DRUMMER BOY

MAINTENANCE & OPERATION MANUAL

RIDEWORKS, INC.
PO BOX 5806
SARASOTA, FL
34277

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DRUMMER BOY

SPECIFICATIONS

CAPACITY

Number of Drums	6
Max Passengers Per Drum	8 children or 4 adults & 2 children
Max Weight Per Drum	1000 lbs
Loading	Self Loading

PERFORMANCE

Direction of travel	counterclockwise
Ride speed	8.0 rpm
Ride duration (adjustable)	0 to 3 minutes
Ride duration (recommended)	2 minutes
Hourly capacity	720

Electrical Requirements

220v
3 phase
60 Hz
60 amp

Ride weight

Without passengers	17,000 lbs.

Space requirements

Operation	30 ft
Height	14 ft

ERECTION & DISMANTLING PROCEDURES

1. Locate 12 volt power leads & control box for hydraulic pump
2. Connect quick couplers to hydraulic, foot in trailer
3. Raise trailer to separate from tow vehicle
4. Remove all items from trailer tongue
5. Remove trailer tongue
6. Lower front of trailer to approximately 12" from ground
7. Install screw jacks at trailer rear
8. Raise trailer front until axles are free
9. Pull axle pins & unplug axle plug (located driver side, ahead of wheels)
10. Roll axles to rear of trailer (within 6" of screw jacks)
11. Lower trailer front to remove screw jacks
12. Raise trailer front to install screw jacks in center of trailer
13. Lower trailer front, now roll axles clear of ride
14. Raise trailer front
15. Remove screw jacks
16. Lower trailer front (level & block accordingly)
17. Disconnect hydraulic foot & connect quick couplers to either side
18. Install jackstands("special" at both ends of trailer) & level
19. Install fence lamp post & platforms
20. Connect all power cords from control box
21. Remove transit support on side & lower: **CAUTION-NEVER DISCONNECT QUICK COUPLERS UNTIL SIDE IS IN SECURED POSITION**
22. Install support & cover
23. Disconnect & repeat #21 & #22
24. Check ride area for any tools & see that ride area is free from any obstacles
25. Check ride rotation for proper direction of travel

ELECTRA-GEAR

LUBRICATION AND MAINTENANCE MANUAL

Lubrication and Maintenance manual for Worm, Worm Planetary, Helical Worm, single or double reduction Gearmotor or Gear Reducer.

WARNING

Improper installation or operation of the gearmotor/gear reducer may cause injury to personnel or gearmotor/gear reducer failure. Read all of the operating instructions. Motor must be installed and grounded per local and national electrical codes.

To reduce potential of electrical shock, disconnect all power sources before initiating any maintenance or repairs. Keep fingers and foreign objects away from ventilation and other openings. Keep air passages clear.

Motor lead wires must be connected per the wire diagram contained in the conduit box or on the motor nameplate.

OPERATIONS

Never leave the controls while the ride is in operation.

Never leave your ride unattended, even if no one is riding.

Do not attempt to service your ride while the ride is in operation.

Do not operate your ride unless the Maintenance Department has inspected and okayed it for operation.

Never overload your ride.

Do not allow intoxicated guests to ride your ride. If a problem occurs, contact your foreman.

If a guest requires assistance, offer the guest help. Do not lift or carry the guest.

Observe the guests at all times while boarding the ride, during the ride, and while exiting the ride.

Always enforce all restrictions fairly and firmly.

INSPECTION & MAINTENANCE INSTRUCTIONS

NOTE: Any maintenance or inspections performed on the center requires that the electrical power is shut off. No one should attempt any type of work in this area without first insuring that the main breaker is in the off position and the lockout on your electrical cabinet secured. It is also a safe practice to disconnect the motor lead line.

SPECIFICATIONS

GEARBOX

A. INSTALLATION

1. GENERAL

The Reducer or Gearmotor should be mounted on a flat surface on the machine or foundation, securely bolted and accurately aligned. Shims under the mounting base should be used when required to provide a level mounting surface.

2. SOLID SHAFT MOUNTING

The output shaft should be connected to the load by flexible coupling, sprocket and chain, sheave and V-Belt or pinion. Check to insure proper alignment and tension of all loads. If sprocket, sheave or pinion is used, mount as close to gear housing as possible to minimize bearing load and shaft deflection. Overhung load must be checked to make certain it does not exceed published capacity.

3. HOLLOW SHAFT MOUNTING

The torque arm of the shaft-mounted worm gearmotors/gear reducer must not be mounted too rigidly. If the torque arm is held down without any flexibility, shaft eccentricity, which is usually present, can seriously overload the bearings of the gearmotor. The flexible grommet provided with all torque arms must be retained, or some other suitable means provided to allow the torque arm to be mounted with some flexibility. The torque arm should be in tension (based on direction of rotation, not compression.)

B. RUN-IN PERIOD

1. The maximum efficiency of our Gearmotors/Gear Reducers is obtained after a "Run-In" period. The length of time required will depend on the load applied and will be two to four hours at rated load and considerably longer at light loads. Overloading will not decrease the "Run-in" time but may cause severe wear. During "Run-in" higher than normal motor currents, higher than normal temperature and lower efficiency and output torque can be expected.

CAUTION: Check Lube Level On All Units.
See Paragraph G (Long Term Storage) if storing for more than 6 months.

C.LUBRICATION - Worm Gear Units

1. All single and multiple reduction worm reducers are shipped with the proper amount of oil for the mounting position and input speeds as ordered. If so ordered, however, factory filing will not be performed.

2. Worm Gear Units can be single or multiple reduction, which may also utilize helical or planetary stages in combination with worm stages. The same oil can be utilized in all stages to simplify stocking of lube oils.

3. The factory filled lube is a non-toxic rust inhibiting AGMA 8 compound worm gear oil, suitable for an Ambient Temperature of +50°F to 125°F.

4. Worm Gear Reducer oil must be used to obtain satisfactory gear and worm operating life. Select the proper type of oil from the recommended lubricant chart depending on expected ambient temperature.
   a. For Ambient temperatures below +15°F or above +125°F, refer to Factory for recommendations.
   b. Worm Gear Reducer oils and compunds in accordance with AGMA specifications are commercially available from all major oil companies.

5. Before placing in operation, make certain that the solid plugs located in the highest position on the gear housing are replaced with the vented breather plug supplied with the unit. If the mounting position is changed from the position ordered consult the oil level and mounting positions chart to obtain proper oil level.

6. Drain and refill oil after first 100 hours of operation. Under normal operating conditions, change oil every 2,500 hours of operation or every 6 months thereafter, whichever occurs first.

7. The maximum input HP rating as shown in the published Rating Tables is based on a stabilized oil bath temperature not exceeding 200°F for normal ambients. Higher oil bath temperatures or continued operation in excess of rated input HP will tend to shorten the useful life of a lubricant. For high ambient temperatures in excess of 100°F, special lubricants or derating of the Gearmotor may be required. Consult the Factory or Local Office with complete application data.

D. LUBRICATION - Helical Gear Units

1. All single and multiple reduction helical gear reducers and gearmotors are factory filled with the proper amount of helical gear oil (AGMA 4EP), suitable for Ambient Temperatures of +60°F to 165°F.

2. Refer to Paragraph C, Lubrication, Worm Gear Units, Item 5, 6 & 7, for Vent Plug positioning, Drain and Fill Intervals and General Lube Information. See Helical Gear Lube Chart, Page 7, for AGMA Lube Ambient Temperature Ranges.

E. MAINTENANCE

1. This gear reducer was accurately adjusted and tested at the factory. Care must be taken when the gearcase is disassembled and reassembled. This should be done by an authorized service station as damage to internal parts may result if adjusted improperly. Frequent oil level inspection with the unit not running, (perferably when warm) should be made by removing the proper oil level plug to see that the oil level is being maintained. If low (without replacing oil level plug) add lubricant through one of the upper openings until it comes out of the oil level hole.

F. SERVICE FACTOR

1. **CAUTION:** Load conditions must be within the published catalog ratings and the recommended AGMA and NEMA service factors should be used.

G. LONG TERM STORAGE (6 months or more)

1. Units should be stored indoors, in a dry, warm location.

2. Completely fill the unit with oil.

3. Rotate the input shaft so that the output shaft rotates at least one revolution per month.

4. Completely cover the input and output shaft with grease.

5. At time of start up, drain the storage oil, install the breather, and fill to the proper oil level with the correct lubricant for the operating condition.

The Flexidyne mechanism has been lubricated at the factory and no further lubrication is required. **Never apply grease, oil or any other foreign material to the flow charge.**

H. WARRANTY (Limited)

1. The warranty will cover all of the parts in our gearmotors or reducers for the first 12 months of operation from date of start-up but not to exceed 18 months from date of shipment. Based on 2080 operational hours per year.

2. The warranty is only for Electra-Gear parts and labor. In no event shall our liability exceed the original price of the unit, nor does it cover cost of on site repair, installation, or freight.

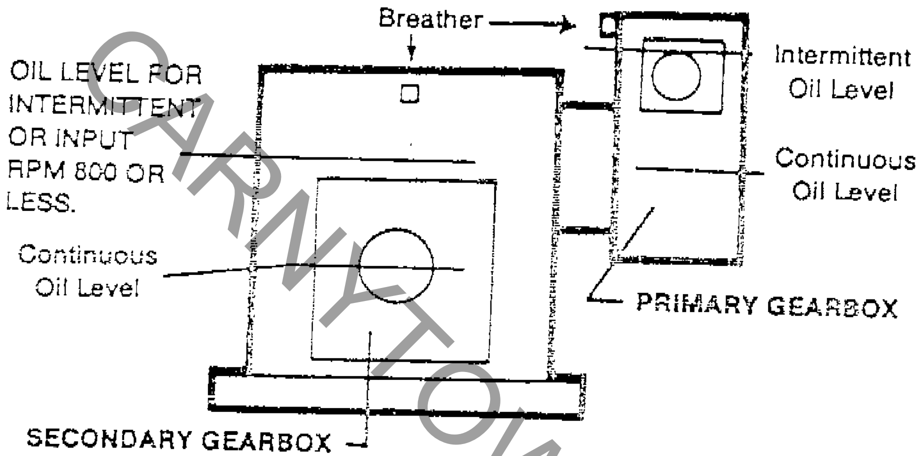
3. Contact the service department for a complete explanation as to the full warranty policies and conditions of sale.
   All dimensions, designs and specifications are subject to change without notice.

NOTE: For shipping and handling, some reducers will have pipe plugs installed at all locations. Select the "highest" plug location for the mounting position used. Install breather or relief valve (and adapter bushing) here. Breather (and adapter) will be bagged or wired to reducer.

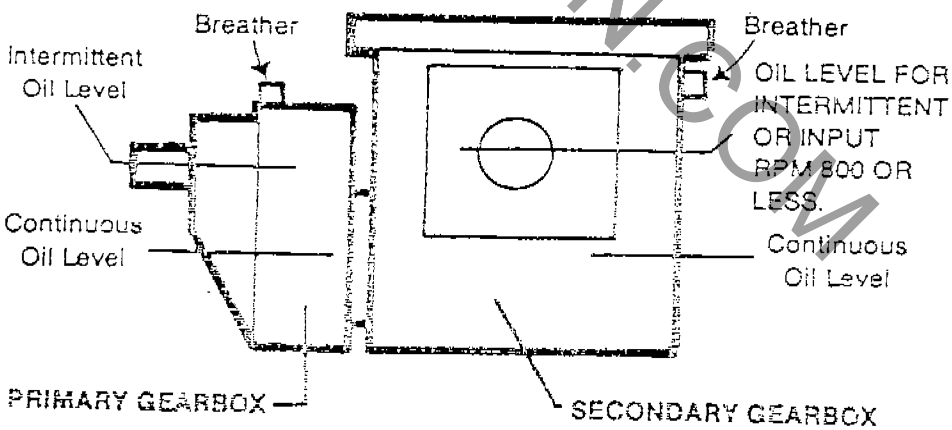
CAUTION: The mounting positions shown are for single reduction. If you have a DOUBLE reduction unit, you MUST apply each mounting configuration to the primary and secondary gearbox as EACH gearbox has its own SEPARATE oil reservoir. NOTE: For worm planetary mounted "Output shaft up," consult the factory for proper oil level.

*This position is not recommended as the high speed oil seal must support the full head of gearcase oil.
Consult the factory for mounting positions other than those shown above.
For LOW SPEED applications (input RPM 800 or less) use an intermittent oil level.
For CONTINUOUS DUTY applications, use a continuous oil level.
For INTERMITTENT or CONTINUOUS - EXTREME load duty applications, we recommend filling to 85% level and using an 8 E.P. lubricant such as Shell Omala No. 680 or equal.

DOUBLE WORM REDUCER



HELICAL WORM REDUCER



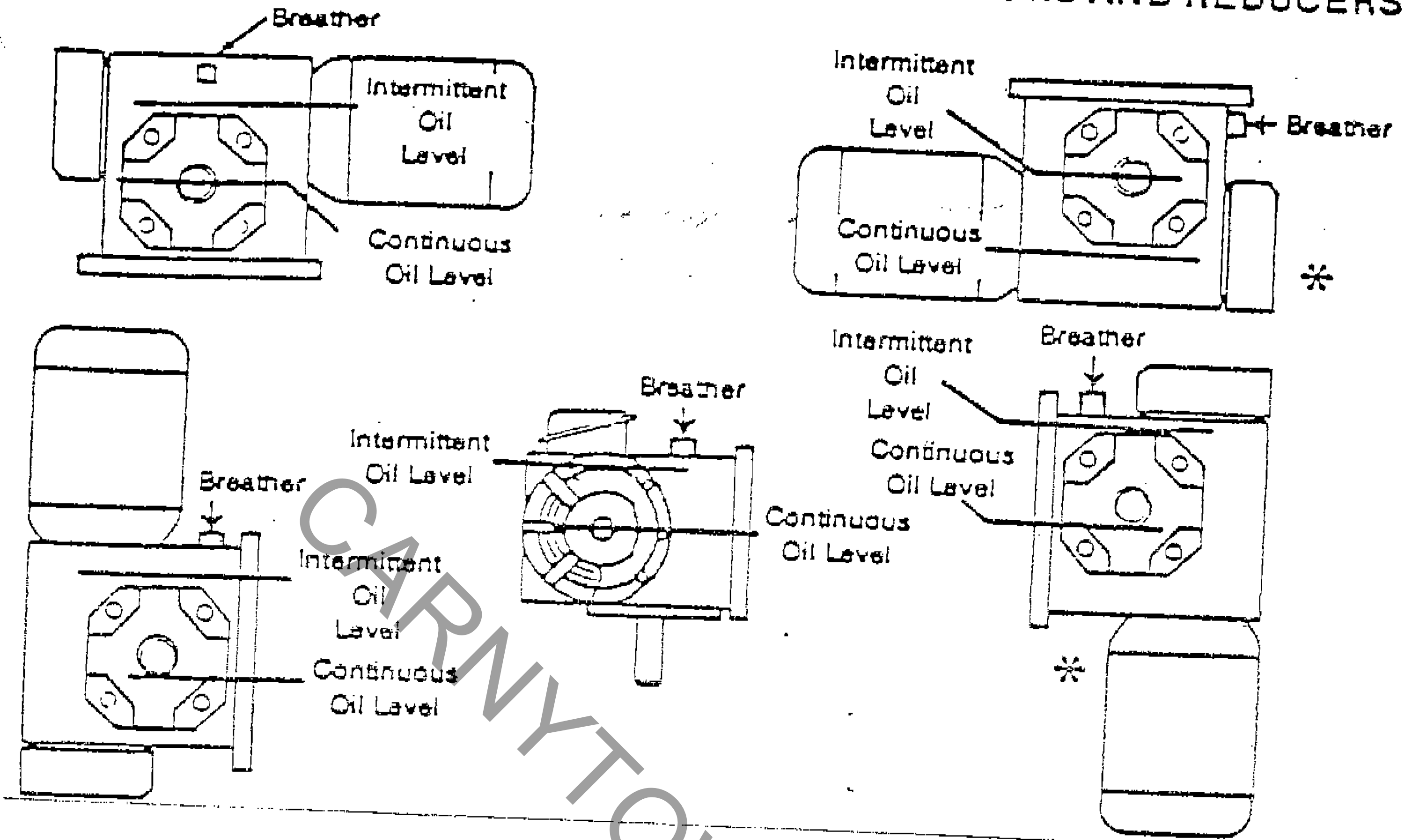
CAUTION: Each gearbox of a Double reduction unit must be filled separately to its proper oil level, depending on its particular assembly and mounting position. For low speed applications (800 RPM or less) use intermittent oil level.

NOTE: On double reduction, generally the secondary gear box is filled to the high oil level.

MANUFACTURER	LUBRICANT NAME	AMBIENT TEMP. RANGE	A.G.M.A. RATING
RECOMMENDED LUBRICANTS (FOR WORM GEARS)			
Getty Refining Co.	Veedol Asreslube 98	+100 to +150°F	8 EP
Getty Refining Co.	Veedol Asreslube 95	+ 50 to +105°F	7 EP
Getty Refining Co.	Veedol Asreslube 90	+ 40 to +100°F	6 EP
Getty Refining Co.	Veedol Asreslube 86	+ 25 to + 90°F	5 EP
Lubrication Eng. Inc.	Almasol 609	+ 45 to +125°F	8
Lubrication Eng. Inc.	Almasol 608	+ 32 to +105°F	7
Lubrication Eng. Inc.	Almasol 607	+ 15 to + 70°F	5
Mobil Oil Corp.	Mobilgear 634	+ 50 to +110°F	8 EP
Mobil Oil Corp.	Mobil Extra Hecla Super	+ 50 to +125°F	8
Mobil Oil Corp.	Mobil Cylinder 600W	+ 32 to +100°F	7
Mobil Oil Corp.	Mobilgear 630	+ 25 to + 75°F	5 EP
Shell Oil Co.	Omala 460	+ 40 to +115°F	7 EP
Shell Oil Co.	Valvata J460	+ 40 to +105°F	7
Shell Oil Co.	Omala 680	+ 50 to +110°F	8 EP
Shell Oil Co.	Valvata J680	+ 50 to +125°F	8
Texaco Inc.	Meropa 680	+ 45 to +120°F	8 EP
Texaco Inc.	Meropa 460	+ 32 to +100°F	7 EP
Texaco Inc.	Meropa 220	+ 15 to + 75°F	5 EP
SPECIAL BROAD TEMPERATURE RANGE LUBRICANTS			
Electragear International Inc.	Electra Lube	+ 15 to +125°F	—
Kendall	3 Star	− 10 to +100°F	7
Mobil Oil Co.	Mobil SHC 634	0 to +135°F	7 EP
Mobil Oil Co.	Mobil SHC 629	− 25 to +100°F	5 EP
Mobil Oil Co.	Mobil SHC 626	− 40 to + 40°F	3 EP
SPECIAL COLD DUTY LUBRICANTS			
Conoco	Polar Start 600	− 40 to + 10°F	—
Lubrication Eng. Inc.	Almasol 606	− 10 to + 40°F	3 EP
Mobil Oil Co.	Mobil SHC 624	− 55 to 0°F	—
Mobil Oil Co.	Gargoyle Arctic Oil "C"	− 30 to + 5°F	—
Mobil Oil Co.	Mobilgear 627	− 10 to + 40°F	3 EP
Shell Oil Co.	Donax A.T.F. T-6	− 55 to + 5°F	None
RECOMMENDED LUBRICANTS (HELICAL GEAR UNITS)			
See above manufacturers and/or others for their recommended lubricants.		+ 15 to + 50°F	2 or 2 EP
		+ 50 to +125°F	3 or 3 EP
		+ 60 to +165°F	4 EP

1. Ambient temperature range is based upon 1.0 service factor.
2. Above lubes are compounded for use in *worm gears.* Some contain non-corrosive, extreme pressure. DO NOT USE lubes that contain sulphur and/or chlorine which are corrosive to bronze gears. Extreme pressure lubes, in some cases, contain materials that are toxic. Avoid use of these lubes where they can result in harmful effects. If in doubt, consult your local lube supplier.
3. Only use A.G.M.A. rated *worm gear* lubes, except for helical prefixes.

OIL LEVEL AND MOUNTING POSITIONS FOR GEARMOTORS AND REDUCERS



NOTE: For shipping and handling, some reducers will have pipe plugs installed at all locations. Select the "highest" plug location for the mounting position used. Install breather or relief valve (and adapter bushing) here. Breather (and adapter) will be bagged or wired to reducer.

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Consult the factory for mounting positions other than those shown above.
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For INTERMITTENT or CONTINUOUS - EXTREME load duty applications, we recommend filling to 85% level and using an 8 E.P. lubricant such as Shell Omala No. 680 or equal.

SPECIFICATIONS

FLUID COUPLING

INSTRUCTION MANUAL FOR

70C, 70D, 75C and 75D

FLEXIDYNE

Couplings and Drives

WARNING: Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed: Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. the instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Reliance Electric nor are the responsibility of Reliance Electric. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a failsafe device must be an integral part of the driven equipment beyond the speed reducer output shaft.

DESCRIPTION

Flexidyne dry fluid couplings and drives are unique concepts to provide soft start and momentary overload protection for all types of driven equipment. Standard NEMA-B motors with RPM base speeds of 1750, 1160 or 860 are commonly used with a Flexidyne coupling or drive, yet other available power sources may be used with the Flexidyne mechanism.

The dry "fluid" in the Flexidyne housing is heat treated steel shot. A measured amount, referred to as flow charge, is added into a housing which has been keyed to the motor shaft. When the motor is started, centrifugal force throws the flow charge to the perimeter of the housing, packs it between the housing and the rotor which in turn transmits power to the load.

After the starting period of slippage between housing and rotor the two become locked together and achieve full load speed, operating without slip and with 100% efficiency.

Consequently, the motor accelerates instantly to base speed, while the load starts gradually and smoothly.

INSTALLATION

COUPLINGS:

Install coupling flange on motor shaft and drive housing mechanism on driven shaft in accordance with the instruction manual (499645) packaged with the TaperLock bushings. **Note: The coupling flange must be mounted on motor shaft (not driven shaft) to allow proper operation of the Flexidyne coupling.** Shaft ends must not protrude beyond bushing ends. Install coupling disc over pins on drive housing mechanism. Position the motor and the driven unit so that the spacer buttons on the coupling disc slightly contact the coupling flange. Reference Dimension A on parts drawing. (A = 5/8" on size 70C; A = 3/4" on size 75C)

For longest Flexidyne coupling life, it is always desirable to align coupling as accurately as possible at initial installation. Check alignment by laying a straight edge across the coupling flange and drive housing at several points around the circumference.

Note: Driven shaft must not touch housing hub.

DRIVES:

Install the Flexidyne special bolt-on sheave on the driven hub. Use screws and lock washers provided with the Flexidyne drive. Torque screws to 160 pound-inches.

Stake motor shaft key in place and slide Flexidyne drive onto the motor shaft, with collar as close to the motor as possible. Tighten key set screw securely against motor shaft key. Tighten shaft set screw securely against motor shaft.

Note: the sheave is the output of the Flexidyne drive, do not input power to the Flexidyne drive through the sheave. In other words, do not mount the Flexidyne drive on the driven shaft.

OPERATION

The amount of flow charge in the housing determines the acceleration time for a given load. Slower acceleration times will occur when less flow charge is used and faster acceleration, from stop to full speed, will be observed with greater amounts of flow charge.

The Flexidyne mechanism should start the load smoothly and without delay provided the proper amount of flow charge has been used. Should the acceleration time exceed the maximum allowable in Table 1, shut off power to the Flexidyne mechanism immediately. Allow the Flexidyne mechanism to cool, then add small amounts of flow charge until proper acceleration is observed.

Vibration is an indication of accelerating too rapidly and not allowing flow charge to become evenly distributed in the Flexidyne housing. This can be corrected by removing small amounts of flow charge until vibration subsides. Other causes of vibration are, undersize shafting, unit not installed far enough on shaft or worn bore in the unit.

Slippage - The Flexidyne mechanism can, without slipping, transmit overloads up to 130% of its pre-set starting torque. Should this breakaway torque be exceeded the Flexidyne mechanism will slip and generate heat (see Overload Protection). Although slippage usually indicates increased loads, it can also be caused by worn flow charge or a worn rotor especially if the Flexidyne mechanism has been in operation for some time. The necessity to replace either a rotor or flow charge will be made evident by a loss in power transmitting capacity of the Flexidyne mechanism.

MAINTENANCE

For average industrial applications involving 3 or 4 starts a day and of not more than 6 seconds acceleration time each, the flow charge should be changed every 10,000 hours of operation. For more severe conditions, visually inspect flow charge at more frequent intervals; it should be changed when it has deteriorated to a half powder, half granular condition. See page 6 for flow charge analysis. Visual inspections should continue until enough flow charge changes have been made to adequately establish a schedule for renewing Flexidyne flow charge.

START-UP

1. Remove the filler plug and install the proper amount of flow charge specified in Table 1. Replace and tighten filler plug, making sure that no flow charge is trapped in threads. Torque filler plug to 35 inch-pounds.

2. Attach AC ammeter (conventional clamp-on or equivalent) to one line of the AC motor. Set range to cover 200% of motor nameplate current.

3. Note maximum allowable acceleration time as stated in Tables 1 and 2. **Note:** Table 2 lists starting time capacity for starting cycles occuring more than once every 2 hours.

4. Push start button. Observe motor current during load acceleration and number of seconds required to reach full speed (Fig. 2).

   Increase amount of flow charge if:

   A. Acceleration time reaches maximum allowable before load is up to speed. Turn off power immediately if this time is reached.

   B. Acceleration amperage is below motor nameplate.

   Decrease amount of flow charge if:

   A. Acceleration time is less than 1 1/2 seconds.

   B. Acceleration amperage is above 200% of motor nameplate.

5. Once satisfactory operation has been obtained record the following for future reference:

   1. The amount of flow charge.

   2. Starting current.

   3. Acceleration Time.

WARNING: The rotor must slip during acceleration to allow flow charge to become evenly distributed in the Flexidyne housing. Therefore, DO NOT ALLOW FLEXIDYNE MECHANISM TO RUN "FREE" (that is, without a load on the driven end), otherwise an out-of-balance condition may result, damaging mechanism and attached equipment.

THERMAL CAPACITY

Since there is slippage within the flow charge during acceleration, heat is generated from friction. The thermal capacity of the Flexidyne mechanism is based on balancing this heat generated during acceleration against the cooling time between accelerations. The amount of heat generated is determined by the amount of horsepower dissipated by slipping and the duration of each acceleration. If the flow charge weight is light, the heat generated will not be as great as that which would be generated with a heavier flow charge, when compared at the same acceleration time. A longer time between starts will dissipate more heat; therefore, higher starting horsepowers may be transmitted, or longer acceleration times may be allowable. (See Starting Cycle)

Acceleration times shown in Table 1 are for starting frequencies of one start per hour or less. If starting frequency is more than once per hour, use acceleration time for actual starting cycle shown in Table 2.

Acceleration times listed in Tables 1 and 2 are the MAXIMUM permissible for the various starting frequencies listed. The MINIMUM acceleration time required for proper Flexidyne mechanism operation is 1 to 1 1/2 seconds. This is the time required for the flow charge to be uniformly distributed around the housing cavity before the unit "locks in". Any acceleration time between the minimum and maximum listed is acceptable, although a shorter acceleration time will generally provide longer wear life. For applications requiring a specific acceleration time (within these limits) flow charge may be added or removed to produce the required results.

STALLED - If a jam-up stalls the drive, the motor continues to run and the Flexidyne mechanism slips. This causes heat to be generated at twice the rate of normal acceleration. Therefore, the allowable slipping time, when stalled, is half the allowable acceleration time given in Table 1.

Starting Cycle is the time from the beginning of one acceleration to the beginning of the next. Allowable acceleration times in Table 2 are based on the assumption except for a momentary stop before the next start. If the stop is more than momentary, decrease the actual starting cycle by one-half the stopped time before using Table 2; for example, with a 50 minute actual starting cycle of which 20 minutes is stopped time, decrease 50 by half of 20 to give 40 minutes as the starting cycle time to use for Table 2.

Grouped Starts - For several starts grouped together followed by uninterrupted running, add the acceleration times of all starts and consider it as the time for one start. The starting cycle would be the time from the beginning of one group of starts to the beginning of the next group.

OVERLOAD PROTECTION

A Thermal Cutout is available from Dodge and is recommended for Flexidyne mechanism Size 70 and 75 where slippage (due to overloads, starting or reversing), is frequent or prolonged. Its function is to protect against excessive heat which may be generated by the Flexidyne mechanism. A Speed Drop Cutout is also available from Dodge for installation where overloads or jamming may occur.

Either unit can be installed to send a signal to interrupt the motor current and, if desired, activate a bell, light or other warning device. Cutout switches are intended for use in control circuits only and are not recommended for dc current nor should they be used directly in the line to the motor. Both units are available in special explosion-proof models for hazardous atmospheres.

REPLACEMENT OF PARTS

COUPLINGS:

Disassembly:

1. Remove drive housing mechanism from driven shaft.
2. Remove filler plug and flow charge from Flexidyne housing.
3. Remove housing screws, housing cover and cover seal.
4. Remove screws that attach driven hub to rotor retainer. Remove driven hub and rotor.
5. Remove bronze bushing retainer ring and slip bronze bushing off drive housing.
6. Remove ball bearing snap ring and ball bearing. In removing ball bearing, place 3 equal length pins in the 3 holes thru the end of the drive housing and press against the pins. For sizes 70 and 75 use 1/8" to 9/64" diameter pins.
7. Remove rotor retainer.

Reassembly:

1. Install new seal felt and housing seal in drive housing.
2. Set rotor retainer in place in drive housing.
3. Press ball bearings onto drive housing. Note: Press against inner (not outer) race of bearing. Make sure rotor retainer is not cocked when bearing enters it. Check to see that rotor retainer rotates freely in housing seal.
4. Install ball bearing retaining ring.
5. Install bronze bushing and snap ring.
6. Install rotor and driven hub. Install and tighten screws.
7. Install cover seal in housing cover and place cover in position on drive housing. Install and tighten housing screws.
8. Replace flow charge and filler plug per STARTUP, Item 1 on page 2.

4. Place rotor in position. Slide driven hub over drive hub. Install and tighten the six rotor screws.

5. Install cover seal. Install housing cover on drive hub housing so filler plug hole lines up with relief on the flange of drive hub housing. Install and tighten housing screws.

6. Install motor shaft collar and filler plug. Place bolt-on sheave in position and install and tighten six sheave bolts.

Table 1. Flow Charge Recommendations (cont.)

Based on % of Starting Torque for 875 RPM NEMA Design B Motors

Motor HP	Flexidyne Mechanism Size	100% @ 875 RPM				125% @ 870 RPM				150% @ 850 RPM				175% @ 840 RPM				200% @ 820 RPM			
		Starting HP	Flow Charge Lbs.	Flow Charge Oz.	Max. Time in Sec.	Starting HP	Flow Charge Lbs.	Flow Charge Oz.	Max. Time in Sec.	Starting HP	Flow Charge Lbs.	Flow Charge Oz.	Max. Time in Sec.	Starting HP	Flow Charge Lbs.	Flow Charge Oz.	Max. Time in Sec.	Starting HP	Flow Charge Lbs.	Flow Charge Oz.	Max. Time in Sec.
½	70C, 70D	.50	1	12	900	.62	1	15	850	.75	2	1	800	.85	2	4	750	.94	2	6	570
¾	70C, 70D	.75	2	0	800	.94	2	3	570	1.1	2	6	500	1.3	2	8	400	1.4	2	12	350
1	75C, 75D	1.0	1	13	520	1.2	2	0	400	1.5	2	3	330	1.7	2	7	320	1.9	2	8	300
1½	75C, 75D	1.5	2	2	330	1.9	2	7	300	2.2	2	10	250	2.5	2	11	220	2.3	2	12	200

Table 2. Thermal Capacity

Maximum Allowable Acceleration Time in Seconds for Standard Motor Speeds at Various Starting Cycles

Flexidyne Mechanism Size	Starting HP	2 Hours 870	2 Hours 1160	2 Hours 1750	1 Hour 870	1 Hour 1160	1 Hour 1750	30 Min. 870	30 Min. 1160	30 Min. 1750	15 Min. 870	15 Min. 1160	15 Min. 1750
70	.50	900	...	...	900	...	...	900	...	...	800	...	...
	.75	800	...	...	800	...	...	800	...	...	700	...	...
	1.0	550	500	...	550	500	...	550	500	..	500	450	...
	2.0	...	260	210	...	260	210	...	260	210	...	230	190
	2.5	...	190	180	...	190	180	...	190	180	...	165	160
	3.0	...	170	150	...	170	150	...	170	150	...	155	140
	4.0	...	130	110	...	130	110	...	130	110	...	118	100
	6.0	...	...	80	...	...	80	...	...	80	...	...	72
	8.0	...	...	63	...	..	63	...	...	63	...	...	56
	10.0	...	...	53	...	...	53	...	...	53	...	...	46
75	1.0	520	...	...	520	...	...	520	...	...	520	...	...
	2.0	300	250	...	300	250	...	300	250	...	300	220	...
	3.0	200	150	...	200	150	...	200	150	...	200	130	...
	4.0	...	110	...	...	110	...	...	110	...	...	100	...
	5.0	...	90	85	...	90	85	...	90	85	...	85	80
	7.0	...	75	73	...	75	73	...	75	73	...	70	68
	8.0	...	...	70	...	...	70	...	...	70	...	...	64
	10.0	...	...	58	...	...	58	...	...	58	...	...	53
	15.0	...	...	48	...	...	48	...	...	48	...	...	43
	20.0	...	...	40	...	...	40	...	...	40	...	...	35

Flexidyne Mechanism Size	Starting HP	10 Min. 870	10 Min. 1160	10 Min. 1750	5 Min. 870	5 Min. 1160	5 Min. 1750	2 Min. 870	2 Min. 1160	2 Min. 1750	1 Min. 870	1 Min. 1160	1 Min. 1750
70	.50	500	...	...	250	...	...	100	...	...	50	...	...
	.75	400	...	...	230	...	...	100	...	...	50	...	...
	1.0	330	320	...	210	200	...	100	80	...	50	45	...
	2.0	...	190	170	...	120	105	...	60	58	...	38	36
	2.5	...	143	140	...	88	85	...	49	45	...	33	29
	3.0	...	133	120	...	80	74	...	45	39	...	28	25
	4.0	...	90	83	...	60	54	...	36	30	...	23	19
	6.0	...	...	60	...	...	38	...	...	21	...	...	13
	8.0	...	...	41	...	...	29	...	...	16	...	...	10
	10.0	...	...	36	...	...	23	...	...	13	...	...	8
75	1.0	420	...	...	260	...	...	100	...	...	50	...	...
	2.0	210	180	...	130	110	...	80	60	...	40	40	...
	3.0	150	110	...	100	65	...	52	40	...	30	22	...
	4.0	...	82	...	...	50	...	...	28	...	...	18	...
	5.0	...	70	65	...	45	40	...	24	22	...	16	15
	7.0	...	60	57	...	38	37	...	21	20	...	14	13
	8.0	...	...	54	...	...	35	...	...	18	...	...	11
	10.0	...	...	45	...	...	30	...	...	16	...	...	10
	15.0	...	...	34	...	...	21	...	...	11	...	...	8
	20.0	...	...	27	...	...	17	...	...	8	...	...	5

REPLACEMENT OF PARTS

COUPLINGS:

Disassembly:

1. Remove drive housing mechanism from driven shaft.
2. Remove filler plug and flow charge from Flexidyne housing.
3. Remove housing screws, housing cover and cover seal.
4. Remove screws that attach driven hub to rotor retainer. Remove driven hub and rotor.
5. Remove bronze bushing retainer ring and slip bronze bushing off drive housing.
6. Remove ball bearing snap ring and ball bearing. In removing ball bearing, place 3 equal length pins in the 3 holes thru the end of the drive housing and press against the pins. For sizes 70 and 75 use 1/8" to 9/64" diameter pins.
7. Remove rotor retainer.

Reassembly:

1. Install new seal felt and housing seal in drive housing.
2. Set rotor retainer in place in drive housing.
3. Press ball bearings onto drive housing. Note: Press against inner (not outer) race of bearing. Make sure rotor retainer is not cocked when bearing enters it. Check to see that rotor retainer rotates freely in housing seal.
4. Install ball bearing retaining ring.
5. Install bronze bushing and snap ring.
6. Install rotor and driven hub. Install and tighten screws.
7. Install cover seal in housing cover and place cover in position on drive housing. Install and tighten housing screws.
8. Replace flow charge and filler plug per STARTUP, Item 1 on page 2.

DRIVES:

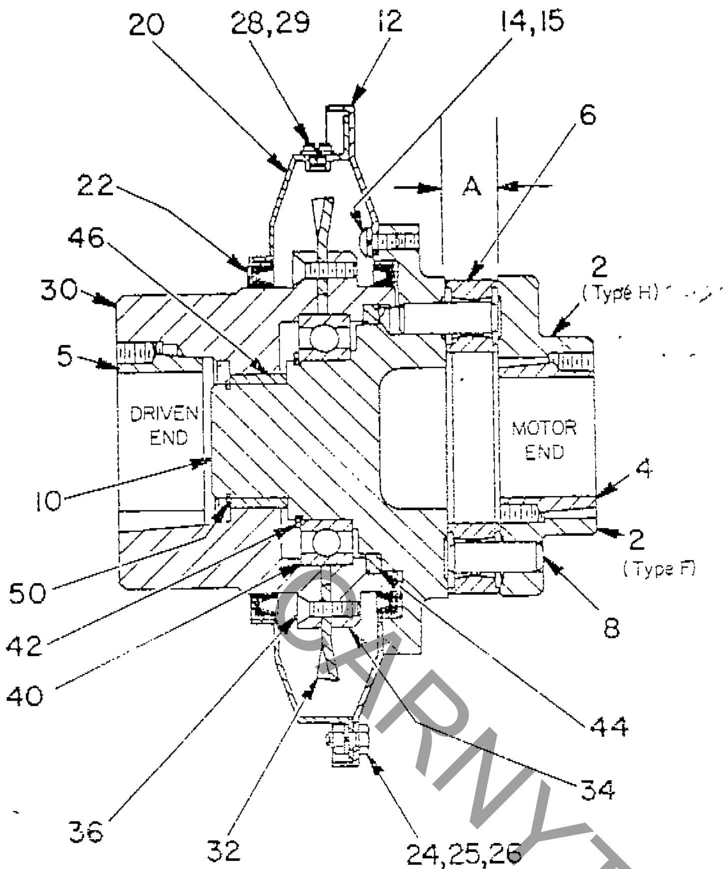
Disassembly:

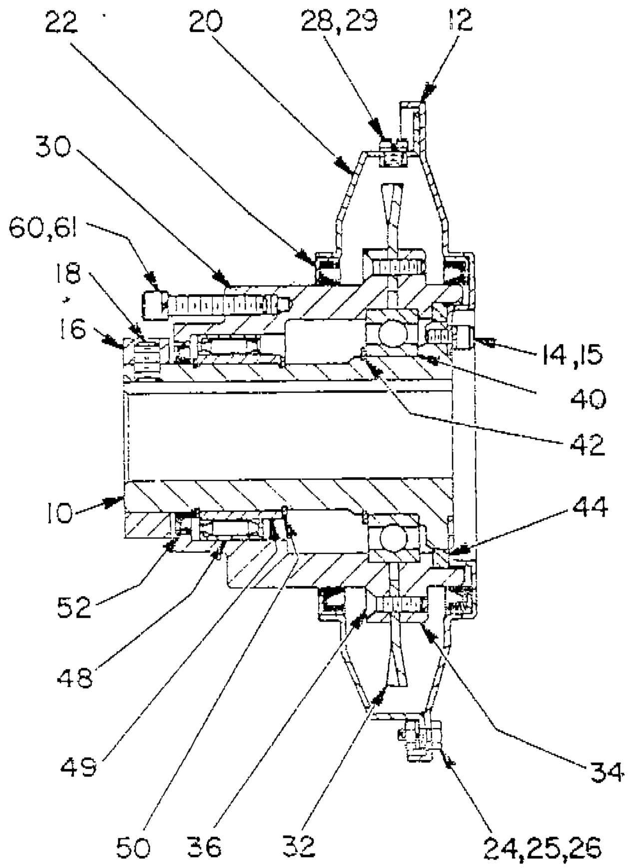
1. Loosen set screws in collar and remove Flexidyne drive from motor shaft.
2. Remove filler plug and drain flow charge from Flexidyne housing.
3. Remove sheave from Flexidyne mechanism.
4. Remove housing screws and remove housing cover. Remove cover seal.
5. Remove collar. Remove the six rotor screws and slide driven hub off drive hub. Remove rotor.
6. Remove needle bearing snap ring and needle bearing inner race.
7. Remove the six drive hub screws and remove the drive hub housing. Remove housing seal.
8. Remove rotor retainer and seal felt.
9. Remove ball bearing snap ring and remove ball bearing.
10. Remove needle bearing and seal from driven hub by placing a plug in the left hand end (as viewed in the drawing) of driven hub bore and pressing against the plug.

Reassembly:

1. Press needle bearing into right hand end of driven hub. Make sure left hand end of bearing is ¼" from left hand end of driven hub. Needle bearing should be filled with high temperature roller bearing grease. Tap needle bearing seal into place, flush with left hand end of driven hub.
2. Install housing seal in drive hub housing and attach drive hub housing to drive hub with six screws. Install

(cont. on page 6)





Reference	Name of Part	No. Req'd.	Part Numbers 70C	75C	70D	75D
2	Coupling Flange { Type H	1	008041	008043	......	......
	{ Type F		008040	008042	......	......
4	Taper-Lock Bushing w/screws (Motor End)	1	1215	1615	......	......
5	Taper-Lock Bushing w/screws (Driven End)	1	1610	1610	......	......
6	POLY-DISC® Coupling Element	1	008032	008033	......	......
8	Flange Pin	4	409122	409123	......	......
10	Drive Hub	1	305076	305077	◈	⊡
12	Drive Hub Housing	1	305078	305078	305079	305079
14	Drive Hub Screw	6	415100	415100	417020	417020
15	Lockwasher	6	419007	419007	419043	419043
16	Drive Hub Collar	1	......	......	305135	305135
18	Drive Hub Collar Set Screw		......	......	♦	♦
♦	Drive Hub Key	§	......	......	......	443390
20	Housing Cover	1	305091	305091	305091	305091
22	Housing Seal	2	305138	305138	305138	305138
24	Housing Screw	6	411296	411296	411296	411296
25	Lockwasher	6	419007	419007	419007	419007
26	Hex Nut	6	407082	407082	407082	407082
28	Filler Plug	1	305018	305018	305018	305018
29	Lockwasher	1	419190	419190	419190	419190
30	Driven Hub	1	305075	305075	305073	305074
32	Rotor	1	305094	305095	305094	305095
34	Rotor Retainer	1	305096	305096	305096	305096
36	Rotor Screw	6	415052	415052	415052	415052
40	Ball Bearing	1	391200	391200	391200	391200
42	Retaining Ring	1	421150	421150	421150	421150
44	Dust Seal	1	308024	308024	308024	308024
46	Bronze Bearing	1	426070	426070	......	......
48	Needle Bearing	1	......	......	426022	426022
49	Needle Bearing Inner Race	1	......	......	426039	426039
50	Retaining Ring	Δ	421004	421004	421145	421145
52	Bearing Seal	1	......	......	305139	305139
60	Sheave Screw	4	......	......	417047	417050
61	Lockwasher	4	......	......	419045	419045

♦ Not shown on parts drawing.
Δ 1 req'd. on Flexidyne Coupling units; 2 req'd. on Flexidyne Drive units.
§ 1 req'd. on Size 75D x 1⅜ only.
◈ 305069 req'd. on Size 70D x ⅞; 305070 req'd. on Size 70D x 1⅛.
⊡ 305071 req'd. on Size 75D x 1⅛; 305072 req'd. on Size 75D x 1⅜.
♦ Size 70D x ⅞ — 400062, 2 req'd.; Sizes 70D x 1⅛ & 75D x 1⅛ — 400054, 1 req'd. & 400058, 1 req'd.; Size 75D x 1⅜ — 400054, 2 req'd.

Replacement of Parts (cont.)

seal felt on drive hub and rotor retainer in position in drive hub housing, making sure that housing seal is properly seated in drive hub housing.

3. Press ball bearing onto drive hub. Press against inner (not outer) race of bearing. Rotor retainer must not be cocked when bearing enters it. Check, after pressing by making certain rotor retainer rotates freely in seal. Install ball bearing snap ring. Install needle bearing inner race and snap ring on drive hub.

4. Place rotor in position. Slide driven hub over drive hub. Install and tighten the six rotor screws.

5. Install cover seal. Install housing cover on drive hub housing so filler plug hole lines up with relief on the flange of drive hub housing. Install and tighten housing screws.

6. Install motor shaft collar and filler plug. Place bolt-on sheave in position and install and tighten six sheave bolts.

Table Manufacturer's Part Numbers for Replacement Ball Bearings

Flexidyne Mechanism Size	DODGE Part Number	SKF Part Number	NEW DEPARTURE Part Number
70C & 70D	391200	6010 2RS/ME	Z4993L10X1V
75C & 75D	391200	6010 2RS/ME	Z4993L10X1V

Flexidyne Mechanism Trouble Analysis

Symptom	Cause	Cure
Vibration	1. Misalignment	1. Realign drive or coupling.
	2. Bent shaft	2. Replace or straighten.
	3. Excess flow charge	3. Remove small amount of flow charge.
	4. Fused flow charge	4. Correct the overload.
	5. Improper installation — Output shaft jammed against housing	5. Readjust spacing between shafts and Flexidyne housing.
Erratic Acceleration	1. Breakdown of flow charge	1. Replace flow charge.
	2. Caked flow charge	2. Moist environment — use stainless flow charge.
	3. Below minimum amount of flow charge	3. Add flow charge.
Flexidyne Mechanism Doesn't Slip	1. Improper installation — Output shaft jammed against housing	1. Readjust spacing between shafts and Flexidyne housing.
	2. Flow charge in bearings — causing bearing seizure	2. Replace seals, bearings and flow charge or replace Flexidyne mechanism.
Excessive Slippage	1. Not enough flow charge	1. Add flow charge.
	2. Overload	2. Relieve overload.
	3. Worn flow charge	3. Replace flow charge.
	4. Worn rotor	4. Replace rotor.
Poor or short flow charge life	1. Excessive slip at start up	1. Add flow charge to reduce starting time.
	2. Excessive inching or jogging of machine	2. Install time delay in motor control circuit.

Flexidyne Mechanism Flow Charge Analysis

Condition	Cause
1. Red oxide color, granular consistency	1. Normal after some usage.
2. Red oxide color, powdery consistency, possibly with powdery flakes	2. Worn-out, can cause Flexidyne mechanism damage.
3. Black, powdery	3. Rotor worn, excessive slip and heat.
4. Red oxide, powdery and chunky	4. Worn-out and moisture present.
5. Clumping of flow charge	5. Moisture present, use stainless flow charge.

OMNI FILMS International, Inc.

SUBJECT TUB SHAFT ASSY

BY J. TAYLOR PAGE 1 OF 16 DATE 7/22/93

SECTION 1

Approved: 9/8/93

[signature]

OMNI FILMS International, Inc.

SUBJECT ROTATING TUB - DESIGN CONDITIONS

BY J. TAYLOR PAGE 2 OF 16 DATE 7/23/93

SECTION 4A-1

RIDERS

ADULT WEIGHT	170 LB
CHILD	110 LB

PER ASTM F1159-88

ROTATING TUB

ROTATION	7.5 RPM
WEIGHT	220 LB.

ROTATING DECK

ROTATION	8.5 RPM

OMNI FILMS International, Inc.

SUBJECT ROTATING TUB BEARING SELECTION

BY J. TAYLOR PAGE 3 OF 16 DATE

LB-1

DETERMINE BEARING REACTION LOADS

(CONDITION 1 (1 ADULT RIDER)

ACCELERATION (TUB)

$$A_{TUB} = \frac{V^2}{R} = \frac{\left[\left(75 \frac{REV}{MIN}\right)\left(\frac{MIN}{60 SEC}\right)\left(\frac{2\pi\ RAD}{REV}\right)\left(15.0\ IN\right)\left(\frac{FT}{12\ IN}\right)\right]^2}{15\ IN\left(\frac{FT}{12\ IN}\right)} = 77.1 \frac{FT}{SEC^2}$$

CENTRIFUGAL FORCE (1 ADULT TO THE TUB)

$$\frac{(170\ LB_m)(77.1 \frac{FT}{SEC^2})}{32.2 \frac{LB_m\ FT}{LB_f\ SEC^2}} = 407\ LB_f$$

$$A_{DECK} = \frac{\left[\left(8.5 \frac{REV}{MIN}\right)\left(\frac{MIN}{60 SEC}\right)\left(\frac{2\pi\ RAD}{REV}\right)\left(8\ FT\right)\right]^2}{8\ FT} = 6.4 \frac{FT}{SEC^2}$$

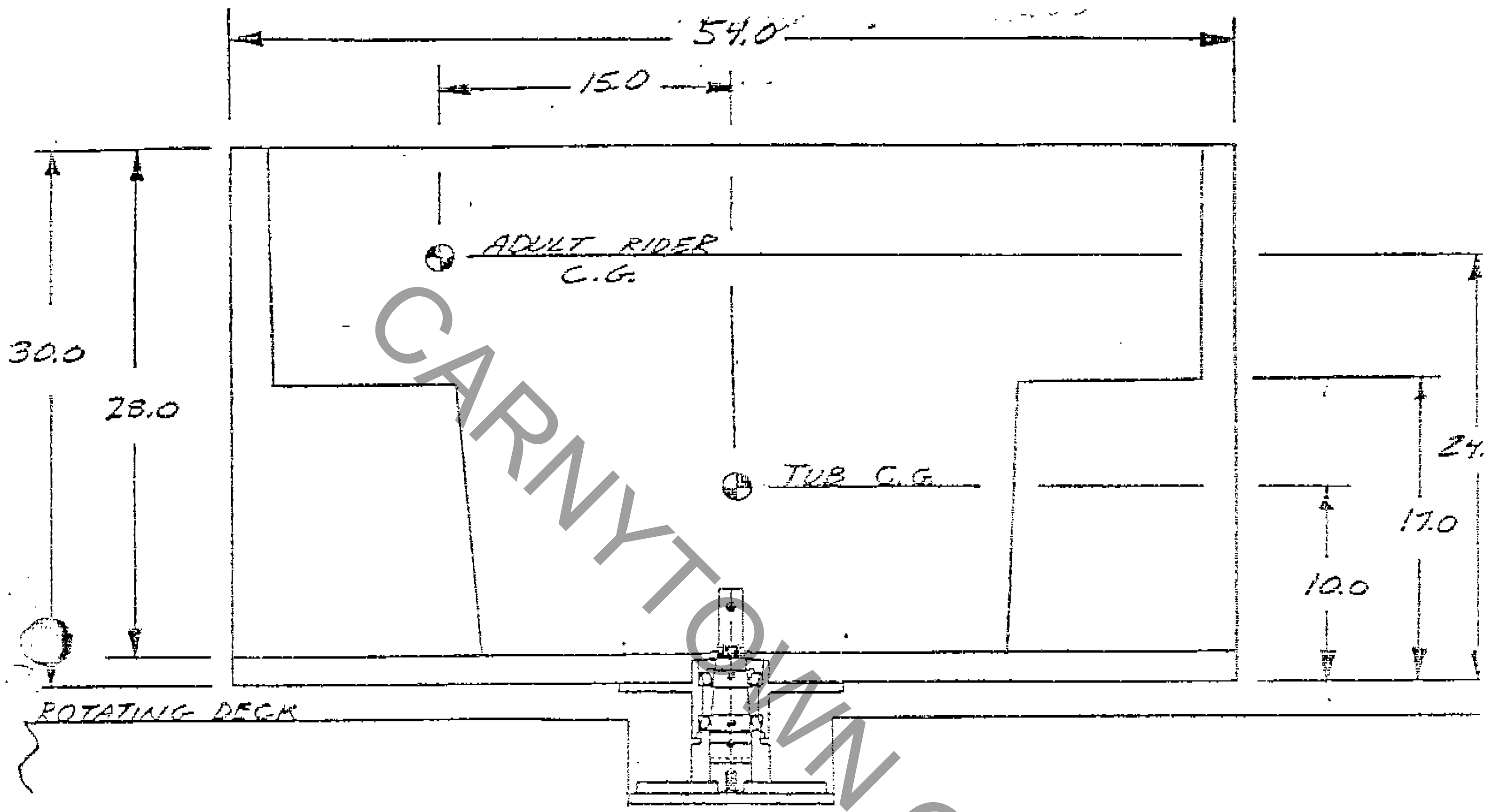
CENTRIFUGAL FORCE (1 ADULT RIDER TO THE DECK)

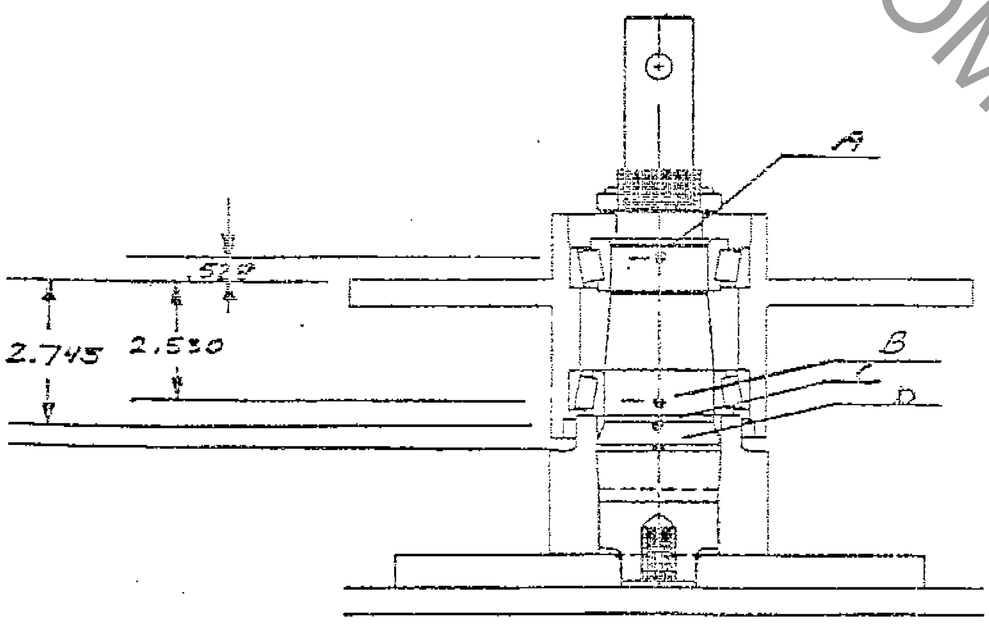
$$\frac{(170\ LB_m)(6.4 \frac{FT}{SEC^2})}{32.2 \frac{LB_m\ FT}{LB_f\ SEC^2}} = 33.8\ LB_F$$

ROTATING TUB

1 ADULT RIDER

6/15/94
4 of



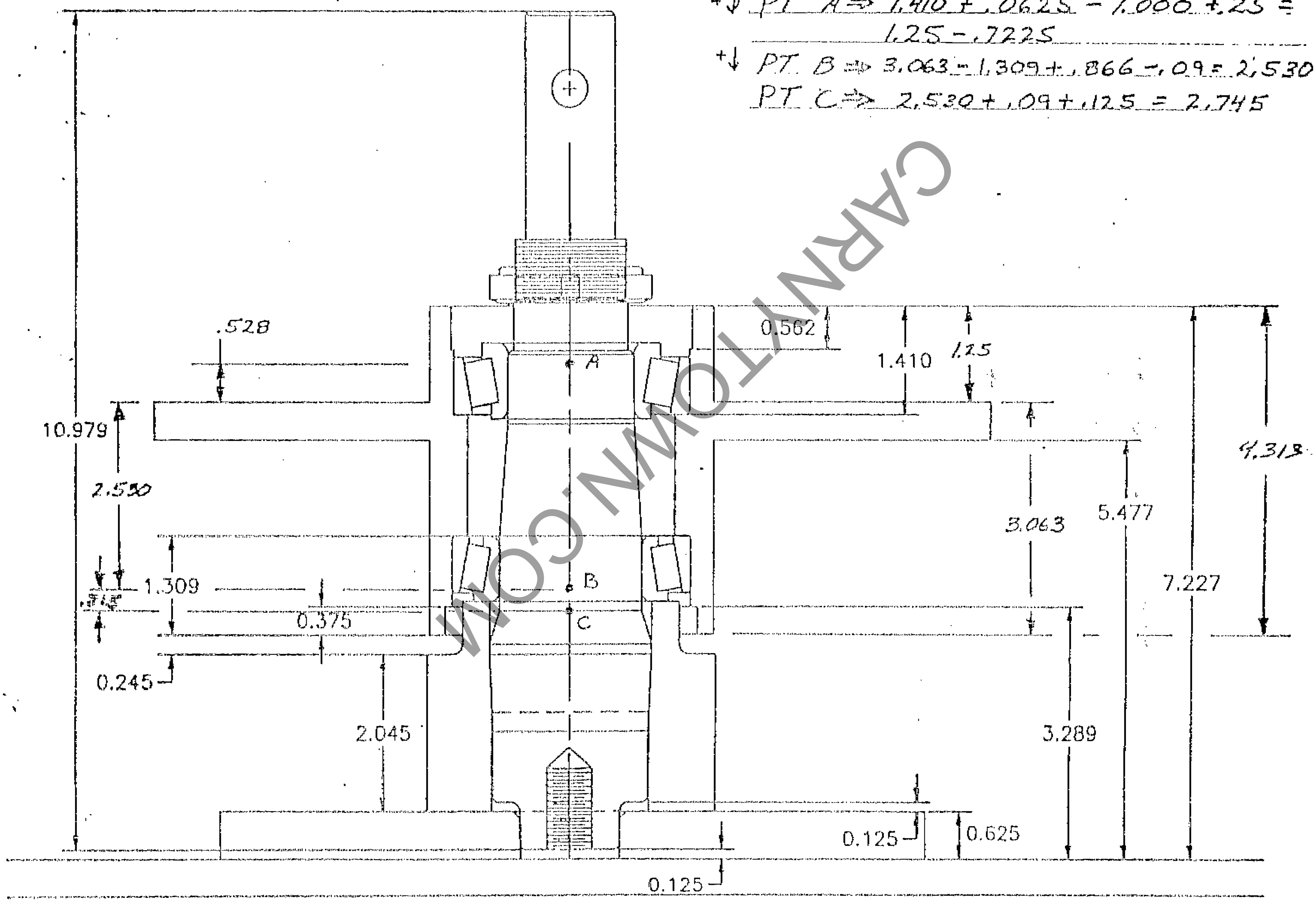


VIEW A

+↓ PT A ⇒ 1.410 + .0625 - 1.000 + .25 =
1.25 - .7225

+↓ PT. B ⇒ 3.063 - 1.309 + .866 - .09 = 2.530

PT C ⇒ 2.530 + .09 + .125 = 2.745



OMNI FILMS International, Inc.

SUBJECT ROTATING TUB - BEARING SELECTION

BY J. TAYLOR PAGE 6 OF 16 DATE

1B-2

CENTRIFUGAL FORCE (1 TUB TO THE DECK)

$$\frac{(220\ LB_m)(6.4\ \frac{FT}{SEC^2})}{32.2\ \frac{LB_m\ FT}{LB_f\ SEC^2}} = 43.7\ LB_f$$

DESCRIPTION OF CRITICAL LOCATION OF THE BEARING ASSY

PT-A LOAD CENTER OF THE TOP BEARING

PT-B LOAD CENTER OF THE BOTTOM BEARING

PT-C LOCATION OF THE HIGHEST STRESSES DUE TO BENDING

PT-D LOCATION WHERE SHAFT BENDING BEGINS (NO ASSISTANCE FROM THE SHAFT SLEEVE)

BEARING REACTION LOADS

$$+\circlearrowleft \sum M_B = (15.0\ IN)(170\ LB) + (24.0\ IN + 2.53\ IN)(407\ LB)$$
$$+ (24.0\ IN + 2.53\ IN)(33.8\ LB) + (17.0\ IN + 2.53\ IN)(43.7\ LB)$$
$$- (2.53\ IN + .53\ IN)\ F_A \Rightarrow$$

$$F_A = 4933\ LB$$

OMNI FILMS International, Inc.

SUBJECT: ROTATING TUB - BEARING SELECTION

BY: J. TAYLOR PAGE 7 OF 16 DATE

$$\sum_{\rightarrow +} F_{HORIZONTAL} = 407\ LB + (33.9\ LB) + (43.7\ LB) - 4933\ LB = F_B$$

$$F_B = 4449\ LB$$

REFERENCE

TIMKEN BEARING SELECTION HANDBOOK 1986 PG 39

FROM TABLE III

$$\frac{.47\ F_{rB}}{K_B} \leq \left(\frac{0.47\ F_{rA}}{K_A} + F_{ae} \right)$$

WHERE

$F_{rB} = F_B$

$F_{rA} = F_A$

$F_{ae} = 170 + 220 = 390\ LB$

$K_A \Rightarrow$ BEARING A (# JLM704649) = 1.24

$K_B \Rightarrow$ BEARING B (25590) = 1.74

Check

$$\frac{(.47)(4449)}{1.74} \leq \left[\frac{(.47)(4933)}{1.74} + 390 \right]$$

$$1202 \leq 1722$$

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SUBJECT ROTATING TUB - BEARING SELECTION

BY J. TAYLOR PAGE 8 OF 16 DATE

TR-4

$F_{aA} = \frac{(.47)(4933)}{1.34}$ 1730 LB

$F_{aB} = \frac{(.47)(4449)}{1.74} + 390$ 1591 LB

$P_A = F_{rA}$ 4933 LB

$P_B = (.4)(4449) + (1.74)(1591)$ 4548 LB

BEARING LIFE

$$C_{90} = F_a P_e \left[\frac{L_{10} S}{L_{a,l} (1.5 \times 10^6)} \right]^{.3}$$

WHERE

$F_a \Rightarrow$ APPLICATIONS FACTOR = 1.00

$P_e =$ 6525 LB

$C_{90} =$ ~~#~~ 25590 4880 LB

L_{10} = BEARING LIFE

$S = {}^{150}/_d$

d = BEARING BORE 1.75 IN

OMNI FILMS International, Inc.

SUBJECT: ROTATING TUB - BEARING SELECTION

BY: J. TAYLOR PAGE 9 OF 16 DATE

1B-5

$a_3 l = F_T F_V$

F_T ⇒ FROM FIG 7 PG 23
TEMP 95°F @ 75 RPM

$F_T = 1800\, \theta^{-1.5} \left(\frac{S}{F_C}\right)^{.2}$

$S = \frac{150}{1.75}$ 85.7

$F_C = \frac{d_o D_o}{d_o + D_o} = \frac{(2.24)(2.71)}{(2.24 + 2.71)} =$ 1.26

$\theta =$ 95°F

$F_T = 1800\,(95)^{-1.5} \left(\frac{85.7}{1.26}\right)^{.2}$ 1.15

F_V ⇒ GRADE 100 1.07

$a_3 l = (1.15)(1.07) =$ 1.23

$4880 = (1.00 \times 4548) \left[\frac{L_{10}\,(75)}{1.23 \times 1.5 \times 10^6}\right]^{.3}$

L_{10} = LIFE 31,112 HR

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SUBJECT ROTATING TUB - BEARING SELECTION

BY J. TAYLOR PAGE 10 OF 16 DATE

13-6

CONDITION 2
(6 CHILDREN)

CENTRIFUGAL FORCE (6 CHILDREN) TO THE DECK

$$\frac{(6)(110\ LB)(6.4\ FT/SEC^2)}{32.2\ FT/SEC^2} = 131.2\ LB$$

$$+\circlearrowright \Sigma M_B = (24.0\ IN + 2.53\ IN)(131.2\ LB) + (17.0\ IN + 2.53\ IN)(43.7\ LB) - (2.53 + .53)F_A$$

$$F_A = 1416\ LB$$

$$\Sigma F_{HORIZONTAL} = (131.2\ LB) + (43.7\ LB) - (1416\ LB) = F_B$$

$$F_B = 1241\ LB$$

F_A AND F_B FOR CONDITION 2 ARE LESS THAN CONDITION 1

CONDITION 1 IS THE WORST CASE

AS A 3[RD] CONDITION IF THE TUB RATED LOAD OF 1000 LB IS CONSIDERED, CONDITION WOULD STILL BE THE MOST SEVERE.

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SUBJECT TUB SHAFT DESIGN

BY J. TAYLOR PAGE 11 OF 16 DATE

TC-1

LOCATION OF THE HIGHEST STRESSES ⇒ PT C
SEE FIGURE

USE CONDITION 1 TO DETERMINE STRESSES.
USE BEARING REACTION LOADS FROM THE PREVIOUS SECTION.

$\circlearrowright^{+} \Sigma M_c = -(.5 IN + 2.5 IN + .215 IN)(444.9\ LB_F) + (.215 IN)(4933\ LB_F) - M_c = 0$

$M_c = -1350.9\ IN\text{-}LB_F$

ΣF_H : 4933 LB − 4449 LB ⇒ $F_H = 484\ LB_F$

$\Sigma F_V = 220 + 170$ ⇒ $F_V = 390\ LB_F$

SHAFT MATERIAL ⇒ STEEL 4150
SEE SPEC SHEET

SHAFT DIAMETER 1.968 IN

AREA ⇒ $\pi \frac{1.968^2}{4}$ 3.04 IN^2

$\tau = \frac{484\ LB_F}{3.04\ IN^2}$ 159 $\frac{LB_F}{IN^2}$

$\sigma_{COMPRESSION} = \frac{390}{3.04}$ 128 $\frac{LB_F}{IN^2}$

$\sigma_{BENDING} = \frac{1350.9 \times 1.968/2}{\pi (1.968/2)^4 / 4}$ ⇒ 23003 $\frac{LB_F}{IN^2}$

SUBJECT TUB SHAFT DESIGN

BY J TAYLOR PAGE 12 OF 16 DATE

1C-2

$\sigma_{AXIAL} = \sigma_{BENDING} - \sigma_{COMPRESSION}$

$\sigma_{AXIAL} = 23004 - 128 \Rightarrow$ 22876 LB/IN²

$\tau =$ 159 LB/IN²

$\sigma_1 = \left(\frac{22876}{2}\right) + \sqrt{\left(\frac{22876}{2}\right)^2 + 159^2}$ 22977 LB/IN²

MATERIAL ALLOWABLES

FROM THE MATERIAL DATA SHEET UTS = 139.5 KSI

FROM SHIGLEY, MECHANICAL ENGINEERING DESIGN
THIRD ED PG 188

$S_E = S_E' K_A K_B K_C K_D K_E K_F$

WHERE

S_E' = ENDURANCE LIMIT OF ROTATING BEAM SPECIMAN
K_A = SURFACE FACTOR
K_B = SIZE
K_C = RELIABILITY (3σ) ⇒ SAFETY FACTOR 1.32
K_D = TEMP
K_E = STRESS CONCENTRATOR
KF = MISCELLANEOUS
S_E = ENDURANCE LIMIT OF MECHANICAL ELEMENTS

$S_E' = UTS/2$

COPPERWELD STEEL CO.
4000 MAHONING AVE., N.W.
WARREN, OHIO 44483

TEST REPORT

A of 1

NO. *

CUSTOMER PURCHASE ORDER NUMBER & DESCRIPTION	ORIG. T.R. DATE	REV. T.R. DATE	SALES ORDER
LTL1568217	12/31/1992		61402

SOLD TO: ALRO STEEL CORPORATION
3100 E. HIGH
JACKSON MI 49204

SHIP TO: ALRO STEEL
361 D STREET
PERRYSBERG OH 43551

DESCRIPTION OF MATERIAL ORDERED

FEET:	PIECES	WEIGHT	SIZE	SHAPE:	LENGTH:
		6,000	2.500"	RD	20'/18'

PRODUCT DESCRIPTION:
R Q & T MACH STR STRESS REL

PART NUMBER: 09501700

GRADE: 4150H RESULF

SPECIFICATION:
ASTM A29-91
ASTM A304-91
ASTM A322-91
ASTM A434-90 CLASS BC

Heat No.	C	Mn	P	S	Si	Ni	Cr	Mo	Al	Cu
1969	.49	.92	.029	.072	.26	.13	.99	.22	.030	.14

Jominy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	20	24	28	32	Gr Size
	61	61	61	60	60	60	60	60		59		58		56.		54		52	50	48	47	6-8

Material Stamped with Heat Code: JLP

Hardness HB
SURFACE 302

QUENCH: 1520F 2 HOURS
MEDIA : OIL
TEMPER: 1140F 2 HOURS
STRESS: 1140F 2 HOURS

Charge Number	Off Set	Yield PSI	Tensile PSI	Elong %	RA %
	.2	123,000	138,500	20.0	59.8

ALRO STEEL CORP
RT60046560

Tub Shaft Material

We hereby certify that the above data are correct as contained in the records of Copperweld Steel Company.

Veryl D. Kifer
Veryl D. Kifer,
MET Release Supervisor

COPPERWELD MATERIAL IS NOT SUBJECTED TO MERCURY DURING PROCESSING OR TESTING. NO WELDING PERFORMED ON MATERIAL. MATERIAL PRODUCED AND CERTIFIED TO SPECIFICATIONS SHOWN ABOVE. NO ADDITIONAL CERTIFICATION IS IMPLIED OR WARRANTED.

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SUBJECT TUB SHAFT DESIGN

BY J. TAYLOR PAGE 14 OF 16 DATE 7/20/93

LC-3

$S_e = (.72)(.85)(.75)(1)(1)(1)(^{138.5}/_2) = 31.8$ KSI

THEREFORE THE FINAL SAFETY FACTOR IS

$^{31.8}/_{23.0} = 1.38$

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SUBJECT TUB SHAFT ASSY - FINAL RESULTS

BY J. TAYLOR PAGE 15 OF 16 DATE

1 D-1

BEARING LIFE	31112 HR
BEARING SHAFT SAFETY FACTOR	1.38

DRUMMER BOY

Thank you for your purchase of Drummer Boy. We have manufactured this equipment for years of both a safe operation and durability. So to enhance your purchase please take some time to read our manual to familiarize yourself and your personnel with our recommendations and guidelines.

Also we request that you inform us immediately regarding any resale so that we may keep our files current and have the proper mailing address for any maintenance bulletins.

SERIAL # 6004P394