BI006278

Technical Manual

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MAINTENANCE TIPS

Just as the operator acquires a "feel" for the machine, the entire crew should try to sense failure before it strikes. Take that extra step to examine anything that appears out of place. How about a bubble or discolored crack in the paint? It is an early warning for metal stress or breakage. Could that slight hiss indicate a growing air leak? After all, it is easier to tighten a packing nut than shut down for packing repairs. An alert crew will:

Check operating air pressure.

Wipe away excess lube around bearings and gears.

Maintain correct supply lubricants.

Lube regularly.

Never lubricate parts in motion, that is gears, etc.

Look for and secure any loose bolts or locking devices.

Check all wire ropes for early signs of wear or failure.

Promptly replace all guards, inspection plates, access covers or other safety devices after inspection/repair.

USE EXTREME CAUTION around ANY electrical lines and equipment. This pertains to low as well as high voltage.

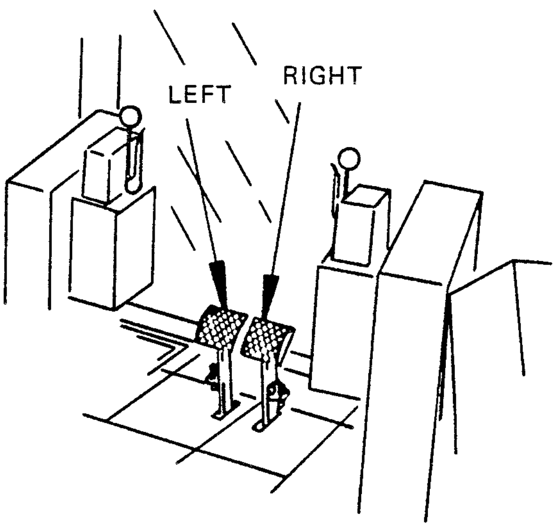
Never attempt electrical repairs, unless qualified.

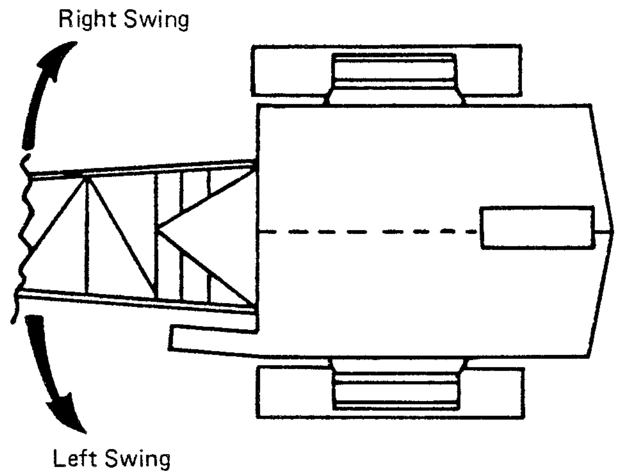
Assure power source is properly grounded.

Check limit switches for proper operation.

Check overloads and thermal breakers.

The swing pedals, centered on floor in front of seat, control 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.

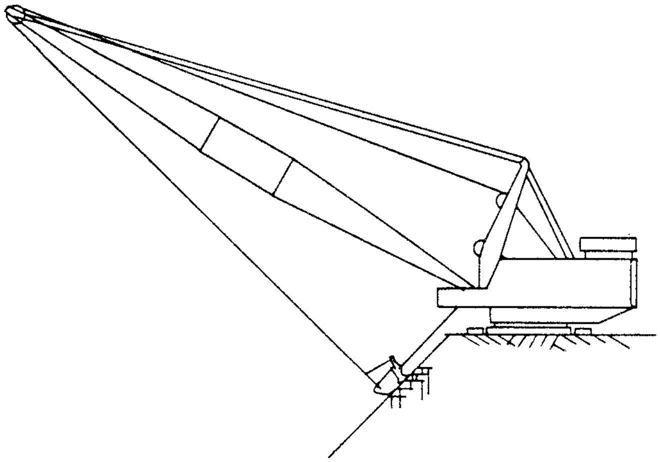
NOTE: This machine is equipped with a special "Limitrol System". In addition to the standard functions of tightline detection and hoist and drag limits, this system has special functions of bucket depth indication, hoist and drag load indication, presettable bucket depth signals, and loaded bucket indication. Operator controls are located in a control box attached to the left hand control stand. A rope limit display box is located in the left front corner of the operators' cab. Refer to the Limitrol System operation manual for details.

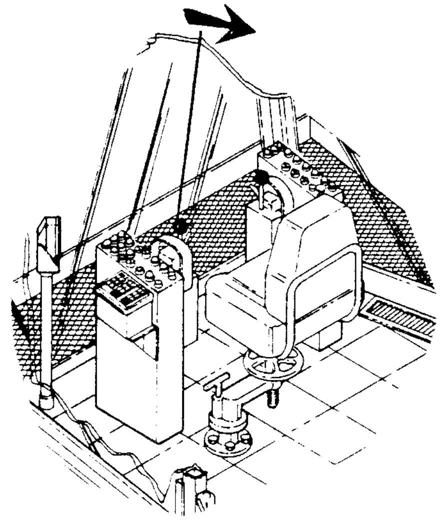
COMMENT ABOUT PRIMARY CONTROLS – The hoist and drag controller is a SPEED REGULATOR. Practically full torque or line pull is obtained with the slightest handle movement. Move lever only far enough to obtain desired speed. Do not move lever(s) too far, then back off. Use smooth movements, lever jockeying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

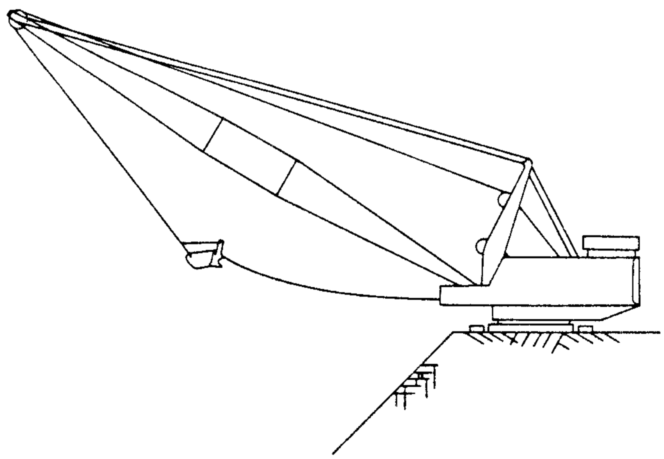
Start **TYPICAL DIGGING CYCLE** with bucket on ground, in pit, under boom (point). If machine tends to drift (rotate) apply enough pressure on opposite swing pedal to hold machine.

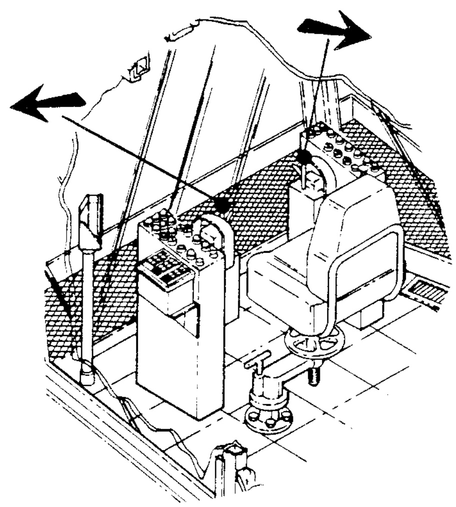




Start dragging in bucket by pulling toward you the drag control lever (at left hand). The further the lever is moved, the faster the bucket is pulled toward the machine. Hold tension on hoist ropes by depressing the thumblatch on drag controller. If more power is needed coordinate movement of hoist and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

LUBRICATION SPECIFICATIONS

SPECIFICATION – GREASES

CODE OR SYMBOL NO.	ASTM or TEST	MPG	RGL	OGL TYPE B	OGL TYPE H
Penetration Worked 60X					
Summer, NLGI	D-217	2	semi-	1	–
Winter, NLGI		1	fluid	0	–
Penetration Worked 5000X, Max. Change	D-217	10%	–	–	–
Dropping Point, Min. ^{o}F.	D-566	350	–	325	–
Base Oil Viscosity @ 210^{o}F., Min.	D-446	75 SUS	140 SUS	200 SUF	200 SUF
Oxidation Stability Max. psi Drop – 100 hrs.	D-942	10	–	–	–
Water Resistance Max. Loss @ 100^{o}F.	D-1264	20%	–	10%	10%
Texture	Visual	Buttery	–	Adhesive	Tacky
EP Timken, Min. OK	–	35 lbs.	–	35 lbs.	35 lbs.

SPECIFICATION – OILS

CODE OR SYMBOL NO.		ASTM or TEST	MO	OILS PO
Pour Point ^{o}F. Max.	- Summer	D-97	5	15
	Winter		0	15
Flash Point ^{o}F. Min.	- Summer	D-92	450	410
	Winter		420	410
Viscosity @ 100^{o}F. SUS		D-446	–	150 Min.

NAME OF PART	TYPE	NO. OF POINTS	LOCATION	LUB. SYM.	METHOD & FREQUENCY
Fan Motors	–	–	–	EMG	500-600 hrs.
Filter Ducts Motor	–	–	–	EMG	500-600 hrs.
Floating Sheaves on House	Bushing	5	End of Pins	MPG	Auto, 15 min.
Boom Raising Sheave	–	–	–	–	As required

LUBRICATION OF DRAGLINE BUCKET

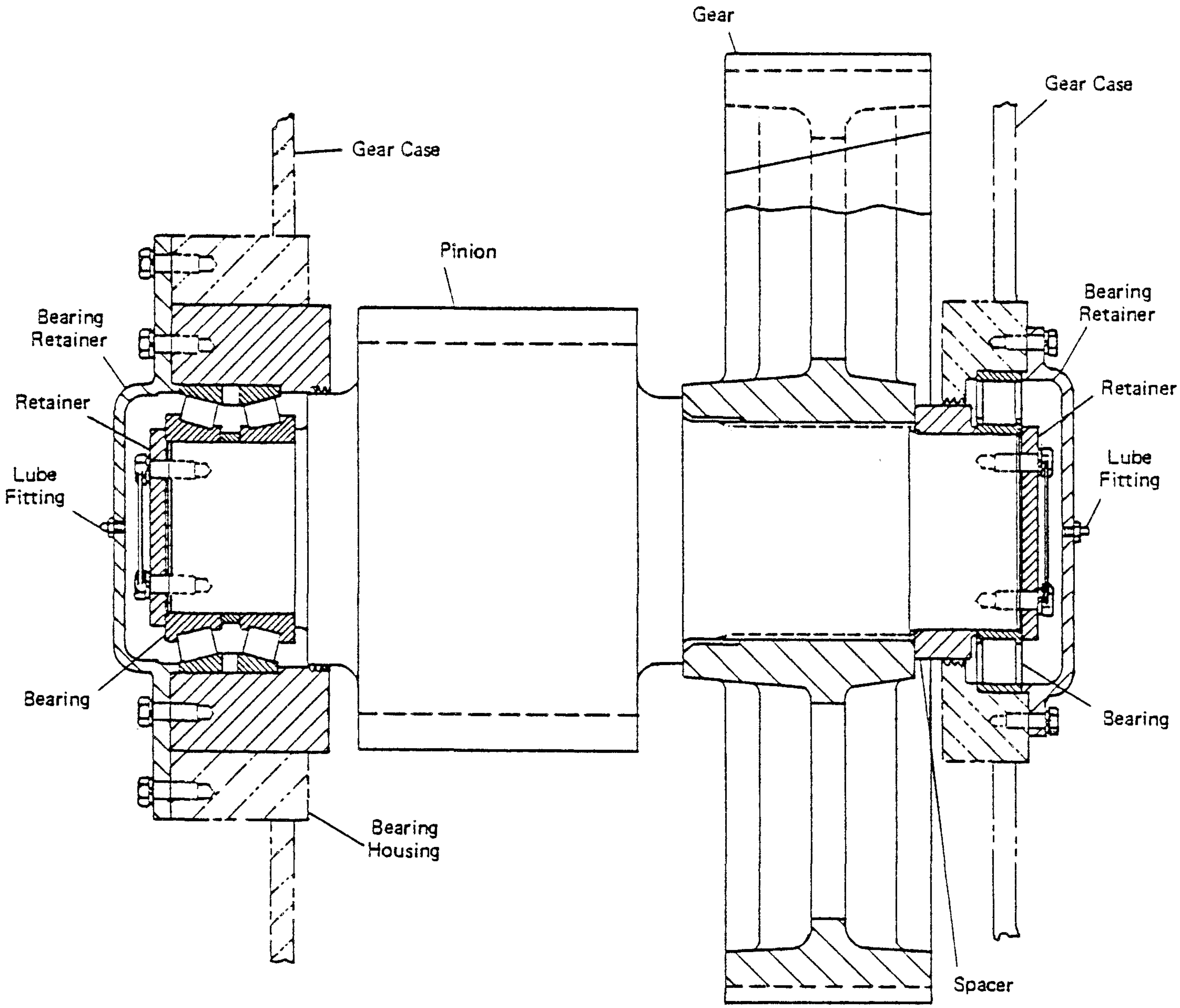
NAME OF PART	TYPE	NO. OF POINTS	LOCATION	LUB. SYM.	METHOD & FREQUENCY
Dump Block Sheave	–	2	End of Shaft and Pin	MPG	Hand, 8 hrs.
Dump Block Anchor	–	2	End of Pin	MPG	Hand, 8 hrs.

The main propel drive shaft connects the left hand and right hand second intermediate shaft assemblies. The drive shaft is mounted on the deck of the rotating frame.

Pinions on the left hand and right hand third intermediate shafts mesh with the main propel drive gears to turn the propel cranks. The cranks extend through the walls of the machinery house to connect with the walking arms which raise and lower the walking shoes.

The **PROPEL LINKAGE** on each side of the house consists of the walking arm, the stabilizer arm and the walking shoe. The upper end of the walking arm is connected to the stabilizer arm. The lower end of the walking arm is connected to the walking shoe by a ball and socket joint which allows the shoe to tilt in any direction to compensate for uneven ground. A lateral shaft through the ball joint allows side movement of the shoe.

CAUTION IS THE BY-WORD



SHAFT – FIRST INTERMEDIATE PROPEL

Working inside the tub, the bearings and spacers can now be installed on the lower end of the main rotating shaft. Then jack the pinion up into position on the shaft splines and install the retainer plate. Secure the retainer plate cap screws with lock wire. Make sure that the main rotating shaft bearing is properly lubricated.

Lower the intermediate gear onto the shaft and measure the distance between the top of the shaft and top of the gear hub. This distance should be five-eighths inch. If it is not, replace or grind the spacer to obtain the correct measurement. Install the gear retainer plate.

Remove the temporary holddown bolts securing the gear case center section to the lower section. Lower the gear case cover into position and install all of the holddown bolts to secure it in position.

Assemble the cylindrical bearings on the motor extension shaft and install the shaft in the motor coupling housing. Lower the motor coupling housing into position on the gear case and install the holddown bolts. Add shims under housing as required to align extension shaft pinion with intermediate gear.

Install the lower coupling half on the motor extension shaft, tighten the jam nut on the shaft, and tighten the cap screws to secure the jam nut in position. Finally, lower the motor onto the coupling housing, install the motor holddown bolts, and the coupling halves. Then install the access cover plates on the housing.

Call an electrician to make the electrical connections. Connect the brake air line and, after double checking the drain valves to make sure they are closed, fill the gear cases with lubricant.

ROTATING BRAKE – The rotating brake is located on the top of each of the four rotating electric motors. The brake is an external shoe type brake that acts on a friction housing, keyed to the rotating motor armature shaft. The brake is spring set and air released.

The rotating brake is a holding brake. Do not apply the brake to slow down or stop the swing motion except in case of emergency. Stop the swing by "plugging" the swing motor.

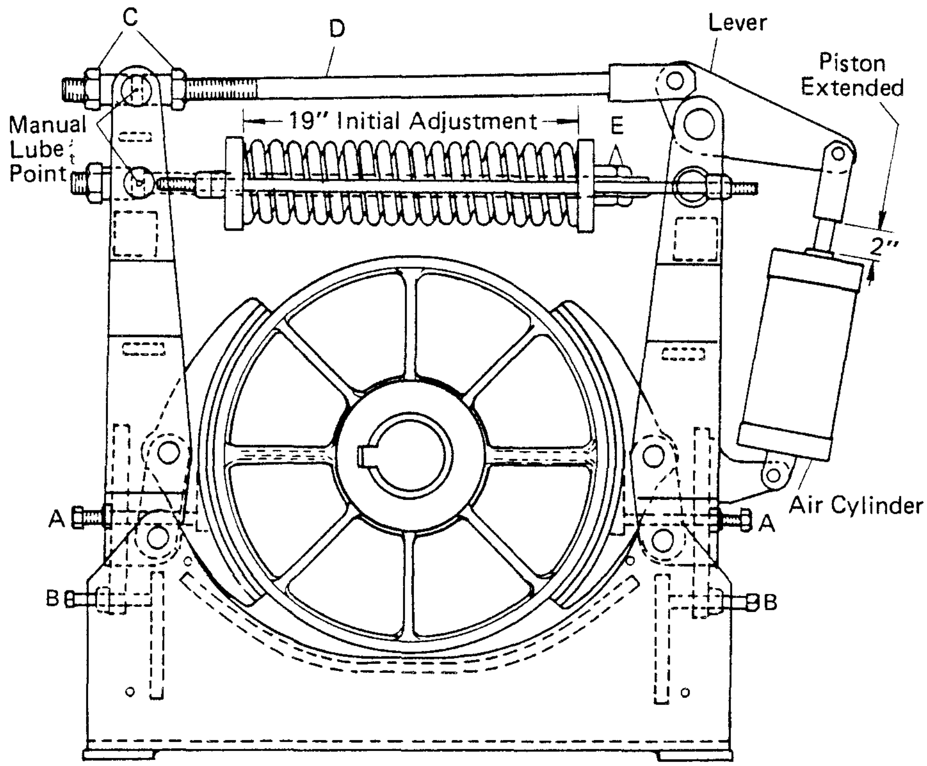
The brake is set by moving the two operating links together totward the toggle position. Adjust the position of the toggle by turning the adjusting bolt between the end castings of the inside link. Loosen the lock nuts "A" and turn the hex on the adjusting bolt "B" until the centerlines of the links are 5/8" apart, measured at point "C".

Adjust the set spring by turning the spring retainer sleeve at the rod end of the cylinder. Loosen the set screw "D" and turn the sleeve clockwise to increase the spring tension. Do

The hoist and drag brakes are not intended to stop or slow the rotation of the motor armature shaft. The brakes are designed as holding brakes to be used when the motor is de-energized. Each brake consists of two shoes that act on a brake wheel that is keyed to the motor armature shaft. The brake is set by a compression spring and released by an air cylinder. If power to the machine is lost, for any reason, the brakes will set.

To adjust the brake on the rear drag motor, see the propel section of this manual for adjustment instructions.

To adjust the brake on the front drag motor or either hoist motor, turn the manual override switch on the magnet valve to the "release" position. Air pressure will push the brake cylinder piston out and release the brake.



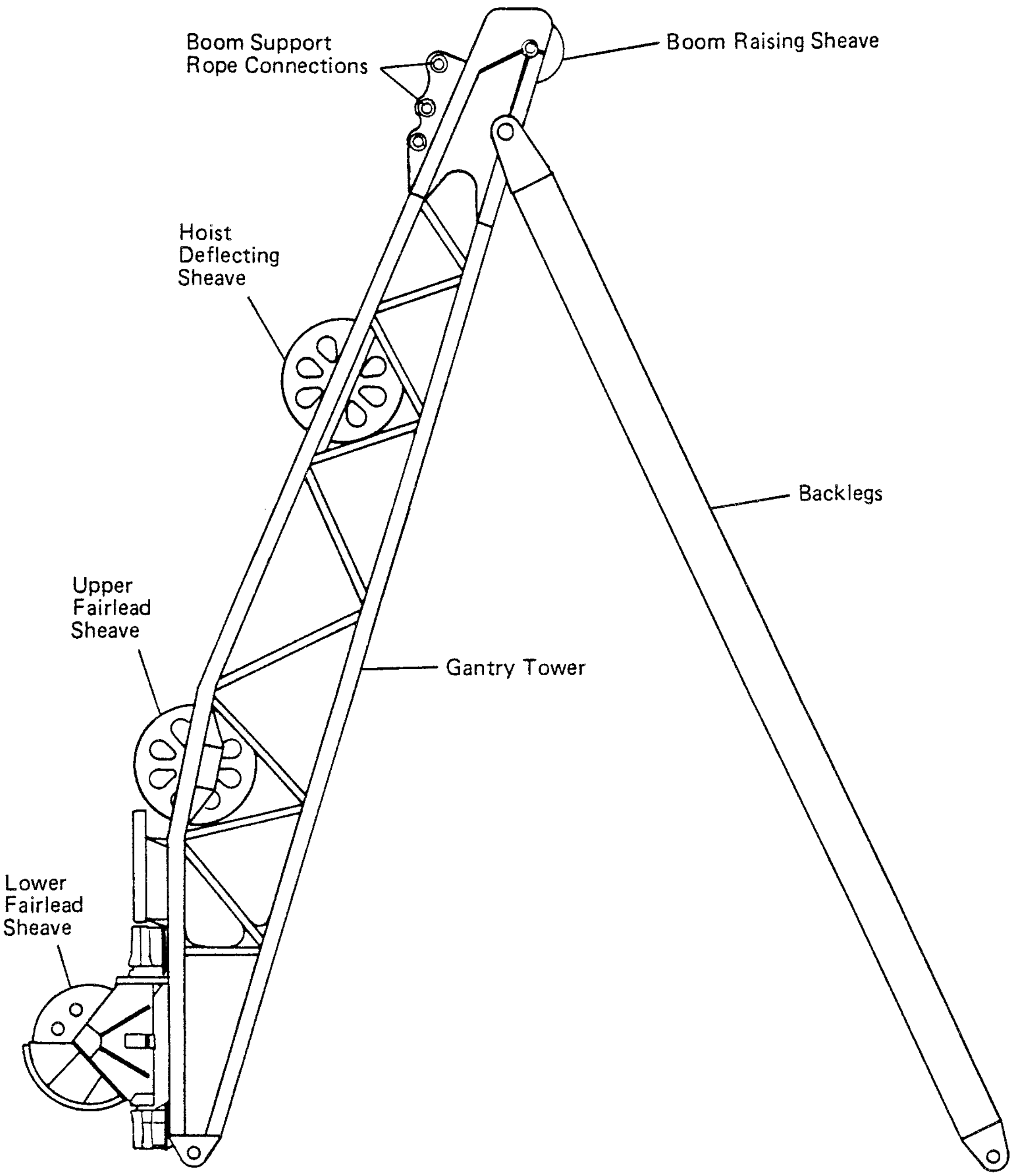
HOIST-DRAG BRAKE ASSEMBLY

Adjust brake in the released position. Loosen set screws "A" and "B" and turn nuts "C" on adjusting bolt "D" until clearance is 1/8 inch between brake shoes and brake wheel. Equalize clearance by adjusting set screws "A". Position brake shoes by turning set screw "B" so that heel of shoe does not drag on housing when brake is released.

With the brake in SET position, adjust nuts "E" so that spring initial length is 19 inches for either hoist or drag brake.

At six month intervals, a damper should be removed for examination of the inside strands. If the first one is found in bad condition, remove the others and inspect. The fabric liner should be staturated with light lubricant if dry.

The GANTRY is a welded structure and pin connected to lugs on the front girder of rotating frame. Two wide spread back legs support the top of gantry.



GANTRY-FAIRLEAD TOWER ASSEMBLY

WARNING

DUE TO THE DANGERS INHERENT IN THE OPERATION OF ANY HIGH VOLTAGE ELECTRICAL EQUIPMENT, A SAFE GROUNDING SYSTEM SHOULD INCLUDE GROUND CONDUCTORS IN THE CABLE, A NEUTRAL GROUNDING RESISTOR AND RELATED RELAYS AND SWITCHGEAR. A GROUND CONTINUITY CHECK SYSTEM IS ALSO RECOMMENDED.

Marion provides (under separate cover) a separate book/manual from the electrical manufacturer in addition to the information supplied in this section.

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 this adequate ground endangers works 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 local electric supplier for details.

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Rectifiers normally fail by shorting, but the effect depends upon the circuit. With rectifiers used to convert A.C. to D.C., shorting provides A.C. in output; detected by a multimeter on the output circuit. Shorted, blocked rectifiers allow current flow when the wrong polarity of voltage is detected.

Rectifier failure detection using the ohmmeter works, but the low voltage batteries in the meter do not always give a good test. Best results show up using the high resistance scale, but even this may not be conclusive.

The best test for rectifiers uses D.C. voltage at least 1/4th its rating. Connect a resistor in series with rectifier to limit current to a safe value. Connect resistor and rectifier across D.C. voltage, then read voltage across resistor. Reverse rectifier and measure resistor voltage. A good rectifier gives voltage across resistor with only one polarity.

Many other failures occur and often good intuition and ingenuity is needed to find them.

The trouble discussed thus far usually results in complete and permanent malfunction.

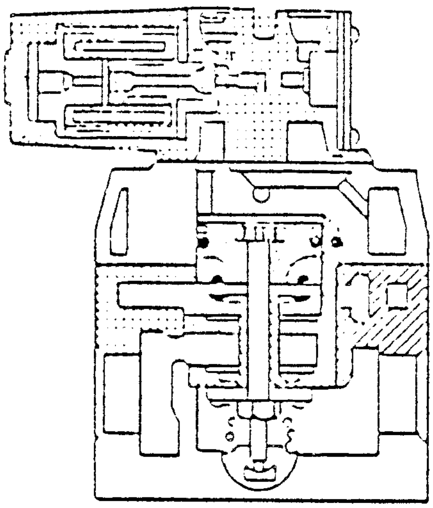
Perhaps more common and more difficult to find are intermittent failures resulting in only partial power loss. These trouble types distinguish a good troubleshooter from an average one.

Start as before, interviewing operator, oiler and witnesses. Try in questioning to determine the exact nature of trouble. When complaint indicates partial power loss, find the effect under various load conditions and determine the cause of this effect.

Often a cause for weakening may be determined in a similar manner as locating complete failure. Select a starting point and compare measurements taken against recorded data. Compare honestly. A slight difference shows due to aging, temperature or an inaccurate instrument along with failure. Tests under one condition might not give a true problem indication. For example, tests at stall do not indicate no-load voltage is incorrect. Likewise, test for proper motor field voltage ONLY with controller (master switch) in proper position. In addition, check that stall current or no-load voltage varies properly with master switch position, since trouble could be failure of master switch.

In locating trouble of the weakening kind, one needs to know the various devices functions used to augment or increase power under certain conditions. Master switch contacts fall in this device class. Motor field contactors increase field strength under certain conditions. Conversely, current or voltage feedback circuits limit certain quantities to acceptable values. Failures resulting in decreased or increased outputs generally come from failure in these supplementary circuits.

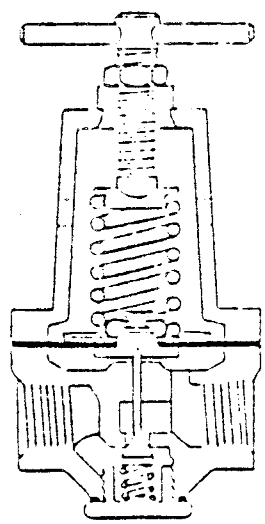
Help here comes from knowing the effects certain changes have on performance. Naturally, filling; NEVER REFILL THRU WICK CAP. Use methyl alcohol only. (Permanent anti-freeze types do not evaporate fast enough for good protection).



MAGNET VALVES need little or no maintenance. Dirt and scale cause a leaky valve sometimes. Try opening and closing it several times quickly by turning the small screw on top. Cleaning this way often avoids disassembly. If not, DISMANTLE, CLEAN, and REPLACE worn or damaged parts. Lube with a small amount of MPG.

These electrically operated (on and off) valves are normally closed when de-energized. A spring loaded plunger shuts OFF air from supply to cylinder while the exhaust port from the cylinder to atmosphere is OPEN. Energizing the coil moves the plunger down, CLOSING the exhaust port and OPENING the port from supply to the brake release cylinder.

PRESSURE REGULATORS consist of a spring loaded diaphragm that moves a cone shaped seat which opens and closes, allowing air to pass thru the valve. A spring under this seat keeps it against the diaphragm. A T-handle on top screws in and out to adjust diaphragm spring tension. Right (clockwise) increases and left (counterclockwise) decreases the tension; and the air pressure. When used in connection with clutches, the setting is at tank pressure low end to soften action and protect the clutch or parts. NEVER USE MORE pressure than needed to handle a fully loaded bucket. When used elsewhere, a pressure gauge reading shows needed operating setting.



AIR CYLINDER VALVES actuate the brakes and are spring set; air released. A sleeve retains the spring and threads into the open cylinder end. A set screw locks this sleeve. To repack cylinder, unlock set screw and turn out sleeve to release return spring tension. Discon-

RUNNING CLEARANCE FOR BRONZE BUSHINGS

Shaft Nom. Diam.	Shaft O.D.	Running Clearance	Shaft Nom. Diam.	Shaft O.D.	Running Clearance
1	1.000 .999	.006 .010	5	5.000 4.998	.011 .020
1-1/4	1.250 1.249	.005 .010	5-1/4	5.250 5.248	.011 .020
1-1/2	1.500 1.499	.008 .013	5-1/2	5.500 5.498	.012 .020
1-3/4	1.750 1.749	.008 .013	5-3/4	5.750 5.748	.012 .021
2	2.000 1.999	.007 .012	6	6.000 5.998	.012 .021
2-1/4	2.250 2.248	.006 .013	6-1/4	6.250 6.248	.012 .021
2-1/2	2.500 2.498	.006 .013	6-1/2	6.500 6.498	.012 .021
2-3/4	2.750 2.748	.008 .015	6-3/4	6.750 6.748	.013 .022
3	3.000 2.998	.008 .015	7	7.000 6.998	.013 .022
3-1/4	3.250 3.248	.008 .015	7-1/4	7.250 7.248	.013 .022
3-1/2	3.500 3.498	.008 .015	7-1/2	7.500 7.498	.014 .022
3-3/4	3.750 3.748	.011 .019	7-3/4	7.750 7.748	.016 .024
4	4.000 3.998	.011 .019	8	8.000 7.998	.015 .024
4-1/4	4.250 4.248	.010 .019	8-1/4	8.250 8.248	.015 .024
4-1/2	4.500 4.498	.010 .019	8-1/2	8.500 8.498	.016 .025
4-3/4	4.750 4.748	.014 .022	8-3/4	8.750 8.748	.016 .025

D. To check the temperature of the component, use a Fahrenheit or Celsius thermometer by placing putty over the bulb and holding it against the hub. Heat component a few degrees above the desired temperature before removing it from the oven.

9. After the component has been removed from the oven, wait a few minutes until the bore has cooled to the temperature required, remove the thermometer and quickly mount as described.

10. After making sure the bore is clean, quickly locate the component in the same angular position on the shaft as when cold. When nearly engaged with the taper fit, but not actually in contact, snap it forcibly into place with a quick push. **It is important that the hot component be instantly snapped into position before it has cooled appreciably. Otherwise, it will immediately freeze to the shaft and cannot be adjusted further.**

11. Check the hot shrunk-on position of the component on the shaft using the micrometer depth gauge as before.

    A. The actual advance is the difference between the depth gauge reading at the hot and cold positions. To control the stresses in the component the advance must be within the limits specified in the table.

    If the advance is not within the limits given, the component should be pulled and remounted.

12. After the component has been properly shrunk on the shaft, assemble the lock washer and nut or other means of locking.

13. When shoulder nuts are used, make certain the shoulder does not bottom before the main body of the nut tightens on the locking plate. In case the shoulder on the nut bottoms before tightening on the locking plate, the nut should be removed and the shoulder ground or machined off so clearance is available.

14. After it is certain that the nut is securely tight, turn up the locking plate on at least two faces of the nut.

    A. It should be kept in mind that **the component fit on the shaft and the fit on the key are the important points** in doing a good job of holding the component on the shaft. The locking plate simply serves to hold the nut on the shaft. With the correct fit between the tapered bore and shaft there is no load on the nut and locking plate.

GEAR INSPECTION PROCEDURES

METHOD OF CHECKING RIM FACE RUNOUT OF GEAR. If gear can be rotated without end float., place dial indicator squarely against the rim face stamped (000), at station stamped (1) and set to zero.

Revolve gear slowly. Record reading at each station. After one complete revolution, indicator should read within (plus or minus) .002". If not, recheck. Allowable rim face runout is shown in table 1. Total rim face runout is the algebraic difference between maximum plus and maximum minus readings.

EXAMPLE: Readings for a 16 foot diameter gear are listed in a chart below.

Total tim runout is .020" is obtained between station 3 with a maximum plus reading of .005" and station 9 with a maximum minus reading of .015". This is within allowable .022" shown in table 1.

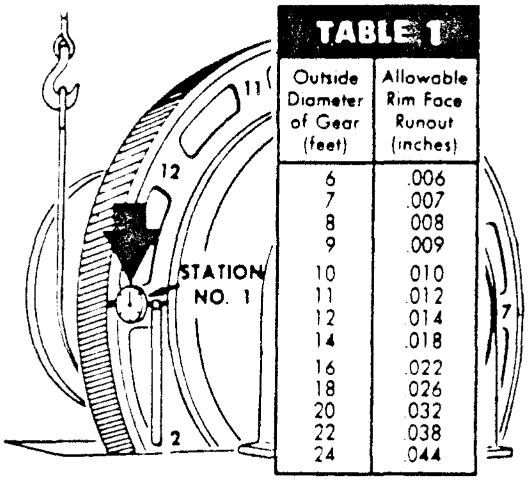


TABLE 1

Outside Diameter of Gear (feet)	Allowable Rim Face Runout (inches)
6	.006
7	.007
8	008
9	.009
10	010
11	.012
12	014
14	.018
16	.022
18	026
20	.032
22	038
24	.044

Station No.
Indicator Reading

1	2	3	4	5	6	7
.000	+.004	+.005	+.004	.000	−.005	−.010

8	9	10	11	12	1
−.014	−.015	−.014	−.010	−.005	.000

CHECKING RADIAL RUNOUT OF GEAR: Mount a dial indicator so it can be set against one of four machined surfaces. See sketch. Place indicator square with the machined surfaces at one of the stations stamped on the gear rim face. Revolve gear slowly and record readings at each station under the corresponding station number. After one complete revolution, indicator should read within (plus or minus) .002" of initial reading at starting station.

ALLOWABLE RADIAL RUNOUT is shown in table 2. The total radial runout is the algebraic difference between maximum plus and maximum minus readings. If radial runout ex-

Broken wires.

Corroded wires.

Marks indicating mechanical abuse, distortion or crushing.

Inspect rope sheaves often. Check sheaves and drums for proper alignment. Use no reeving that requires reverse bends unless provided with sufficient space between the bends for adequate rope recovery.

Do not allow wear at rope sheave groove. An old rope wears a groove to a reduced radius. This groove crushes or deforms a newly installed rope.

Avoid sheave groove or drum lagging from assuming rope lay shape. Alternate right and left hand lays, if needed. Keep sheaves and drum free of rough spots, nicks or burrs. Never use cracked or chipped sheave.

Maximum rope life and the best service evolves from extreme care in handling and installation. This is important. Working a new rope at reduced loads gives the rope lay time to acquire a permanent set. Slow acceleration and deceleration of load and eliminating sudden actions are good habits to develop. Never overstress a rope by jerking or catching a heavy, falling load.

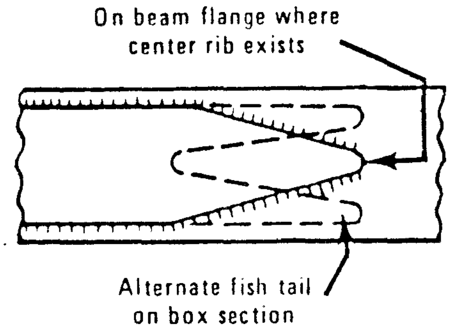
Lubrication remains the most important item in rope care. All rope is lubed when manufactured. Generally thin and filmy, this lube eases the manufacture rather than preserves the rope. This film drys rapidly or dissipates thru surrounding conditions.

Lubricate every rope at installation and keep coated thru continued service. Lubricant serves to reduce internal friction wear and the outer wire wear against sheave or drum. Lube protects rope from weather and corrosive air, too.

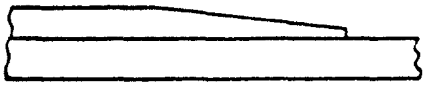
Marion recommends a light, penetrating type lubricant (WRL) containing anti-rust or corrosion agents and anti-wear additives. This lube saturates rope interior thus reducing internal friction while providing a protective outer coating.

The rope lubricant selected may be an asphaltic type containing volatile solvent or diluent which allows strand and core penetration. This lube type works well for operations in highly abrasive material or water submersion.

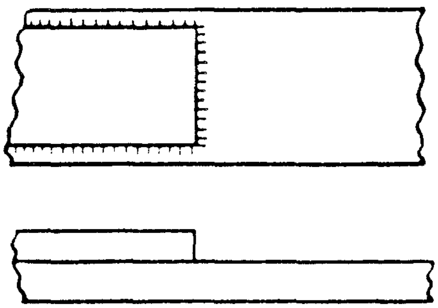
One method of rope lubrication utilizes an automatic system that provides a drip fixture above sheaves on boom point, gantry, and fairlead. This system is generally timer controlled with manual override for severe conditions.



REINFORCING REQUIRES EXTREME CAUTION in weld repairs. Faulty reinforcing has caused many repeat failures. The weld alone, if PROPERLY made, is sufficient to make the part as strong as it was originally. However, in cases where reinforcing seems needed, apply the following. Patch plates of NOT greater than three fourths the thickness of the part being reinforced to EXTEND beyond the critical areas. TAPER and ROUND the ends of these plates. EXTEND the weld completely around the ends and SMOOTH OUT gradually to the original structure. TAKE every care to eliminate stress concentration, such as: square ends; sharp break offs; exposed and rough, flame-cut edges; etc. (See sketches).



Reinforcing Plate Taper End recommended



Reinforcing Plate Square End, not recommended

POSTHEAT TREATMENT: When employing this or in cold weather, SLOWLY COOL the welding area at a rate of 50 degrees F. or 27 degrees C. per hour to the normal temperature of 150 degrees F. (65.5 degrees C.) This is important. This usually means additional general heating AFTER completing the weld. Smooth up ALL rough edges and welds. Clean and repaint the repair areas.

ADDITIONAL INFORMATION or material on welding for a particular repair job may be obtained by sending ALL details to the Service Department of Marion Power Shovel Division, at Marion, Ohio 43302.

MATERIAL IDENTIFICATION

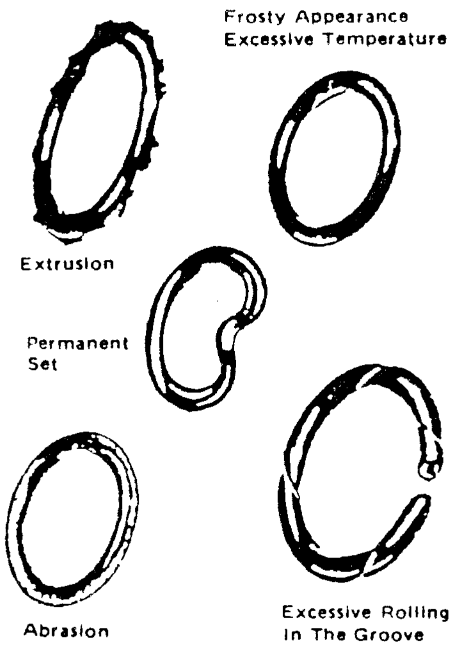
MARION MATERIAL SYMBOLS and

MAJOR COMPONENT PARTS

The following information contains the various materials used in major parts. Refer to the identification plate or material symbol on casting for specifics.

NOTE: Use E-6010 or E-6012 for nonstructural parts ONLY. For example; sheet metal, guard rails, catwalks, house coverings and stiffners.

O-rings in service undergo slight swelling and softening which may be non-visible, when worn. Increased damage can occur on re-installation, so use ONLY NEW RINGS. Inspection of old, damaged rings can identify failure from extrusion, wear, torsion set, excessive permanent set or rolling in the groove.



Excessive extrusion may indicate the use of the wrong ring or backup rings were not installed. Irregular wear may indicate a rough spot or eccentricity in the cylinder. The ring may also fail from defect that careful pre-installation inspection may have seen. Some O-rings, lacking proper resilience, might have been subjected to overtemperatures. Since rings are not designed for high temperatures, they should be replaced, regardless of appearance, once known rings have been subjected to unusual heat. Overheated rings are hardened, crack with flexing, take a set and lack resilience. Once old ring has been inspected, cut it in two pieces and THROW AWAY.

Before installing, check surfaces and rings. Metal surfaces must be free of dust, dirt and gunk. Stoddard solvent (kerosene base with rust inhibitor) cleans parts and leaves a good surface for lube to adhere to. However, these cleaning fluids can cause some rings to swell. So check that cleaning fluid does not harm the O-ring if left on surface.

Once the proper O-ring is selected and part number is rechecked; examine the ring closely for defects, dirt or lint.

Throw out faulty rings after cutting so they do not get mixed with good ones. Discard new rings that are too tight once installed, do not return these to storage.

Once installed; an O-ring seats snugly, but freely in its groove.

PREPARATION requires checking the surface for scratches from fingernails, tools or fitting threads. DO NOT pinch ring between boss and fitting. Watch for sharp edges on groove shoulder or fitting. Thread burrs may be removed by running a nut onto the thread.

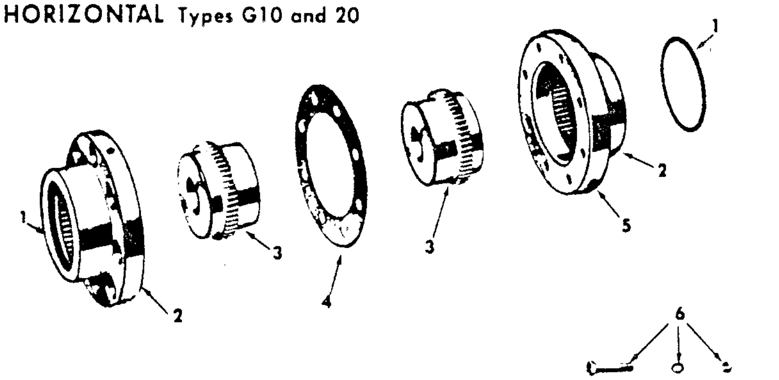
Before installing, lube ring and surface sparingly with a light coat of grease. Lubing helps eliminate a distorting stretch (causing a leak) and aids ring in seating naturally in groove without wrinkles or twists. Remember, the lube must be compatible with O-ring material and system fluid.

FALK COUPLING

TYPE G AND GV

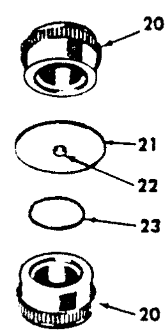
G TYPE INSTALLATION

HORIZONTAL Types G10 and 20



1. Seal Ring
2. Flanged Sleeve
3. G Flex Hub (Specify Bore and Keyway)
4. Gasket
5. Lube Plug
6. Bolt, Nut, Lockwasher

VERTICAL Types GV10 and 20



20. GV Flex Hub (Specify Bore and Keyway)
21. Center Plate
22. Thrust Button
23. Thrust Plate

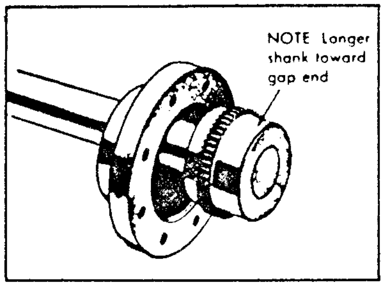
Parts 1, 2, 4, 5 and 6 shown at the left complete the balance of the coupling.

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

CONVERSION TABLE
Fractional Inch to Decimal Inch and Millimeters

Fractional Inch	Decimal Inch	Millimeters	Fractional Inch	Decimal Inch	Millimeters
1/64	0.015625	0.3969	33/64	0.515625	13.0969
1/32	0.03125	0.7938	17/32	0.53125	13.4938
3/64	0.046875	1.1906	35/64	0.546875	13.8906
1/16	0.0625	1.5875	9/16	0.5625	14.2875
5/64	0.078125	1.9844	37/64	0.578125	14.6844
3/32	0.09375	2.3812	19/32	0.59375	15.0812
7/64	0.109375	2.7781	39/64	0.609375	15.4781
1/8	0.125	3.1750	5/8	0.625	15.8750
9/64	0.140625	3.5719	41/64	0.640625	16.2719
5/32	0.15625	3.9688	21/32	0.65625	16.6688
11/64	0.171875	4.3656	43/64	0.671875	17.0656
3/16	0.1875	4.7625	11/16	0.6875	17.4625
13/64	0.203125	5.1594	45/64	0.703125	17.8594
7/32	0.21875	5.5562	23/32	0.71875	18.2562
15/64	0.234375	5.9531	47/64	0.734375	18.6531
1/4	0.25	6.3500	3/4	0.75	19.0500
17/64	0.265625	6.7469	49/64	0.765625	19.4469
9/32	0.28125	7.1438	25/32	0.78125	19.8438
19/64	0.296875	7.5406	51/64	0.796875	20.2406
5/16	0.3125	7.9375	13/16	0.8125	20.6375
21/64	0.328125	8.3414	53/64	0.828125	21.0344
11/32	0.34375	8.7312	27/32	0.84375	21.4312
23/64	0.359375	9.1281	55/64	0.859375	21.281
3/8	0.375	9.5250	7/8	0.875	22.2250
25/64	0.390625	9.9219	57/64	0.890625	22.6219
13/32	0.40625	10.3188	29/32	0.90625	23.0188
27/64	0.421875	10.7156	59/64	0.921875	23.4156
7/16	0.4375	11.1125	15/16	0.9375	23.8125
29/64	0.453125	11.5094	61/64	0.953125	24.2094
15/32	0.46875	11.9062	31/32	0.96875	24.6062
31/64	0.484375	12.3031	63/64	0.984375	25.0031
1/2	0.50	12.7000	1	1.00000	25.4000

CONVERSION TABLE
Millimeters to Inches

Millimeters	Inches	Millimeters	Inches	Millimeters	Inches
1	0.0394	36	1.4173	71	2.7953
2	0.0787	37	1.4567	72	2.8316
3	0.1181	38	1.4061	73	2.8740
4	0.1575	39	1.5354	74	2.9134
5	0.1968	40	1.5748	75	2.9527
6	0.2362	41	1.6142	76	2.9921
7	0.2756	42	1.6535	77	3.0315
8	0.3150	43	1.6929	78	3.0709
9	0.3543	44	1.7323	79	3.1102
10	0.3937	45	1.7716	80	3.1496
11	0.4331	46	1.8110	81	3.1890
12	0.4724	47	1.8504	82	3.2283
13	0.5118	48	1.8898	83	3.2677
14	0.5513	49	1.9291	84	3.3071
15	0.5905	50	1.9685	85	3.3464
16	0.6299	51	2.0079	86	3.3858
17	0.6693	52	2.0472	87	3.4252
18	0.7087	53	2.0866	88	3.4616
19	0.7480	54	2.1260	89	3.5039
20	0.7874	55	2.1653	90	3.5433
21	0.7874	56	2.2047	91	3.5827
22	0.8661	57	2.2441	92	3.6220
23	0.9055	58	2.2835	93	3.6614
24	0.9449	59	2.3228	94	3.7008
25	0.9842	60	2.3622	95	3.7401
26	1.0236	61	2.4016	96	3.7795
27	1.0630	62	2.4409	97	3.8189
28	1.1024	63	2.4409	98	3.8583
29	1.1417	64	2.5197	99	3.8976
30	1.1811	65	2.5590	100	3.9370
31	1.2205	66	2.5984		
32	1.2598	67	2.6378		
33	1.2992	68	2.6772		
34	1.3386	69	2.7165		
35	1.3779	70	2.7559		

1 millimeter = .03937 inch. 1 inch = 25.4 millimeter.

METRIC CONVERSIONS

To convert a metric unit to the equivalent English unit, multiply or divide by the conversion factor as indicated below.

To convert from an English unit to a corresponding metric unit, use the same conversion factors, but, reverse all multiplications to division and all divisions to multiplication.

Calories x 3.968 = British thermal units
Calories ÷ .252 = British thermal units
Centimeters x .3937 = Inches
Centimeters ÷ 2.54 = Inches
Cubic Centimeters ÷ 16.387 = Cubic Inches
Cubic Centimeters ÷ 3.70 = Fluid Drams (U.S.P.)
Cubic Centimeters ÷ 29.57 = Fluid Ounces (U.S.P.)
Cubic Meters x 35.314 = Cubic Feet
Cubic Meters x 1.308 = Cubic Yards
Grams x 15.432 = Grains
Grams ÷ 28.35 = Ounces avoirdupois
Grams per cu. cm. ÷ 27.7 = Pounds per cubic inch
Grams (water) ÷ 29.57 = Fluid Ounces
Hectares x 2.471 = Acres
Hectares x .003861 = Square Miles
Hectoliters x 2.84 = Bushels (2150.42 Cubic Inches)
Hectoliters x 3.53 = Cubic Feet
Hectoliters x .131 = Cubic Yards
Hectoliters x 26.42 = Gallons (231 Cubic Inches)
Kilo per cheval x 2.235 = Pounds per horse power
Kilo per cubic meter x .062 = Pounds per cubic foot
Kilo per meter x .672 = Pounds per foot
Kilogram Meters x 7.233 = Foot Pounds
Kilograms x 2.2046 = Pounds
Kilograms x 35.3 = Ounces avoirdupois
Kilograms ÷ 907.18 = Short Tons (2000 pounds)
Kilograms per sq. cm. x 14.223 = Pounds per square inch
Kilograms per sq. cm. ÷ .0703 = Pounds per square inch
Kilograms per sq. mm. x 1422.32 = Pounds per sq. inch
Kilometers x .621 = Miles
Kilometers ÷ 1.6093 = Miles
Kilometers x 3280.8 = Feet
Kilowatts x 1.34 = H.P. (33,000 ft. lbs. per min.)
Liters x 61.025 = Cubic Inches
Liters ÷ 28.317 = Cubic Feet
Liters x 33.81 = Fluid Ounces (U.S.P.)
Liters x .2642 = Gallons (231 Cubic Inches)
Liters ÷ 3.785 = Gallons (231 Cubic Inches)
Meters x 3.28 = Feet
Meters x 39.37 = Inches
Meters x 1.094 = Yards
Metric Tons x 2204.6 = Pounds
Millimeters x .03937 = Inches
Millimeters ÷ 25.4 = Inches
Square Centimeters x .155 = Square Inches
Square Centimeters ÷ 6.45 = Square Inches
Square Kilometers x 247.1 = Acres
Square Kilometers x .3861 = Square Miles
Square Meters x 10.764 = Square Feet
Square Millimeters x .00155 = Square Inches
Square Millimeters ÷ 645 = Square Inches
Watts ÷ 746 = Horse Power
Watts x .00134 = Horse Power

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