



# Technical Manual

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## **SAFETY SUGGESTIONS**

The operator controls the machine and its usefulness. The crew alone thinks for it. Safety, constantly in mind, prevents accidents. Develop good habits. Everyone has bad habits, but try to erase them quickly. Cleanliness and safety go together. A clean machine is easier to operate, inspect, and maintain.

**READ and OBSERVE ALL** warning signs, they're placed for your health and safety.

**KNOW** the location of fire extinguisher.

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

**PROPERLY GROUND** the power source.

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

**NEVER** attempt electrical repairs, unless qualified.

**PLEASE READ** carefully this Manual and Parts Book.

**PLEASE CREATE A SYSTEMATIC MAINTENANCE** procedure and follow it.

**PLEASE KEEP** safe operating procedures in mind at **ALL** times.

**CAUTION IS THE BY-WORD.** Develop a feel for the machine. Try to sense failure before it arrives. Take that extra second to look at something that seems out of place. A paint chip or bubble may be an early warning. A slight hiss may indicate a growing air leak. It's much easier to tighten a packing nut than shutdown for packing repair.

**LOOK FOR** loose bolts and locking devices.

**KEEP FLOORS CLEAN** and free of oil and grease.

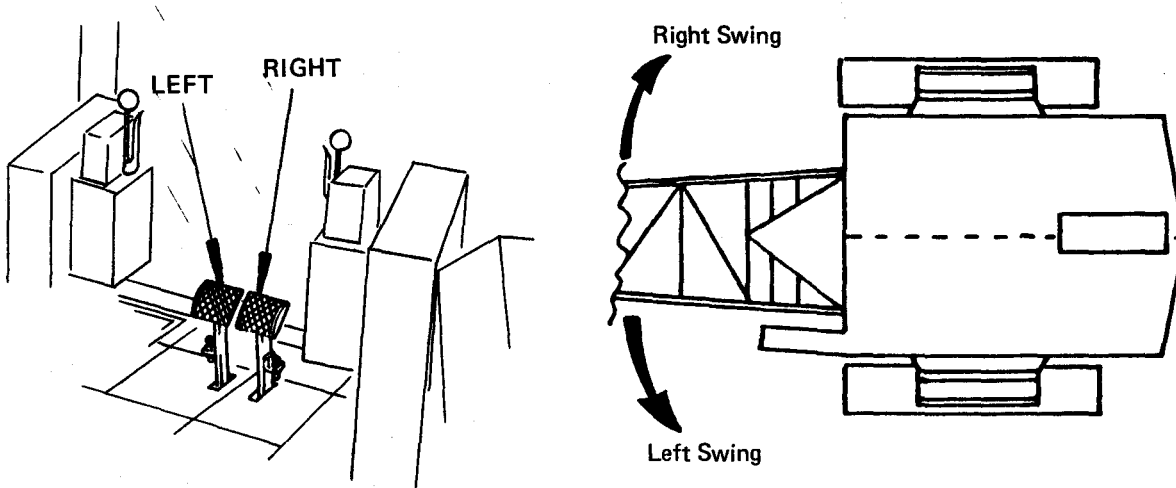
**WIPE AWAY** excess grease and oil around bearings and gears.

**KEEP** hands, feet and clothing away from moving parts.

**MAINTAIN CLEAR** walkways.

**PLEASE LUBE** regularly.

The swing pedals, centered on floor in front of seat, controls the machine rotation. Pressing right pedal, machine swings right. Left pedal causes a left swing or rotation. The swing motion is stopped also by plugging the controls, that is, depressing opposite swing pedal to



slow or stop motions. The pedals are linked together so that only one pedal can be pressed. When no pressure is applied, the pedals will self-neutralize in the neutral position.

**COMMENT ABOUT PRIMARY CONTROLS** – The hoist and drag controller is a **SPEED REGULATOR**. Practically full torque or line pull is obtained with the slightest handle movement. Move lever only far enough to obtain desired speed. Do not move lever(s) too far, then back off. Use smooth movements, lever jockeying is not required and only results in overheating the motors.

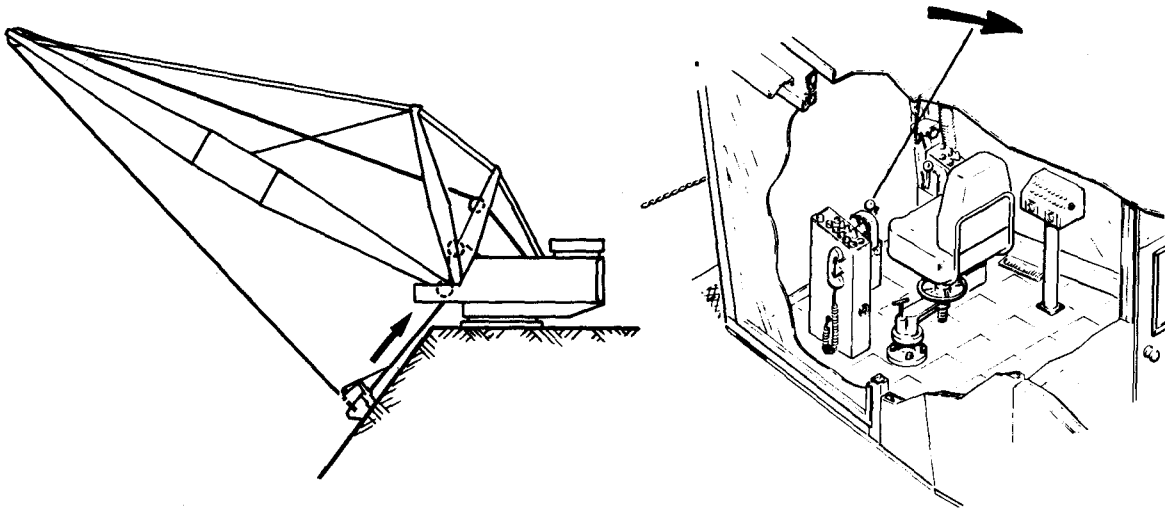
The swing pedals are a **TORQUE REGULATOR**. The swing torque applied to machine increases as the pedal is pushed farther down and thus the acceleration rate is increased. This means full swing speed is obtainable at any pedal position.

**PLUGGING THE MOTION** means reversing the generator field to act as a braking force and stop motion.

In normal operation, stop or retard the motion of D.C. drive motors by moving the control lever (or pedal) in the opposite direction. This reverses the current in the generator field. This reversing of field acts as a braking force, retarding or stopping the motion. At the same time the rotation reaches zero, you must move the controller lever (or pedal) to the neutral position.

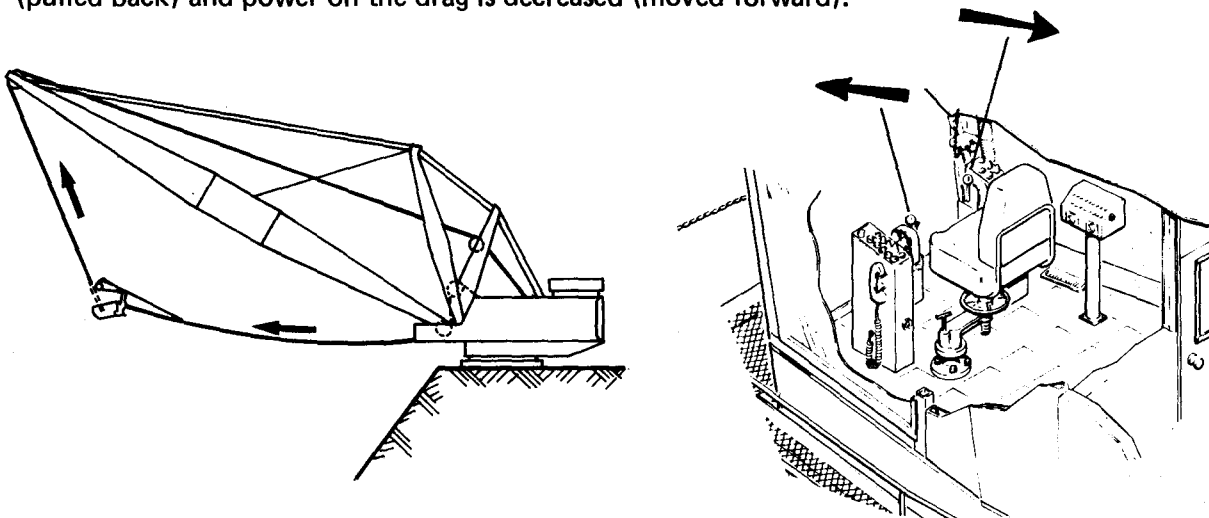
Plugging the motion rapidly dissipates the energy of heavy rotating parts by regenerating

Start **TYPICAL DIGGING CYCLE** with bucket on ground, in pit, under boom (point). If machine tends to drift (rotate) apply enough pressure on opposite swing pedal to hold machine.



Start dragging in bucket by pulling toward you the drag control lever (at left hand). The further the lever is moved, the faster the bucket is pulled toward the machine. Hold tension on hoist ropes by depressing the thumbblatch on drag controller. If more power is needed coordinate movement of hoist and drag controls. Pull bucket in until it is full.

Then by proper movement of hoist and drag control levers, power on hoist is increased (pulled back) and power on the drag is decreased (moved forward).



**NOTE:** Only enough tension is kept on the drag ropes to keep the bucket from dumping. Too much tension will cause bucket to carry near boom, add strain to boom and slow down hoist speed.

**NOTE:** Unusually dusty or dirty atmosphere, high humidity and extreme temperatures alter the effective life of a lubricant. Therefore, it shall be the responsibility of the owner/operator to determine the most effective lubricant interval according to existing environmental conditions for all components, bearings (plain and anti-friction), gears, gear cases, etc.

**WIRE ROPE PENDANT LUBRICATION** dislodges with the movement of strand against strand. This permits moisture to enter and causes deterioration of the rope. The area where greatest deflection occurs is at or adjacent to the socket connection. Experience shows this the most likely point of boom point support bridge strand rope failure. To avoid this condition and increase useful life expectancy of the bridge strand support rope apply wire rope lube to the socket area using the hand spray.

**CHECK LIST** for initial lubrication start up and any inspection following:

Clean up spilled petroleum products immediately.

Remove promptly any petroleum product that gets on your skin.

Don't use gasoline, naphtha, turpentine, or similar solvents to remove oil or grease from your skin.

Don't use dirty wipe cloths.

Avoid breathing oil mist or solvent vapors.

Don't wear oil-soaked garments.

Remove grease accumulation around bearing and gears.

All grease piping connected and filled.

Proper lube supply to all bearing and lube points.

Proper oil level in all gear cases.

Open and semi-enclosed gear teeth coated with lube.

Automatic lubrication system with adequate lube supply.

<b>NAME OF PART</b>	<b>TYPE</b>	<b>NO. OF POINTS</b>	<b>LOCATION</b>	<b>LUB. SYM.</b>	<b>METHOD AND FREQUENCY</b>
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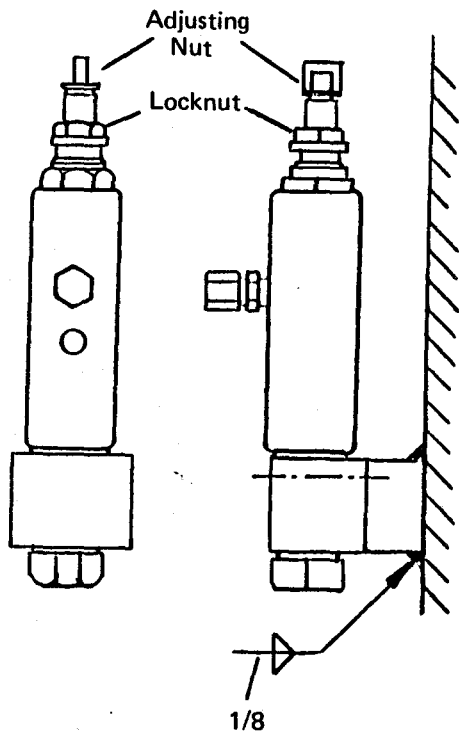
**LUBRICATION OF ROTATING MACHINERY (1 of 4)**

Main Rotating Gear Case	—	—	Fill at Dip Stick	GL	280 gal. capacity Check Weekly
Main Rotating Shaft Top Bearings	Anti-Friction	—	From Gear Case	—	—
Intermediate Shaft Bearings	Anti-Friction	—	From Gear Case	—	—
Motor Extension Shaft Bearings	Anti-Friction	—	From Gear Case	—	—
Rotating Motor Coupler	—	—	Plug in Coupler Flange	MPG	500 Hrs., As Required
Rotating Pinion	—	2	Drip On	OGL	Automatic
Main Rotating Shaft Spline	—	1	Fitting at Top of Swing Case	MPG	Hand, 500 Hrs.
Rotating Motor	Anti-Friction	2	In Motor End Bell	EMG	Hand, 500 Hrs.
Rotating Bearing	Anti-Friction	1	Bottom of Shaft in Upper Frame	MPG	Automatic

**LUBRICATION OF ROLLER CIRCLE**

Roller	Nylatron	120	In End of Spacer	MPG	Every 8 Hrs.
Roller Thrust Washer	Nylatron	—	—	—	—
Roller Rail	—	6	Drip On	OGL	Automatic

## ADJUSTING AND MOUNTING OF LINCOLN INJECTOR

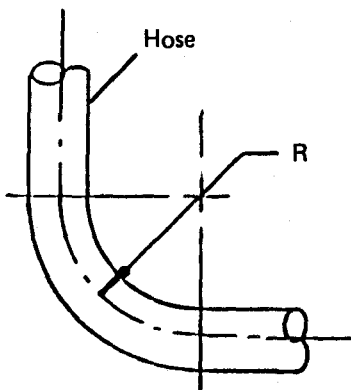


LINCOLN injector is preset for maximum discharge.

To Reduce Discharge:

- Loosen Locknut
- Turn Adjusting Nut Clockwise
- Tighten Locknut

## HOSE BEND RADIUS

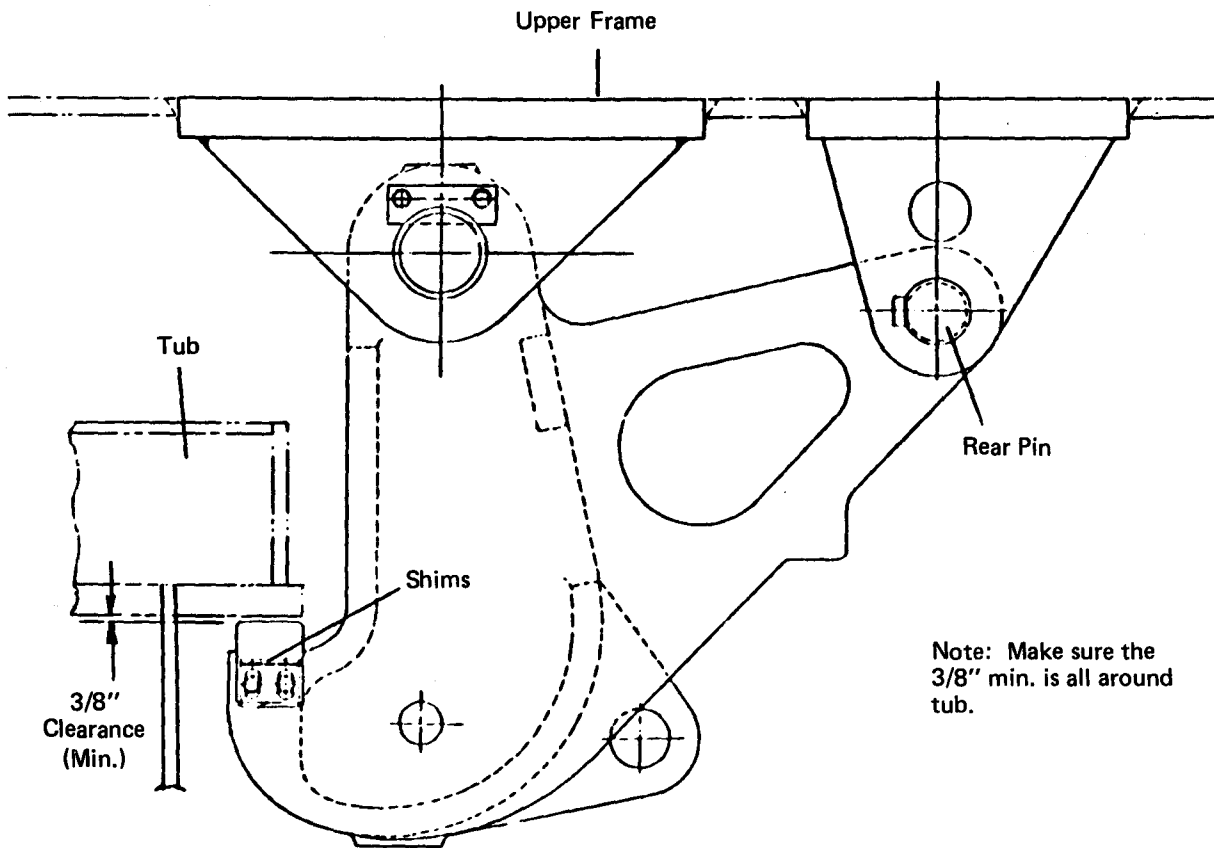


<u>MPS No.</u>	<u>Min. Radius (R)</u>
Hose R5-5	3-3/8
Hose R2-8	7
Hose R2-12	9-1/2
Hose R2-16	11

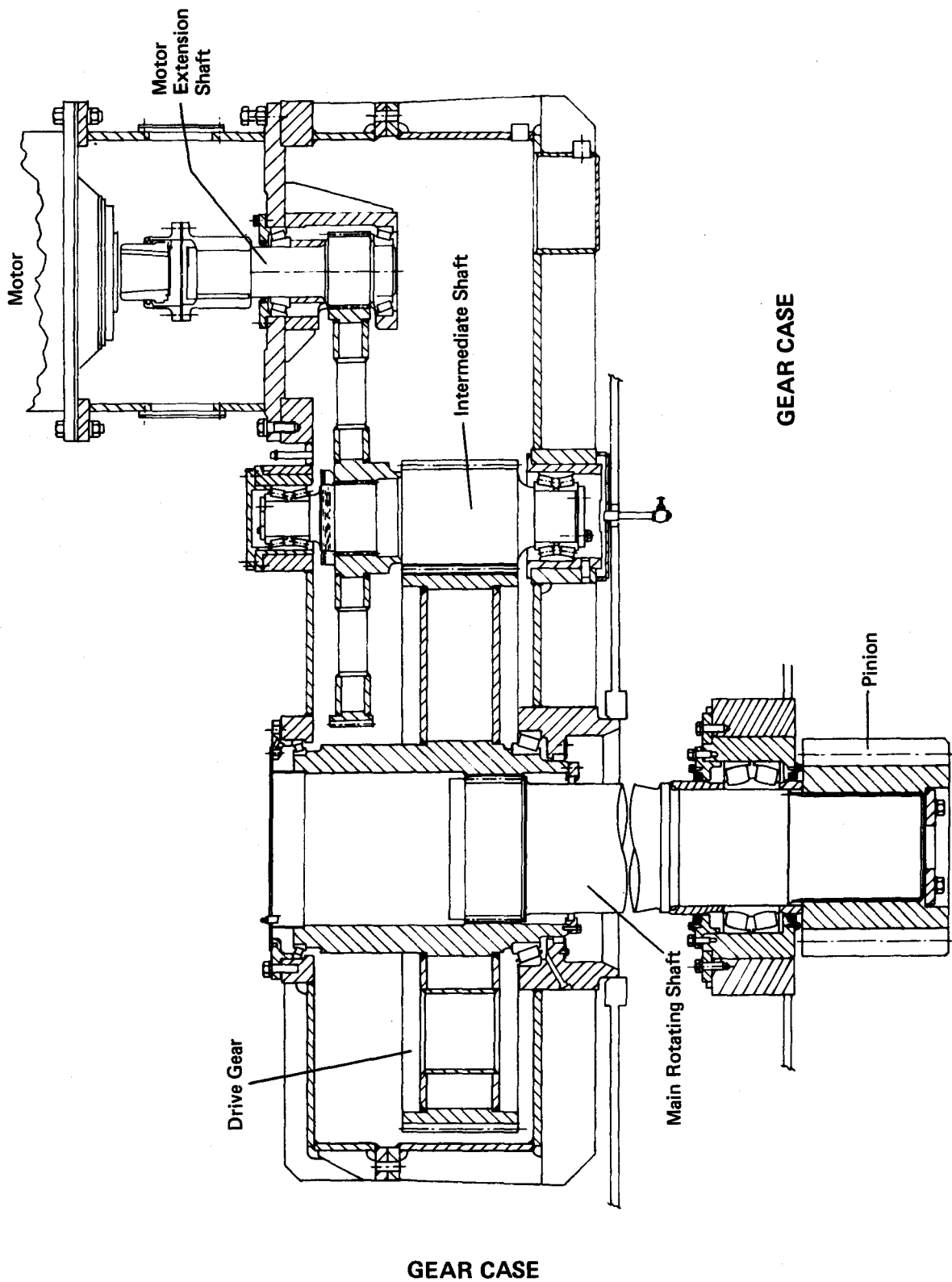
A matching rail is bolted to bottom of rotating frame and is the same as the tub rail except for the space provided to remove the rollers.

Two **HOOK SHOES** lift the leading edge of tub during the walking step. Each hook shoe is pinned to a support casting that is welded to the bottom of the rotating frame. Clearance of 3/8 inch exists between the hook rail on the tub and the wear plate on hook shoe when machine weight rests evenly on all rollers. Adjust clearance by placing or removing shims between the wear plate and hook shoe.

Disengage hook shoe by removing the rear pin and swing hook toward rear of machine and replace pin in top hole to hold hook shoe.



**HOOK SHOE**



**HOIST AND/OR DRAG DRUM** assemblies consists of two self supporting rope lagging sections bolted together at center with rod bolts. Parts are interchangeable.

The drum end castings and gear hub are rod bolted to the lagging.

The split double helical drive gear halves are joined together and mounted on drum end castings as described in Engineering Data Section.

**NOTE:** All bolts should be checked after first week of operation, thereafter, every 500 hours. Should any bolts appear loose, repeat tightening procedure.

The drum is supported by two large diameter spherical roller bearings. The bearings are mounted in bearing housings that are bolted to gear case and pedestal. The bearing cones are held in place on the stub shaft by a retainer plate. Be sure spacer ring is placed over stub shaft before bearing cone is assembled on shaft. The bearing cup is held in housing by a retainer plate and bearing cap with rod bolts. The gear end bearing cup is held snug between cap and plate. The opposite bearing cap is allowed to float on the drag drum while the right end of hoist drum is allowed to float. Hand pack bearings at assembly with MPG.

**HOIST OR DRAG MACHINERY GEAR CASE** motors and gearbox for hoist drum are located at left of drum. The drag drum motors and gearbox are located at right of drum.

The motors drive the drum thru a gear train consisting of motor extension shafts and intermediate shaft assemblies. The shaft assemblies are mounted in an oil tight case.

The motor extension is a shaft with integral pinion that is coupled directly to motor armature shaft by a flexible coupling. The shaft is supported in the gear case by two single row cylindrical roller bearings. The bearings and flexible coupling allow limited end play so that pinion can self align double helical gear mesh. Refer to eccentric cartridge mounting for gear teeth alignment.

The motor coupling hub is attached to the tapered motor armature shaft by the procedure described in Engineering Data Section under installation of shrink fit pinions.

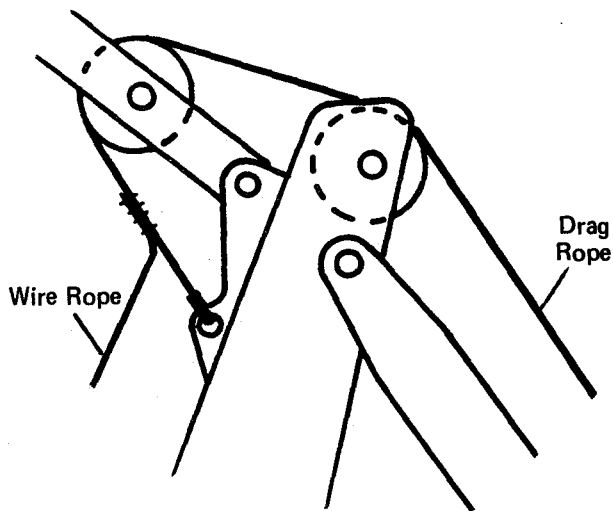
The intermediate shaft assembly consists of a large double helical gear that meshes with the motor extension shaft pinions. The gear is attached to the shaft and integral pinion by involute splines. The shaft is supported by two single row, cylindrical, roller bearings. One bearing is mounted in a boss of the gear case. The inside end of shaft is supported by a bearing mounted in an outboard bearing housing, bolted to gear case structure.

Only the drive gear is inside oil tight gear case. The pinion that turns main drum shaft gear is an open gear with suitable guard. A split oil seal on the shaft between gear and pinion is

To **RAISE BOOM**, (Once Lowered), using drag machinery power raise mast until boom support ropes are in a tight position. Remove the cribbing that was used to support the mast.

Lift boom a few inches off cribbing and set brakes. If the brakes hold in this position, they will hold the boom at any angle.

After testing brakes, **SLOWLY** and **CAUTIOUSLY** raise boom until the bores on the mast link and gantry are aligned. Replace the mast link pins and all lube lines atop gantry.



If boom is raised to high to insert pins, an easy way to control a slight lowering is snap a brake magnet valve **QUICKLY** off and on with a screwdriver.

Run a wire rope up front of gantry and attach it to the drag rope near socket. Attach other end to a dozer or truck in a tight position. Remove the pin holding the socket to gantry.

Remove the electrical jumper from the hoist and drag brakes and readjust all brakes. Replace all hoist and drag ropes to the operating position.

While pulling wire rope, remove drag rope from both drums. Attach hoist winch line to end of drag rope to keep rope from running after it has cleared hoist drum.

Before starting digging cycle recheck placement of pins, retainers, lube line, etc.

Two **BOOM POINT SHEAVE** assemblies mount at the boom point. A sheave assembly consists of a sheave that turns on two tapered roller bearings. The bearings mount on a sleeve carrier that is supported by a ball joint and spherical bushing. The ball joint allows sheaves to oscillate in order to follow the fleet angle of the hoist rope.

Each sheave is returned to the normal or vertical position by a torsion bar. The live end of the torsion bar is attached to the bearing housing and the dead end is anchored to a bulkhead in the boom structure. With an aligning pin the male member and female member of the ball joint limit the oscillation of the sheave to a plane parallel to center line of boom.

The fixed knobbed point shaft is held in place by two bearing caps rod bolted to the boom structure and retainer plates bolted to shaft end.

## **PROCEDURE FOR ASSEMBLING FAIRLEAD SWIVEL PINS INTO MOUNTING BRACKET –**

1. Assemble lower swivel pin (solid pin) into lower bracket.
  - A. Pack pin in dry ice for a minimum of 12 hours, circulate the air inside the box to provide even cooling of the whole pin.
  - B. Locate bracket so that pin may be removed from cooling box and installed into bracket in a minimum amount of time. Suggest a dry run before freezing pin to practice handling.
  - C. After installing frozen pin, maintain pressure to hold pin against shoulder in bracket while it warms to room temperature.
  
2. Assemble upper swivel pin (hollow pin) into upper bracket.
  - A. Assemble bearing complete, bearing retainer and bearing retainer sleeve on shaft.
  - B. Pack pin in dry ice for a minimum of 6 hours, circulate the air inside the box to provide even cooling of whole pin.
  - C. Locate bracket so that pin may be removed from cooling box and installed into bracket in a minimum of time. Suggest a dry run before freezing pin to practice handling.
  - D. After installing frozen pin, maintain pressure to hold assembly against bracket clamping the bearing and bearing retainer sleeve while it warms to room temperature.

**FAIRLEAD SNUBBERS** (two used) consist of a two pieced friction band anchored to gantry and wrapped on a friction housing bolted to top of fairlead swivel bracket. A bolt and heavy spring join the band halves. Adjust snubber, by turning connection bolt nuts, tight enough to stop any swinging of fairlead bracket at start or stop of machine rotation.

**NOTE:** Many small motors use sealed bearings requiring no lube for 2 or 3 years. Add lube with units stopped and drain plug removed. After adding lube, run generator or motor with bottom plug removed for about one full hour to allow ALL excess lube to flow out. PLEASE REPLACE DRAIN PLUG. In most cases, the main hoist, drag and swing motors have no plug to remove. Surplus grease flows out in the pocket beneath bearing housing.

On vertical and a few horizontal motors, remove the plug same as with generators. As mentioned in the 250 hour lube procedure, these bottom plugs are removed before lubing to see that excess lube escapes. Probing with a clean wire assures the old grease has not hardened and blocked the passage. PLEASE REPLACE DRAIN PLUG.

About once a year, or after 7500 operating hours; purge bearings by pumping enough lube thru bearing while running so new grease appears at shaft or bottom plug hole. As lube seeps out along shaft, wipe away. This is important. Finally, after 15 or 20 minutes of operation, thoroughly clean off shaft. New grease usually appears first at bottom hole, but it may be seen first at the shaft. PLEASE DO NOT FORGET THE DRAIN PLUG.

Whenever possible, about once in 2 years, disassemble bearings and remove ALL old lube by thoroughly cleaning with light lube oil or petroleum solvent. Each time the bottom plug is removed, push a clean wire into the hole to check the lube is not hard and plugging the hole.

One measuring tablespoon equals approximately one ounce of grease. Use General Electric Company ball bearing grease D6A2C5 for their equipment. Use Westinghouse Electric grease 1449556 for their equipment.

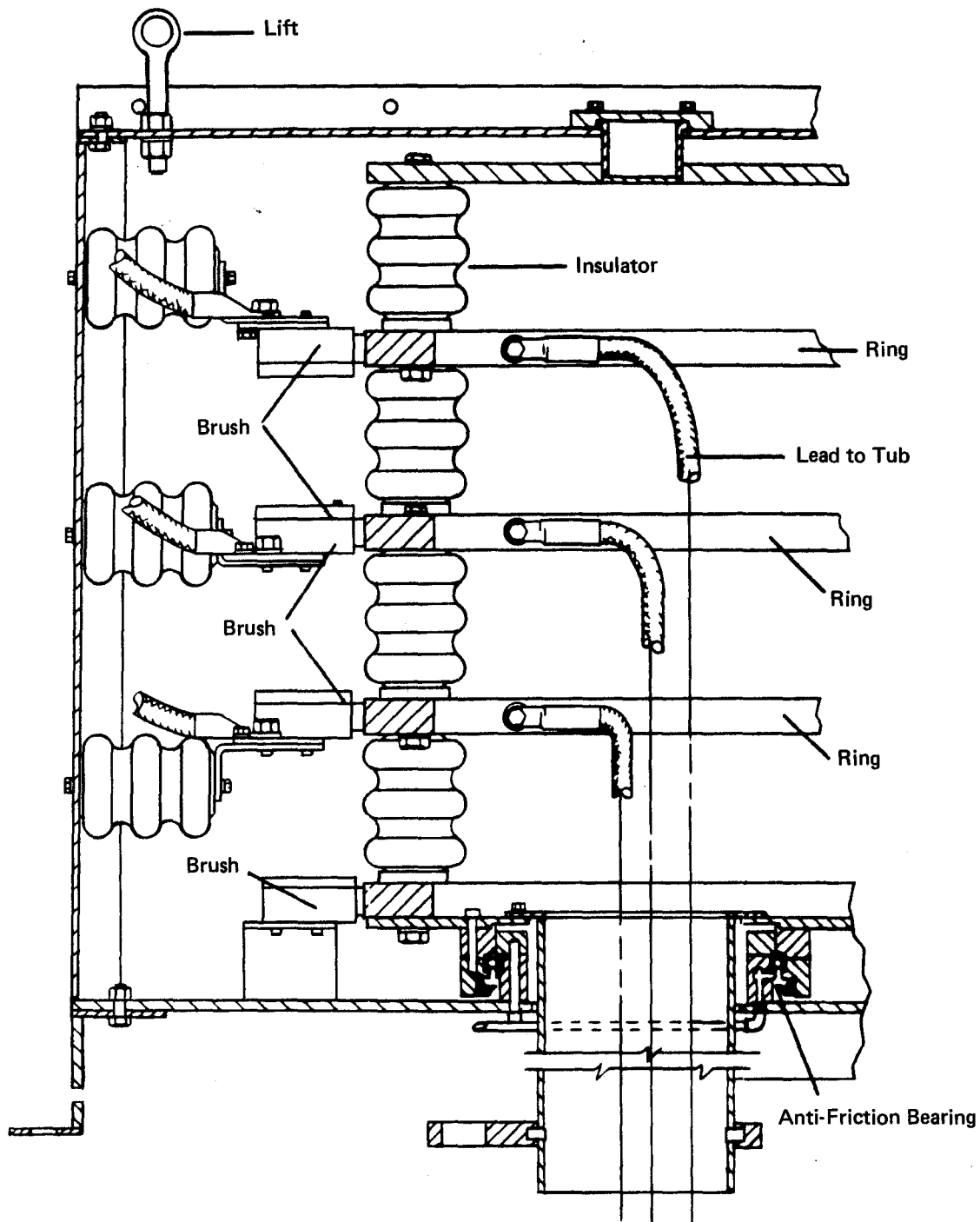
**CAUTION: DO NOT MIX GREASE NOT OF THE SAME BASE.**

In cold weather, when machine shuts down long enough to cool off, run hoist, drag and swing motors for warm up and allowing lube to flow before starting to dig. In extreme cold weather, motor bearings may be warmed with a radiant heater. As each set of motors warms up, run under light loads to maintain lube flow while the next set warms up.

**FEEDER CABLE** must contain a provision for a ground connection. Especially where 2300 volts and above are used. The power line end must attach (see paragraph on ground circuits) to a suitable permanent ground. The machine end must securely attach thru a bolted connection to ground machine frame. This provides a constant ground for the machine and electrical equipment. Failure to provide adequate ground endangers workers and equipment.

**POWER LINE GROUNDING CIRCUIT ADEQUATE FOR THE MACHINE CANNOT BE OVER EMPHASIZED.** Without a good grounding system, high voltage exists between the machine and ground. The portable cable and power lines supplying the machine must have a ground wire ample in capacity running parallel to the main wires over the entire distance from transformer to machine. A suitable grounding system must be used at the transformer. Consult your electric supplier or MPSD for details.

The **COLLECTOR RINGS** transmit incoming power from tub to rotating frame. **ALWAYS DISCONNECT** this incoming power at the source when servicing. This assembly consists of four rings stacked with ceramic insulators secured to tub center pin. Location is in space over center journal below deck of rotating frame. The brushes attach to the outside case. Clean and inspect every 30 days.





Nom. Diam.	Shaft		Running Clearance	Nom. Diam.	Shaft		Running Clearance
	O.D.				O.D.		
34-1/2	34.500	.046	.068	38-3/4	38.750	.051	.073
	34.494	.068			38.744	.073	
34-3/4	34.750	.046	.068	39	39.000	.051	.073
	34.744	.068			38.994	.073	
35	35.000	.046	.068	39-1/4	39.250	.051	.073
	34.994	.068			39.244	.073	
35-1/4	35.250	.046	.068	39-1/2	39.500	.051	.073
	35.244	.068			39.494	.073	
35-1/2	35.500	.046	.068	39-3/4	39.750	.052	.074
	35.494	.068			39.744	.074	
35-3/4	35.750	.048	.070	40	40.000	.052	.074
	35.744	.070			39.994	.074	
36	36.000	.048	.070	40-1/4	40.250	.052	.074
	35.994	.070			40.244	.074	
36-1/4	36.250	.048	.070	40-1/2	40.500	.052	.074
	36.244	.070			40.494	.074	
36-1/2	36.500	.048	.070	40-3/4	40.750	.054	.076
	36.494	.070			40.744	.076	
36-3/4	36.750	.049	.071	41	41.000	.054	.076
	36.744	.071			40.994	.076	
37	37.000	.049	.071	41-1/4	41.250	.054	.076
	36.994	.071			41.244	.076	
37-1/4	37.250	.049	.071	41-1/2	41.500	.054	.076
	37.244	.071			41.494	.076	
37-1/2	37.500	.049	.071	41-3/4	41.750	.055	.077
	37.494	.071			41.744	.077	
37-3/4	37.750	.051	.073	42	42.000	.055	.077
	37.744	.073			41.994	.077	
38	38.000	.051	.073	42-1/4	42.250	.055	.077
	37.994	.073			42.244	.077	
38-1/4	38.250	.051	.073	42-1/2	42.500	.055	.077
	38.244	.073			42.494	.077	
38-1/2	38.500	.051	.073	42-3/4	42.750	.056	.079
	38.494	.073			42.744	.079	

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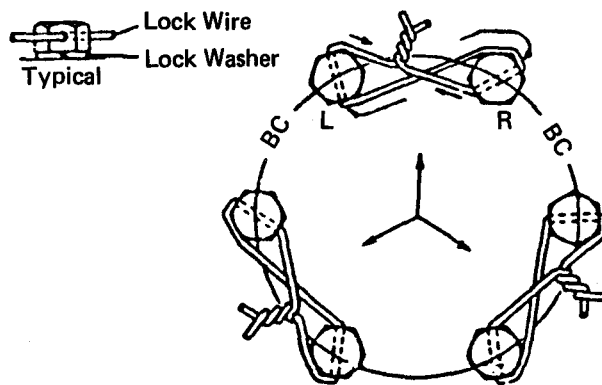
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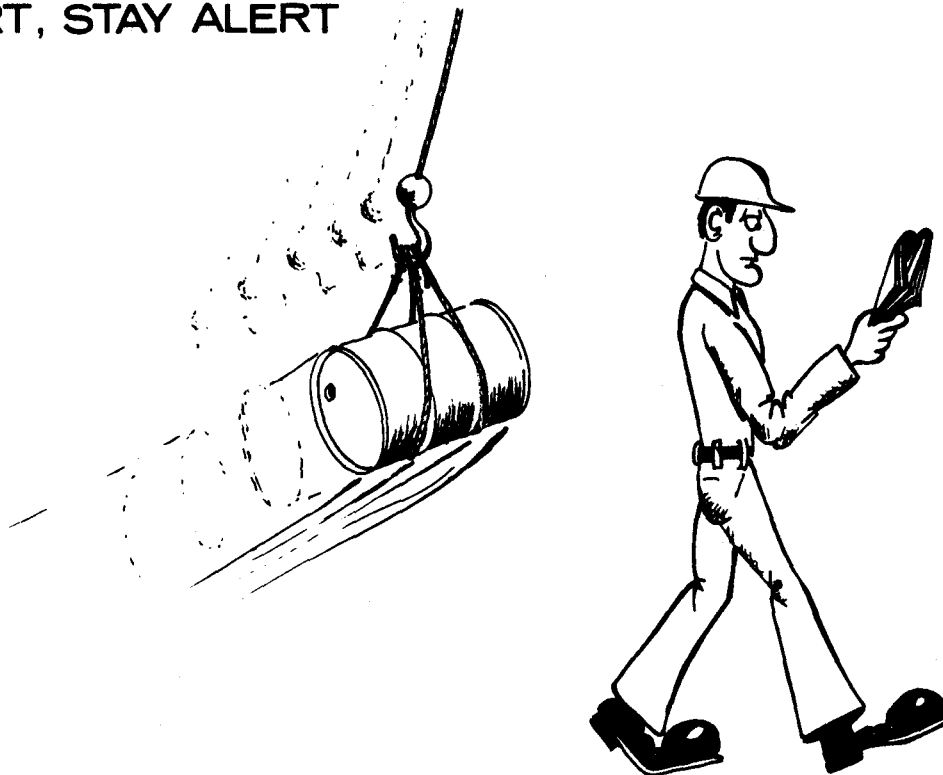
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**ENGINEERING STANDARD 1101-2** for wire lock cap screws. This standard establishes recommended method for these features. Use here is for designs where maximum locking assurance is required and periodic visual inspection is not possible. Check classification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

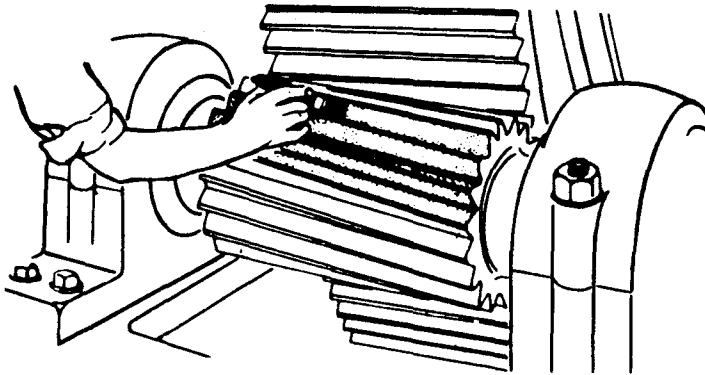


**Wired in Pairs:** Establish left and right hand fasteners as viewed from center of bolt circle. Insert left end of wire thru left hand fastener from inside to outside of bolt circle. Insert right end of wire thru right hand fastener from outside to inside of bolt circle.

**BE ALERT, STAY ALERT**

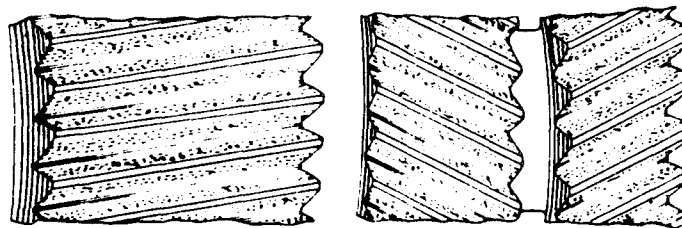


teeth across the face. Roll pinions back and forth thru the mesh several times to trace contact pattern on gear teeth. If motor power unavailable, use a torque arm and BUMP teeth on BOTH sides as pinion is rolled back and forth. This contact pattern may be scattered, but shows across at least 80 percent of the gear face. (See following sketch).



**TYPICAL CONTACT PATTERNS:**

After a satisfactory pattern is established for the initial position of the gear, make the SAME contact check at three more points on gear, spaced 90 degrees apart. A minor adjustment to pinion may be necessary to produce the best average contact on the gear.

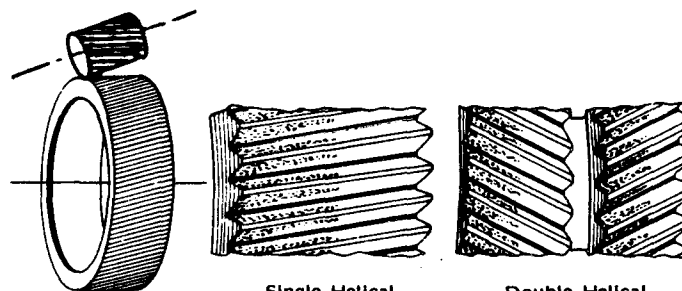


Single Helical

Double Helical

**INSPECTION:** Dowel ALL bearing pedestals and RECHECK ALL bolts to secure gear setting. INSPECT gear teeth and REMOVE ALL metal upsets and burrs that occurred in handling or assembly. CLEAN gear teeth and enclosures thoroughly BEFORE enclosing gears.

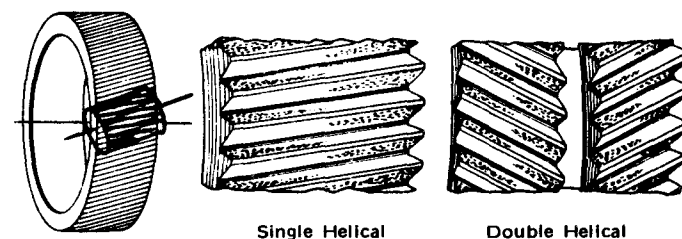
**AVOID MISALIGNMENT IN PLANE OF CENTERS:** If gears are misaligned in plane of centers, pattern develops as shown in sketches at right. MOVE pedestals to correct this condition and obtain FULL contact across ENTIRE face width of gear.



Single Helical

Double Helical

**AVOID MISALIGNMENT AT RIGHT ANGLE TO PLANE OF CENTERS:** If gears are misaligned at right angles to plane of centers, pattern develops as shown in sketches at left. To correct, MOVE pedestals until obtaining a FULL contact across ENTIRE face width of gear.



Single Helical

Double Helical

Intermittent bands applied to large diameter strands during manufacture minimize outer wire displacement while handling. These bands should remain on the strand until after installation.

After accurate measurement at the factory, a longitudinal strip is placed on the strand. During installation, it is extremely important that this longitudinal stripe is kept in a straight line and NOT permitted to spiral around the strand.

If rotating the strand to align socket pin hole is absolutely necessary; then its BEST to rotate in a direction opposite to the strand lay. For example, right lay strand (outer wires spiral to the right) may be turned in a counterclockwise direction. Left lay (outer wires spiral to left) may be turned in a clockwise direction. It is IMPORTANT that the strand be turned so as to tighten, rather than loosen the lay of the outer wires. Exception: only if adjustment is very small.

Following installation, and periodically thereafter, lube the strands at socket base for a minimum distance of three feet.

**COILS**, small enough for uncoiling by hand, require that one man hold the socket tagged, **FRONT END**. The second man rolls the strand coil along a level and obstacle-free surface away from the first man. This permits the strand to uncoil naturally without spiraling or twisting.

Please **DO NOT** attempt to uncoil the strand in the manner often used to uncoil a garden hose. (**DO NOT** lay coil on ground and carry one end away from it). This is wrong. This method easily results in completely ruining the strand. Besides its not great for hoses either.

When using a swift turntable for larger diameter strands shipped in coils, as recommended, use also a drag-type brake to prevent any rapid rotating speed from exceeding the pulling speed. This prevents kinking and looping. The pulling device attaches to the socket tagged, **FRONT END**.

Needless to say, observe all the Common Precautions also. Remember the longitudinal stripe and keep it aligned.

**REELS** need a shaft thru a center hole and enough height to clear ground and revolve properly.




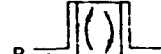
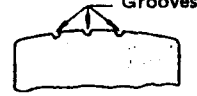

Use a simple timber brake against reel flange(s) to provide uniform unwinding and prevent slack from developing in strand on reel.

**TABLE 2 (cont.)**

<b><u>BUCKET COMPONENT PART</u></b>	<b><u>MATERIAL – MPSD SYMBOL</u></b>
Runners	FR4
Shrouds	CL4B
Tooth Point	CFE-S, CK-QS
Top Corner Casting	CK-Q
Tooth Wedge	CK-Q
Top Rail Casting	CK-Q
Trunnion	CL4B
Wear Shoes	CFE
<b><u>RIGGING COMPONENT PART</u></b>	<b><u>MATERIAL – MPSD SYMBOL</u></b>
Bushings	KO4, Manganese
Chain Links (Build-up not recommended)	CO1
Dump Block, Frame	F, FHL, FK
Sheave	CC2A
Retainers	F
Socket Casting & Ball	KP3
Equalizer Block, Frame	F
Sheave	CC2A
Wear Blocks	CB
Pins (Build-up not recommended)	KO1 Ind. Hardened
Rigging Casting Misc.	CFE
Spreader Bar	CN, F, FHL

**THIS INFORMATION IS FROM MPSD CI-937**

## MODES OF FAILURE

FAILURE	GENERAL CONDITION	EXAMPLE
Progressive cutting by corner of piston groove.	Pulsating pressure on O-Ring.	
Progressive cutting as in static packing plus abrasive wear.	Pulsating pressure on O-Rings.	
Knibbling extrusion. Rupture of material, large pieces torn off.	Fatigue from shock loads, high temperature, local seizure, pulsating pressure, etc.	
Rotation of part or all of circumference of packing in groove. (Sometimes called "spiral failure")	Complete explanation not found. Occurrence not predictable. Possibly sudden increase in friction on working face.	 Found to occur chiefly when packing was moving in same direction as pressure.
Axial grooves worn in working surface.	Imperfections in cylinder surface. Particles of dirt, metal, or rubber.	 Segment of Plan View
Axial grooves as above.	Rapid passage of oil across working face.	See above sketch
Packing totally extrudes thru clearance space.	Large radial clearance. Soft packing.	

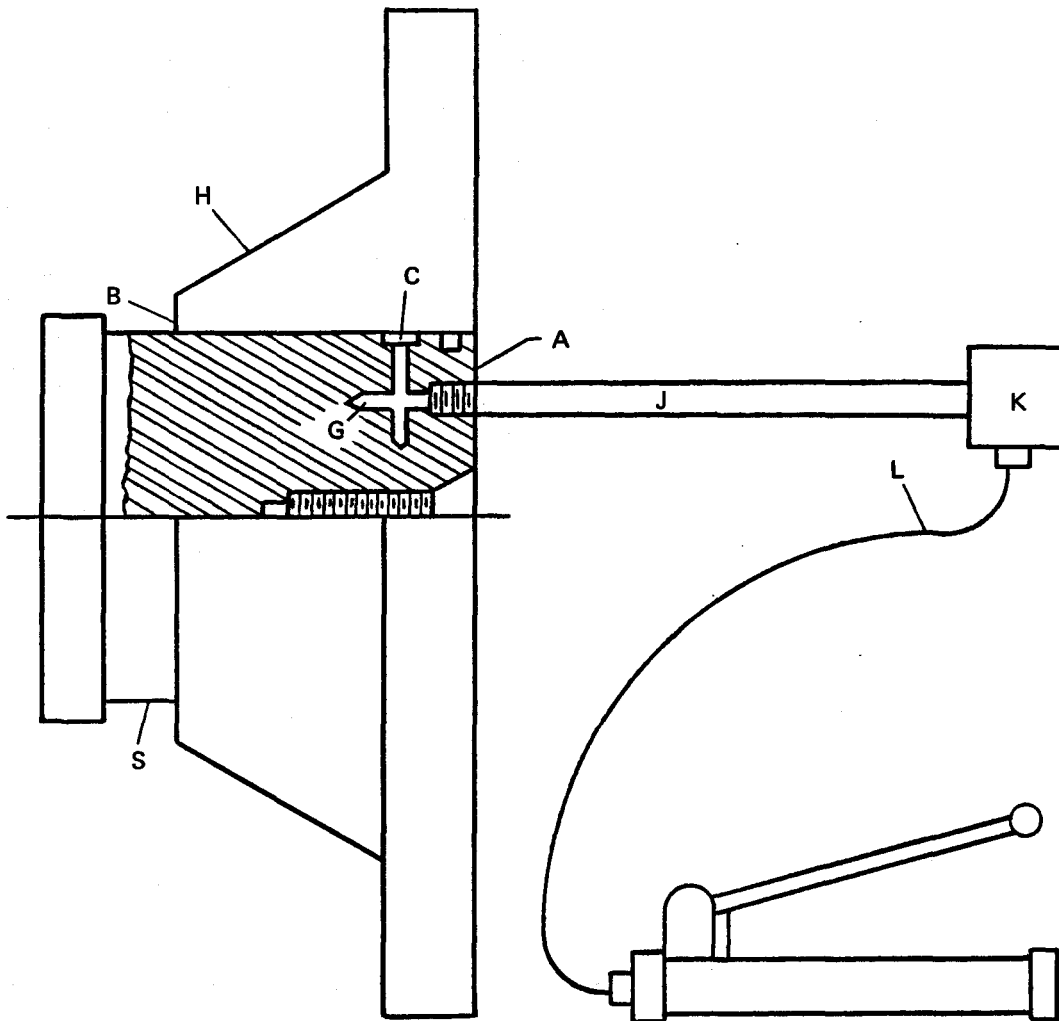
## DECIMAL EQUIVALENTS

1/32	.0156	—	1/64
	.0312		
1/16	.0468	—	3/64
	.0625		
3/32	.0781	—	5/64
	.0937		
1/8	.1094	—	7/64
	.1250		
5/32	.1406	—	9/64
	.1562		
3/16	.1719	—	11/64
	.1875		
7/32	.2031	—	13/64
	.2187		
1/4	.2344	—	15/64
	.2500		
9/32	.2656	—	17/64
	.2812		
5/16	.2969	—	19/64
	.3125		
11/32	.3281	—	21/64
	.3437		
3/8	.3594	—	23/64
	.3750		
13/32	.3906	—	25/64
	.4062		
7/16	.4219	—	27/64
	.4375		
15/32	.4531	—	29/64
	.4687		
1/2	.4844	—	31/64
	.5000		
17/32	.5156	—	33/64
	.5312		
9/16	.5469	—	35/64
	.5625		
19/32	.5781	—	37/64
	.5937		
5/8	.6094	—	39/64
	.6250		
21/32	.6406	—	41/64
	.6562		
11/16	.6719	—	43/64
	.6875		
23/32	.7031	—	45/64
	.7187		
3/4	.7344	—	47/64
	.7500		
25/32	.7656	—	49/64
	.7812		
13/16	.7969	—	51/64
	.8125		
27/32	.8281	—	53/64
	.8437		
7/8	.8594	—	55/64
	.875		
29/32	.8906	—	57/64
	.9062		
15/8	.9219	—	59/64
	.9375		
31/32	.9531	—	61/64
	.9687		
	.9843	—	63/64
1	1.0		

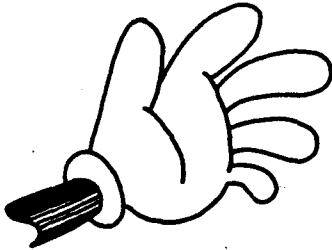
If oil does not appear on both hub ends due to insufficient pressure (excessive shaft end leaks), use heavier oil or grease. Slight, cautious peening around leak helps.

If pressure builds up, but no oil appears at hub end opposite shaft end; heating hub helps. Apply torch carefully and evenly to hub as far back from shaft end as possible. This heat relieves the back area of fit and allows oil to appear at both hub ends.

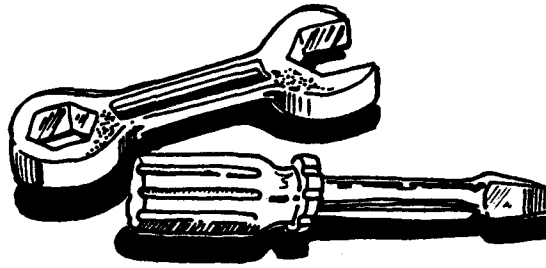
**PRESSURE EQUIPMENT**, such as a Blackhawk pump, connects to groove C by high pressure flex hose L, high pressure elbow K and high pressure nipple J. This nipple J is long enough for hub to pull clear of shaft extension and not interfere with elbow or hose. The nipple J also supports coupling when it drops free. The nipple screws into a pipe tap in the shaft end which connects to groove C thru two drilled holes G.



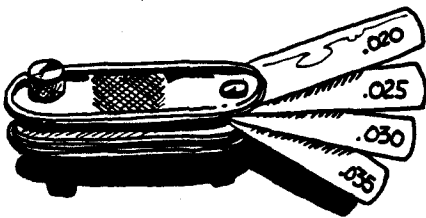
**FEELING**



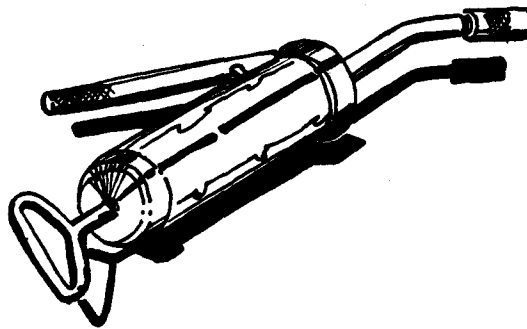
**TIGHTENING**



**ADJUSTING**

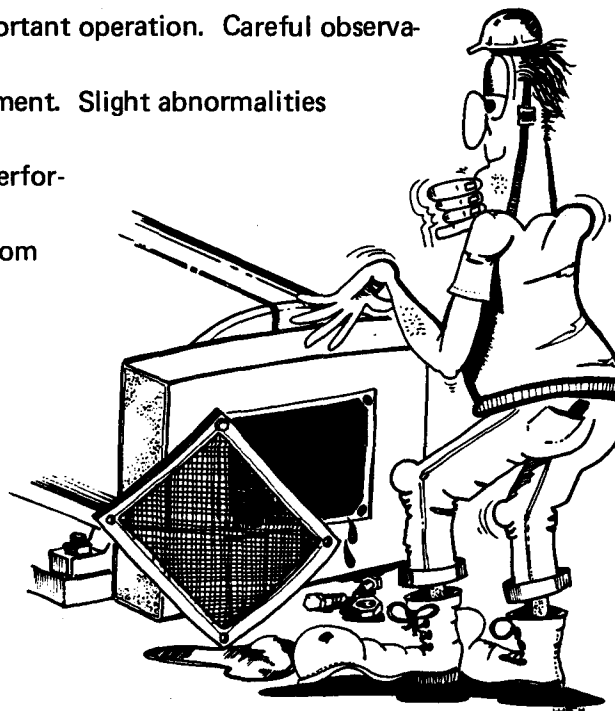


**LUBRICATING**



**INSPECTION** is probably the most important operation. Careful observation is required of all parts of the equipment. Slight abnormalities may not interfere with the equipment performance BUT those that are a deviation from the normal should be discovered early.

When inspecting, notice placement, state of cleanliness, color, etc. of parts(s). Example: discoloration indicates overheating; all guards, bolts in place and good housekeeping.





















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