aligning the drum shaft splines and coupling splines at the opposite end of the drum.

Tap on end of coupling (9) until bearing (8) is seated in gear case bore.

5. Shrink bearing inner race (2, Figure 5-14), shoulder first, on the right and left hand drum pinion shafts until tight against the shoulder of the shaft. Shrink on ring spacer (1) tight against the inner race. Install inner race (3) on the opposite end of shaft. Install the right and left hand drum pinion shaft assemblies in the gear case. Do this carefully so the oil seals in the gear case are not damaged. THE MATCH MARKS ON THE GEAR CASE AND ON THE INTERMEDIATE GEARS MUST BE IN PERFECT ALIGNMENT as shown in Figure 5-15. Note that left and right gears are identified by the letters L and R.

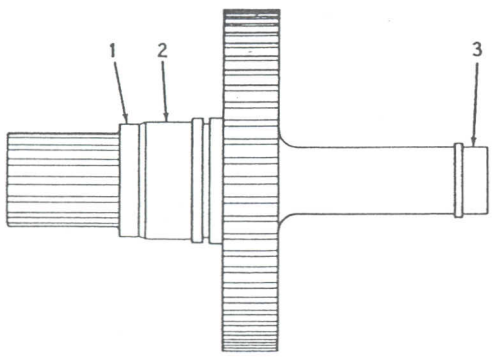


Figure 5-14. Drum Pinion Shaft Assembly, R.H. Shown

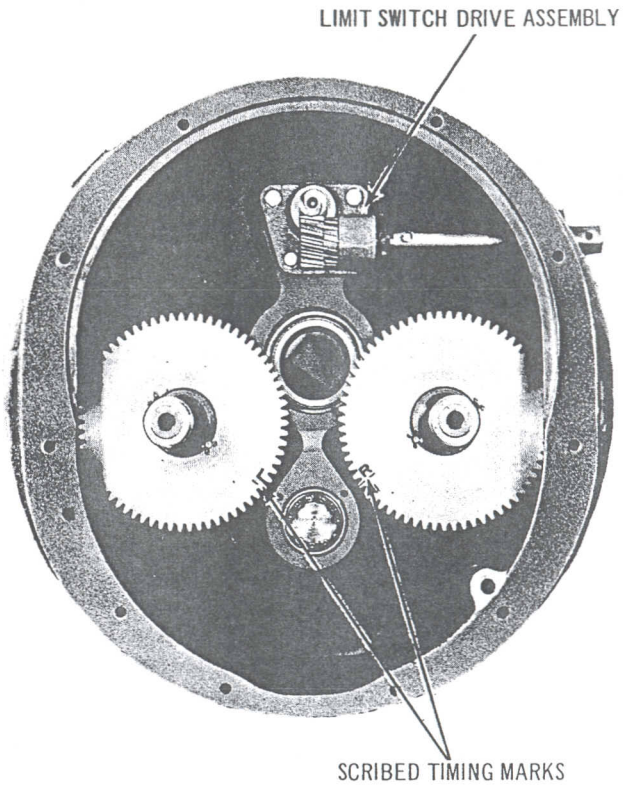


Figure 5-15. Gear Case Assembly Timing Marks

CAUTION

When a drum pinion shaft assembly requires replacement, both the left and right hand drum pinion shaft assemblies must be replaced. These will be match marked at the factory. Be extremely careful to install the match marks in perfect alignment. Failure to do so will result in the gearing failing in a very short time.

If a geared limit switch is used, install the drive assembly in the gear case at this time.

6. To reassemble the load brake shaft assembly, proceed as follows (see Figure 5-16):

Press on bearing inner race (11). Install key in keyway. Press on intermediate pinion (1) on the large diameter end of the shaft until it is tight against the shoulder.

Rivet the friction disc linings to the ratchet (2). Carefully press the bushing (5) into the ratchet. File any burrs from the edge of the motor gear (4) hub. Oil the ratchet lining surface. Install the ratchet on the motor gear hub.

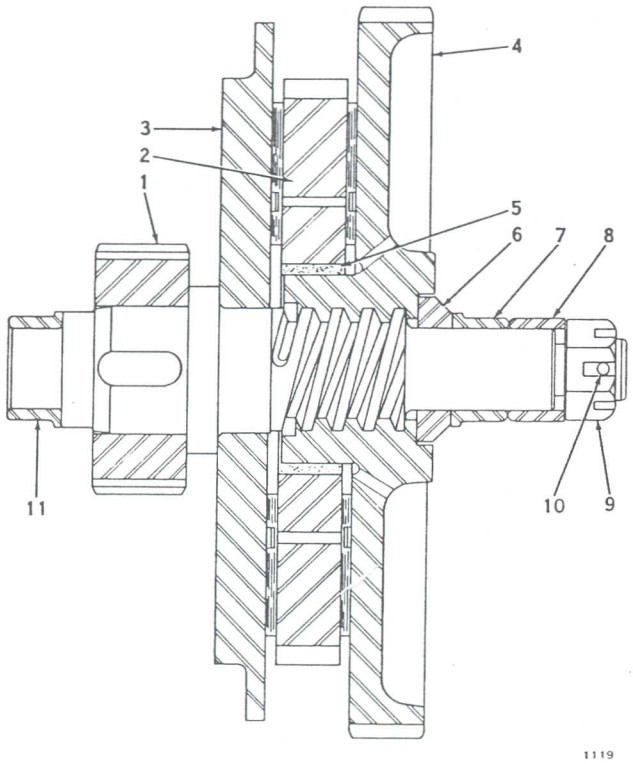


Figure 5-16. Load Brake Shaft Assembly

NOTE

Install the ratchet so that flat of teeth are down on left hand side when viewing the polished side of the motor gear.

Secure the intermediate pinion in a vise with protective jaws. The shaft should be in a vertical position. Lay the gear and ratchet down so the gear is on top. Grasp the two parts together and slide them onto the shaft. Thread the gear and ratchet onto the shaft by turning them in a counterclockwise rotation, as viewed from the gear end of the shaft, until it is tight against the flange. Slip the spacer (6), shoulder first, on the shaft until it is tight against the motor gear. Tap bearing inner race (7), shoulder first, and inner race (8) on the shaft. Tighten nut (9) on the end of the shaft. This will slide the inner races to the proper position on the shaft.

NOTE

If a new load shaft assembly is being installed, loosen the motor gear and remove protective plastic sheets from each side of the ratchet assembly. Oil the ratchet linings by application through the four holes in the motor gear hub. This can be done with a squirt type oil can. The adjusting nut is set at the factory for initial installation and is to be considered a non-adjustable item once assembled in the gear case.

Turn the adjusting nut clockwise until it is tight so the spacer is forced against the motor gear. Back off the nut 1/4 turn and line up the hole on the end of the shaft to the nearest castle nut slot and insert the cotter pin. At this point, do not bend the cotter pin for permanent assembly.

Rotate the motor gear clockwise, viewing from the gear end, until the spacer and inner races are forced back against the adjusting nut. This is what is referred to as "open condition" of the load brake shaft assembly. It is in this "open condition" that the assembly must be installed in the gear case. Care should be taken not to turn the gear to a closed condition which would make the axial float check inaccurate. This axial float check is described in subsequent pages.

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

7. When a hoist is not equipped with a mechanical load brake, an intermediate shaft assembly is used, and should be assembled as follows (see Figure 5-17):

Install the keys in keyways of the intermediate shaft (1) and press on the intermediate pinion (2) until it is tight against the shoulder. Press on motor gear (3) until it is tight against the other side of the shoulder. Tap on bearing inner races (4) on each end of shaft. Install the shaft assembly into the lower bearing seat of the gear case.

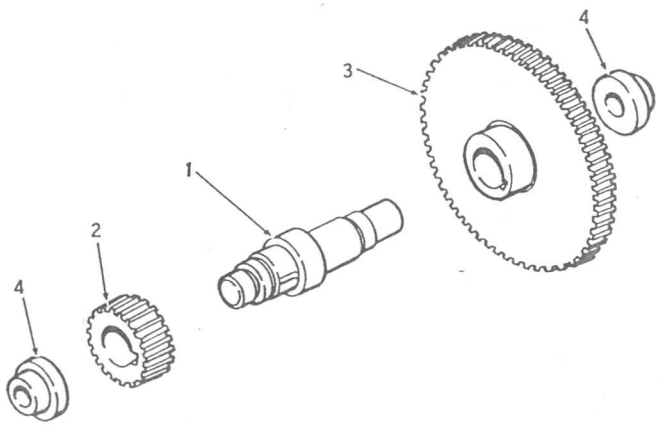


Figure 5-17. Intermediate Shaft Assembly

8. Slide the load brake spring cap assembly into the pawl. Compress the spring cap and insert the pawl between the load brake flange and gear. Engage the pawl between the ears which are part of the gear case and install the pin to secure the pawl to the gear case. By hand, rotate the gear counterclockwise and adjust the set screw until the pawl clears the ratchet teeth by 1/16 to 1/8 inch. See Figure 5-6 for this adjustment.

9. Press bearing (11) on motor pinion shaft (10) and install shaft in the splined coupling in the center bore of the gear case; Figure 5-21.

10. Before installing the gear case cover, perform the following operations (see Figure 5-18):

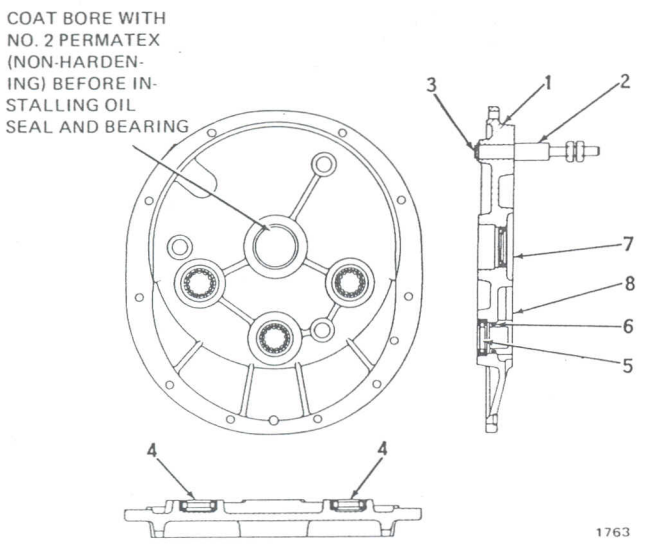


Figure 5-18. Gear Case Cover Assembly

Press three brake pins (2) into brake side of gear case cover and secure with snap rings (3). Tap in two bearings (4) for right and left hand drum pinion shaft assemblies. Tap in bearing (5) for load brake shaft (or intermediate shaft) assembly. Install oil seal (7) for motor pinion shaft.

NOTE

Do not install O-ring (6) or bearing cap (8) at this time. On some previous hoists an oil seal was used in this bore instead of the present bearing cap and O-ring. If a complete new load brake shaft assembly is purchased, a bearing cap and O-ring is included with it. In some cases where the hoist already has a bearing cap, the cap may not have sufficient clearance for the length of the load brake shaft. In this case, redrill the existing bearing cap deeper to obtain adequate clearance for the longer shaft. An additional 1/4 inch is usually adequate.

11. Coat the gear case/cover mating faces with No. 2 Permatex (non-hardening) and then place a new gasket (Figure 5-21, 16) on the gear case.

12. Install the gear case cover assembly to the gear case. Be careful not to damage the oil seals during this operation. Bolt the gear case cover to the gear case using only four or five bolts at this time.

13. Then check axial float. A pair of locking pliers will be required. Grasp across any two flats of the load brake nut with the pliers and, by pushing and pulling, you should obtain a float of at least 1/32 of an inch minimum to 3/32 of an inch maximum. This is required for the successful operation of the load brake assembly. If the axial float is less than 1/32 of an inch, the load brake assembly must be removed and the amount required to obtain 1/32 of an inch minimum will have to be cut off the spacer, which is located between the motor gear and the bearing inner race, which contacts the adjusting nut. The procedure, as outlined previously, must once again be repeated.

If the axial float is found to be more than 3/32 of an inch, either:

A. Remove the gear case cover and place a shim behind the bearing of the load brake shaft against the cover bore. The thickness of the shim should be such to limit the float to less than 3/32 of an inch.

or:

B. Remove the load brake assembly and add a shim washer behind the spacer which is located between the motor gear and the bearing inner race.

If you find that the amount of axial float is within the stated tolerance, bend the cotter pin to its permanent position. Install O-ring (6) and bearing cap (8); as shown in Figure 5-18.

14. To reassemble the magnetic brake (Figure 5-19), slide the disc hub (3) on the spline of the motor pinion shaft and secure in place with the snap ring.

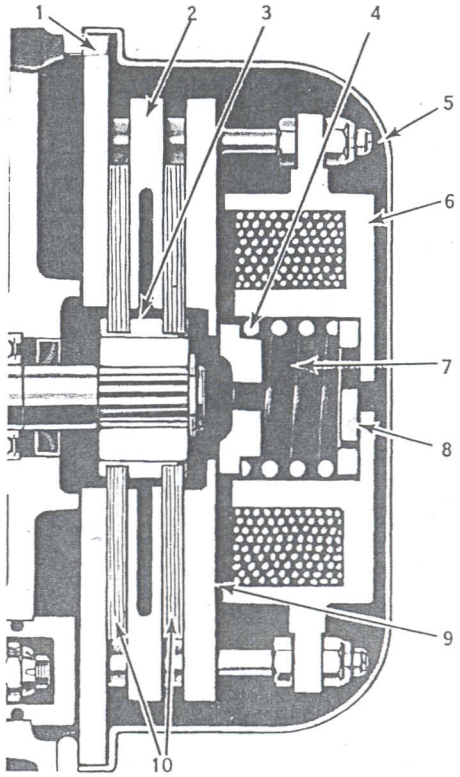
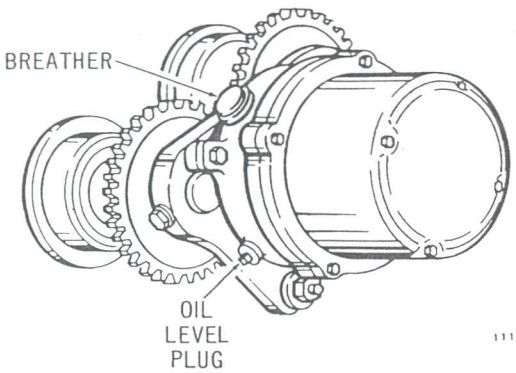
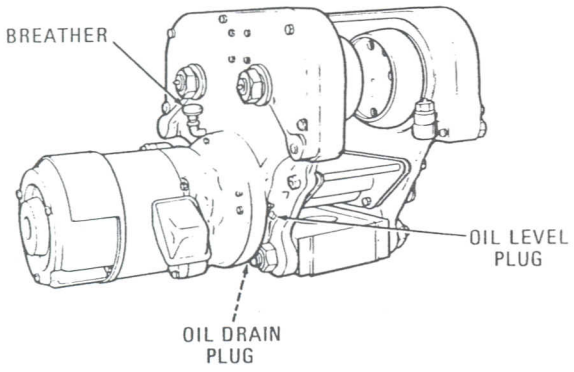


Figure 5-19. Magnetic Brake Assembly

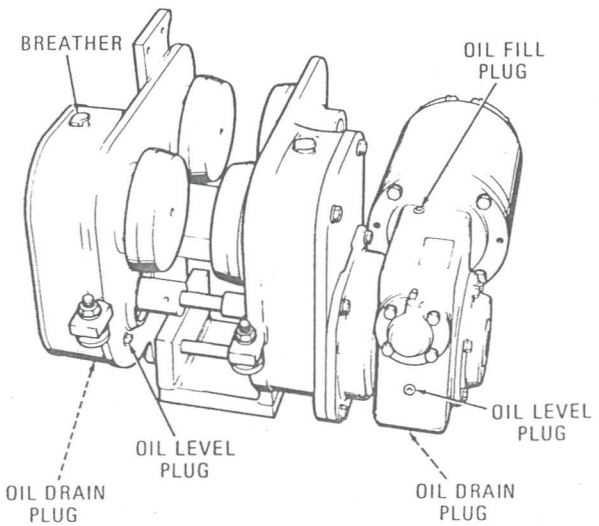
MOTOR GEARED TROLLEY GEAR CASES. Remove the oil level plug (Figure 5-2) and check the oil level at one to three month intervals. If necessary, remove the breather and add gear oil until the oil reaches the oil level plug opening. Replace the oil level plug. Clean the breather in a solvent and reinstall it. Drain and refill the gear case every six months. Use the same type gear oil as used in the hoist gear case.



SINGLE SPEED AND TWO SPEED
MOTOR GEARED TROLLEY GEARCASE



MOTOR DRIVEN TROLLEY – MODEL 668



MOTOR DRIVEN TROLLEY – MODEL 666

Figure 5-2. Trolley Drive Gear Cases

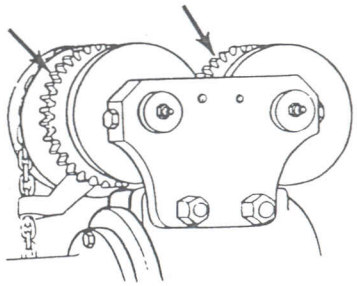
MOTOR DRIVEN TROLLEY GEAR CASES - VARIABLE SPEED. Drain and refill the gear case at least once every six months. Some gear cases are equipped with a drain plug and others with an oil level pipe (Figure 5-2). The oil level pipe must be turned upside down for draining. When empty, return the oil level pipe to its upright position. Then add oil through the breather opening until the oil level reaches the top of the oil level pipe. Replace the pipe cap or pipe plug. Clean and reinstall the breather. Use the same type gear oil as used in the hoist gear case.

Remove the oil level pipe cap to check the oil level at least every three months. The oil level should be to the top of the pipe. Add oil as required.

GEARED TROLLEY WHEELS. Apply open gear lubricant at least every six months to the exposed drive and driven gear teeth. More frequent applications will be necessary if the hoist is in constant use or operating under adverse conditions. Apply the gear lubricant sparingly to prevent it from dripping on the beam flanges, which will cause the trolley wheels to slip.

CAUTION

Geared trolley wheels are not lubricated at the factory and must be lubricated before the hoist is placed into service.



GEARED TROLLEY WHEELS
DO NOT OVER GREASE.
EXCESS GREASE ON RUNWAY WILL
CAUSE SLIPPAGE.

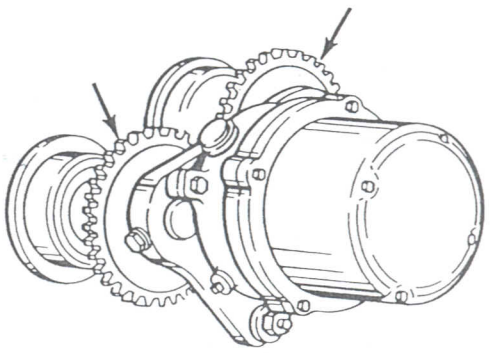


Figure 5-3. Geared Trolley Wheels

Use a high quality open gear lubricant which is adhesive and water resistant (P&H Specification No. 464, or equal). The following are some of the products which meet these requirements:

Open Gear and Wire Rope Lubricant (P&H No. 464)

MANUFACTURER	TRADE NAME
American Oil Co.	Amovis Lubricant and Amoco Open Gear Compound
Atlantic Richfield Oil Co.	Richcote Lubricant, Jet Lubricants "Sinclair" and Atlantic Lubricants 36 thru 40
Continental Oil Co.	Coglube
Humble Oil and Refining Co. (EXXON)	Surett
Mobil Oil Co.	Mobiltak
Shell Oil Co.	Cardium EP Compounds and Fluids
Sun Oil Co. DX Division	DX Coating Compounds
Texaco, Inc.	Crater X
Witmore Mfg. Co.	Open Gear, Dipper Stick and Cam Lube

NOTE

Consult your supplier for the proper grade and viscosity required for your particular application.

GREASE FITTINGS. Some trolley wheels are equipped with permanently lubricated and sealed bearings. However, most do require periodic lubrication. If your trolley wheel bearing points, bottom block and equalizer sheave pins have grease fittings provided, these bearings should be lubricated at least once every six months. Some upper sheave assemblies also have grease fittings provided. These too should be lubricated every six months.

NOTE

Whenever trolley gear cases and bottom blocks are disassembled for service, all bearings should be repacked with grease before reassembling. If the upper sheave assembly (equalizer) is equipped with a bushing, apply grease to the bushing each time the wire rope is being replaced.

Use only Shell Darina No. 2 E.P. high temperature grease, P&H Specification No. 476. This is Shell Oil Company code 71522.

LUBRICATION OF NITRIDED DRUM GEAR. A special nitrided drum gear can be provided for heavy duty hoist as an option, where excessive duty cycle application exists.

In addition to the nitrided drum gear, three external lubrication fittings are provided. One fitting is for the drum lubrication and the remaining two are for the drum bearings. See Figure 5-4.

Only Shell Darina No. 2 E.P. grease (P&H Specification No. 476), shall be used as lubricant for these fittings and shall be applied at three month intervals.

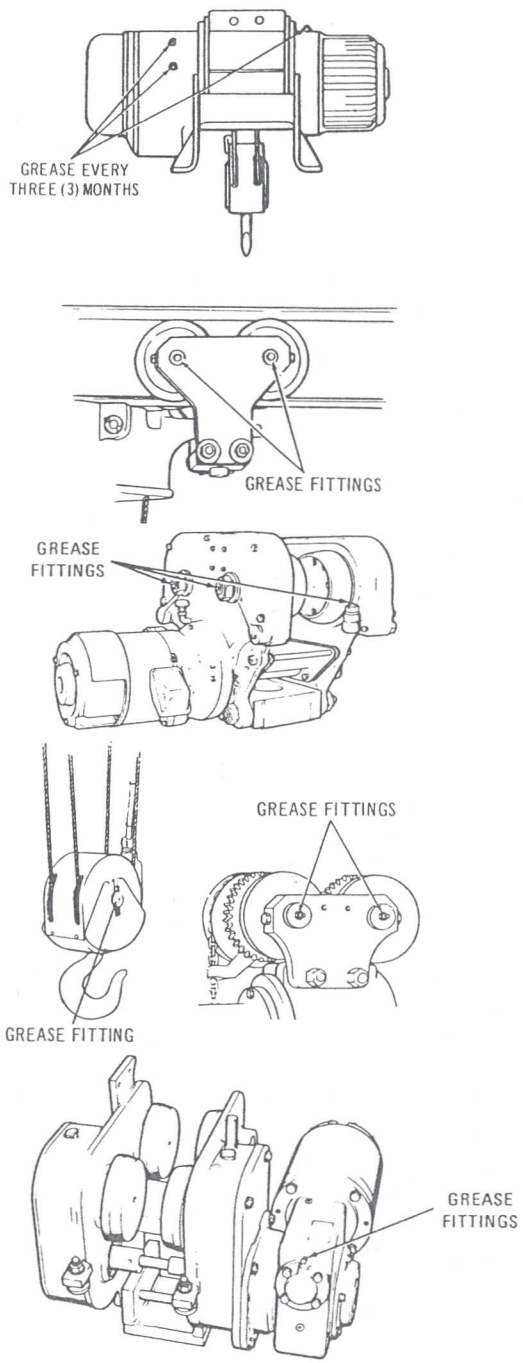


Figure 5-4. Grease Fittings

NOTE

Figure 5-21 is arranged so that the reader may view it in its entirety while reading assembly and disassembly instructions.

Install back plate (1) onto the pins in the gear case cover with the wiring hole at upper right. Position one disc type brake lining (10) on the disc hub. Install the disc plate (2) on the pins. Position the second disc type brake lining on the disc hub. Slide armature (9), counterbored side first on the pins. Install spring spacer (8) into the center hole of the pot assembly (6). Insert a 1/2-13 UNC bolt through the center of the pot. Place spring (7) and spring guide (4) in pot assembly. Lay the pot, face down, on a work bench. Compress the spring by turning the spring guide on the bolt.

NOTE

Use only the factory recommended spring and spacer. Excessive spring tension can cause sluggish release of the brake and increase the heating of the motor which may result in a motor failure.

Thread the three lock nuts to the pins. Slide the brake pot on the pins. Thread the lockwashers and adjusting nuts to the pins. Remove the bolt used to hold spring assembly in place during assembly.

Attach the conduit to the gear case cover and reconnect the brake pot leads to the wires from the control cabinet. Using the adjusting nuts and lock nuts, position the brake pot on the pins so there is a clearance of 1/32 inch between the armature and the brake pot, as shown in Figure 5-5. Install gasket and brake cover.

15. Install the drain plug to the gear case. Add oil to the gear case up to the oil level plug opening. Be sure the hoist is in a level position before doing this. Install the oil level plug and the breather.

16. Install the motor on the motor bracket. The splined motor shaft will mesh with the splined coupling in the motor bracket. Reconnect the conduit to the motor terminal box. Reconnect the motor leads. Replace the terminal box cover.

17. Reeve the wire rope and bottom block to the hoist. Return the hoist to its mounting. Turn the power on. Put the hoist through the ORIGINAL OPERATING CHECK as described in the INSTALLATION section of this manual, paying particular attention to direction of rotation, of load brake and limit switch operation.

BOTTOM BLOCKS

The procedure for disassembling bottom blocks is given in the WIRE ROPE REPLACEMENT portion of this section.

NOTE

Whenever a bottom block is disassembled for service or wire rope replacement, pack the sheave bearings and the thrust (hook) bearing with a high quality No. 2 grade multi-purpose grease.

MAINTENANCE OF WIRE ROPE

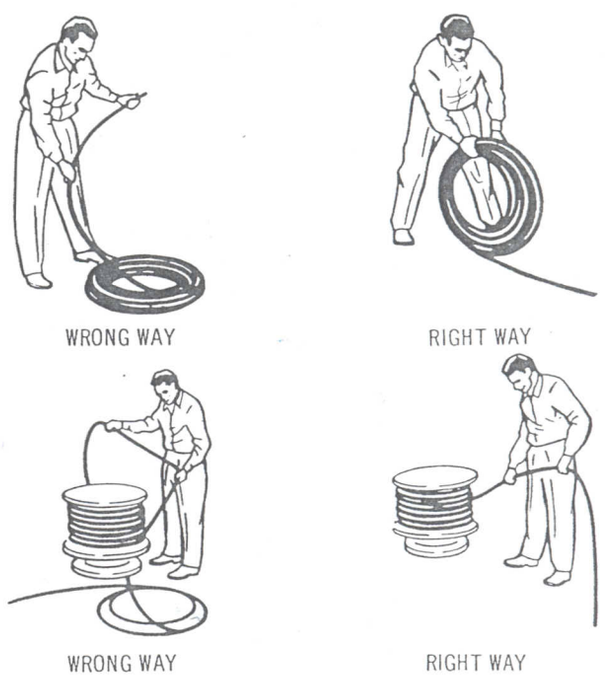
STORAGE. Spare wire rope shall be stored on a reel and protected against weather, possible damage and corrosive elements in the air.

UNREELING OR UNCOILING. Unreel or uncoil wire rope as follows:

1. Wire rope must be unreeled or uncoiled correctly to prevent kinking or twisting. Figure 5-22 illustrates the correct, and incorrect, methods of unreeling and uncoiling wire rope.

2. A reel can also be mounted horizontally on a shaft for unreeling rope. If this method is used, the reel must not be allowed to revolve so rapidly that rope is "thrown" off.

3. If a loop is accidently formed in the rope as it is being unreeled or uncoiled, the loop must be thrown out immediately before it leads to kinking. Figure 5-23 illustrates how a loop progresses to a permanent kink. If the loop is allowed to close up to the point shown in Part 2 of the figure, the kink shown in Part 3 has been formed. A kinked wire rope has been weakened and must not be used in normal service.



WHEN UNREELING OR UNCOILING WIRE ROPE - DO NOT ALLOW ROPE TO FORM A LOOP. IF LOOPS ARE FORMED, KINKING WILL RESULT.

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Figure 5-22. Unreeling Wire Rope

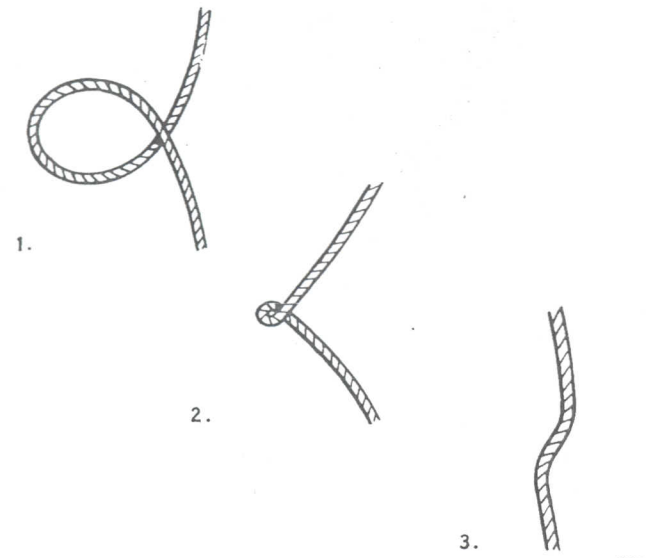


Figure 5-23. Kinking of Wire Rope

4. Use care during all phases of handling to avoid dragging a wire rope through dirt or around objects which could scrape, nick, or induce sharp bends in the rope.

CUTTING WIRE ROPE. Wire rope should be cut, when necessary, as follows:

1. Seizings shall be placed on each side of the spot where the rope is to be cut. Seizings prevent unlaying of the strands.

2. On preformed rope, one seizing on each side of the cut is adequate.

3. On non-performed rope of 7/8 inch diameter or less, two seizings are required on each side of the cut.

4. On non-preformed rope of larger than 7/8 inch diameter, three seizings are required on each side of the cut.

5. Actual cutting can be accomplished with any approved abrasion-type, blade-type or flame-cutting tool.

INSPECTION. All wire ropes in periodic use throughout the shift shall be visually inspected once each shift by the hoist operator, or other appointed person. A thorough inspection of all wire ropes shall be made at least once a month by a qualified person. A full written report of rope condition shall be made by the inspector. This report shall be dated and signed, and kept on file where it is readily available to designated personnel.

The monthly inspection should be aimed at determining the degree of deterioration at the worst rope lay, since this will determine the suitability for continued service. By definition, a rope lay is the axial distance along the rope in which one strand makes one complete turn around the rope.

Any deterioration resulting in appreciable loss of original strength, such as described below, shall be carefully noted. A decision must then be made as to whether further use of the rope would constitute a safety hazard.

NOTE

Pay particular attention to those sections of rope which are normally hidden during inspection and maintenance, such as the section which passes over the equalizer sheave.

1. Reduction of rope diameter below nominal due to loss of core support, internal or external corrosion or wear of outside wires.

2. A number of broken outside wires and the degree or distribution or concentration of such broken wires.

3. Worn outside wires.

4. Corroded or broken wires at end connections.

5. Corroded, cracked, bent, worn or improperly applied end connections.

6. Kinking, crushing, cutting or unstranding.

7. Internal wear caused by grit penetrating between strands and wires.

8. Evidence of improper lubrication.

WIRE ROPE REPLACEMENT

NOTE

Any time a wire rope is replaced on a hoist equipped with a geared limit switch, the switch must be readjusted. The adjustment procedure is outlined earlier in this section.

GENERAL. Precise rules for wire rope replacement cannot be readily established, due to the many variable factors involved. The most important question relating to wire rope is nearly impossible to answer; namely, at what point will a wire rope break?

The types of rope deterioration that could constitute a safety hazard are described in the "Inspection" topic, preceding. On the basis of the rope condition revealed during inspection, an estimate must be made, by a qualified person, of the remaining strength of the rope in question. If, in the

judgement of that person, the remaining strength is insufficient to permit continued normal, safe use of the rope, the rope must be replaced. A rope should be replaced if it has any of the following conditions:

1. Twelve randomly distributed broken wires in one rope lay, or four broken wires in one strand in one rope lay.

2. Wear of one-third the original diameter of outside individual wires.

3. Kinking, crushing, birdcaging or other damage resulting in distortion of the rope structure.

4. Evidence of any heat damage from any cause, or of exposure to an electrical current.

5. A reduction from nominal diameter in excess of the following:

a. 1/64 inch for rope diameters through 5/16 inch.

b. 1/32 inch for rope diameters from 3/8 inch through 1/2 inch.

c. 3/64 inch for rope diameters from 9/16 inch through 3/4 inch.

d. 1/16 inch for rope diameters from 7/8 inch through 1-1/8 inch.

e. 3/32 inch for rope diameters from 1-1/4 inch through 1-1/2 inch.

f. The development of two broken wires adjacent to a socketed fitting, or signs of corrosion at those points.

NOTE

Resocketing of the rope is permissible where the conditions described in step f exist, rather than replacing the entire rope. Resocketing must not be attempted, however, if the resulting rope length is insufficient for safe operation. With the hook block at its lowest operating position, one full wrap of rope must remain on the drum if the hoist has a lower limit switch and two full wraps must remain on the drum if the hoist does not have a lower limit switch.

REPLACEMENT. The replacement procedure varies with the particular type of reeving employed for the hoist. The basic reeving diagrams are illustrated in Figure 5-24. One-rope, one-part single reeving (A) and two-rope, one-part double reeving (D) require no special instructions. Instructions for the other types of reeving are outlined separately below.

NOTE

These instructions apply only to replacing a wire rope with a wire rope assembly as furnished by Harnischfeger Corporation. These assemblies are furnished complete with swaged wire rope sockets. The use of speltered wire rope sockets is not recommended.

TWO PART SINGLE REEVING. Proceed as follows to replace a two part single reeved wire rope (see Figure 5-24B and Figure 5-25):

NOTE

When reeving 2 or 4-part single with certain types of wire rope, the bottom block may assume a twist after a few lifting operations. If this occurs, lower the bottom block to the floor or other support and put 2 or 4 reverse twists in the rope at the dead end. Repeat the procedure as necessary until the bottom block hangs straight.

1. Lower the bottom block to the floor or onto a bench to relieve tension on the wire rope.

2. Remove the sheave guard by removing the three slotted round head machine screws from one side of the side plate assembly.

3. Remove the snap ring from one end of the sheave pin and slide the sheave pin out from the other end.

4. Lift the sheave from the top of the side plate assembly and remove the wire rope.

5. If used, remove the limit switch counterweight from the wire rope.

6. Remove the dead end pin from the drum hanger to free the wire rope dead end socket.

7. Operate the hoist to completely unwind the wire rope from the drum and remove the wire rope live end socket from the slot in the drum.

8. Lay the new wire rope out in one continuous length and thread the sheave guard from one end.

9. Loop the wire rope on the sheave and while holding it firmly, slide the sheave into the side plate assembly and install the sheave pin and then the snap ring.

10. Lower the sheave guard on the bottom block and insert the three machine screws.

11. Insert the wire rope live end socket in the slot of the drum and operate the hoist to wind the wire rope on the drum until approximately six feet of it remains unwound.

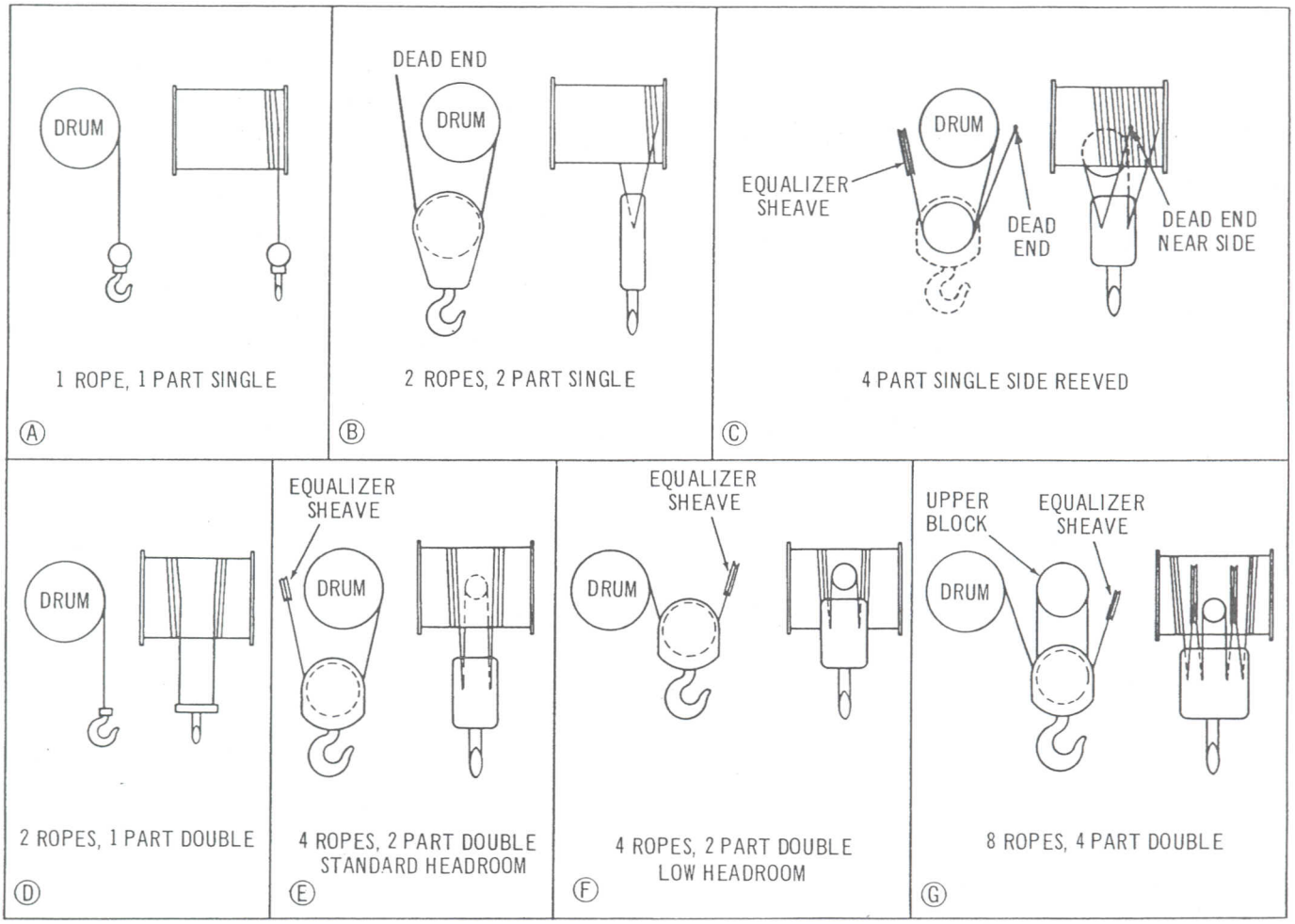


Figure 5-24. Basic Reeving Diagrams

WARNING

Wear a glove to guide the wire rope on the drum.

12. Insert the wire rope dead end socket in the drum hanger and replace the dead end pin.

13. Reattach the limit switch counterweight.

TWO PART DOUBLE REEVING. Proceed as follows to replace a two part double reeved wire rope (see Figure 5-24, E and F, and Figure 5-26):

1. Lower the bottom block to the floor or onto a work bench to relieve tension on the wire rope.

2. Remove screws (1) and lift off upper sheave guard. Remove screws (2 and 3) and remove lower sheave guards.

3. Remove the wire rope from the sheaves.

4. Operate the hoist to completely unwind the wire rope from the drum and remove the wire rope live end sockets from the slots in the drum.

5. Remove the wire rope from the upper sheave guard.

6. Remove the equalizer sheave pin from the drum hanger to remove the sheave and the wire rope.

7. Lay out the new wire rope with a loop in the center and the two live end sockets together.

8. Thread the socket ends of the wire rope through the slots in the upper sheave guard.

9. Loop one part of the wire rope over one of the bottom block sheaves and replace the lower sheave guard for that side. Turn the bottom block over and loop the other part of the wire rope on the second bottom block sheave. Attach the other lower sheave guard and the upper sheave guard to the bottom block.

10. Insert the wire rope live end sockets in the slots in the drum.

11. Operate the hoist to wind the wire rope on the drum until approximately six feet of rope remains unwound.

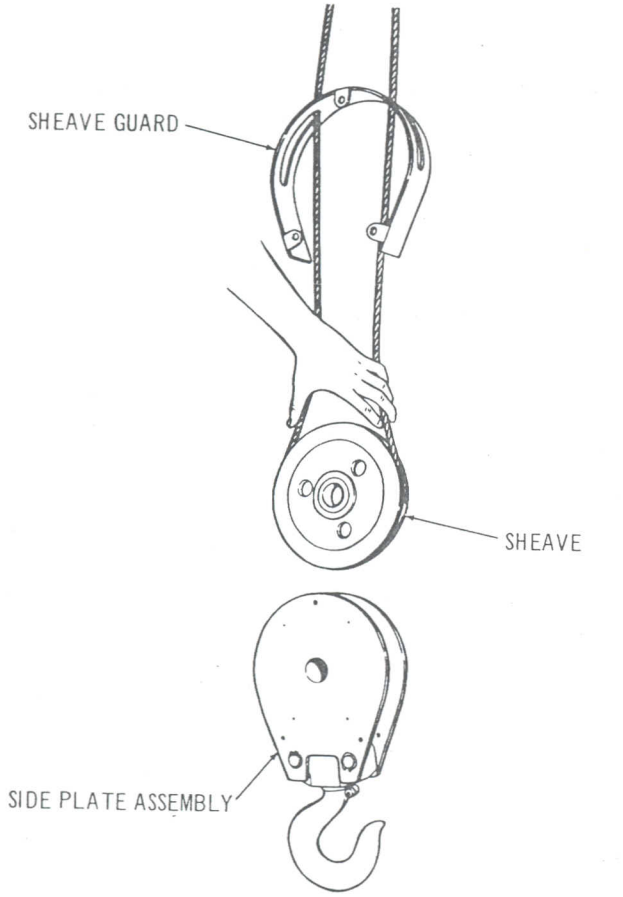


Figure 5-25. Installing Wire Rope in Single Reeved Bottom Block

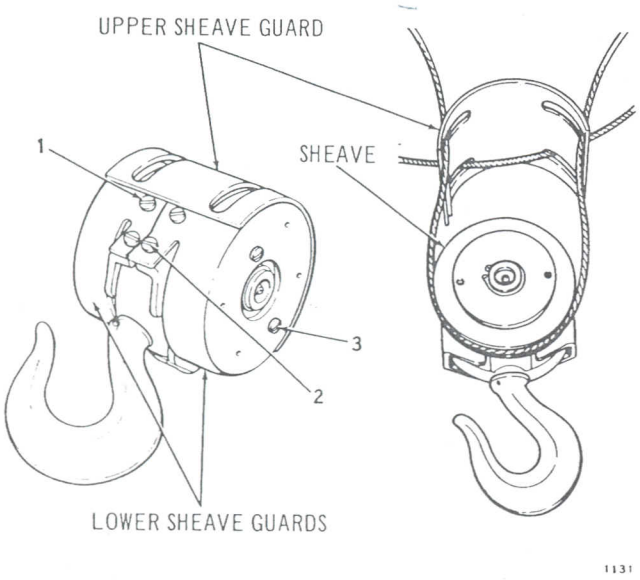


Figure 5-26. Installing Wire Rope in Double Reeved Bottom Block

WARNING

Wear gloves to guide the wire rope on the drum.

12. Place the loop in the center of the wire rope on the equalizer sheave and replace the equalizer sheave in the drum hanger.

FOUR PART SINGLE SIDE REEVING. Replacing a four part single side reeved wire rope (Figure 5-24, C) is the same as replacing a two part double reeved wire rope except that only one end of the wire rope is inserted into the drum and the other end of the wire rope is the dead end which is attached to the hanger. The limit switch counterweight rides on the dead end of the wire rope.

FOUR PART DOUBLE REEVING. Proceed as follows to replace a four part double reeved wire rope (see Figure 5-24, G, Figures 5-27 and 5-28):

1. Lower the bottom block to the floor or onto a bench to relieve tension from the wire rope.

2. Remove the round head screws and lift off the upper sheave guard.

3. Remove the keeper plates and slide out the sheave pin.

4. Lift out the sheaves and remove the wire rope.

5. Operate the hoist to completely unwind the wire rope from the drum and remove the wire rope live end sockets from the slots in the drum.

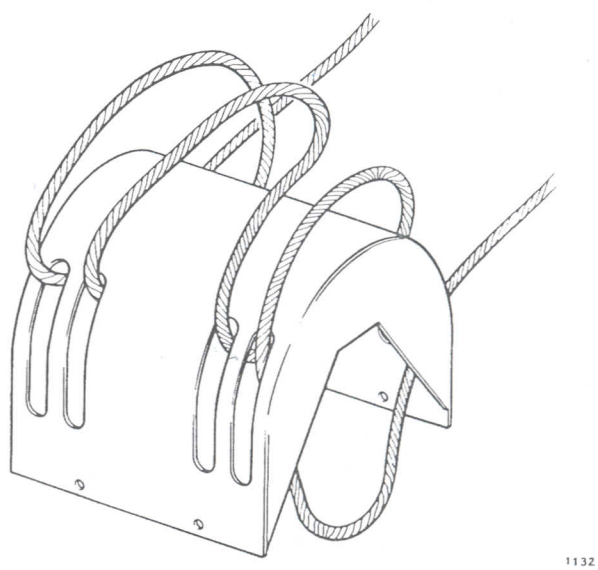


Figure 5-27. Wire Rope Threaded through Sheave Guard of Bottom Block for Four Part Double Reeving

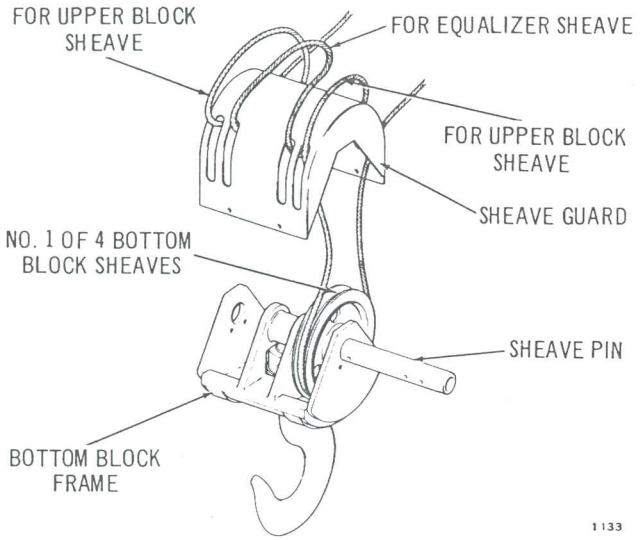


Figure 5-28. Installing First Part of Wire Rope in Four Part Double Reeved Bottom Block

6. Remove the keeper plates and slide out the sheave pin from the upper block (Figure 5-29). As you slide the pin out, remove the sheaves and spacer one at a time because the sheave pin is the only means of holding them in place. Remove the wire rope from the sheaves.

7. Remove the equalizer sheave pin from the drum hanger to remove the sheave and the wire rope.

8. Remove the wire rope from the sheave guard.

9. Lay out the new wire rope with a loop in the center and both live end sockets together.

10. Thread the live end sockets through the inner slots of the sheave guard (see Figure 5-27). Then thread the live end sockets through the outer slots of the sheave guard,

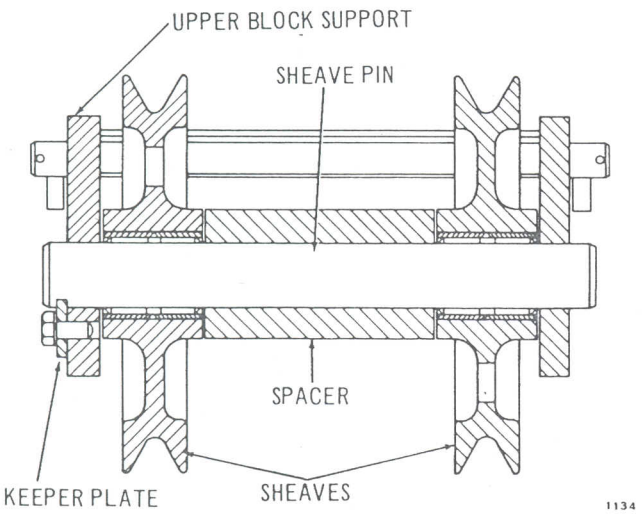


Figure 5-29. Upper Block for Hevi-Lift Hoist with Four Part Double Reeving

threading in the same direction as used to thread the inner slots. This will leave four loops of wire on the underside of the sheave guard (one loop for each bottom block sheave) and three loops on the upper side (one loop for each sheave in the upper block and one for the equalizer sheave).

NOTE

Before assembly, each sheave bearing should be packed with a high quality No. 2 multi-purpose grease.

11. Starting from either end of the bottom block, loop one part of the wire rope from the underside of the sheave guard around a bottom block sheave. Hold the wire rope on the sheave and replace it in the bottom block. Insert the sheave pin through that sheave to hold it in place (Figure 5-28).

12. Repeat this procedure of looping the wire rope around the sheave and insert the sheave in the bottom block until all four sheaves are in place in the bottom block and secured with the sheave pin.

13. Install the keeper plates to secure the sheave pin in the bottom block. Attach the sheave guard to the bottom block.

14. Insert the wire rope live end sockets in the slots of the drum.

15. Operate the hoist to wind the wire rope on the drum until approximately twelve feet remains unwound.

WARNING

Wear gloves to guide wire rope on the drum.

16. Starting from the side of the upper block from which the sheave pin is inserted, loop the wire rope around that sheave. Hold the wire rope in place on the sheave while replacing the sheave in the upper block frame. Slide the sheave pin through that sheave and the spacer. Loop the wire rope around the second sheave, install it into the upper block frame and secure the pin with the keeper plate.

17. Loop the remaining part of the wire rope around the equalizer sheave and install it in place in the drum hanger.

NOTE

For special applications, a reeving diagram can be obtained by contacting the Harnishfeger Corporation Sales or Service Office in your area.

TROLLEY MAINTENANCE. Except for the lubrication of trolleys described in the first pages of this section, all trolley maintenance is covered by a separate manual. Please contact the Harnishfeger Corporation regional service office in your area to obtain this manual.

WIRE ROPE TRUNNION REPLACEMENT. Some hoists with 2 or 4-part reeving have the hoist rope dead-ended at a trunnion arrangement. The trunnion assembly is shown in Figure 5-29A. Use the following procedure to replace the trunnion or to disconnect and reconnect the wire rope.

1. Remove the snap ring (5) below the sleeve (4) covering the dead end assembly.

2. Slip the sleeve downward, exposing the two clamps (2) which couple the trunnion (1) to the wire rope dead end fitting.

3. Remove the two rope clamp halves.

4. The trunnion is now uncoupled from the rope assembly. Remove the two 1/4" cap screws (7) which retain the "S" hooks (6) and lift the trunnion out of the slot in the drum hanger.

5. Place the new trunnion in the slots in the drum hanger.

6. Replace the "S" hooks and the cap screws that retain the hooks. Tighten the screws.

7. Slip the snap ring and the clamp retaining sleeve over the ball end fitting on the wire rope.

8. Bring the ball end of the wire rope fitting to the lower, half-spherical, end of the trunnion.

9. Replace the two rope clamps over the ball end fitting and half-spherical end of the trunnion.

10. Slip the sleeve up over the rope clamp halves.

11. Install the snap ring in the slot in the lower end of the clamp halves.

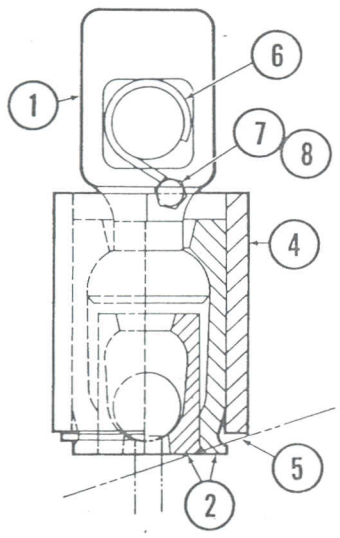


Figure 5-29A. Wire Rope Dead-Ending Trunnion

CONTROL MAINTENANCE

GENERAL. Remove the control cabinet cover for access to the control components.

WARNING

Before removing or checking any of the components, be sure the power supply is shut off and the fuses pulled or the circuit breaker is placed in off position.

Tag all wire leads before disconnecting them to facilitate proper connections when reconnecting them. Also refer to the wiring diagram secured to the inside of the control cabinet cover.

Use an ohmmeter to test the selenium rectifier. There should be a low resistance in one direction and infinite resistance in the other direction.

When electrical components have been replaced and when any wires have been disconnected and reconnected, check with an ohmmeter between terminals L1, L2, and L3 before connecting the power supply to make sure that no direct short circuits exist.

NOTE

A low resistance will be indicated between the L1 and L2 terminals. This is normal since the L1 and L2 leads are connected to the primary terminals of the control transformer and transformer resistance will be indicated by the ohmmeter (see Figure 5-30).

PUSH BUTTON STATION. The three types of push button elements, single speed, two speed and variable speed are replaceable only as a complete unit. All other components in the push button station can be individually replaced.

ALLEN-BRADLEY CONTACTORS. The stationary and movable contacts should be visually inspected at least once every one to three months. These can easily be inspected by removing the contact block cover (see Figure 5-31). Replacement is not necessary if the contacts appear to be

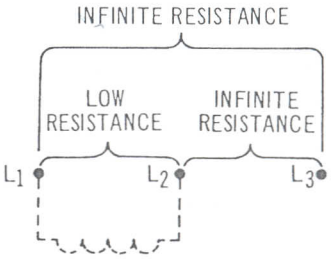


Figure 5-30. Control Circuit Check

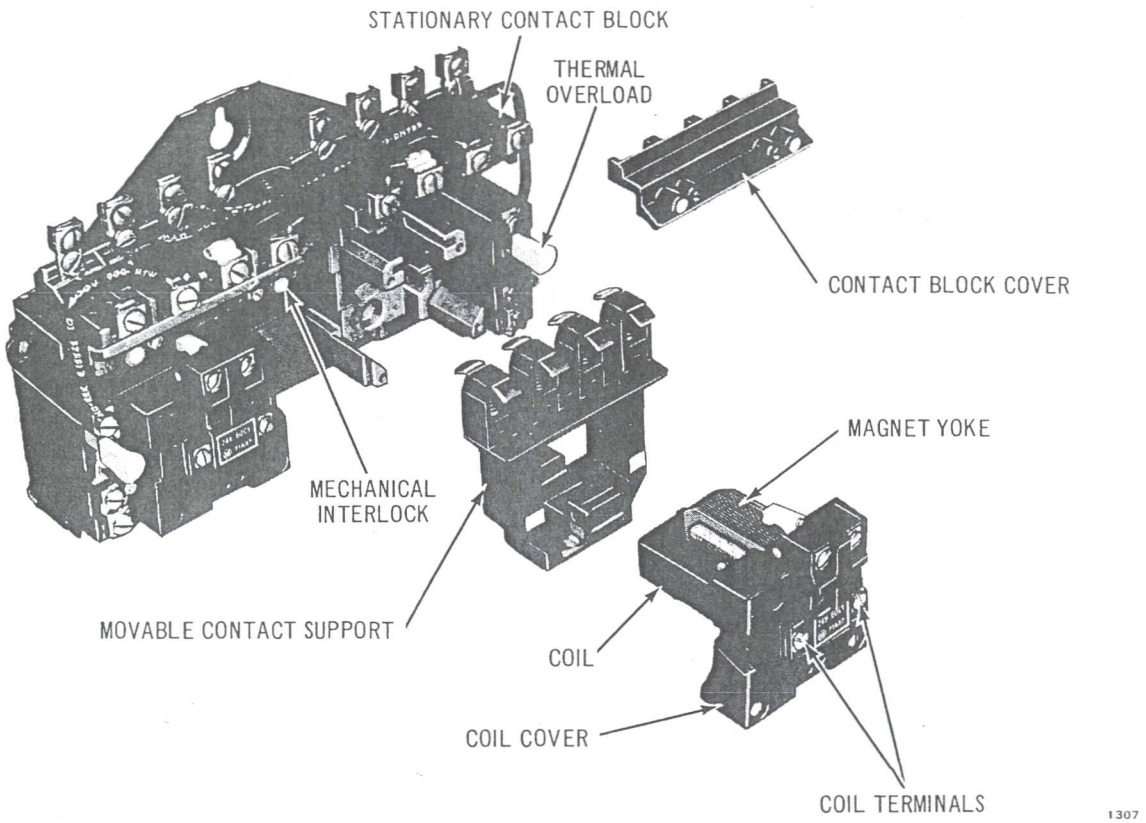


Figure 5-31. Typical Reversing Contactor (Allen-Bradley)

dirty. The contacts should be replaced if a general pitted condition exists. To replace the stationary contacts, remove the stationary contact block. Each contact is then individually screwed in place. To replace the movable contacts, remove the four screws holding the coil cover in place and slide out the coil cover. Then slide out the movable contact support. The contacts are held in place by spring tension only.

If the contactor should fail to function, check the voltage across the coil terminals. To replace the coil, remove the coil cover and slide the coil out from the back of the coil cover. Be sure to insert the magnet yoke into the coil before installing it into the coil cover.

To remove the magnet armature (1, Figure 5-32) from the movable contact support (4), insert a screw driver into the slot of the retainer (2), lift the screw driver and at the same time, push the magnet armature out. The retainer spring (3) will then slide out.

P&H CONTACTORS. Two types of P&H contactors are in use in hoist control systems. The newer type ("Innova") is shown in Figure 5-33. The older type is shown in Figure 5-34. Contact replacement and coil replacement procedures for the "Innova" type are covered in steps 1 and 2, below. Similar procedures for the older type are covered in steps 3 and 4. Proceed as follows:

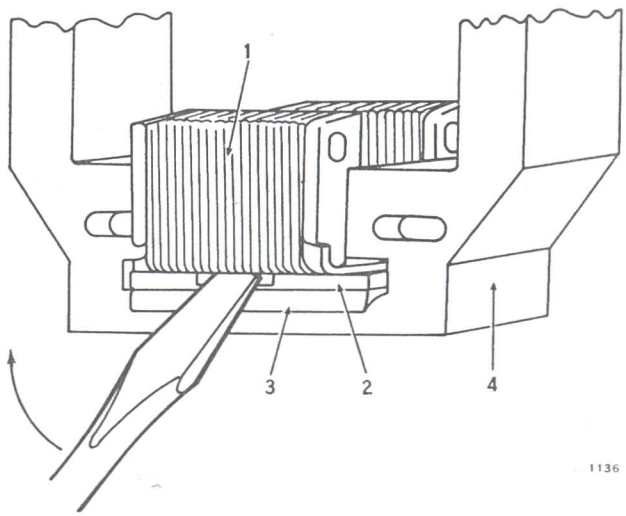


Figure 5-32. Removal of Magnet Yoke (Allen-Bradley Contactor)

NOTE

Replacement contacts are furnished in kit form for both types of contactors. Refer to your Parts Catalog for ordering information.

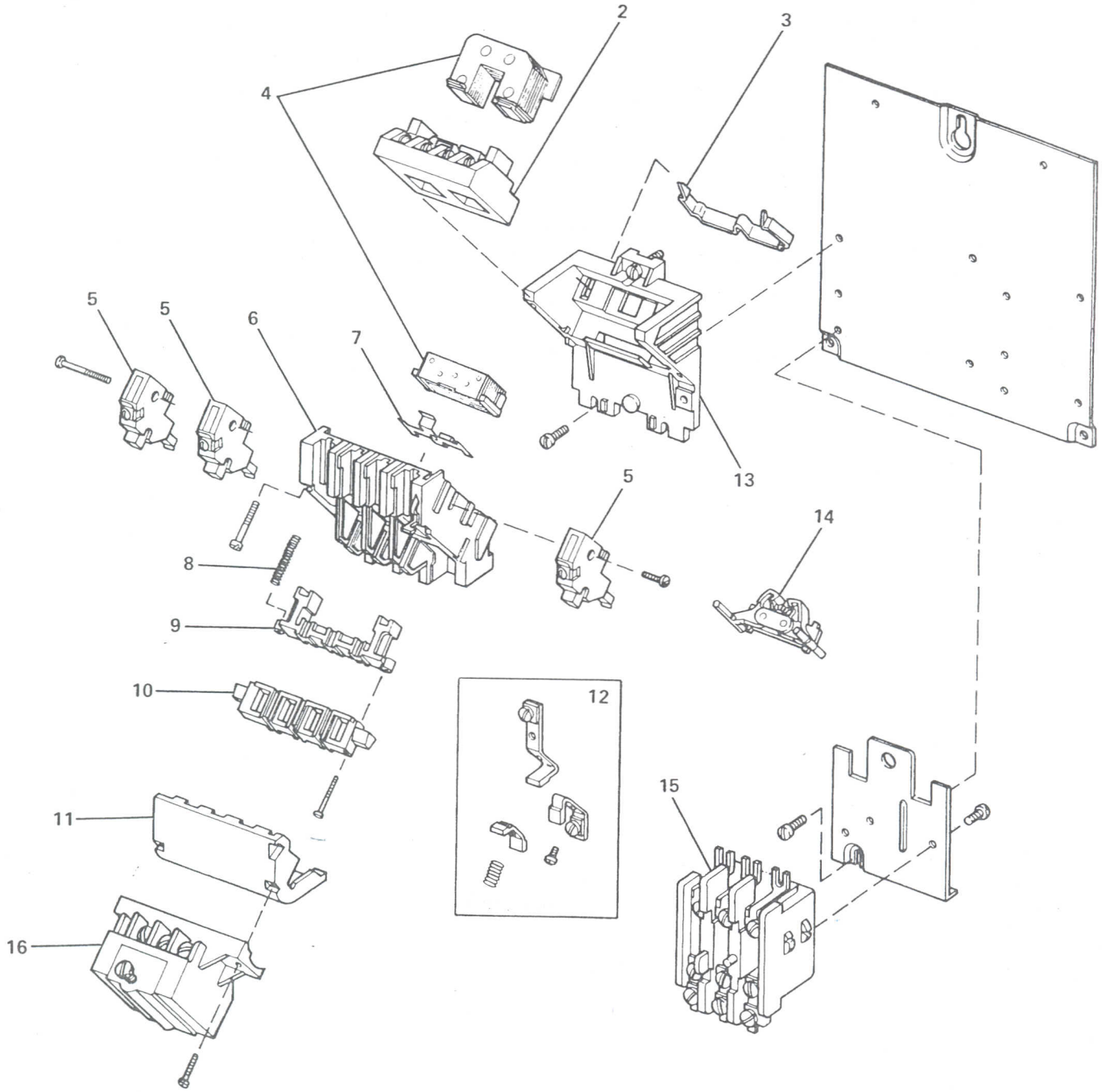


Figure 5-33. P&H Innova Reversing Contactor

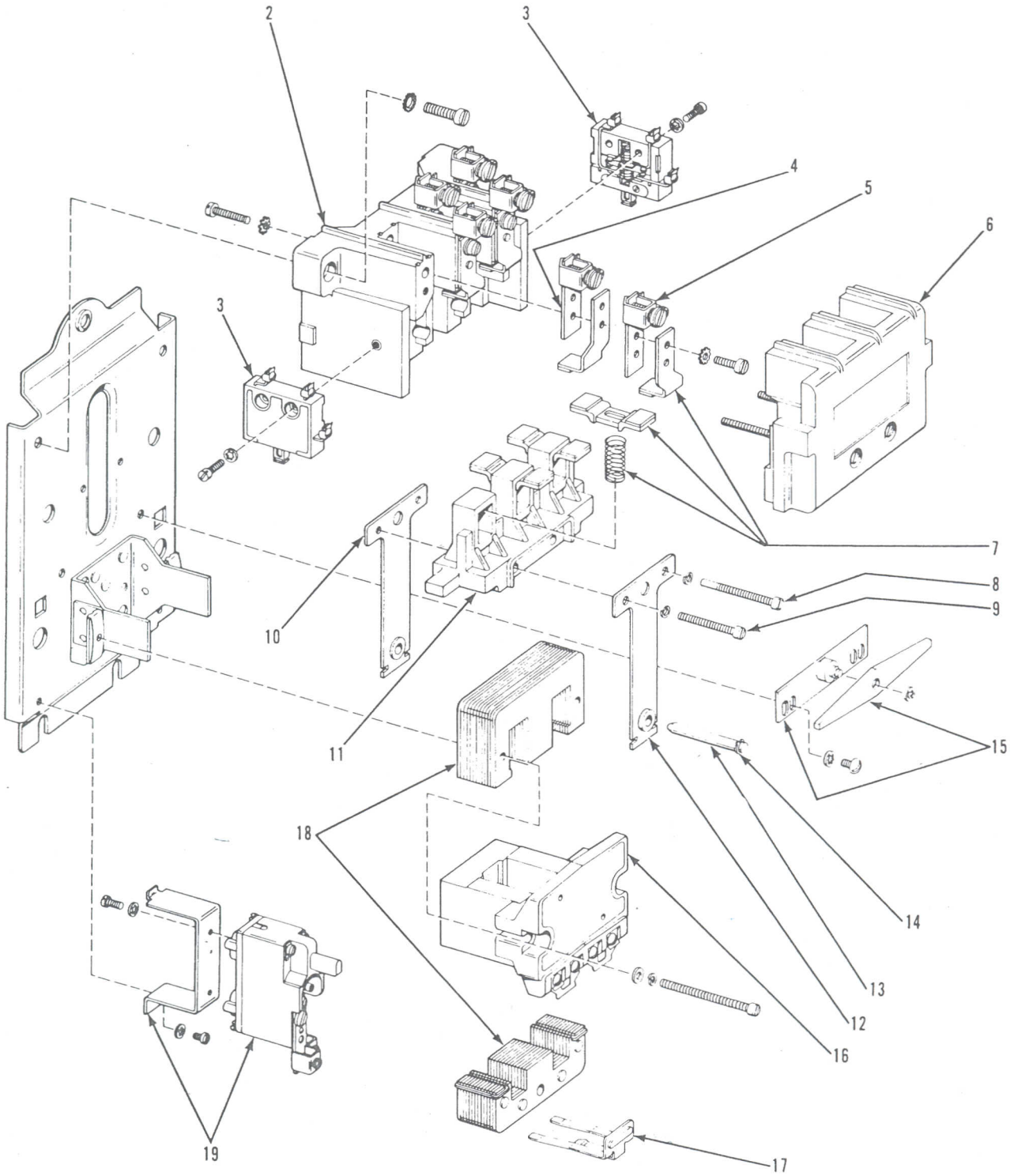


Figure 5-34. Older Type P&H Reversing Contactor

1. Replace contacts on the "Innova" reversing contactors as follows:

a. Open the main disconnect switch and tag it appropriately.

b. Remove overload block (15, Figure 5-33) and its mounting plate.

c. Unclip and remove cover (11).

d. Remove the two screws securing cross arm (10) to base (9).

e. Remove the movable contacts and springs from cross arm (10). Carefully note the positions of the movable contacts and spring prior to removal.

f. Disconnect the leads from the stationary contacts and remove the stationary contacts from contact board (6).

g. Install new contacts and springs from the appropriate contact repair kit.

h. Connect the leads to the stationary contacts.

i. Install cover (11) and overload block (15), with its mounting plate.

j. Close the main disconnect switch and operate the controller to test the reversing contactors.

2. Replace the coil in the "Innova" contactor as follows:

a. Open the main disconnect switch and tag it appropriately.

b. Push the ears of clip (3, Figure 5-33) outward. Coil (2) and the armature will release for easy removal.

c. Insert the armature in the new coil and reinstall the coil. Push the coil in against clip (3) until the clip engages the coil firmly.

d. Close the main disconnect switch and operate the controller to test the repaired reversing contactor.

3. Replace contacts in the other style of reversing contactor as follows (see Figure 5-34):

a. Open the main disconnect switch and tag it appropriately.

b. Loosen the two attaching screws and remove contact board cover (6).

c. Remove the screws from the stationary contacts and lift out the stationary contacts.

d. With a screwdriver, carefully lift the movable contact springs from crossarm (11). Then, remove the movable contacts from crossarm (11) by tilting them slightly and pulling straight out.

e. Install the new contacts and springs from the contact repair kit in reverse order of removal.

f. Install contact board cover (6).

g. Close the main disconnect switch and operate the controller to test the reversing contactor.

4. Replace the coil on the other style reversing contactor as follows (see Figure 5-34):

a. Open the main disconnect switch and tag it appropriately.

b. Disconnect the leads from the coil terminals.

c. Remove the two screws securing coil (16) and magnetic and armature assembly (18) to the base plate.

d. Pull retainer clip (17) and separate the coil from the magnet and armature.

e. Assemble the magnet and armature to the new coil and install retainer clip (17).

f. Install the assembly on the base plate and reconnect the coil leads.

g. Close the main disconnect switch and operate the system to test the new coil.

DISC BRAKE RECTIFIER. To check the disc type brake rectifier assembly (Figure 5-35), measure and compare voltage and current with Table 5-3. If rectifier voltage is low, measure and compare the transformer primary and secondary with nameplate data. If these agree with the nameplate data, it is the rectifier that requires replacement.

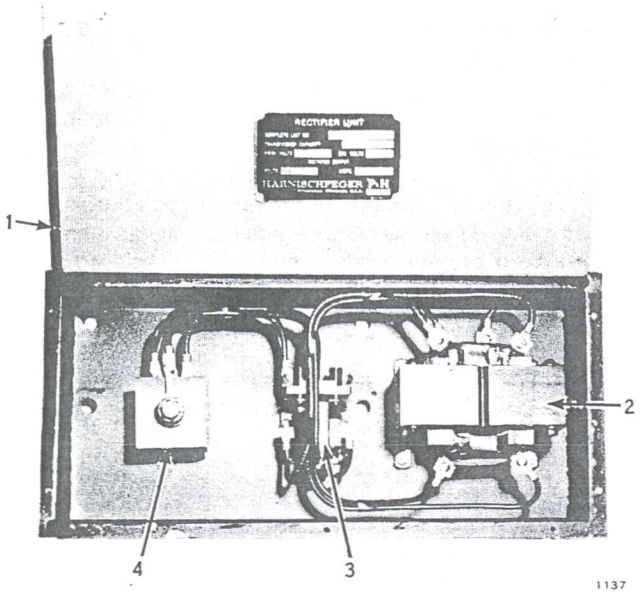
Table 5-3. Disc Brake Rectifier Data

BRAKE SIZE	BRAKE COIL RES. (OHMS)		BRAKE COIL CURRENT (AMPS)		RECT. RATING (AMPS)	
	18V COIL	100V COIL	18V COIL	100V COIL	18V COIL	100V COIL
*CD-0	18.2	426.4	0.99	0.22	4.0	12.0
*CD-1	11.67	276.0	1.54	0.36	4.0	12.0
**CD-2	9.14	216.8	1.97	0.46	4.0	12.0
**CD-2D	9.38	142.1	1.92	0.70	4.0	12.0
**CD-3	7.26	170.5	2.48	0.59	4.0	12.0
**CD-3D	7.89	115.7	2.28	0.87	4.0	12.0
**CD-4	5.35	125.6	3.36	0.80	4.0	12.0
**CD-4D	5.29	124.0	3.40	0.81	4.0	12.0
**CD-5	5.37	80.6	3.35	1.25	4.0	12.0
**CD-5D	4.62	75.4	3.20	1.33	4.0	12.0
**CD-6	4.87	86.7	3.70	1.15	4.0	12.0
**CD-6D	4.80	75.7	3.75	1.32	4.0	12.0

*Intermittent Hoist Service
**Data Also Applies to Adjustable Brake of Comparable Size

CONDUCTOR AND COLLECTOR SYSTEMS

Conductor systems should be maintained straight and true, keeping contact surfaces clean and polished. If copper wire is used, the wire should be free of kinks.



1. Case
2. Transformer
3. Relay
4. Rectifier

Figure 5-35. Rectifier Assembly for Disc Type Brakes

If a hoist is used intermittently eight hours each day, five days per week, make the following inspections, monthly, as a program of preventive maintenance:

CAUTION

Be sure the power supply is disconnected before attempting inspection.

INSPECTION

1. Keep contact surfaces of conductors clean and polished.

2. Conductor supports should be securely fastened.

3. Insulators must be clean. Wipe them with a clean dry cloth or use an electrical cleaning solvent if necessary. Replace any damaged insulators to prevent the possibility of the conductor shorting to ground.

4. Check for continuous contact of collector to conductor for the full length of the conductor. Adjust collector spring tension as required.

5. Check all terminal and shunt connections for good contact.

6. Check all collector shoes and wheels for excessive wear and for freedom of rotation. Replace shoes, wheels or bearings as required. Lubricate wheel bearings as required.

MOTOR MAINTENANCE

GENERAL. Three types of motors are used for hoist and trolley drives (AC wound rotor, DC and AC squirrel cage). All motors are totally enclosed, eliminating the need for periodic internal cleaning. All are equipped with permanently lubricated, sealed shaft bearings, eliminating the need for periodic lubrication. Maintenance required for the three types of motors are covered separately in following paragraphs. Reconnection instructions for dual voltage AC motors (both wound rotor and squirrel cage) and internal wiring information for DC motors are also provided in following paragraphs.

WARNING

Disconnect the hoist from its power supply before performing any maintenance on the motor.

AC WOUND ROTOR MOTORS. These motors are used only on variable speed hoists and trolleys. At regular intervals, depending on the particular operation conditions, the following maintenance should be performed.

1. Check the banding for tightness.

2. The slip rings must be kept clean, smooth and concentric. They can be cleaned with no. 00 sandpaper or a commutator stone (do not use emery cloth, as emery grit is a conductor).

3. If the slip rings are rough or pitted, either smooth them out with fine sandpaper, take a light cut on them with a lathe, or grind them with a fine stone. Then polish the slip rings with no. 00 or no. 000 sandpaper.

4. Check the brushes to ensure that they make good contact with the slip rings and that they move freely in their holders.

5.Check the brushes for excessive wear. Brushes should be replaced when worn to 40 to 60 percent of their original length, The maximum allowable wear, within this range, is left to the individual maintenance man.

6. When replacing or renewing the brushes, carefully fit the brushes to the contour of the slip rings with no. 00 sandpaper (never use emery cloth, as emery grit is a conductor). After seating the brushes, remove them from the holders and clean the brushes and holder to ensure free

movement of the brushes in the holders. Be sure to blow the carbon dust from the motor after sanding the brushes.

7. A constant pressure spring assembly is utilized on newer AC motors (see Figure 5-36). No periodic adjustments are required when this type of spring is used. If for any reason spring tension has been lost, replace the spring and backup plate assembly as shown in Figure 5-36.

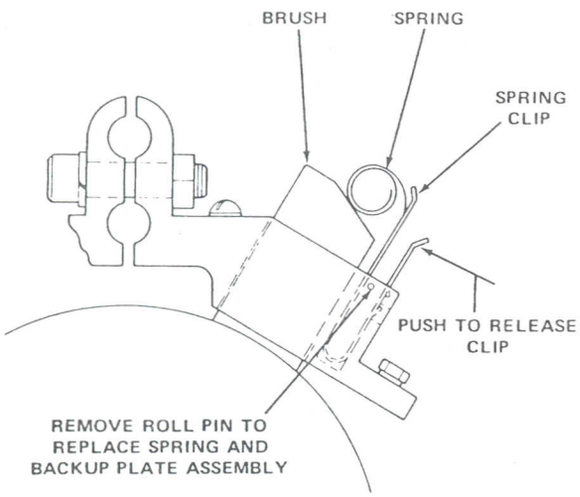


Figure 5-36. Constant Pressure Brush Assembly, AC Motors

8. On older AC motors, an adjustable style brush holder is used (see Figure 5-37). On this style of brush holder, brush tension will diminish as the brushes wear. The recommended brush tension is 3-1/2 to 4 pounds per square inch of brush contact area. Check this tension periodically, and correct the tension using the adjusting pin.

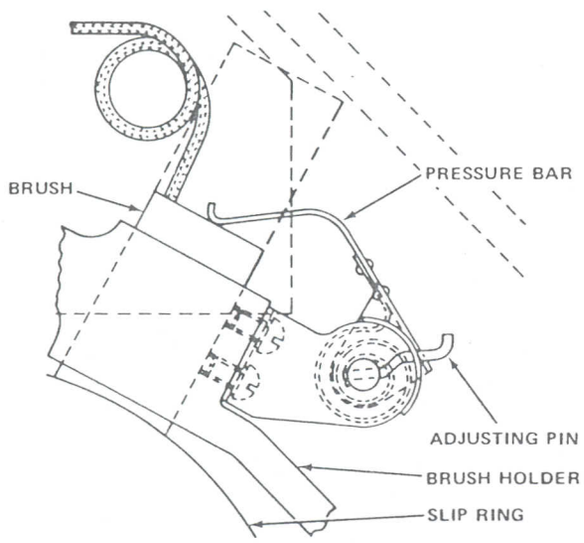


Figure 5-37. Typical Adjustable Brush Holder Assembly, AC Motors

9. While inspecting brushes, the brush pig tail lugs should be checked to ensure that the attaching screws are tight and good electrical contact is being made. A loose screw or poor electrical connection will result in current flow through the brush holder spring. The spring will then lose temper and be unable to apply adequate pressure on the brush.

10. At least annually, and more often if operating conditions are severe, subject the motor windings to an insulation resistance test using a 500 volt megger. The insulation resistance between the stator windings and ground and between the rotor windings and ground must be minimum of one (1) megohm.

11. Make frequent checks of the motor for unusual noises or vibration. These conditions may be a sign of bearing failure. Worn or damaged bearings must be replaced as soon as possible, with a factory replacement bearing which insures a properly lubricated bearing for long service life.

DC MOTORS. At regular intervals, depending on the particular operating conditions, the following maintenance should be performed:

1. Check the banding for tightness.

2. The commutator must be kept clean, smooth and concentric. It can be cleaned with fine sandpaper (no. 00). Do not use emery cloth to clean the commutator.

3. If the commutator is eccentric or deeply pitted, remove the armature and take a slight cut on the commutator in a lathe, followed by undercutting and a final polishing with no. 00 or no. 000 sandpaper. The undercut grooves must be kept free of carbon dust.

4. Be sure the mica between the commutator bars is under cut to a depth of approximately 1/32 to 1/16 inch after turning. It is advisable to make periodic inspections to make sure that the mica is not flush with the commutator bars. Also check that no slivers of high mica exist.

5. Check to ensure that the brush faces are in full contact with the commutator, and move freely in their holders.

6. Check to ensure that brush spring tension is sufficient to achieve a good electrical connection.

7. Older DC motors are equipped with an adjustable type brush holder (see Figure 5-38). The recommended brush pressure is 3-1/2 to 4 pounds of pressure per square inch of brush contact surface. If the measured pressure is not within this range, adjust the pressure by moving the adjusting pin either clockwise or counterclockwise, as required, until the recommended pressure is obtained.

8. Newer DC motors are equipped with the constant-pressure type brush holder shown in Figure 5-39. If insufficient pressure exists, it can only be corrected by replacing the brush spring assembly.

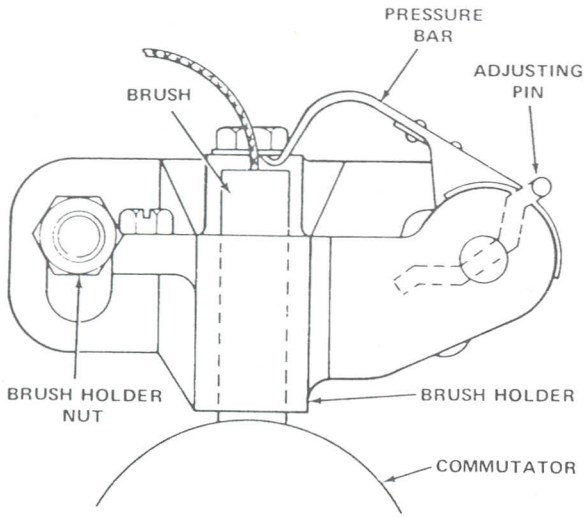


Figure 5-38. Adjustable Brush Holder, DC Motors

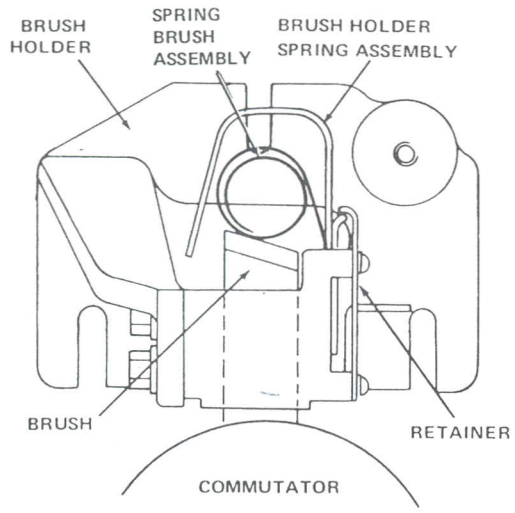


Figure 5-39. Constant-Pressure Brush Holder, DC Motors

9. Measure each brush for wear. Brushes should be replaced when they have worn to 40-60 percent of their original length. The maximum allowable wear, within this range, is left to the judgement of the individual maintenance man.

a. If the motor uses adjustable brush holders (Figure 5-38), raise the pressure bar clear of the brush and lift the brush from the holder. Detach the pig tail lead.

b. If constant-pressure brush holders are used (Figure 5-39), push down slightly on the brush holder spring assembly and then push it slightly toward the brush to release the spring from its retainer. Release the brush holder spring assembly. The brush can then be lifted out.

c. Install new brushes in the reverse order of removal.

d. Adjust the brush pressure if the motor is equipped with an adjustable type brush holder (refer to step 7 above).

10. When replacing or renewing the brushes, carefully fit the brushes to the contour of the commutator with fine sandpaper (no. 00). Never use emery cloth, since emery grit is a conductor. After seating the brushes, remove them from the holders and clean the brushes and holder to ensure free movement of the brushes in the holders. Be sure to blow the carbon dust from the motor after sanding the brushes.

11. Whenever the brushes are replaced, or removed for any reason, check the clearance between the holders and the commutator. The clearance should be equal for all brush holders and should range from 1/16 to 3/32 inch. It is also important that the holders are equally spaced around the commutator circumference.

12. Check to ensure that the brush pig tail lug attaching screws are tight, and that a good electrical connection exists. A loose screw or poor connection will result in current flow through the brush holder spring. The spring will then eventually lose temper and will be unable to apply adequate pressure to its brush.

13. At least annually, and more often if operating conditions are severe, subject the motor windings to an insulation resistance test using a 500 volt megger. The insulation resistance between the coils and ground and between the armature and ground must be a minimum of one (1) megohm.

14. Make frequent checks of the motor for unusual noises or vibration. These conditions may be a sign of bearing failure. Worn or damaged bearings must be replaced as soon as possible, with a factory replacement bearing which ensures a properly lubricated bearing for longer service life.

AC SQUIRREL CAGE MOTORS. At regular intervals depending on the particular operating conditions, perform the following maintenance:

1. At least annually, and more often if operating conditions are severe, subject the stator windings to an insulation resistance test using a 500 volt megger. The insulation resistance between the stator windings and ground must be a minimum of one (1) megohm.

2. Make frequent checks of the motor for unusual noises or vibration. These conditions may be a sign of bearing failure. Worn or damaged bearings must be replaced as soon as possible, with a factory replacement bearing which ensures a properly lubricated bearing for long service life.

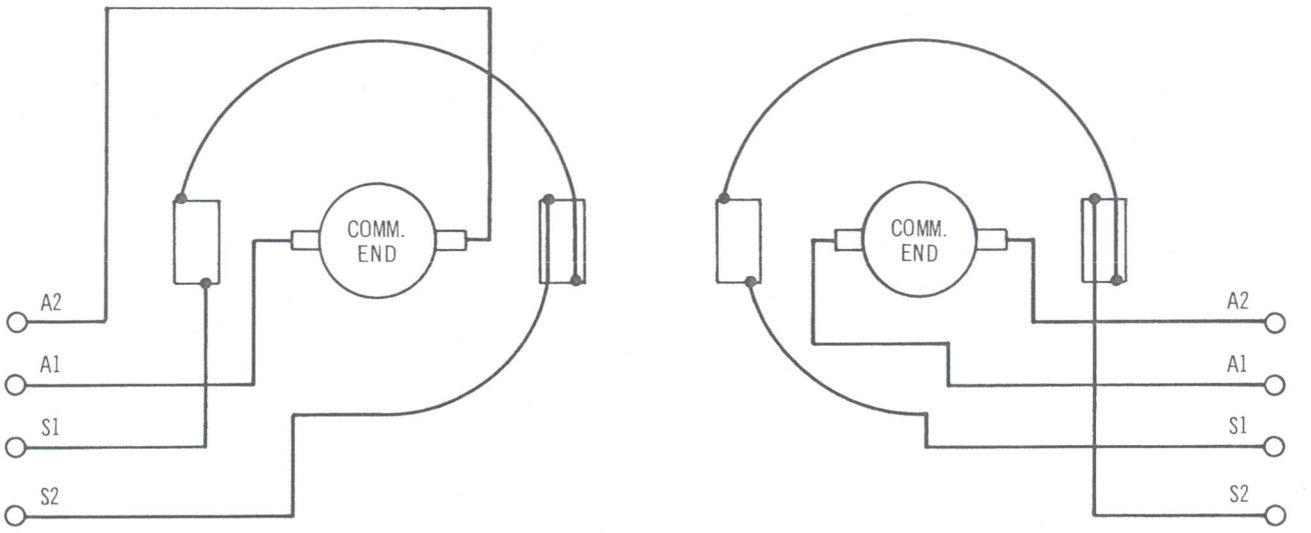


DIAGRAM SHOWING TERMINAL LEADS ON L.H. SIDE VIEWED FROM COMM. END.

DIAGRAM SHOWING TERMINAL LEADS ON R.H. SIDE VIEWED FROM COMM. END.

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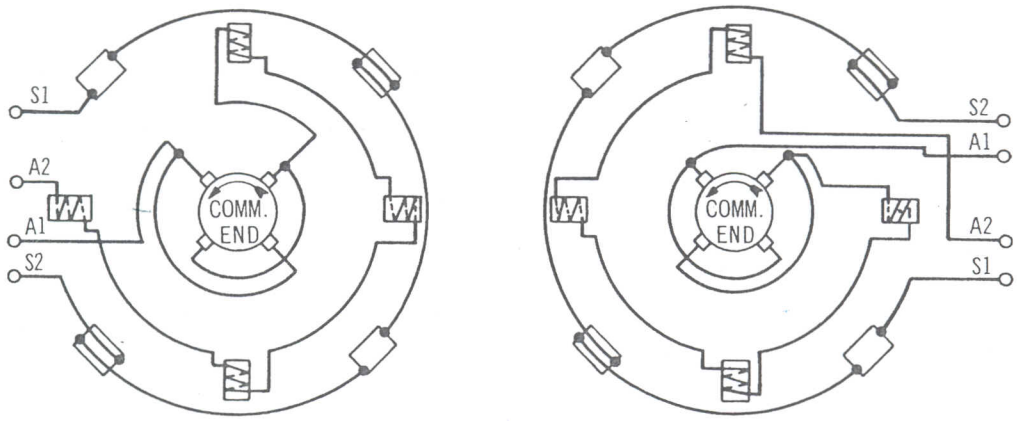
Figure 5-42. Wiring Diagram for 2 Pole Type DS Reversible Series D.C. Motor without Interpoles

LEADS ON L. H. SIDE AS VIEWED FROM COMMUTATOR END

LEADS ON R.H. SIDE AS VIEWED FROM COMMUTATOR END



TO REVERSE DIRECTION OF ROTATION INTERCHANGE CONNECTIONS TO A1 & A2

Figure 5-43. Wiring Diagram for 4 Pole Type DS Reversible Series D.C. Motor with Interpoles

STORAGE

If the hoist is to be stored for more than six months, it should be protected as follows:

1. Drain the hoist gear case (and the trolley gear case if a motor geared trolley is used) and fill with fresh gear oil to the oil level plug opening. Replace the gear case breather with a pipe plug.

2. Every six months, remove the hoist from storage and operate it on a test bench for a few minutes. Replace the gear case breather for the test bench operation.

3. Every six months, remove the magnetic brake armature and disc plate and inspect them for rust.

4. Replace the gear case breather when the hoist is removed from storage.