Technical Manual

Be sure to promptly reinstall safety devices, guards or shields after adjusting and/or servicing the machine.

After servicing, be sure all tools, parts or servicing equipment are removed from the machine.

Protective eye goggles should be worn at all times when working on the air conditioning system. Work on the air conditioning system only in a well ventilated area.

Wipe away excess lubricants around bearings and gears. Never lubricate parts in motion.

Operate machine on level ground and be continuously aware of swing clearance. Never hold a load longer than needed in dump cycle. Use swing brakes only when machine is stopped.

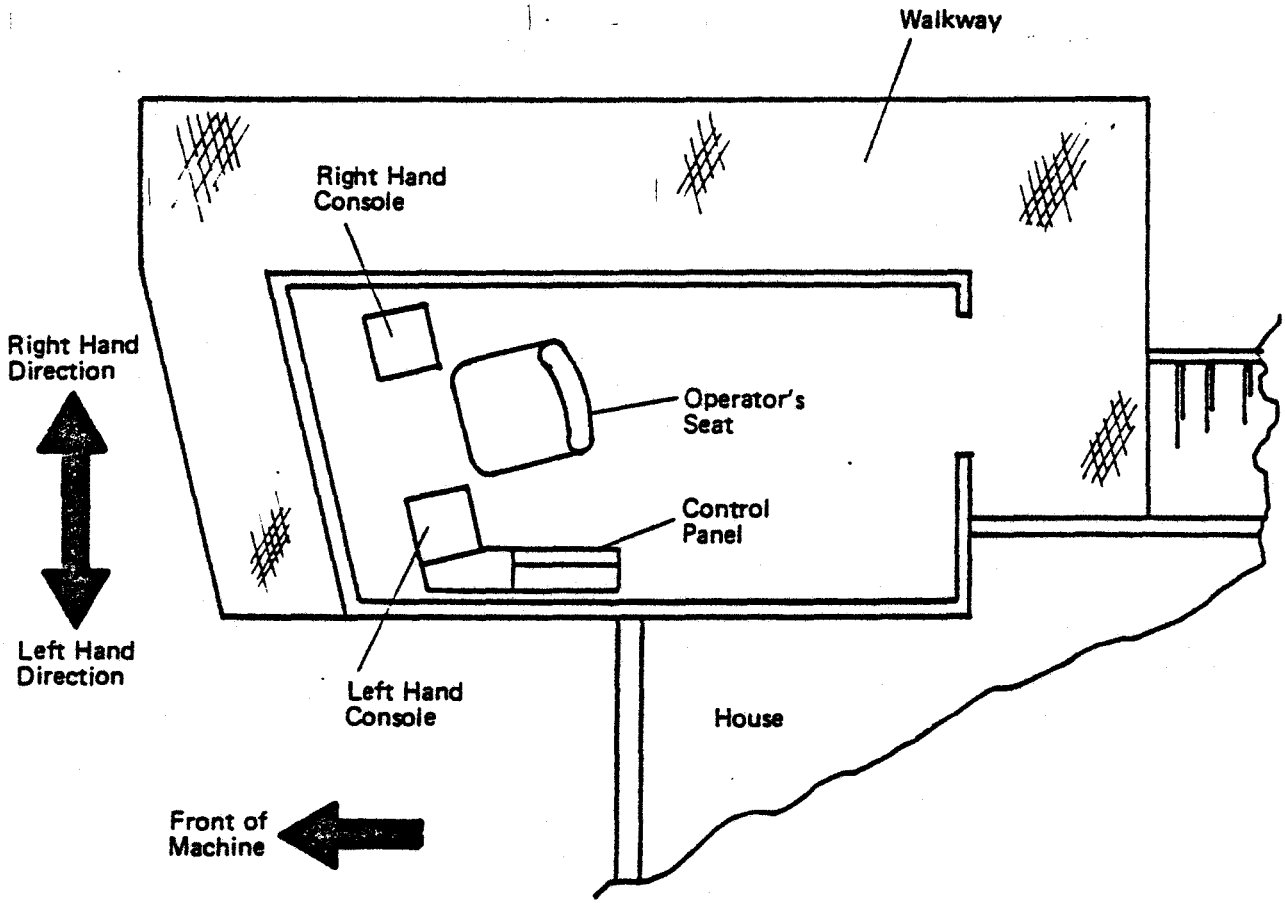
SECTION 2

OPERATION

The operating controls are grouped as Primary or Secondary, depending on their relationship to the digging cycle. The Primary controls are directly involved with the digging operation (Cycle) and the Secondary controls are the necessary lights, buttons, etc. to support the Primary controls.

PRIMARY CONTROLS are the Hoist/Swing joystick located on the right hand console and the Crowd Lever, with Dipper Trip on the left hand console.

NOTE: Right and left corresponds to the operator's hands at the controls as he faces the dipper.



TYPICAL START-UP — From a completely shutdown machine. Use the controls on the starting panel at rear of machine.

First, make sure the phase sequence light is not on; then start the three filter fans, one at a time. The sound of the fan will tell you if it is operating. Push the stop button if unusual sounds are heard.

Next, start the motor blowers by depressing the start pushbutton. The sound of the fans will tell if they are operating. Stop fans immediately if unusual sounds are heard.

Now, turn the air compressor switch to the "auto" position, then push the PCM XFMRS reset button if the red hoist and/or swing light below this button is on.

Finally, start the PCM XFMRS by fully depressing and releasing the start pushbutton. Make sure the green indicator light is on.

If all systems are operating normally, leave the machinery house and proceed to the operator's cab.

Upon entering the cab observe the air pressure gauge to see if it is reading between 90 and 115 PSIG. If it does not, check reason before proceeding. See Section 6 of this manual for details of air system.

Now, see if any of the warning lights on the left hand control panel is on. If a light is on investigate the reason.

Check the swing, crowd and hoist brake switches to be sure they are in the "Set" position. Also, the "Dig-Propel" transfer switch should be in the "Brk Set" (center) position.

Next, check the position of the crowd control and the hoist/swing joystick to be sure they are in neutral (center) position.

Now, adjust the operator's seat and foot rest to fit you. Depress the excitation start pushbutton. This energize the motion controllers.

Move the transfer switch to "Dig" position and the swing crowd and hoist brake switches to "REL" position. The machine is now in the DIG mode as indicated by the green light on rear of the right hand console.

USE ONLY CLEAN AND PROPER LUBRICANT – KEEP IT CLEAN

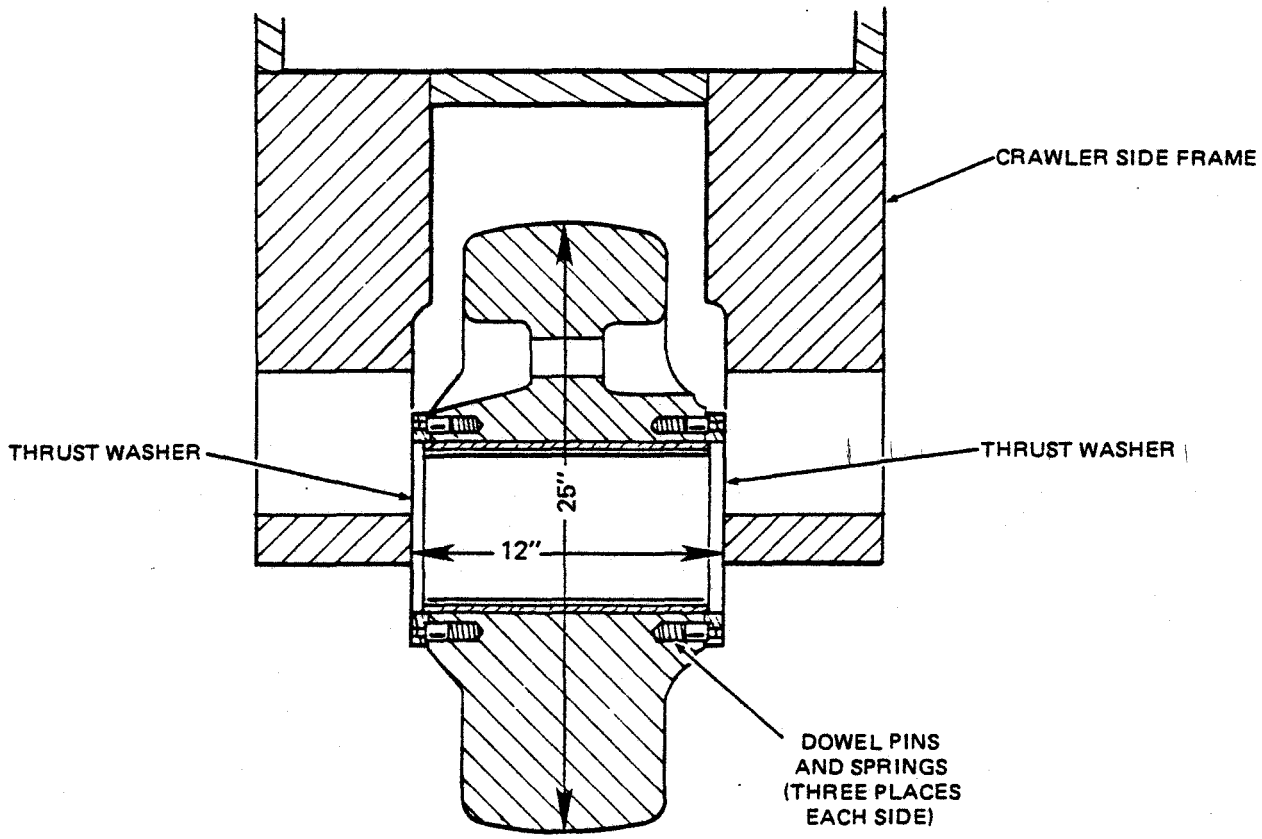
Selection of proper lubricant remains of the utmost importance. Improperly lubricated bearings, gears, couplings, and other precision parts quickly fail. For this reason, lubricants selected in accord with the ASTM Standards are recommended. These standards were compiled in cooperation with major petroleum suppliers to insure the consumer of exact supply to specific requirements regardless of source.

We recomr end you avail your petroleum supplier of the following information to assist him in selecting the proper product for each application on this machine.

Final acceptance of all lubricants supplied to this standard will be based upon satisfactory performance in its intended application and does not relieve the supplier of performance responsibility of brand name products.

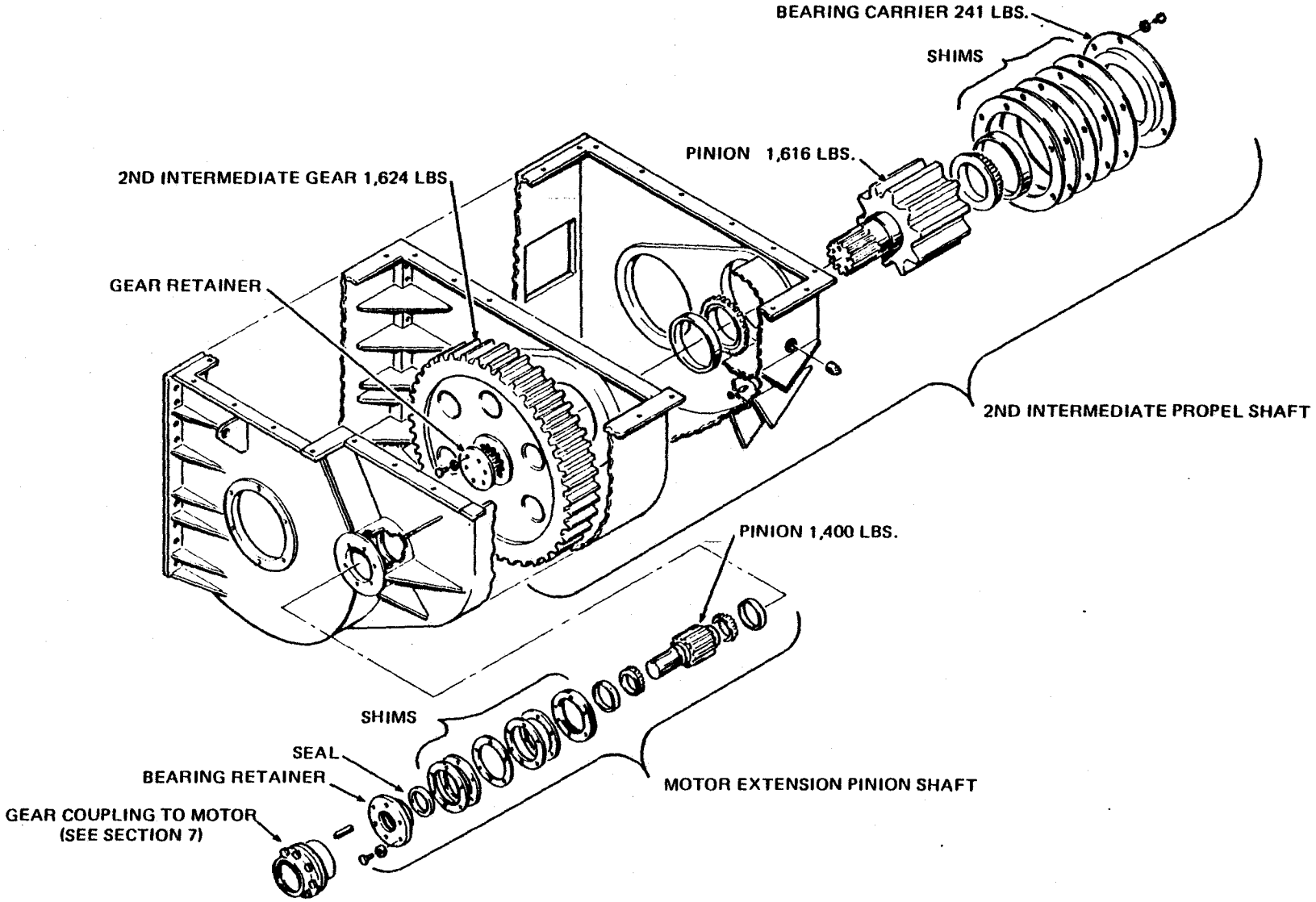
NAME OF PART	TYPE	NO. OF POINTS	LOCATION	LUB. SYM.	METHOD & FREQUENCY
			LUBRICATION OF UPPER FRAME (cont.)		
Hoist Motor Pinion	Anti-Friction	2	In Bearing Boss	MPG	Auto, 15 Min., Digging
			LUBRICATION OF GANTRY		
Boom Support Anchor	Plain	6	In End of Clevis Pin	MPG	Auto, 15 Min., Digging
Support Bar	Plain	2	In End of Pin	MPG	Auto, 15 Min. Digging
Dipper Trip	Gear	1	Top of Casing	MPG	Auto, 15 Min. Digging
Dipper Trip	Anti-Friction	2	Top of Base	MPG	Manual, 500 Hrs.
			LUBRICATION OF BOOM & FRONT END		
Boom Support Anchor	Plain	4	In End of Clevis Pin	MPG	Auto, 15 Min. Digging
Boom Point Sheave	Anti-Friction	2	In End of Shaft	MPG	Auto, 15 Min. Digging
Shipper Shaft Yoke Block	Plain	4	In Top of Yoke Block	MPG	Auto, 15 Min. Digging
Shipper Shaft Bearing	Bushing	2	In Top of Bearing Boss	MPG	Auto, 15 Min. Digging
Int. Crowd Gear	—	1	Drip	OGL	Auto, 15 Min. Digging
Crowd Gear	—	1	Drip	OGL	Auto, 15 Min. Digging

Remove lube guard and disconnect autolube piping to roller. Remove roller shaft retaining bolt. Support roller on jacks or cribbing or use handling fixture similar to sketch. Carefully lower roller. If fixture is not used, clamp thrust washers to roller to prevent loss of dowel pins and springs. See figure titled "removal of load roller".



REMOVAL OF LOAD ROLLER

To install a new roller, position the roller, with assembled thrust washers, springs and dowel pins, into handling fixture. As an alternate method, clamp thrust washers to roller. Use



PROPEL GEAR CASE
(Sheet 1 of 2)

If the clutch does not have minimum engagement, adjust the position as described in Step B. Repeat this procedure to also check the right hand clutch for minimum clutch engagement.

If adjustment was required to meet the criteria of Step C or D, return to and repeat Step B thru D as a confirmation that the steering linkage is correctly adjusted for all conditions.

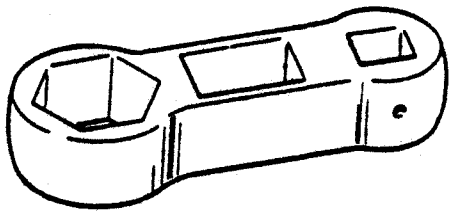
If it is not possible to adjust the steering linkage to meet the criteria of each individual step, something in the linkage is not correct. Dismantle the steering linkage mechanism. Dimensionally check the links, steering clutch, main clutches, anchor eyebolts and the cylinder's bracket location. Reassemble steering linkage and repeat adjustment procedure.

ROLLER CIRCLE AND MAIN SWING GEAR – The lower frame rail forms a full circle bolted and welded to the main rotating gear. The weight of the rotating frame and front end equipment is supported by the roller circle. There are 45 tapered rollers, with a flange on the inside edge. Each roller is mounted on a bushing. There is a thrust washer on the outer side of the roller. Top rail is in four segments with gap at each side of upper frame to permit roller replacement.

When starting a new machine, swing about 10 times in each direction with UNLOADED dipper, then repeat with LOADED dipper. For the first several operating days, swing machine one full revolution every four hours. After that, swing machine one full revolution at start of each shift.

Main swing gear mounting screws may loosen during machine operation unless proper torque of 2,285 foot-pounds is maintained. Due to inaccessibility of screws with standard torque wrench, use following tools:

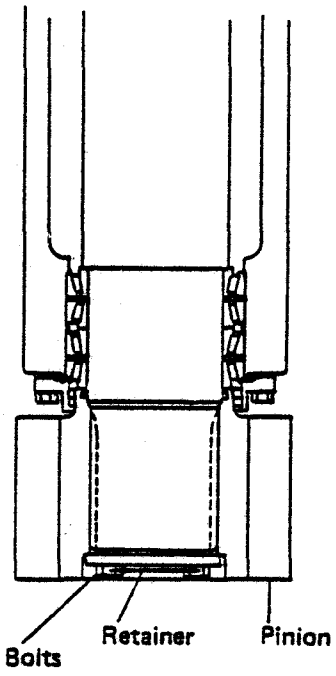
1. Adjustable click type torque wrench, range 100-600 ft.-lbs.
2. Torque multiplier
3. Torque drive off-set adapter



TORQUE DRIVE OFF-SET ADAPTER

In each unit, the motor pinion meshes with a large helical gear mounted on the intermediate shaft by involute splines. The bottom of the intermediate shaft has an integral pinion. This pinion meshes with a large gear which is splined to the main rotating shaft. This shaft extends thru the rotating frame. At the bottom is a pinion that meshes with the main rotating gear on the lower frame.

DISASSEMBLE THE SWING MACHINERY by rotating the machine until the machinery to be disassembled is directly over the front of the lower frame. Drain the 100 gallons of GL from the case at the globe valve under the upper frame. Then drain the main rotating shaft housing by removing the pipe plug on the side of the housing.



Remove the pinion guard. Support the pinion on jacks and cribbing so that the retainer can be removed. Remove the bolts and retainer. Lower the pinion onto the cribbing.

Remove the house roof panels over the swing case. Disconnect the electrical wiring from the motor and the air line from the brake. Next, remove the motor hold down bolts, disconnect the motor coupling and lift motor out of the machine with a choke cable.

Thru the opening in the gear case unbolt the pinion housing and lift out the housing and pinion assembly. Attach an eyebolt to the main rotating shaft and support it with a crane. Remove the lower retainer, oil seals and O-ring. Lower the shaft out of the assembly, the roller bearings will come out with it.

Remove the oil drain pipe and the gear case hold down bolts. Lift the gear case out in the same manner in which the motor was removed.

DISASSEMBLE THE GEAR CASE by removing the gear case cover hold down bolts. Mark the location of the five shoulder bolts as they are removed; then lift off the cover.

Remove the screws and lock plate from the top of the intermediate shaft; then lift the gear off the shaft splines. Next, remove the bearing retainers and shims from top bearings of the intermediate shaft and main rotating shaft.

Remove the bolts from the case center section; then, lift center section from gear case. Next, lift out the main gear and intermediate shaft. The bearings can then be removed.

Clean and flush out the case with light oil. Inspect all case components for signs of wear, cracks, chips, etc. Replace parts if necessary.

REPLACEMENT OF DIAPHRAGM – To install a new diaphragm, follow the steps on this page:

DANGER: Prior to removal of the brake, make sure the machinery will remain in a safe position.

1. Remove the brake from the machine, place it on a clean working surface with the end plate facing up. Next remove the shield.

2. Remove hex head screw from end plate in alternating sequence, two turns at a time (see sketch). The end plate, diaphragm, outer and inner clamp ring can be removed as an assembly.

3. Place the end plate with the diaphragm up. Remove the hex head screws to remove the outer clamp ring.

4. Remove the hex head screws holding the inner clamp ring, then remove ring.

5. Inspect and replace diaphragm as required.

6. Reinstall outer clamp ring and torque hex head screws to 20 foot-pound (27 Nm).

7. Reinstall inner clamp ring and torque hex head screws to 10 foot-pound (14 Nm).

8. Carefully place newly assembled end plate, diaphragm, outer and inner clamp ring on the brake. Assemble end plate hex screws using the same sequence as they were removed. Torque screws to 50 foot-pound (68 Nm).

9. Reinstall shield, then reinstall brake on machine. See MOUNT and STATIC ADJUSTMENT PROCEDURE.

SYSTEM STATIC ADJUSTMENT PROCEDURE – Before the machine is placed in operation, a static actuation check of the brake is recommended as follows:

DANGER: Prior to adjustment, make sure that the machinery will remain in a safe position.

1. Bypass any interlocks or use manual overrides on actuation valve.

2. Check for proper air pressure in air receiver tank.

3. Check for "all clear" in and around machinery.

a. Remove jam screw (51) and set screw (43). Press cylinder out of brake shoe. Press new cylinder into shoe and lock in place with set screw (43) and jam screw (51).

8. Coat the inside cylinder diameter with a soft silicone type grease, primarily intended for dynamic lubrication between rubber and metal. A typical grease is Dow Corning 55M.

9. Slide the piston rod into the end cap, and insert the assembly into the cylinder. Lock the end cap in place with the snap ring or cap screws and lockwashers.

10. Install the brake on the machine by following installation instructions given in the Brake Removal and Installation Section.

WARNING: Safety and product identification decals are located on the brake releasing cylinder (34). Do not remove these decals. Replace any decal that is damaged.

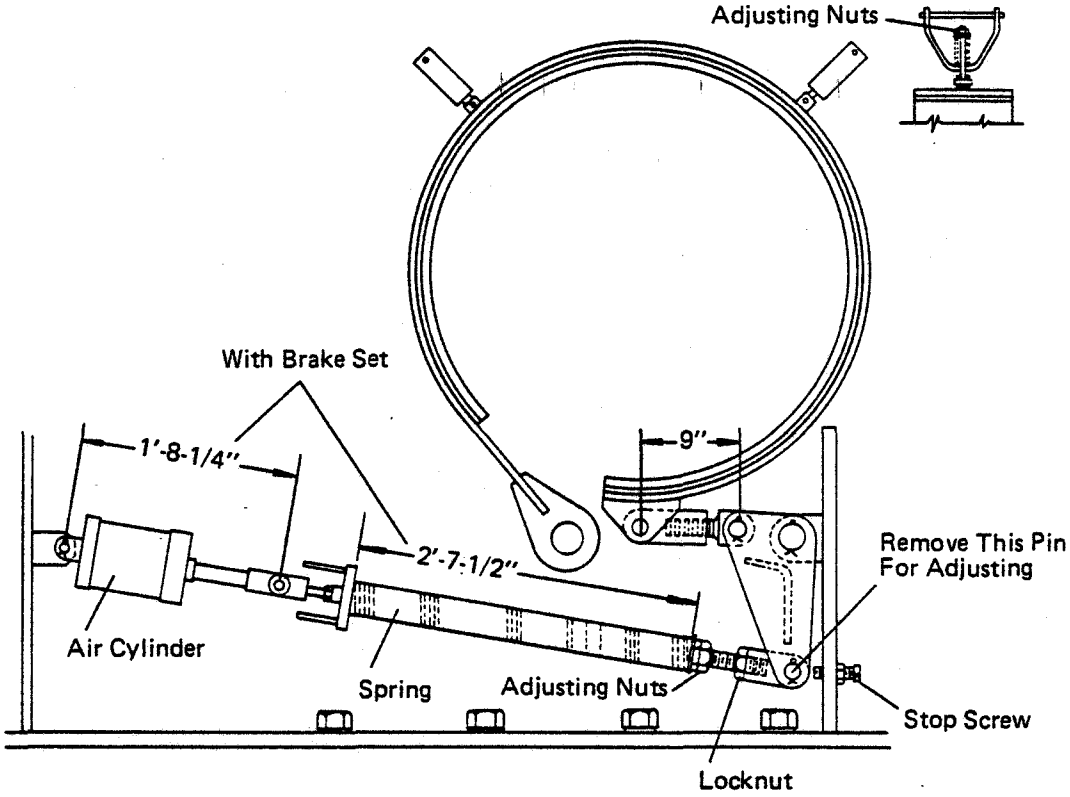
NOTES:

The hoist brake is a holding brake. Stop the hoist drum rotation by plugging the hoist motor (see Operation Section).

HOIST BRAKE ADJUSTMENT – A properly adjusted brake must hold the suspended loaded dipper. Adjust brake after replacement of part or after relining the band, by the following procedure.

Place dipper on the ground. Loosen the band lifters adjusting nuts to prevent restriction of the band. Clamp the band to the brake housing using three or more C-clamps. Make sure the band is in full contact with the housing all around the band. Release the compression on the set spring so that the linkage moves freely.

Remove the bottom pin from the lever, loosen the locknut on the spring rod. Turn the eye bar until the pin hole on the lever and eye bar are approximately 1/2 to 5/8 inch of alignment. Tighten locknut. Run the stop screw in until the holes are aligned, insert the pin and retain with the cotter pins. Back out stop screw until 1/2 inch clearance exists between the stop screw and lever.



HOIST BRAKE

Now, turn the compression spring adjusting nuts until the spring is compressed to 2'-7-1/2". Remove the C-clamps. Recheck clearance at stop screw and the length of the set spring.

Remove the sling or choker from the handle and attach the equalizer block to the dipper. Reconnect the dipper trip rope.

HANDLE ADJUSTMENTS – Install the wear bars in top of each yoke and check the clearance. The dipper must travel thru the yoke the entire handle length without binding with minimum clearance.

To measure clearance, the handle should be in the horizontal position with dipper slightly extended. Also, the weight of the handle must be resting squarely on the shipper shaft pinion.

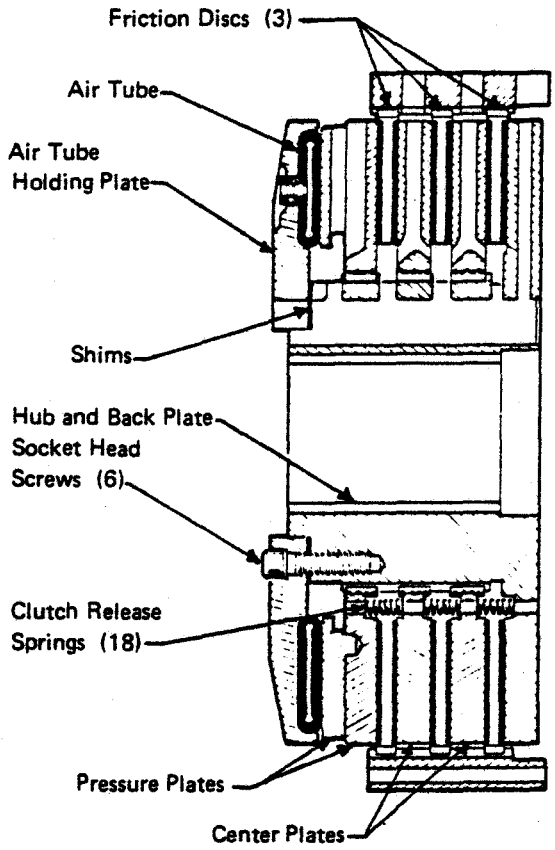
Pry up the ends of the wear bars until they stop moving. Measure the gap between the bar and the handle. If the gap is greater than 1/8 inch, add shims above bar to obtain 1/8 clearance. Always add the same number of shims at each end of the yoke block. If more than 1/4 inch of shims are required, replace the wear bars. Torque wear bar retainer bolts to 265 foot-pounds.

Before putting machine back into operation, check to see that all bolts, hardware, retainers, etc., are properly fastened and all lube points have been covered.

CROWD AIR CLUTCH – Is a friction drive designed to protect crowd machinery, dipper and dipper handle. When properly adjusted, clutch will transmit full stall torque but will slip when shock or overload is imposed.

Clutch requires no adjustment to compensate for wear. Air pressure, which determines slip point, can be adjusted by operator to suit digging conditions. Pressure is controlled by a regulator valve at operator's station. Use approximately 45 psi as an initial setting.

AIR TUBE REPLACEMENT – Release air pressure, then disconnect air hose from roto seal and air tube. Remove six socket head screws and air tube holding plate. Remove air tube.



SECTION 6

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, crowd and hoist brakes, steering clutches, crowd clutch and the auto lube system.

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 90 psi, SHUT DOWN and investigate the cause.

NEVER OPERATE THIS MACHINE WITHOUT FULL TANK PRESSURE.

AIR COMPRESSOR is located on the right front corner of the deck. The compressor mounts on a 120 gallon horizontal tank with a 10 hp, 3 phase electric motor. Pressure gauge, pressure switch adjusted to 100-125 psi and a manual are supplied. We suggest reading the manual and keeping as handy reference.

INSPECT the belt drive often and always 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, Section 3, for proper NON-DETERGENT oil used. Clean the air cleaner once a week or daily if conditions require.

AIR RECEIVER (Tank) drain valve should be opened several times a day to blow out condensed moisture. At beginning of each shift, open valve and blow out entire system.

TANNER DEICER introduces a chemical into the compressed air on the downstream side of the lubricator. To fill, slowly unscrew the fill plug at the top until air pressure in the tank has been vented by the check valve thru the bleed port in the plug, then remove the fill plug. Add deicer fluid to the level indicated on the sight gauge and replace plug. To regulate fluid flow, open the needle valve, on top, one full turn. Then, while operating the machine in a normal dig cycle, close the valve until a steady droplet flow is visible thru the sight dome.

NOTE: Each shift should check the deicer fluid level at the sight gauge.

The proper **INSTALLATION OF OIL AND GREASE SEALS** insures the continued operation of this machine.

Wherever assembly design permits; solid molded, soft type seals are used. Each molded seal fits with a slight interference on the outside diameter creating an oil tight fit between seal and bore. This fit holds the seal and prevents it from turning in the bore. The split seals supplied for replacement avoid the major machine disassembly required to install solid seals.

WARNING: DO NOT CUT A SOLID SEAL TO MAKE A SPLIT SEAL.

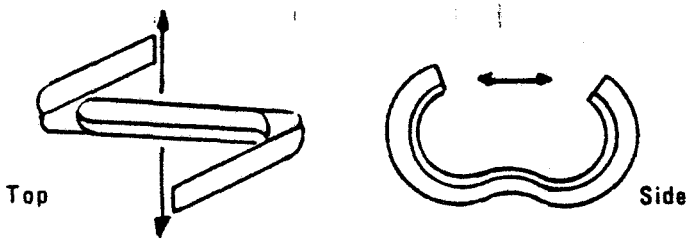
Split seals, especially made with interference fit at butt, install with compression at the joint. Consider split seals as temporary, until replaced with a solid seal at next major overhaul.

Store seals in a dark, cool, dry area. DO NOT OPEN shipping container before use. KEEP seal as clean as possible.

SPLIT SEALS install in a similar manner to solid seals.

1. Remove the garter spring and separate at the hook and eye.

2. Open the seal for shaft installation as shown in sketch.



Right Way Wrong Way

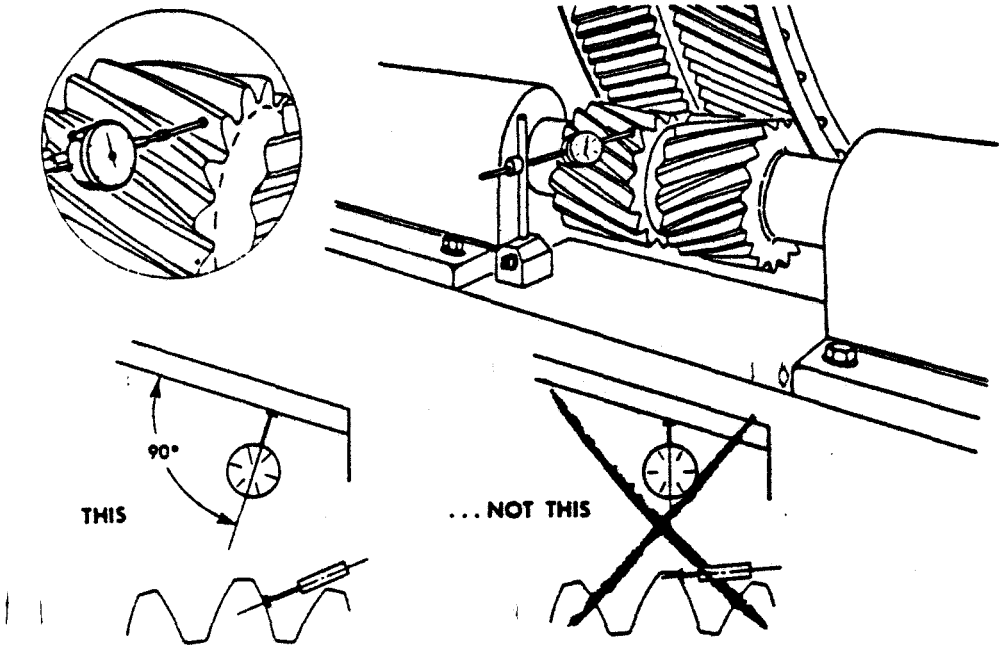
3. Move the butt ends along the axis of the seal.

DO NOT PULL ENDS APART. THIS BENDS OR BREAKS THE BACK OF THE SEAL.

WARNING: AT FIRST A SPLIT SEAL MAY APPEAR TOO LONG. DO NOT TRIM OR CUT THE ENDS OF THE SEAL.

4. Lube ALL seal surfaces, particularly the O.D. and the lip. Apply lube to shaft and bore also.

GEAR BACKLASH – All backlash values are given in the normal plane. Therefore, backlash checked with a dial indicator requires this device be set perpendicular to the helix of the teeth.

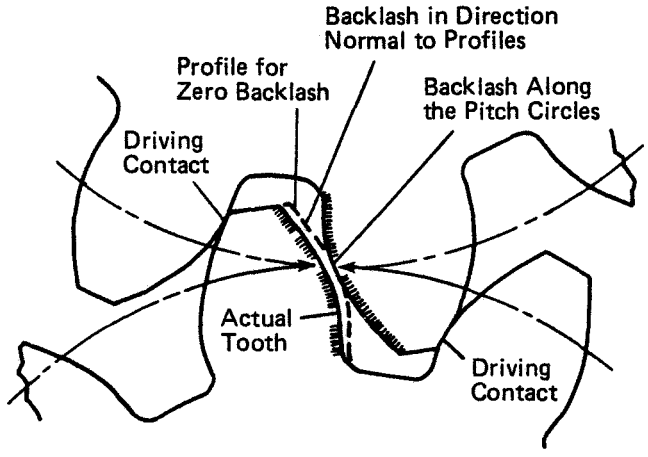


NOTE: Backlash is the amount by which a tooth space exceeds the thickness of an engaging tooth measured in pitch circles.

Required backlash for gears used on mining machines vary depending on value of diametral pitch. Table on page 16 gives assembled backlash values. These are measured in the plane of rotation.

NOTE: PLANE OF ROTATING BACKLASH is the actual clearance measured with a dial indicator between teeth on an assembled gear set after rotating to the point of closest engagement.

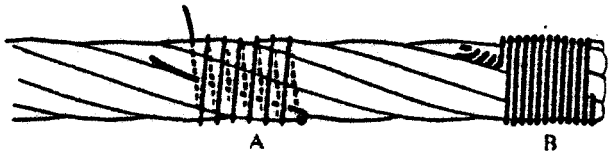
Backlash shall be checked four (4) places at 90° on all gears. No reading less than the minimum value indicated in table (page 16) is acceptable. Individual readings may exceed table maximums however the average of the four (4) readings shall remain within the chart range.



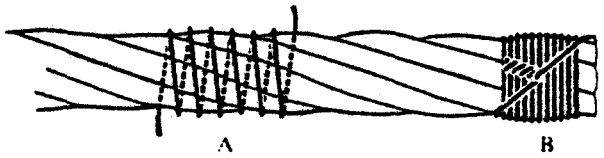
Another method requires hand pouring of lube onto rope after brush or air jet cleaning. In either method, the rope must remain coated at all times.

Inaccessible boom supports and bridge strands need lubricant applied at and around boom hoist sheaves, as well as, the dead end anchor area. Spray can lube helps here.

Proper Methods of Seizing



Sketch of Method No. 1 for applying seizings. At A the turns of the seizing wire are spread apart to illustrate method of applying them. Completed seizing is shown at B.



Sketch of Method No. 2 for applying seizings. At A the turns are spread apart to show method of applying them. Completed seizing is shown at B.

PROPERLY SEIZING wire rope ends prevent the strands from slipping. Any strand movement causes uneven load distribution in the strands and reduces rope life. (See Sketch.)

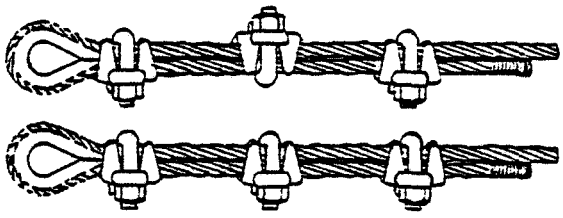
Seize rope BEFORE cutting. Tighten wrap, (a soft, annealed wire), about strand size wire; around rope. Pull wrap tight. Twist wire end secure. Use 1/4 inch wrap length on all rope up to 1/4 inch. On all other rope, measure wrap length at least one rope diameter in length. Place the first wrap about 1 to 1-1/2 inches from the intended cut. Then place a second wrap or seizing about 4 to 6 inches from the first.

APPLYING WIRE ROPE CLIPS

Use a portable cable cutter whenever possible. Often a flame cutting torch is used and generally fuses the strand and wires together. Do not use a melting tip here.

The Right Way to Clip Wire Rope

Space wire rope clips about 6 rope diameters apart. Tighten clip on rope BEFORE placing rope in tension. Then retighten after rope is in use. Any rope diameter loss caused by pulling on rope, loosens clips. Retighten clips.



The Wrong Way to Clip Wire Rope

Only one correct method of attaching U-bolt clips on wire rope exists. The clip base must bear on the live end of rope. The U of the bolt bears on the rope dead end (see sketch). Otherwise, the U-bolt kinks or cuts the anchor live end and causes failure.

Wire rope adjacent to the dragline bucket is subject to the greatest abrasive wear. This is true of the shovel dipper ropes too. When this rope section shows excessive wear, remove the rope socket, seize the worn area and cut off.

NOTE: The preceding Material Information is not an accepted practice for new rails, and MPSD will not be responsible. New rails should be ordered (from MPSD) as repair may be short lived.

AUSTENITIC MANGANESE STEEL – MPSD Symbol CH and FCHN

NEVER exceed 500 degrees F. (260 degrees C.) (1/2 inch back from joint) when welding OR flame cutting this steel; otherwise an embrittled (heat affected) zone results. Manganese, normally non-magnetic, may be slightly magnetic when work hardened. Because of this, remove the work hardened area by grinding BEFORE welding.

CAST IRON

FRICTION HOUSINGS

Welding for permanent repair is NOT recommended. Brazing or bronze welding gives temporary repair. Use general preheat. SLOWLY preheat entire part to a minimum of 400 degrees F. (204 degrees C.) MAINTAIN heat during welding. SLOWLY COOL after welding. When application does not permit brazing, use electric arc process, using ENiFe-CI electrodes (such as "Ni-Rod 55"). General preheat applies here.

WELDING INSTRUCTIONS

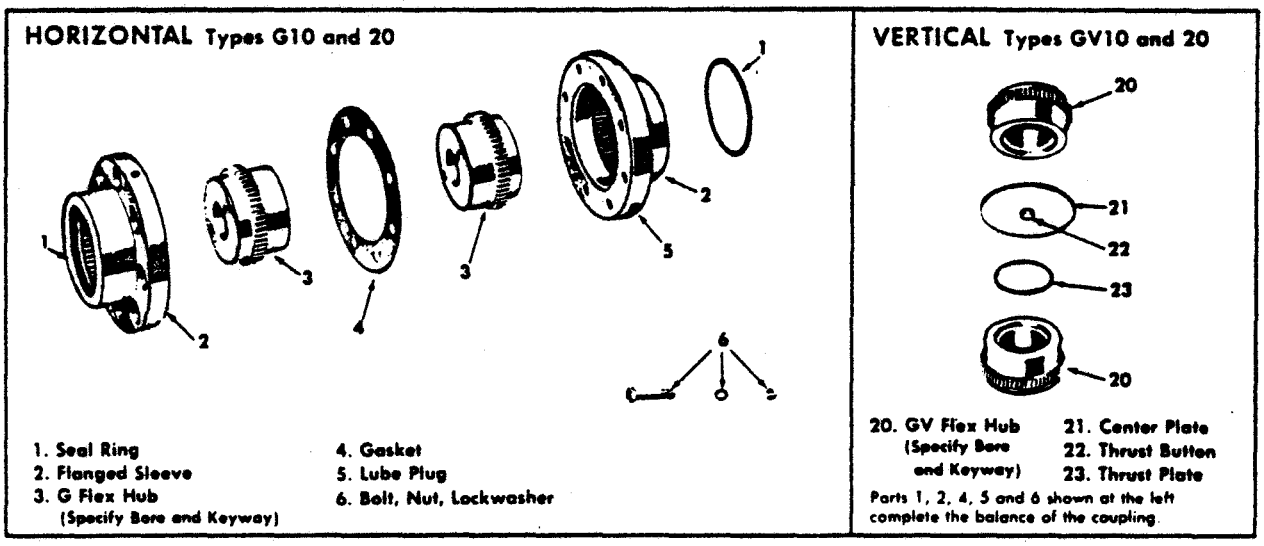
WELDING ELECTRODE TYPES, shown in Welding Specifications, are classified according to the American Welding Society standards. Use any reliable brand electrode conforming with A.W.S. We recommend LOW HYDROGEN ELECTRODES (AWS EXX-18) for all repair work. Please keep these electrodes dry. Use according to manufacturer's recommendations for the best results. Bake electrodes, when possible, in oven for one hour at 700 degrees F. (371 degrees C.). Then place in holding oven at 250 degrees F. (121 degrees C.) until used. If wire chemistry is compatible to specified stick electrodes; use CO2 semi-automatic, flux-core wire for flat position joints.

The following data shall serve as a guide for the proper selection and application of electrodes and preheat temperatures for welding all MARION ferrous materials. Standard electrodes specified hereafter supersede listings in drawing bills of material. These specifications in no way countermand specific instructions or procedures for specific weldments or mate-

FALK COUPLING

TYPE G AND GV

G TYPE INSTALLATION

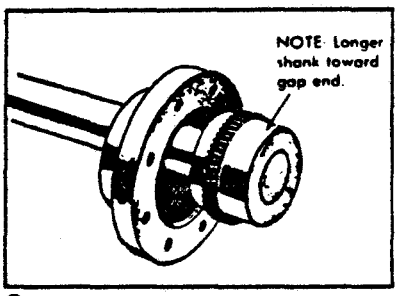


1. Clean all parts. Heat hubs in an oil bath or oven to a maximum of 275 degrees F. (135 degrees C.). DO NOT rest gear teeth on container bottom or apply a flame directly to gear teeth.

   Pack sleeve teeth with grease and lightly coat seals with grease BEFORE assembly. DO NOT use cup grease. DO NOT DAMAGE SEALS.

   Use a dial indicator to align dynamically balance couplings and assembly parts with mating match marks aligned. Mount indicator on one hub and take readings for OFF-SET check on O.D. of other hub. The difference between minimum and maximum readings DIVIDED by two should not exceed the values in Table. For ANGULAR check, take readings on either face of other hub. The difference between the minimum and maximum readings should not exceed the values in Table.

2. MOUNT FLANGED SLEEVES, SEAL AND HUBS – Place flanged sleeves WITH seal rings on shafts before mounting hubs. **CAUTION:** DO NOT DAMAGE SEALS. Mount hubs on respective shafts, as shown so each hub face is flush with its shaft end. Position equipment in approximate alignment with approximate gap specified in Table.



2 MOUNT FLANGED SLEEVES, SEALS AND HUBS

DAILY MECHANICAL INSPECTION

OPERATOR'S CAB

1. Are all electrical controls functional?
2. Do the hand levers operate properly?
3. Do the windshield wipers work?
4. Do the windows open properly?
5. Do the heaters work?
6. Does the air conditioner work?
7. Do the overhead lights work?
8. Is the seat satisfactory?
9. Do any of the controllers need overhaul?
10. Are gauges working properly?

WEEKLY MECHANICAL INSPECTION

HOUSE

1. Are all panels in place and undamaged?
2. Are roof arches in good condition?
3. Are all windows intact?
4. Any leaks in the house?
5. Are all house bolts in place and tight?

INSPECTION FORM

REMARKS: _____

_____

_____

_____

_____

_____

_____

INSPECTED BY: _____ DATE: _____

CORRECTION: _____

_____

_____

_____

_____

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AUTHORIZED BY: _____ DATE: _____

INSPECTION FORM

REMARKS: _____

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INSPECTED BY: _____ DATE: _____

CORRECTION: _____

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