



Technical Manual

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CHECK boom suspension and hoist ropes for early signs of wear or failure. Kinks cause permanent damage.

CHECK LIMIT switches for proper operation.

CHECK OVERLOAD and thermal breakers.

MAINTAIN correct supply of lubricant.

MAINTAIN CLEAR walkways.

LOOK FOR loose bolts and locking devices.

KEEP FLOORS CLEAN and free of oil and grease.

WIPE AWAY excess grease and oil around bearings and gears.

KEEP hands, feet and clothing away from moving parts.

PROMPTLY REPLACE all guards, inspection doors, access covers and other safety features after inspection or repair.

NEVER attempt electrical repair, unless qualified.

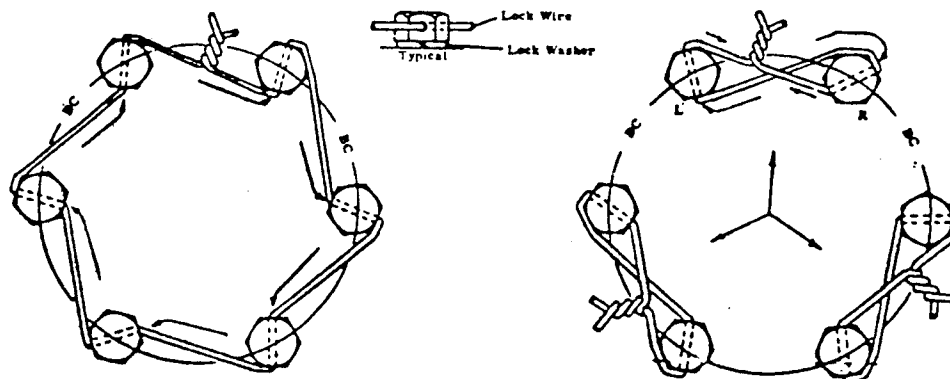
HIGH VOLTAGE power lines require using **EXTREME CAUTION**.

Open pit mining equipment undergoes tremendous shock and stress. Marion's design considers these loads. This machine, built with an ample reserve of power and strength, will meet the demands of its task. Marion's engineers cannot foresee the conditions imposed by abuse, neglect and mismanagement. These factors damage any piece of equipment more than years of continuous operation and normal wear. Care, sound judgement and reason govern the economic need in the operation of power equipment.

Downtime exists, but an ongoing program of inspection and evaluation minimizes it. Awareness of unusual conditions generally warns personnel before breakdown occurs. Normal wear of machinery parts escapes exact definition. Parts do not suddenly expire. Wear takes place at varying degrees over time. Constant checking indicates a wear pattern. An alert maintenance crew checks ALL structural members for evidence of stressed, broken or loose items. Minor cracks occur in steel structures. It's true of ALL machines. This is NOT SERIOUS when weld repaired while SMALL. Cold weather causes faster expansion and brittleness than warm weather. Early detection and quick repair prevents failure. A stretch, bend or defect often shows up in condition of surface paint. A collection of dust along a line may indicate a crack in the metal. Look closely at areas around openings where angles are cut out. Also

Shaft		Running Clearance	Shaft		Running Clearance
Nom. Diam.	O.D.		Nom. Diam.	O.D.	
9	9.000 8.997	.016 .026	13	13.000 12.997	.020 .033
9-1/4	9.250 9.247	.016 .026	13-1/4	13.250 13.247	.020 .033
9-1/2	9.500 9.497	.016 .027	13-1/2	13.500 13.497	.020 .033
9-3/4	9.750 9.747	.016 .027	13-3/4	13.750 13.747	.021 .034
10	10.000 9.997	.027 .027	14	14.000 13.997	.022 .035
10-1/4	10.250 10.247	.016 .027	14-1/4	14.250 14.247	.022 .035
10-1/2	10.500 10.497	.016 .027	14-1/2	14.500 14.497	.022 .035
10-3/4	10.750 10.747	.016 .027	14-3/4	14.750 14.747	.023 .036
11	11.000 10.997	.017 .028	15	15.000 14.997	.024 .036
11-1/4	11.250 11.247	.017 .028	15-1/4	15.250 15.247	.024 .036
11-1/2	11.500 11.497	.017 .028	15-1/2	15.500 15.497	.024 .036
11-3/4	11.750 11.747	.017 .028	15-3/4	15.750 15.747	.024 .036
12	12.000 11.997	.017 .028	16	16.000 15.997	.026 .039
12-1/4	12.250 12.247	.017 .028	16-1/4	16.250 16.246	.026 .040
12-1/2	12.500 12.497	.017 .028	16-1/2	16.500 16.496	.026 .040
12-3/4	12.750 12.747	.019 .030	16-3/4	16.750 16.746	.026 .040

ENGINEERING STANDARD 1101-2 for wire lock cap screws. This standard establishes two recommended methods for these fasteners. Use here is for designs where maximum locking assurance is required and periodic visual inspection is not possible. Check classification 121F for special fasteners with 1/8" holes for locking with 14 gauge soft annealed wire. **RECOMMENDED WIRING METHODS:** The following procedures will exert a tightening force on cap screws as the wire is twisted tight.



Single Wire: Insert wire thru fastener from inside bolt circle toward outside of bolt circle; advancing in clockwise direction.

Wired in Pairs: Establish left and right hand fasteners as viewed from center of bolt circle. Insert left end of wire thru left hand fastener from inside to outside of bolt circle. Insert right end of wire thru right hand fastener from outside to inside of bolt circle.

on a new rope due to minimum surface contact of each wire. As these wires wear, they present a flattened surface and the rate of normal wear decreases.

Determine the cause of outer wire breaks by examining the break.

Tension breaks show a cup and cone effect at the break. This is caused by overload, shock load, jerking a load or catching a falling load.

Careless operational load handling.

Fatigue break showing a square end break with granular metal appearance. Repeated bending over sheave causes fatigue or the sway and vibration at dead end anchor and static sheave.

A shear break indicated by a smooth, twisted break generally comes from external damage (nicks or kinks) in the rope.

Several outer wire breaks at isolated areas along rope length cause little concern. Concentrated breaks at a single location indicate severe rope damage. Retire this rope.

External corrosion indicated by rust, scales or pitting on rope surface remains out in the open. Internal corrosion may appear as pitting in strand valley or rust and scale working out from under strands. Outside wire or strands appear slack or seem to stand out from inner portion with severe corrosion. Under a load this rope shows a loss in diameter.

Internal wear or core fatigue indications emulate those of severe corrosion. Wire or strands appear slack and noticeable loss in diameter occurs under load. Internal wear often results from faulty equipment (tight sheave groove, etc.) in a local area.

Rope retirement from service requires a decision based upon a combination of factors.

Inspection determines the abrasive wear effect on outer wires. Percentage of rope area intact indicates rope strength percentage remaining.

The number of broken wires contained within one lay (one full strand wrap) evaluates remaining rope strength to some degree.

No reliable means of determining corrosive effect and internal wear exists. Good operating conditions and effective lubrication keeps these factors to a minimum.

Study the entire rope to determine the section suffering the most severe deterioration. One or more of the following indicates this deteriorating:

Drastic loss in rope diameter and lay lengthening.

Outer wire abrasion.

correctly and brace, clamp, or tack weld to maintain alignment. Use the specified welding preheats for ALL arcing or burning.

PREHEAT area adjacent to weld area to specified temperatures. (See Welding Specifications).

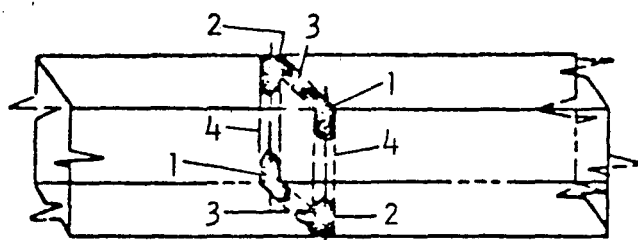
INCREASE preheat temperature 50 degrees F. or 27 degrees C. for material (at weld) 1-1/2 to 2-1/2 inches thick and up to 100 degrees F. or 55 degrees C. for material OVER 2-1/2 inches thick.

MAINTAIN preheat until weld is completed. This is important. Templi-Stiks (from Tempil Corp., N.Y., N.Y.) are helpful for temperature determination.

POSTHEAT area adjacent to weld 100 degrees F. or 55 degrees C., higher than preheat specified. (See Welding Specifications). **MAINTAIN** postheat for one hour PLUS 1/2 hour for each inch of thickness. **CONTROL** cooling rate so temperature is about 50 degrees F. or 27 degrees C. per hour until temperature reaches 150 degrees C. (65.5 degrees C.) This is important.

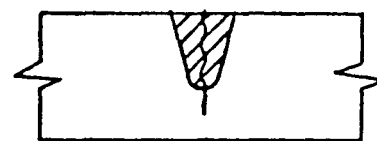
THE ORDER OF WELDING reduces warpage and provides a favorable locked up or residual stress pattern. The use of block welding (short, full size welds) helps reduce warpage. In many cases, V-ing out small areas and rewelding each of these areas; continuing until completing repair eliminates warpage. A favorable locked up or residual stress condition is obtained by making **FULL DEPTH** welds at the area farthest from the neutral axis first; then making welds closest to this neutral axis last.

To eliminate fusion cracks that persist when welding castings; first deposit a thin layer of weld metal on surfaces for weld, then complete the weld. In box section members this means; first, weld the two diagonal corners; second, the remaining corners; third, the top and bottom; and last, the sides. (See sketch). This procedure creates residual compression at the extreme fibers where it is most beneficial.

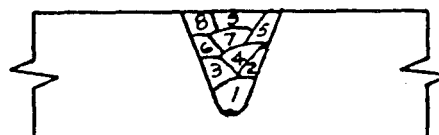


Preferred sequence for blocking in butt joint in box section

PEENING often reduces locked up stresses and maintains original dimensions and alignment, as well as, help prevent weld metal cracking in rigid sections. Use a blunt nosed tool. **DO NOT** peen the first (root or base) pass or cover passes. Avoid **EXCESSIVE** peening in other passes.



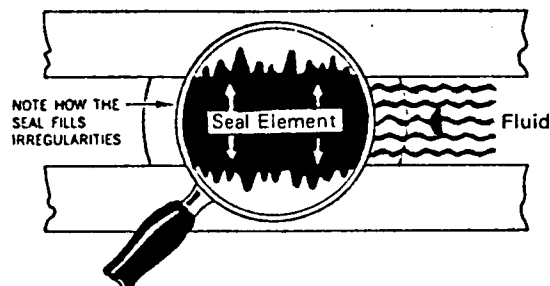
Crack not completely removed reappears in repair weld



Whenever possible make center pass last as shown

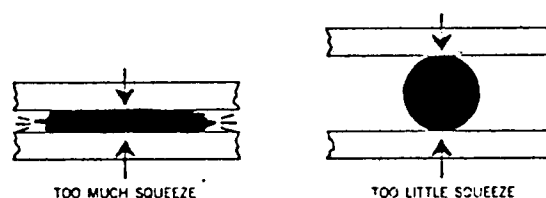
O-RING GUIDE

The dilemma of how to identify an O-ring generally derives from the question; "Is it a gasket, seal or packing?" Hence the confusion. One solution is to rely on the part number. Much like a Social Security number, it identifies even though the name may be confusing. If the part number (Social Security number) is correct, the name doesn't complicate the issue. Chasing down a part number takes a bit longer, but in the end; it is well worth it.

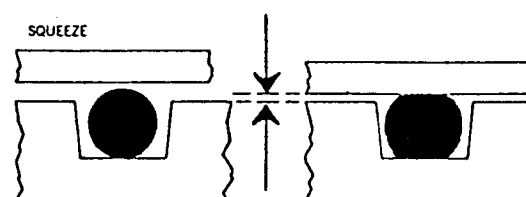


An O-ring's function is to confine and prevent passage of liquids and gases under pressure from the part or joint. Perhaps simply stated; an O-ring closes off a passage to prevent loss or escape of fluid or gas.

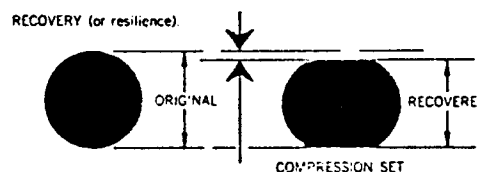
One basic principle of O-rings is compression under load to fill the machined surfaces in mating metal to block off fluid flow. Truly effective O-rings fill surface irregularities and maintain this ability. This is done in the following manners:



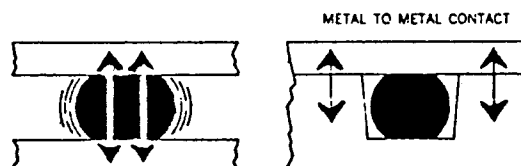
SQUEEZE is the ability of distortion while still blocking a passage. This does not mean CRUSH. Effective and usable squeeze is considered as from 12 to 35 percent. Insufficient squeeze causes leaks, almost always at low temperatures. Too much squeeze outright destroys the O-ring or causes it to cold flow to a premature set.



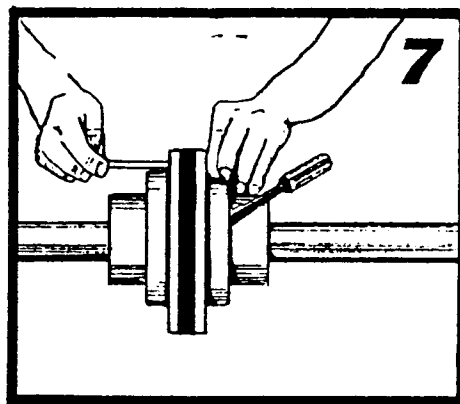
RECOVERY (or resilience) describes an O-ring acting as a surging spring over long periods. Failure to recover after deformation is called compression set.



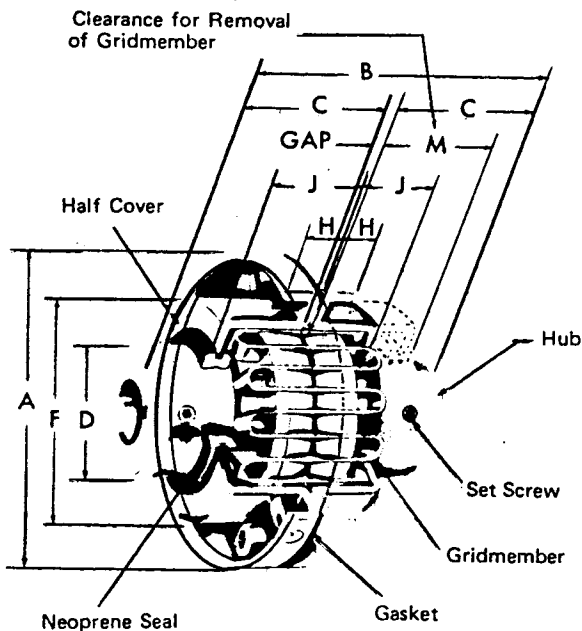
METAL to METAL contact is vital in creating correct squeeze while preventing destruction. A well designed seal transmits torquing loads thru the metal NOT the O-ring.



- Position covers so that lube fittings are 180 degrees apart. Align covers to prevent wobble. Tighten cover bolts. Check seals for proper seat. Insert thin, smooth screwdriver under seal for venting when lubing with permanent fittings.



Lube until grease flows thru coupling and out other hole. Then RE-INSTALL BOTH LUBE PLUGS.



GRIDMEMBER DATA

DO NOT APPLY LOAD UNLESS COMPLETE GRIDMEMBER IS INSTALLED AND ALL SECTIONS IN THEIR PROPER LAYER

Coupling Size	Gridmember Dimensions Inches	No. Rungs	No. Layers	No. Segments Per Layer	Outside Diameter—Inches		
					Single Layer Gridmember Painted Aluminum	Outer Layer Gridmember Painted Bronze & Stamped "OUT"	Inner Layer Gridmember Painted Aluminum & Stamped "IN"
3	.048 x 3/16 x 1 1/2	20	1	1	2.375		
4	1/4 x 3/16 x 2	24	1	1	2.687		
5	1/4 x 1/4 x 2	28	1	1	3.125		
6	1/4 x 1/4 x 2	32	1	1	3.625		
7	1/4 x 3/8 x 2	36	1	2	4.250		
8	3/32 x 3/8 x 2 3/4	40	1	2	5.000		
9	3/32 x 1/2 x 2 3/4	40	1	2	5.500		
10	1/2 x 3/8 x 3 1/2	40	1	2	6.125		
11	1/2 x 1/2 x 3 1/2	40	1	2	6.750		
12	1/2 x 3/4 x 3 1/2	44	2	2		7.500	6.875
13	1/2 x 3/4 x 3 1/2	52	2	2		8.750	8.125
14	3/2 x 1/2 x 4 1/2	48	2	2		9.500	8.750
15	3/4 x 1/2 x 4 1/2	48	2	2		9.750	9.000
16	3/4 x 1/2 x 4 1/2	56	2	2		11.250	10.500
17	3/4 x 1/2 x 4 1/2	64	2	2		12.750	12.000
18	3/4 x 1/2 x 4 1/2	72	2	3		14.250	13.500
180	3/4 x 1/2 x 6 3/4	72	2	4		15.750	14.750

Coupling Size	Max. Speed rpm	Basic Rating	Max. Bore	Min. Bore	DIMENSIONS — INCHES								GAP			Approx. wt With No Bore lb	Lubricant Required lb	Coupling Size
					A	B†	C	D	F	H	J	M*	Min.	Normal	Max.			
3F	6000	0.4	1 1/16	7/16	3 3/8	3 3/8	1 3/8	1 1/4	2 3/8	3/8	3/8	1 1/4	3/4	1/8	3/16	4	1/4	3F
4F	6000	0.9	1 1/4	7/8	4 1/8	4 3/8	2 1/8	1 3/4	2 3/8	3/8	1 1/8	2 1/4	1/4	1/8	3/16	6	1/4	4F
5F	6000	1.5	1 1/2	3/4	4 1/2	4 3/8	2 3/8	2 1/8	3 3/8	3/8	1 1/8	2 1/4	1/4	1/8	3/16	8	1/2	5F
6F	6000	2	1 3/4	7/8	5	4 3/8	2 3/8	2 1/8	3 3/8	3/8	1 1/8	2 1/4	1/4	1/8	3/16	10	1/2	6F
7F	6000	4	2 3/16	7/8	5 3/8	4 3/8	2 3/8	2 1/8	4 1/2	3/8	1 1/8	2 1/4	1/4	1/8	3/16	14	1/2	7F
8F	5000	8	2 3/8	1 1/2	7 3/8	6 3/8	3	3 3/8	5 1/4	3/8	1 1/2	3	1/4	1/8	3/16	28	1/2	8F
9F	4500	12	2 13/16	1 1/4	7 3/8	6 3/8	3 3/4	3 3/4	5 3/4	3/8	1 1/2	3	1/4	1/8	3/16	33	1/2	9F
10F	3750	16	3 3/4	1 1/2	8 3/4	7 1/4	3 3/4	4 1/2	6 3/8	3/8	1 3/8	3 3/4	1/4	1/8	3/16	49	3/8	10F
11F	3600	23	3 3/16	1 1/2	8 3/8	7 1/4	3 3/4	4 1/8	7 1/8	3/8	1 3/8	3 3/4	1/4	1/8	3/16	60	1/2	11F
12F	3600	35	3 3/8	2	9 3/4	7 1/4	3 3/8	5 3/8	7 3/8	3/4	2	3 3/4	1/4	1/8	3/16	75	3/4	12F
13F	2700	48	4 1/4	2	11	7 1/4	3 3/8	6 3/8	9 3/8	3/4	2	3 3/4	1/4	1/8	3/16	97	3/4	13F
14F	2500	70	4 3/8	2 1/2	11 3/8	10	4 3/8	6 3/8	9 3/8	3/8	2 1/2	4 3/4	1/4	1/8	3/16	145	1 1/2	14F
15F	2400	100	5	2 1/2	13 3/4	10 3/4	5	7 3/4	10 3/8	1 1/4	2 1/2	4 3/4	1/4	1/8	3/16	175	1 1/2	15F
16F	2300	140	5 1/2	2 1/2	15 1/4	10 3/4	5	8 3/4	11 3/8	1 1/4	2 1/2	4 3/4	1/4	1/8	3/16	215	2	16F
17F	2200	180	6	3	16 3/4	10 3/4	5 3/8	9 3/8	13 3/8	1 1/4	2 1/2	4 3/4	1/4	1/8	3/16	285	2 3/4	17F
18F	2100	230	7	3	18 3/4	11 3/4	5 3/2	10 1/4	14 3/8	1 1/4	2 1/2	4 3/4	1/4	1/8	3/16	365	3 3/4	18F
190F	2000	330	8	4	21 1/2	15 3/4	7 1/2	12	16 3/4	1 1/4	3 3/8	7 3/8	1/4	1/8	3/16	650	7	190F

† Dimension B Based on NORMAL GAP. * Clearance M required for installation and removal of gridmember. Dimensions for reference only. Sizes 3F thru 11F are furnished for CLEARANCE FIT with set screws over keyway or at 90°, depending on bore size. Sizes 12F thru 190F are furnished for INTERFERENCE FIT without set screws unless otherwise specified.

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LUBRICATION
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DESCRIPTION OF OIL AND GREASE CLASSIFICATION

CODE	NAME	DESCRIPTION
MPG	Multipurpose Grease	A well manufactured E.P. grease having good resistance to both heat and water, possessing good mechanical stability and oxidation resistance. It must be suitable for use in Farval, Lincoln and Trabon automatic dispensing systems. It shall be free of corrosive and deleterious foreign matter of any kind. Special products not meeting the requirements of the Engineering Standard may be required for operation at sub-zero ambient temperatures. MPS Co. should be consulted regarding products intended for service at low ambient temperatures.
RGL	Regular Gear Lubricant	USES--Anti-friction bearings both packed and gun lubricated, chassis and plain bearings and central lubricating systems.
OGL	Open Gear Lubricants	Semi-fluid greases having just enough body to retain them in a semi-enclosed case. It must have good adhesive, load carrying and non-channeling properties. USES--Semi-enclosed gear cases. Either of two types of product may be specified. They are intended for use on open gearing where retention is a problem. Both must be adhesive in nature and resist dripping from or flinging off the exposed gearing either idle or in motion. They must be water and corrosion resistant and have E.P. properties. 1. Type B must be suitable for application without heat or diluent and should be suitable for use in automatic dispensing systems if required.

LUBRICATION OF CRAWLER
(One of Two)

NO.	NAME OF PART	TYPE	NO. OF POINTS	LOCATION	LUB SYM	METHOD AND FREQUENCY (HOURS)
1	Front Roller	Bushing	2	End of Shaft	MPG	
2	Load Roller	Bushing	8	End of Shaft	MPG	Automatic; 2-1/2 Minutes,
3	5th Inter. Propel Shaft	Bushing	2	Top of Bearing Boss	MPG	Propel; 10 Minutes, Digging
4	Sprocket Shaft	Bushing	7	In Bearing Boss	MPG	
5	Sprock Shaft Gear Case	—	—	Fill Thru Top of Case 6 Gal.	GL	Check at Plug Weekly
6	Roller Circle Bushing	Bushing	—	Inside Roller	OGL	
7	Roller Circle Thrust Washer	—	—	Outside Roller	OGL	Assembly Only
8	Roller Circle Rail	—	2	Drip to Rail	OGL	Automatic — 15 Minutes
9	Hoist Gear Case	Anti-Friction	—	Fill Side of Case, 55 Gal.	GL	Check Gauge Weekly Seasonal Change
10	Hoist Gear Teeth	—	8	Dip to Teeth	OGL	Automatic — 15 Minutes
11	Hoist Drum Support Bearing	Anti-Friction	2	Bearing Caps	MPG	Manual — 500 Hours

SECTION 3

COMPRESSED AIR SYSTEM AND COMPONENTS

The Marion air control is quite simple in operation. Reasonable care and maintenance ensures a long and trouble free life. Compressed air is used to operate the propel, swing and hoist brakes, hoist and propel clutch, dipper trip. It is piped to the auto-lube system also.

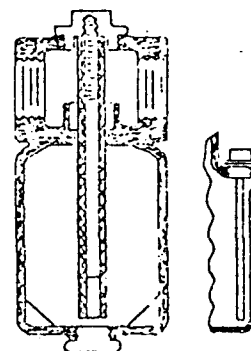
Air pressure provides a vital link in the safe operation of this machine. The operator **MUST CONSTANTLY** check the pressure gauge reading. If at any time this pressure **DROPS** below 80 psi, **SHUT DOWN** and investigate the cause.

NEVER OPERATE THIS MACHINE WITHOUT FULL TANK PRESSURE.

The **AIR COMPRESSOR** (electric machine), located left front corner of the deck, is a complete unit. The direct connected 77.4 CFM (125 lbs.) compressor mounts on an 120 gallon horizontal tank with a 20 hp, 3 phase, 220/240 volt electric motor. Pressure gauge and pressure switch adjusted to 95-115 psi and a manual are supplied. We suggest reading the manual and keeping as handy reference.

INSPECT the belt drive often. Maintain **PROPER** belt tension. **ADJUST** by moving the electric motor on the base. **CHECK** crankcase oil level **DAILY** and keep at dipstick **FULL** mark. Every 500 operational hours, **DRAIN** and **FLUSH** the crankcase. Look in Lubrication Charts for the proper **NON-DETERGENT** oil use. Clean the air cleaner once a week or daily if conditions require.

ANTI-FREEZER, installed in air line, prevents icing and freeze-up of air system in severe weather. Introduced alcohol vapor mixes with water vapor in entering air. A bottom alcohol chamber and a top vapor chamber separate the unit. A central rod fits to a plug in the top. This rod, covered with a wick, carries alcohol up into the vapor chamber where it evaporates into the air stream. This in-line unit is non-adjustable.

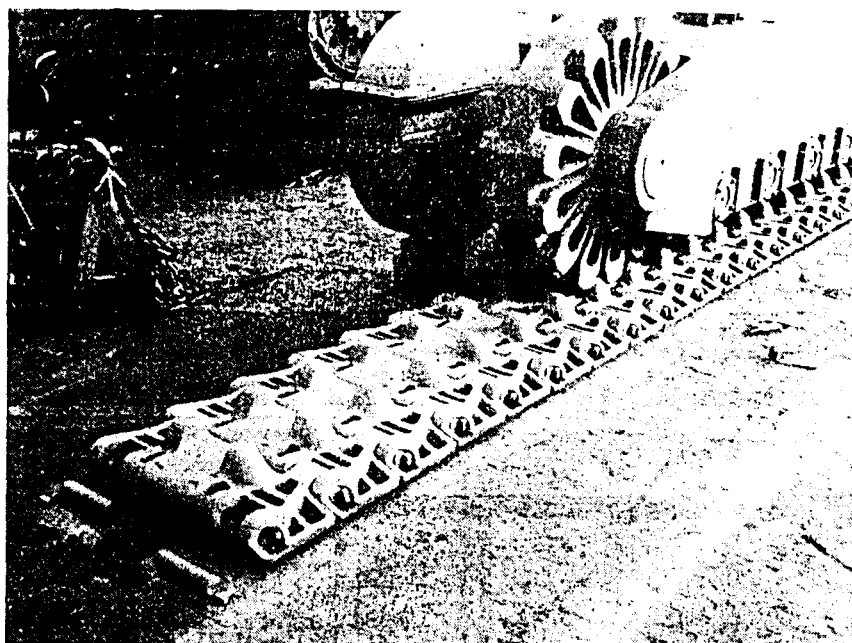


MAINTENANCE requires cleaning bowl and wick assembly with non-flammable solvent before freezing weather. Drain plug is in bottom. **TURN OFF** air compressor **BEFORE** checking or refilling. Vent the line pressure thru cut-out. Pressure not vented off escapes thru a small hole drilled in cap and vents out between cap and bowl. Due to this filler cap safety factor and to avoid

SECTION 4

MECHANICAL ADJUSTMENTS

CRAWLER BELT assembles on the side frame with the bottom strand male connecting lugs turned toward the front. Both belts are identical. Each belt consists of 45 separate shoes, connected at each joint by two hardened steel pins. Each pin locks in place by a bolt thru the shoe web. Each bolt uses two lock washers; one under the bolt head, another under the nut. **DO NOT TRAVEL** with lock bolt missing. Pins work out and the belt separates.



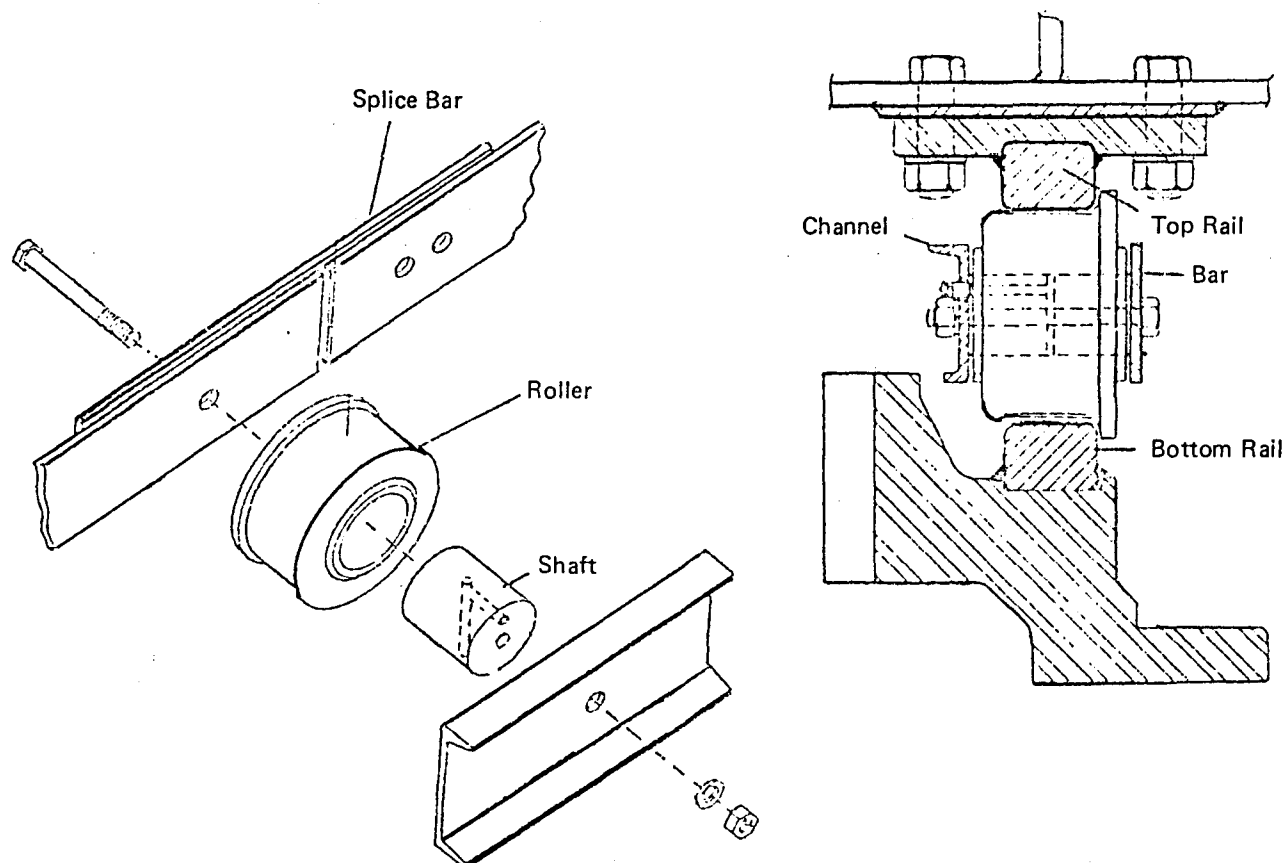
The belt disconnects at ANY joint by removing the lock bolts and driving the pins out. Use a spike maul and sledge here. If pins are bent or deformed, burn them out.

The crawler belt adjusts by moving the front roller shaft assembly. Moving the shaft forward tightens the belt; moving to rear, toward sprocket shaft, loosens the belt. The proper belt adjustment is 3 inches of sag in the top strand between the slides. Adjusting belt too loose causes shoes to climb the sprocket and serious damage may result. Adjusting too tight causes unnecessary wear and loss of power.

The front roller shaft mounts in two bearing blocks fitted into rectangular openings at each side of the crawler side frame. The roller pin is held in place by a shoulder pin which fits thru the slide block and roller pin. This pin also extends thru the rear wall and provides a base for the jack when adjusting belt tension. With roller in place and the proper belt adjustment, place shims on each side of the bearing block to completely fill the rectangular opening.

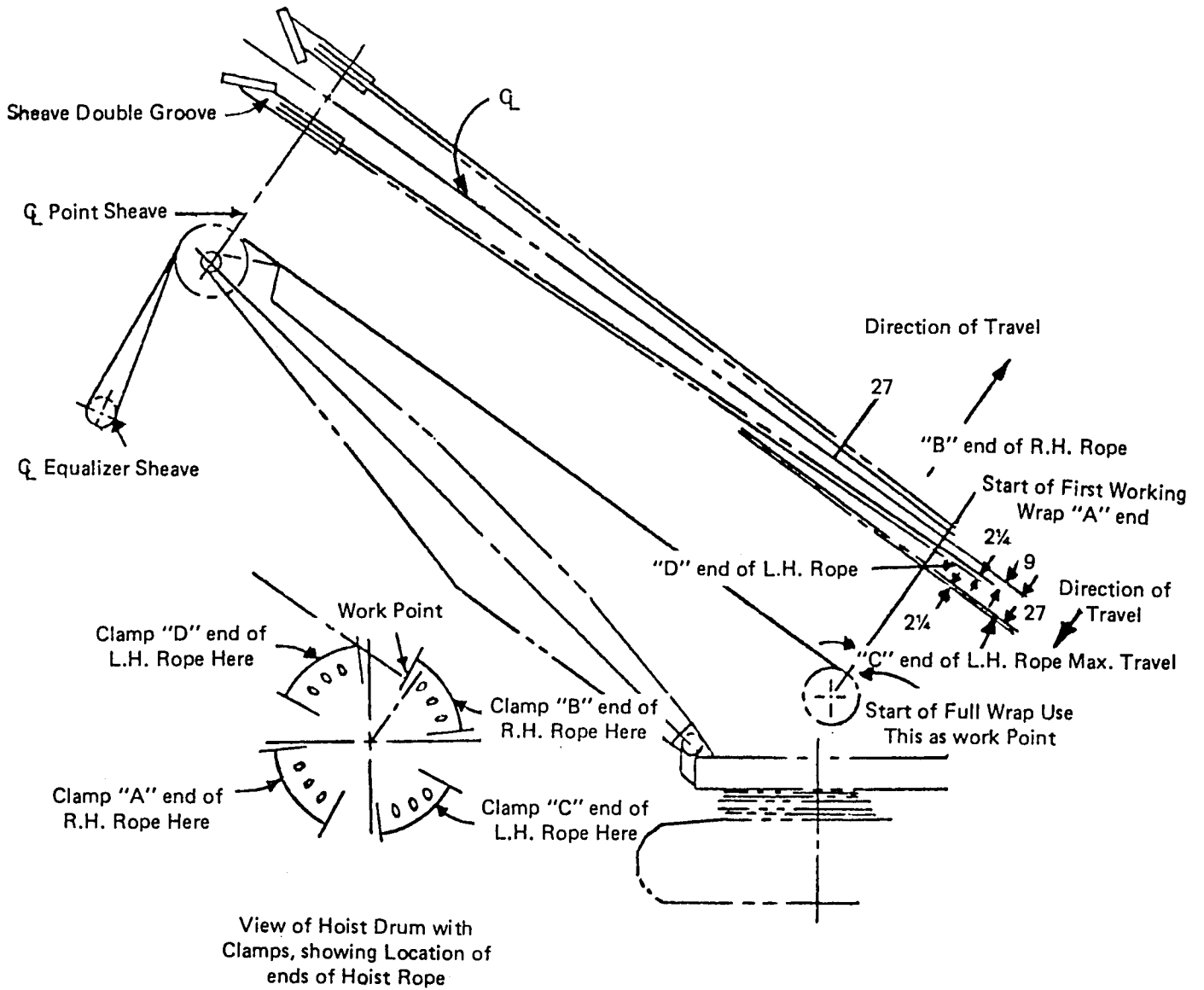
The **ROLLER CIRCLE** supports upper frame and front end weight with 45 hardened, single flange steel rollers. Each roller mounts on a short shaft or spacer with thrust washer toward the outside.

The rollers sandwich between two hardened steel pads or rails. The rail on the lower frame forms a full circle and bolts to the main rotating gear. The top rail consists of four segments, two at the rear and two up front. Each segment bolts to the upper frame. The rollers

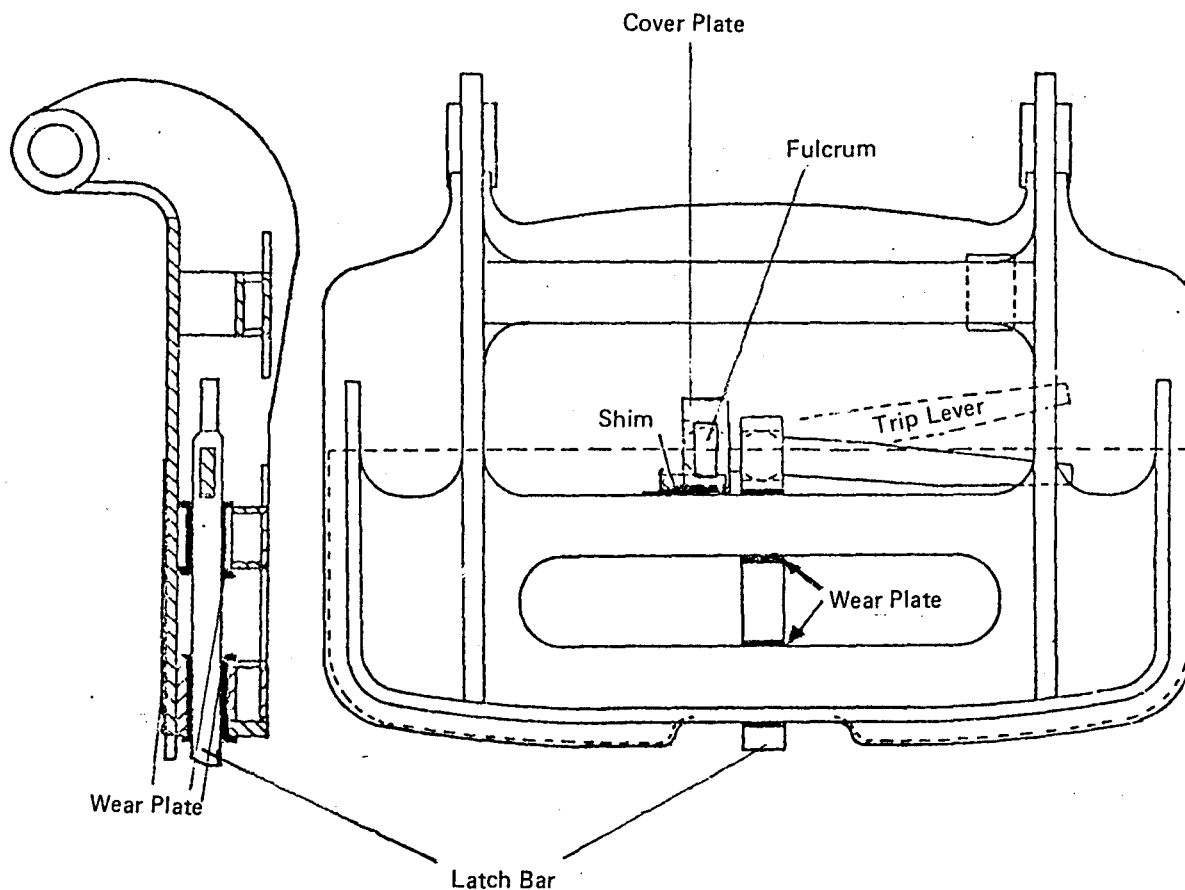


mount between a channel and a bar bent to form circles. The inner and outer circles consisting of three segments each, join with splice bars. Each roller turns independently of all the others. Should a roller become flat or splayed, **REPLACE** it immediately.

TO REPLACE OR REMOVE ROLLER(S), rotate machine until this roller is at the side of the rotating frame (no top rail). Remove the gear guard. Remove the rod bolt. If necessary, loosen rod bolt of adjacent rollers. Lift out roller and spacer. Four rollers may be replaced at one time. The diameter of the new roller **MUST NOT EXCEED** diameter of adjacent roller. Measure adjacent rollers with a micrometer and determine if and how much the new roller needs turned down to match other rollers. Reassemble new roller. Keep rollers and rail clean and lightly coated with lube (OGL).



HOIST ROPES REEVING



DIPPER TRIP

The DIPPER TRIP assembly, located on boom top plate, consists of a gear driven rope dipper trip rope and electric motor.

The rope reeves from trip lever thru fairleads mounted on boom top and bottom and dead ends on dipper trip drum. During the digging cycle, the electric motor (energized by a low voltage current) keeps dipper trip rope taut; but without enough power to withdraw the dipper door latch bar.

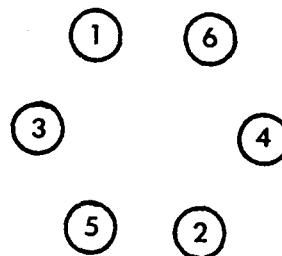
The rope unreels when dipper crowds out. As dipper retracts, motor torque rewinds the rope.

Anytime operator desires dipper door open, he presses the thumbblatch located on the crowd controller. This switches added voltage directly to the dipper trip motor. This added power withdraws the latch bar and frees the door to swing open. No adjustment exists for the trip mechanism.

REPLACEMENT OF FRICTION DISCS

A. SWING AND CROWD (SINGLE DISC) BRAKES

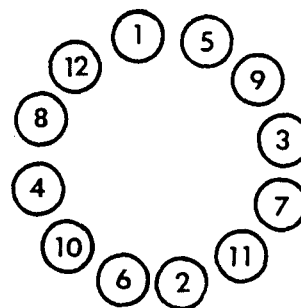
1. Remove locknuts in alternating sequence (as shown in sketch) in increments of 1/4 of the exposed stud thread length. If a stud comes loose from the mounting flange, clean stud thread thoroughly. Apply Loctite 277 or equivalent. Stud must be threaded back in until it bottoms in mounting flange.



2. With locknuts removed, the end plate, spring housing and pressure plate can be removed as an assembly.
3. Remove disc from gear. Inspect disc for wear. If either surface of the disc is worn more than 1/32 inch (0.7938 mm), replace the disc. Removal of the disc from the gear will expose the friction disc mounted on the mounting flange.
4. Remove the old friction discs and replace with new friction discs and NEW flat head screws. Torque the screws to 20 foot-pound (27 Nm).
5. Reinstall the disc.
6. Reassemble the assembly of the end plate, spring housing and pressure plate.
7. Lubricate stud threads with 30 weight oil or "Never Seez".
8. Assemble the locknuts in alternating sequence as they were removed. Torque locknuts to 200 foot-pound (271 Nm).
9. Reinstall shield.

B. HOIST AND PROPEL (DUAL DISC) BRAKES

1. Remove locknuts in alternating sequence, (as shown in sketch) in increments of 1/4 of the exposed stud thread length. If a stud comes loose from the mounting flange, clean stud threads thoroughly. Apply Loctite 277 or equivalent. Stud must be threaded in until it bottoms in mounting flange.



2. With locknuts removed, the end plate, spring housing and pressure plate can be removed as an assembly.

of rotation. Then lift brush, push sandpaper back and repeat. Continue this operation until brush shapes to an even contact with commutator. Be sure to raise the brush before moving sandpaper back for the next stroke. DO NOT raise sandpaper when removing from commutator. This act generally ruins the fit on the brush. DO NOT install brushes and allow to fit by wear. This method usually causes arcing and scoring before brush wears in. After sanding brushes in, thoroughly clean armature, commutator, risers and brush assembly with dry compressed air. Remove ALL carbon and copper cuttings. This prevents possible grounding or short circuiting. Failure to follow this proper cleaning procedure has resulted in costly shutdowns due to damaged armatures. After grinding brush, run in under light loads for a short period. This allows the surface to set or wear in before applying heavier loads. Install a complete set of brushes rather than replacing them one by one.

COMMUTATORS frequently inspected by an electrician assures detection of surface faults in the early stages. This is important. Faults corrected early cost little in time loss or expense. Bar burning, high and low bars, high mica or flat spots become serious at an accelerating rate over time. When not seen and corrected early they often require a long shutdown. A good commutator surface is highly polished. It shows a chocolate brown color. If the commutator is only slightly blackened due to arcing, the best cleaning procedure is the use of a piece of canvas wrapped around a wooden block. The canvas cleans the surface and does not scratch the copper. When excessive arcing takes place over a long time, a burned and blackened commutator results. In these severe cases, use a very fine sandpaper (2/0 or 3/0).

NEVER USE EMERY CLOTH OR EMERY PAPER. Emery conducts electricity. Serious injury to personnel and equipment results.

Shape a wooden block to commutator contour. Fold sandpaper around block and hold against commutator while motor or generator runs at no-load. Use a slow lateral movement of the block to avoid diagonal scratches. Undue amounts of sandpapering destroys the needed polished surface and results in increased brush wear. Use sandpaper as little as possible. In most cases, polishing with canvas (see above) removes the blackening. One main objection to using sandpaper is that it rarely leaves bars properly grounded. On an unslotted commutator particularly with high mica, sandpaper tends to flatten the center of the bars.

Should the commutator become rough or pitted to a point where canvas and sandpaper cleaning does not remove bad spots, use a hand stone as needed. Sandpapering removes some slight spots, but not large flat ones. The effect merely broadens out the spots so they no longer show due to the flexibility of sandpaper. The stone smooths much better here. The stone presents a rigid contact surface and may be held firmly in place while grinding. Sanding or stoning destroys perfect brush contact. After polishing using either method, bring the unit to rest and remove carbon and copper dust with dry compressed air.

Although hand stone grinding restores a true cylindrical surface, it does not remove extreme bad spots or Out of Round. A good commutator is within .0005 to .001 Out of Round

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