

Amusement Rides

Bulletin No. 12017-2C-732

Date July 30, 1958

ALLAN HERSCHELL COMPANY INC.

and

THE MINIATURE TRAIN CO. Division

104 OLIVER STREET

NORTH TONAWANDA, NEW YORK



Service Bulletin

Ride Helicopter

Subject Replacing lower bearings
of Helicopter

File

Re: Blueprint HC-190 Revision
Conversion Lower Bearing
Blueprint HC-100PC
Parts Numbers & Lubricati

INSTRUCTIONS FOR REPLACING LOWER BEARINGS OF HELICOPTER

1. Disconnect main power supply at switch box. This is important for safety since internal electrical connections will be worked on.
2. Remove all vehicles, sweep rods and tension rods from center section. The hydraulic lift cylinders and fittings should be left in place.
3. Remove banners and banner supports.
4. Remove large aluminum rain cover (HC-128) from top of center section by removing 3 round head machine screws and lifting cover.
5. The top of electrical commutator is now exposed inside the top of center section. It is important to make a written diagram showing the color and size of the electrical wires and their position to the numbered connections on the commutator. This will be used when the wires are replaced on the commutator. Disconnect wires and tie with a 20' length of heavy string or wire so the BX cable may be retrieved if it drops into the center section.
6. Leave the wires connected to the brush finger stand and remove entire brush assembly by removing the 2-5/8" bolts in the base and lifting assembly.
7. Loosen the 2 Allen set screws on the commutator ring (feel with finger between brass grooves) and lift commutator to remove.
8. Loosen the single set screw in commutator shaft to free the BX cable harness inside. Make certain the 20' string or wire is secured to top of wire harness and tied to the top of center section to prevent cable from dropping down into the bottom of the tank.
9. Remove the 4 1/4" Allen screws holding the commutator shaft and lift out shaft. Make certain the BX cable does not drop into the center section tank unless secured by wire or string.
10. Using two screw drivers expand and remove the snap ring now visible.

11. Loosen the 2 Allen 3/8" set screws on inner race of Sealmaster bearing. Failure to loosen these set screws will seriously damage center pole post and bearing and may cause serious accident when hoist is used.
12. Remove drive belts from gear reducer. Loosen the 4 bolts in gear reducer base and disengage the pinion drive gear from the large base gear. If desired, the pinion drive gear can be removed and the gear reducer and drive belts will not have to be moved.
13. Remove two hydraulic lift cylinders opposite each other to expose two mounting ears which will be used for lifting center section. Do not remove the hydraulic hoses from cylinders or center section and tie cylinders to side of oil tank with wire to avoid damage.
14. Install a 5/8" clevis, or other secure method, over each of the two mounting ears exposed by hydraulic cylinder removal. These clevis must be securely bolted in place since the total weight of the center section will be supported by them. A short 3/8" minimum diameter cable or chain is secured to each clevis and used to support the entire weight of center section when it is lifted. Over 2,500 lbs. will be lifted so all fittings, cable, etc. must be strong enough to safely support this weight.
15. A crane, advertising sign boom truck or fabricated tripod frame with block and tackle may be used to lift the entire center section from its base. It is necessary to have a clear lift of at least 12 feet and support a weight of 2,500 lbs. The lifting hook must be centered exactly over the center of the stub shaft inside the center column when lifting and lowering the center section assembly over the center column. Unless the assembly is lifted straight up and lowered straight down damage may be done to interior parts. Raise the oil tank very slowly for the first 12" until the Sealmaster bearing is clear of the stub shaft and then raise assembly completely clear of the centerpole.
16. Swing the oil tank clear of the center section and lower onto two strong wooden bucks or supports so that motor base plate is supported at least 24" above the ground. Since wooden bucks or supports must hold at least 2,500 lbs. and a man will be working below, it is absolutely necessary that they be strong enough. Using caution, the assembly may be left hanging on hoist or beam and following work done while suspended.
17. Bearing replacement consists of a three part bearing assembly and new special bolts, spacer nuts and flex-lock nuts. HC-191 is an "H" cross section cast meehanite bearing, HC-204 is the inner bronze sleeve bearing and HC-194-1 is the outer cast meehanite bearing. Early model Helicopters contained an "I" shaped cast meehanite bearing (HC-123) which will be referred to as a #1 type bearing. Later Helicopters contained the "H" shaped cast meehanite bearing (HC-191) but without the inner bronze slip bearing and outer meehanite bearings and will be referred to as a #2 type bearing. Helicopter bearing replacement will involve changing from either a #1 or #2 type to the three piece assembly which will be referred to as a #3 bearing assembly. UNDER NO CONDITIONS SHOULD OLD BEARINGS BE USED AGAIN OR INTERCHANGED WITH NEW BEARINGS.
18. Replacement of #1 type bearing with the new #3 type assembly per Blueprint HC-190 Revision 3.
 - a. Six bolts secure the oil tank to motor base plate. These bolts must be removed one at a time and replaced with the new longer bolts (HC-124-5), spacer nuts (HC-124-6) and Flex-lock nuts. As the short bolts are removed they are discarded and the new long bolts are inserted with the spacer nuts on the underside of the motor base plate threaded on the bolts. The spacer nuts should be left a little loose at this point to allow some movement in the bolt to ease the positioning of the bearing.

- b. The "H" cross section meehanite bearing (HC-191) is raised into position from below with the six bolts projecting through the six holes drilled in the casting. It may be necessary to slightly rotate or "jockey" the bearing until all six bolts project through their proper holes. Apply the six Flex-lock nuts on the bottom of the bolts. With an end wrench very securely tighten the spacer nuts above the bearing since these six bolts support the entire assembly. Now tighten the six Flex-lock nuts with a socket wrench. The oil tank part of the new bearing assembly is now complete.
 - c. On the sub-base unit which was not moved the 10 bolts supporting the old meehanite bearing must be removed and thrown away since they must not be used again. Lift or force up old bearing and discard.
 - d. VERY THOROUGHLY AND COMPLETELY CLEAN ENTIRE BEARING AREA OF ALL DIRT, GRIT AND OLD GREASE.
 - e. Install the new meehanite bearing (HC-194) and bronze sleeve bearing (HC-204) with the groove on top using the 10 new Allen head cap screws 5" long and Flex-lock nuts furnished. Insert the 6 grease fittings and 2 pipe plugs in the new outer bearing if not already assembled. With a grease gun force Socony MP automotive chassis type grease into the six fittings until grease flows over bronze sleeve bearing and fills all bearing channels. Pack about three gallons of this same grease into bearing well until it fills space to the level of the grease gun fitting openings in the bronze sleeve bearing. This completes the replacement of the old style (HC-123) #1 type bearing to the new #3 type bearing assembly.
19. Replacement of #2 type bearing with the new #3 type assembly. This is a simple operation since the six motor base mounting bolts are not removed and they require only new Flex-lock nuts. The #2 type of bearing is similar in appearance to the new #3 (HC-194-1), but must not be interchanged or old parts of the bearing used again.
- a. Remove the six Flex-lock nuts from the underside of the old "H" cross section meehanite bearing and remove the bearing which must not be used again. Raise the new bearing into the same position and secure with six new Flex-lock nuts.
 - b. Remove the old outer steel casting shell and replace with the new meehanite bearing (HC-194-1). The same 10 bolts may be used but new Flex-lock nuts must be secured. Place the bronze sleeve bearing (HC-204) in position with groove up.
 - c. VERY THOROUGHLY AND COMPLETELY CLEAN ENTIRE BEARING AREA OF ALL DIRT, GRIT AND OLD GREASE.
 - d. Insert the 6 grease fittings and 2 pipe plugs in the new outer bearing if not already assembled. With a grease gun force Socony MP automotive chassis type grease into the six fittings until grease flows over bronze sleeve bearing and fills all bearing channels. Pack about three gallons of this same grease into bearing well until it fills space to the level of the grease gun fitting openings in the bronze sleeve bearing. This completes the replacement of the old style (HC-123) #1 type bearing to the new #3 type bearing assembly.

20. The helicopter center section is now ready for re-assembly. Before raising the rotating assembly make a careful inspection of the outside of the stationary center pipe to be certain it has not been scored or worn more than 1/16" deep. If a deep groove more than 1/16" deep is worn into the pipe then it must be filled with weld and dressed down with a file or grinder to approximate face of the pipe. If a large weld bead or filler projects more than 1/16" beyond the face of the pipe it is suggested that the inner bottom ring of the rotating pipe assembly be cut along line "X-X" as shown on the blueprint #HC-190.
21. The center section is now reassembled by reversing steps 1-12. Great care must be taken to position the hoist hook exactly over the center of the stub shaft inside the center column and lower into position very slowly. The assembly must be lowered straight down and exactly centered or damage will result. The last 12" of the lowering operation is very critical and must be done very slowly to mate lower bearings and avoid damage to the top stub commutator shaft.
22. Completely grease the 6 (or 3) lower bearing fittings with a grease gun before operating Helicopter.

NOTE: It cannot be stressed too strongly that the utmost of care and caution be used to remove all dirt, grease or foreign particles from the bearing area. Properly done, long service life the bearings will result.

Caution in rigging, handling and assembly must be the "By Word" to prevent damage to the equipment or injury to the worker.



Amusement Rides

Bulletin No. _____

Date 4-3-58

ALLAN HERSCHELL COMPANY INC.

BOX 465 • 1165 CLINTON STREET • BUFFALO 5, NEW YORK

AREA CODE 716-TA 5-8300

Service Bulletin

Ride Helicopter

Subject Lift Cylinders

File _____

Refer to Print No. HC-215 showing Cylinder parts.

In time, through normal wear it will become necessary to replace the packing washers (No. 5070-20) in the Hydraulic Lift Cylinders of your Helicopter.

The packing washers should be replaced whenever excessive oil leakage is noted around the piston rod.

NOTE: There should be a sufficient amount of oil by-passing the packing washers for normal lubrication of the piston rod.

The tools and parts necessary to do this job are available from Allan Herschell Company at the following prices:

Neoprene packing washers: Three required per cylinder, \$.50 each.
Tools: One protector sleeve, one driving tool, one spanner wrench,
\$8.50 per set.

The following is a step by step procedure for the installation of the packing washers; use this procedure referring to Print HC-215 for the correct identification of the parts and for the order that they are assembled.

1. Disconnect tension rod at clevis pin, remove the clevis and piston rod nut.
2. Disconnect supply line from cylinder (To prevent loss of oil keep end of line above oil level in tank).
3. With spanner wrench, remove packing nut.
4. Push piston rod in a few inches, hold thumb over supply line inlet, a quick pull on the piston rod will pull out three packing washers and one packing adaptor (bronze). Packing adaptor is to be re-used.

SERVICE BULLETIN - Lift Cylinders, Cont'd.
4-3-59

5. Thoroughly clean the piston rod and all parts being re-used before re-assembling.
6. Replace packing adaptor (Bronze), assemble three new neoprene packing washers on the protector sleeve and slide it over threaded part of piston rod. (Note the direction of washer cup). New washers must not touch sharp threads of piston rod.
7. Remove protector sleeve; use special driving tool, push the packing adaptor and packing washers firmly in place.
8. Install packing nut, use spanner wrench to draw nut up snugly.
9. Re-install supply line, piston rod nut, tension rod and clevis pin.



ALLAN HERSCHELL COMPANY

Division of Lisk-Savory Corp.

1165 CLINTON STREET

BOX 465

BUFFALO, NEW YORK 14240

AREA CODE 716 825-8300

Bulletin No. _____
December 1965
Date _____

Service Bulletin

Ride ~~HELICOPTER RIDE~~

Subject ~~LIFT CYLINDERS~~

File _____

Refer to print HC-215 showing cylinder parts.

In time, through normal wear, it will become necessary to replace the packing washers (No. 5070-20) in the hydraulic lift cylinders of your Helicopter Ride.

The packing washers should be replaced whenever excessive oil leakage is noted around the piston rod.

NOTE: There should be a sufficient amount of oil by-passing the packing washers for normal lubrication of the piston rod.

The tools and parts necessary to do this job are available from Allan Herschell Company.

NEOPRENE PACKING
WASHERS:

- 3 required per cylinder.

TOOLS:

- 1 protector sleeve
1 driving tool
1 spanner wrench

The following is a step by step procedure for the installation of the packing washers. Use this procedure, referring to print HC-215 for the correct identification of the parts and for the order that they are to be assembled.

1. Disconnect tension rod at clevis pin.
Remove the clevis and piston rod nut.
2. Disconnect supply line cylinder. (To prevent loss of oil, keep end of line above oil level in tank).

3. With spanner wrench, remove packing nut.
4. Push piston rod in a few inches, hold thumb over supply line inlet. A quick pull on the piston rod will pull out three packing washers and one packing adapter (bronze). Packing adapter is to be re-used.
5. Thoroughly clean the piston rod and all parts being re-used before reassembling.
6. Replacing packing adapter (bronze), assemble three new Neoprene packing washers on the protector sleeve and slide it over threaded part of piston rod. (Note the direction of the washer cup). New washers must not touch the sharp threads of piston rod.
7. Remove protector sleeve. Use special driving tool, then push the packing adapter and packing washers firmly in place.
8. Install packing nut. Use spanner wrench to draw nut up snugly.
9. Re-install supply line, piston rod nut, tension rod and clevis pin.



Number: 16
Date: 7-14-72

Supersedes: 2

America's Largest Manufacturer of Amusement Rides

SERVICE BULLETIN

Effective Serial Numbers:

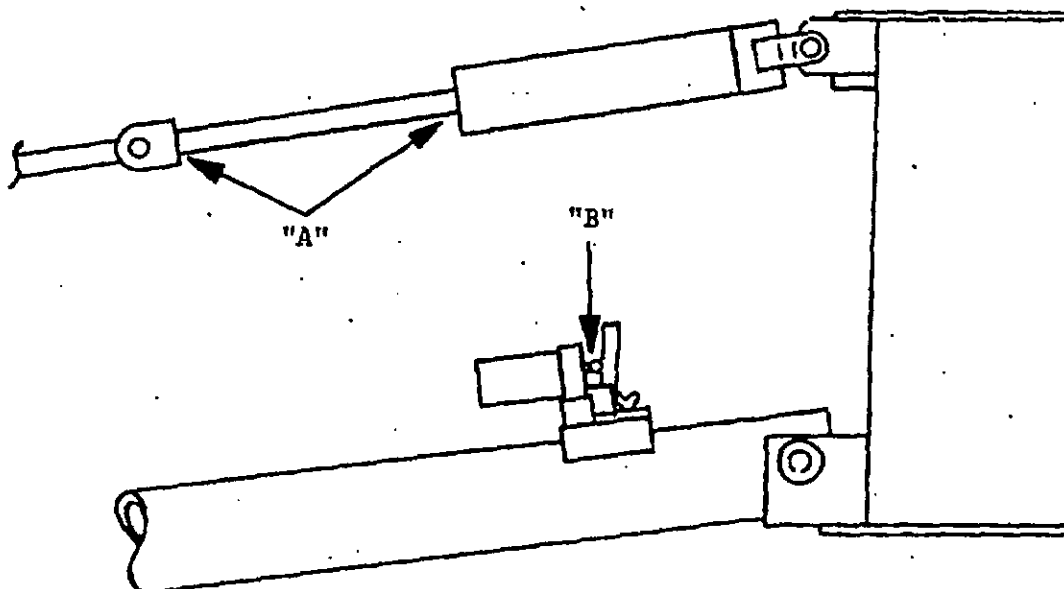
Ride: Helicopter Subject: Winter Storage

It has been brought to our attention that in storing the Helicopter, rust is forming on vital parts. These are the lift rods and control valve plungers of which there are eight of each on a ride.

Clean thoroughly the polished area of the lift rod as shown by the arrows marked "A" on sketch and the polished plunger shown by arrow "B".

After these points are clean, coat them completely using a protective product which will not run off or permit moisture to get under it such as Mobil Kote 302. This product is obtainable from any Mobil Dealer or distributor or can be ordered from Chance Manufacturing Company.

PROTECTION OF THESE PARTS WILL HELP TO INCREASE THE LIFE OF THE SEALS AND PREVENT LEAKS IN THE HYDRAULIC SYSTEM.



Factory and Sales Office: 4219 Irving • P.O. Box 12328 • Wichita, Kansas 67277 • (316) 942-7411

AMUSEMENT RIDES DISCOUNT CORP.

P. O. BOX 222 443

BUFFALO, NEW YORK 14240

October 19, 1972

Ref: Helicopter - Astronaut Ride

Gentlemen:

If the sweeps on your Allan Harschell Helicopter or Astronaut Ride were manufactured in 1963 or earlier, it is very important that they be replaced with new sweeps. These are available from:

Chance Manufacturing Co.
4219 Irving
Wichita, Kansas 67201
Telephone: 316-942-7411

The new sweeps are of the heavier design introduced in 1963, (.180") wall, 3/16" thick tubing. The original sweeps were (.120") wall, 1/8" thick.

Even though the 1/8" thickness sweeps on your ride have been reinforced, they must be replaced. The area at which the reinforcement stops, and the sweep slides into the vehicle, has the greatest stress. The ability of the sweeps to withstand this stress diminishes with each year due to further weathering, rusting and corrosion.

The time has come to remove these sweeps from service and replace them with new ones.

The date of manufacture of your ride can be determined from the serial number which is on a metal plate attached to the ride center. The last two digits of the number indicate the year of manufacture. Thus, 1728468 would indicate the ride was shipped in 1968.

Many of the states, including New York state, have enacted legislation requiring daily inspection of amusement rides. It is most strongly urged that such a policy be initiated on your rides, if it is not now in effect. Experience has indicated daily inspections more than pay for themselves by reducing accidents, reducing down-time and cutting maintenance costs.

On Helicopter, Astronaut and Star Jet rides, particular attention must be given daily to the sweeps and the hydraulic cylinders. Fatigue failures do not occur suddenly. There will be a small crack, which will rust and progressively get larger. It is the responsibility of every operator and owner to constantly look at his equipment for any evidence of excessive wear or any cracks before failure occurs.

In the hydraulic cylinders, regular inspection must be made to be sure the cylinder ends are not pulling apart. Hydraulic pressure should be kept to the minimum which raise the vehicles smoothly and must not exceed 650 PSI. The hydraulic system must be kept clean; adjusted and maintained at all times so the vehicles move up and down slowly, without jerky, sharp movements.

If you no longer own the ride in question, it is important that you fill out and mail the enclosed self addressed, stamped card. Your cooperation is essential and will be appreciated by all concerned.

Very truly yours,

AMUSEMENT RIDES DISCOUNT CORP.

John M. Malisz

John M. Malisz, P.E.
Vice President in Charge of
Engineering

J.M./lg
enc.



ALLAN HERSCHELL

CHANCE
MANUFACTURING CO., INC.

Number: 32
Date: 12-7-72

Superceeds:
Number:
Date: June 1969

Service Information

Ride: HELICOPTER RIDE

Subject: ERECTION AND CARE

REFERENCES:

Blueprints:

HCC-101 Assembly Dwg.
HC-100P Parts Numbers Dwg.
HC-153 Hydraulic Circuit Dwg.
KT-101 Foundation Drawing
HC-169 Wiring Diagram
HC-215 Oil Cylinder
Waterman Valve Print
Link Belt Parts List
Cutler Hammer Brake Information

Pamphlets: Keeping Hydraulic Systems Clean
Installation of Wesche Collector
ring
Electric Circuit Diagram
Electrical Spec. Sheet
Packing List

Service Bulletins: Winter Storage
Lift Cylinders.

ERECTION AND CARE OF MODEL "C" HELICOPTER RIDE

1. Refer to print HCC-101 for general arrangement of parts and to print HC-100P for part number identification and lubrication instructions.
2. Select a spot that is reasonably level - especially for the center of the ride and the platform assembly. **NOTE:** Regrade, if necessary.
3. Place the center drive assembly into position so the motor extension cords will run in the direction of the switch box to suit the operator's convenience.
4. Level the center drive assembly by placing the level which is in the tool box, on top of the beams and using the four adjusting screws and ground plates. Tighten the lock nuts.
5. Attach the four platform tie rods to center base with bolts and lock numbers. The numbers on the tie rods should match the numbers on the center base.

Factory and General Office, 4219 Irving, Box 2397 Wichita, Kansas 67201

Sales Office:

103 Ross Ave Dallas Texas 75202

Area Code (316) 942-7411

6. Assemble the 8 sweeps to the center with shafts and safety pins. The numbers on the sweeps must match the numbers on the center base.
7. Attach the 8 pull rods to hydraulic cylinders with tapered pins and safety pins. Hook the spring end of the pull rods into the ears on the sweeps with the grease fittings facing upwards.
8. Assemble the loading platform using taper pins and safety pins to lock in place. Add screw jacks at platform splices. The platforms are numbered.
9. Assemble Helicopter bodies to the sweeps with vehicle pins and safety pins. Use 3 "C" washers to fasten rotor post to top of the car - and the top of the car to the car body. Complete the vehicle assembly by adding tail post, tail fan and top rotor. The numbers on the vehicles must match the numbers of the sweeps. Adjust the nut on the pull rods to obtain a 6 inch clearance between the bottom of the car and the platform.
10. Attach the cables from the cars to the levers on the hydraulic cylinders after transferring the valves from their shipping mounts to the mounting brackets on top of the sweeps.
11. Assemble the "FLY YOURSELF" sign and the 8 banners to the top of the tripod. Lift the banners, sign and tripod to the top of the center drive unit and fasten with bolts and self-locking nuts. Attach the bottom of banners to circular pipe with "S" hooks.
12. Attach 4 light poles by driving tapered pins into pipe locks. Assemble the switch box to the light pole, matching numbers on the light poles to the numbers on the platforms.
13. Connect twist lock jumper cords from motor, light poles and magnetic valve.
14. Erect chain fence with the numbers on the fence posts matching the numbers on the platform. Outlet and inlet to the ride can be located in any of four places.
15. Check to see that all safety pins are in place and that all set screws are tight.
16. Lubricate the entire machine, with the exception of the reducer. Use SOCONY PD-1020A or SHELL RETINAX "A" (which are in the tool box) on the gear drive. When located near salt water, use FISKE BROS. LUBRIPLATE 630AA.

Lubrication - (continued)

- A. Grease the lower bearings daily (6 fittings).
NOTE: Also see page 5.

- B. Lubricate the top ball bearing with grease once a year. This requires removal of the top aluminum rain cover for access.

- C. Oil and grease the sweep pins and tension rod sleeve weekly. NOTE: Check dwg. HC-100P for further and more detailed lubrication instructions.

- D. Use MOBIL MP GREASE or KING GRAPHITE PRODUCT KGP-24.

NOTE: It is important that the commutator rings (under the rain cover) be kept clean. Brushes should be kept clean and free to slide in brush holder under spring pressure. Replace when worn or it will not operate.

17. At the Allan Herschell factory, the fluid drive sheave is given the proper amount of a premium grade of SAE 10-W oil. A change of oil is necessary every 5 years unless excessive slippage indicates that an earlier change is necessary. Check the oil level yearly. A slippage of 85 R.P.M. between the R.P.M. of motor and the R.P.M. of the hydrosheave is considered standard. The hydrosheave bearings are lubricated for life. The fluid drive sheave has the correct quantity of oil when it is positioned with its 2½ marking at the top center position which places the plug opening off center. Fill with proper fluid until the oil tends to run out the plug opening. Then, replace the pipe plug. Use gasket compound on plug threads.

18. VERTICAL SHAFT WORM REDUCER WV-35 (ceiling mounted).

- A. Follow the instructions on the nameplate, using 600W in warm weather and 1/2 of SAE-40 and 1/2 of 600-W in cold weather. Maintain proper level.

- B. Drain and refill after first 150 hours of operation.

- C. Keep breather fitting clean and open.

NOTE: In locations where 600W is not available have your local supplier recommend a substitute.

During cold weather testing of these rides, the 600-W is too heavy, which throws an overload on the motor for starting after the machine has set idle for some time. In case this happens, start the ride, giving it a little help to get it up to speed and run it for 15 minutes. After this it will be free to run normally.

19. Check the V-belts on the drive for proper tension. When new, adjustments should be made frequently until the initial stretch has been taken up.

NOTE: These are not to be too tight and need very little attention during the season. CAUTION: Any adjustment of the belt drive should be done with the motor. Do not change the position of the gear reducer except to remove excessive backlash between the pinion and ring gear. Slide the pump base only to remove looseness in V-belts between the pump and motor.

20. CURRENT SUPPLY AND WIRING

Rides are wired as follows: See wiring diagram HC-169 Rev. 2.

1. When customer orders 1-phase, 3-wire, 115/230 volt supply, wiring is completed by us within the switch box for a single current supply by the customer.
2. When customer orders 3-phase, 4-wire, 208/120 supply, wiring is completed within the switch-box for a single current supply by the customer.
3. When customer orders 3-phase, 3-wire, 220 volt motor supply, a separate lighting supply must be provided of 115/230 volt, 3-wire, single phase. Wiring is completed within the switch box for these two separate current supplies by the customer.

ADEQUATE VOLTAGE MUST BE MAINTAINED
WITHIN 10% AT ALL TIMES.

21. OPERATING INSTRUCTIONS

- A. Move safety switch to "ON" position. This is normally left set at the "ON" position during the day's operation. (For quick stopping of the ride in case of an emergency, move to the "OFF" position.
- B. Move the main dump valve switch to "ON" position. This is a black handled switch located about 3 inches below the timer switch and permits the ride operator to lower the cars during rotation of the ride. Normally, it is left set at the "ON" position at all times.
- C. Move the timer to "ON" position, causing the ride to rotate only.

- D. After 10 seconds PRESS the push button of the dump valve switch to "ON". (This push button switch is located to the right of the jog switch). This will make oil pressure available to the cylinders. The riders may then pull the lap bars to go up or push the lap bars to go down.
- E. If the ride doesn't start - check the fuses.
- F. Always use the timer delay type of fuses.

Cable adjustments may become necessary if the riders cannot rise after pulling on the lap bar. Eyebolts with long threaded shanks and jam nuts are provided for adjustment when necessary. Turning the eyebolts farther into the levers and tightening the jam nuts should overcome the difficulty.

MAINTENANCE OF HYDRAULIC SYSTEM

In the tool box is an extra coil for the solenoid of the dump valve. If the ride won't come down at the operator's demand, the cause is most likely to be a burned out coil due to low voltage, or a sticky valve and dirty oil. We suggest immediate replacement of the coil. Also, check the power supply line for low voltage and the condition of the oil.

The pressure gauge and pressure relief valve are furnished so that excessively high working pressures will not be imposed upon the motor and other parts of the hydraulic system. If the oil pressure in the system is too low, the vehicles will not rise. A gauge setting of 650 pounds is recommended as sufficient for even the heaviest loads. To check system pressure, open petcock at gauge. If necessary, the system pressure can be changed by operating the relief valve handle. Always turn off petcock after reading to prevent damage to gauge.

The intake oil filter and the air filter should be inspected and cleaned frequently, depending upon local conditions.

If the oil in the 50 gallon tank has become dirty, we suggest replacing it with 45 gallons of Socony DTE light oil, maintaining oil level between high and low marks on the dipstick. If oil has become excessively dirty, drain it, remove the two access doors on side of tank and clean all inside surfaces of the tank with kerosene. Apply Permatex #2 Formgasket compound to tank gasket, access doors and threads of capscrews before re-assembling.

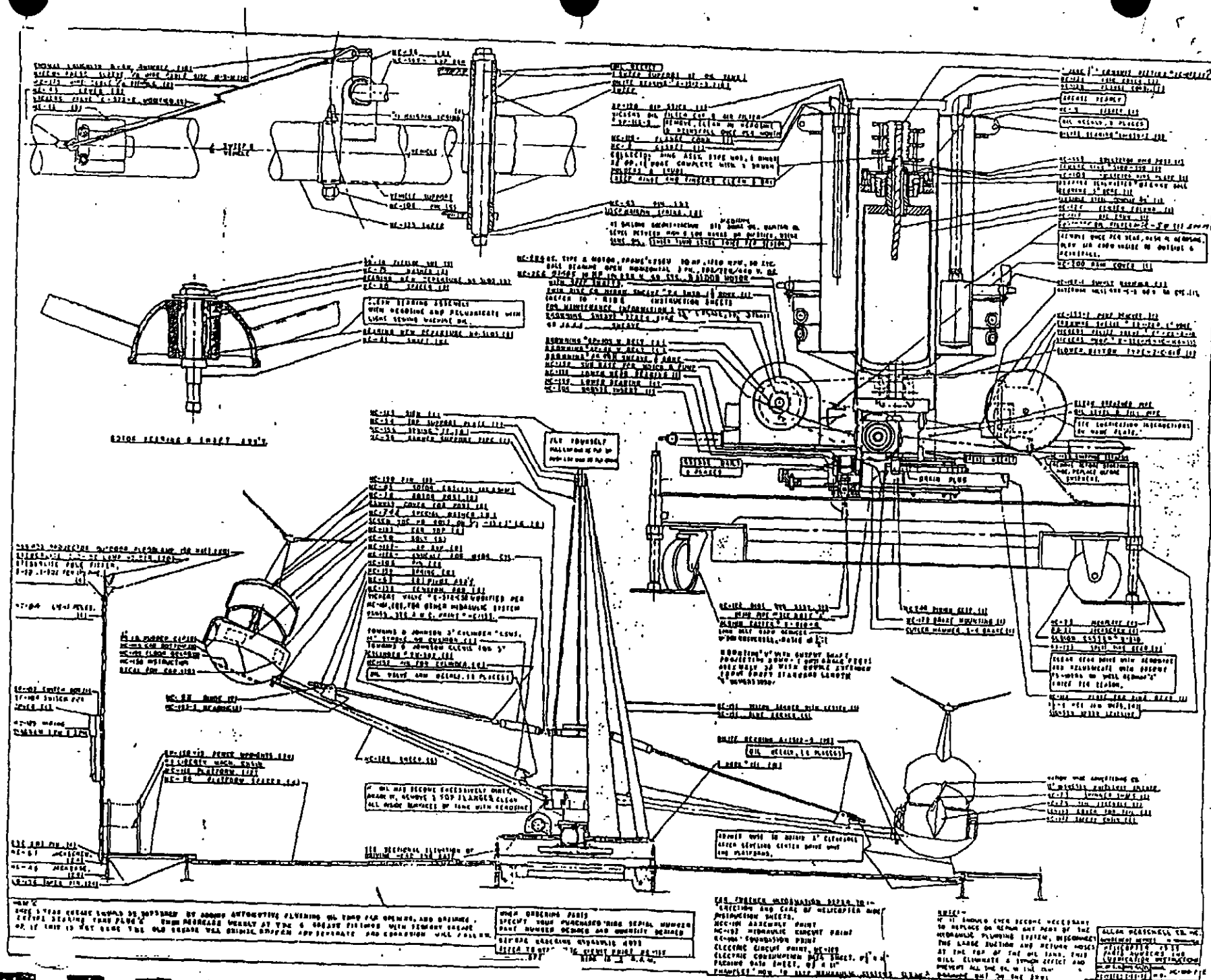
MAINTENANCE OF HYDRAULIC SYSTEM (continued)

If it should ever become necessary to replace or repair any part of the hydraulic plumbing system, disconnect the large suction and return hoses at the top of the oil tank. This will eliminate a syphon effect and prevent all the oil in the tank from draining out on the ground.

Keep gauge valve closed except when reading gauge pressure. This will prolong the life of the pressure gauge.

MAINTENANCE OF LOWER CENTER BEARING

Once a year, grease should be softened by adding automotive flushing oil through fan opening and draining entire bearing through the bottom plug. Then, regrease weekly at the six grease fittings with Mobil MP Grease or King Graphite Product KGP-24. If this is not done, the old grease will oxidize, stiffen and separate and corrosion will follow.





Number: 817-0194-00

Date: 9-17-79

Supersedes:

America's Largest Manufacturer of Amusement Rides

SERVICE BULLETIN

Effective Serial Numbers: ALL RIDES

Ride: HELICOPTER

Subject: ORIFICE KIT

If you no longer own this ride, please notify Chance Manufacturing Co. of new owners name and address and serial number of ride.

Chance Manufacturing Co. is recommending that all Helicopter ride center bases be inspected for structural cracks as shown in Figure A below. Specifically, the weld area where the center bearing base is welded to the I-beam base should be visually inspected. Bouncing the ride vehicle on the sweep during a visual inspection should open any cracks so they can be seen with the naked eye.

If any cracks are found, Chance Manufacturing Co. should be contacted and the ride should not operate until proper repairs are made.

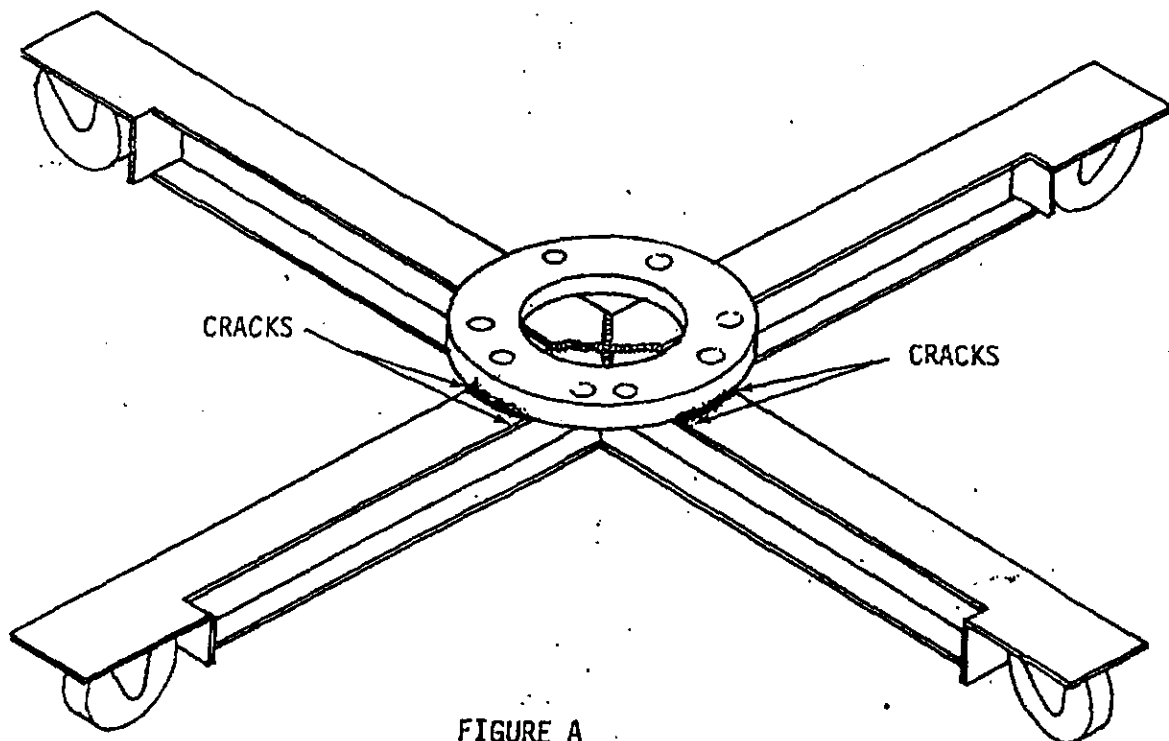


FIGURE A

Factory and Sales Office: 4219 Irving • P.O. Box 12328 • Wichita, Kansas 67277 • (316) 942-7411

Before installing this kit, read the instructions completely and familiarize yourself with the parts listed. Make certain all parts have been received. If any parts are missing, notify Chance Manufacturing Co. immediately. Do not substitute an inferior grade of material or part.

If you have any questions concerning this installation bulletin, please contact Chance Manufacturing for assistance.

ADDITION OF ORIFICE KIT

In order to reduce shock loads to the ride structure, Chance Manufacturing Co. recommends that each Helicopter ride be equipped with a sweep valve orifice, (Kit No. K17-0194-01) as shown in Figure B. This kit will dampen the shock load caused by passengers jerking the lap bar back and forth in rapid succession and will provide a smoother ride to your customers. The kit is easily installed in the field and is available at our bare manufacturing cost for a period of 90 days.

Order from our parts department as follows:

KIT NUMBER K17-0194-01 CONSISTING OF:

QTY.	DESCRIPTION	PART NUMBER
1	BULLETIN NUMBER B17-0194-00	
1	CERTIFICATION OF COMPLIANCE	
8	1/4" CLOSE NIPPLE	688-27658
8	SWEEP VALVE ORIFICE	317-48711

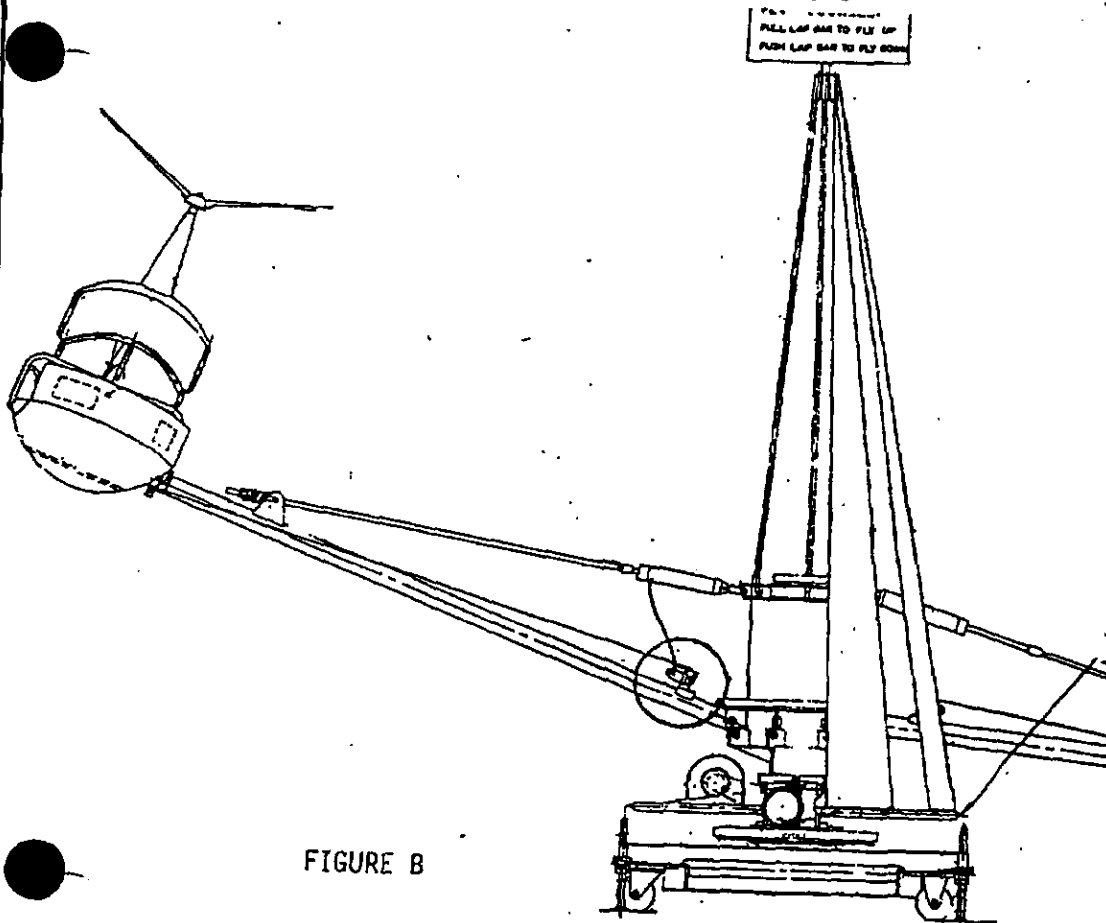


FIGURE B

INSTALLATION OF ORIFICE KIT

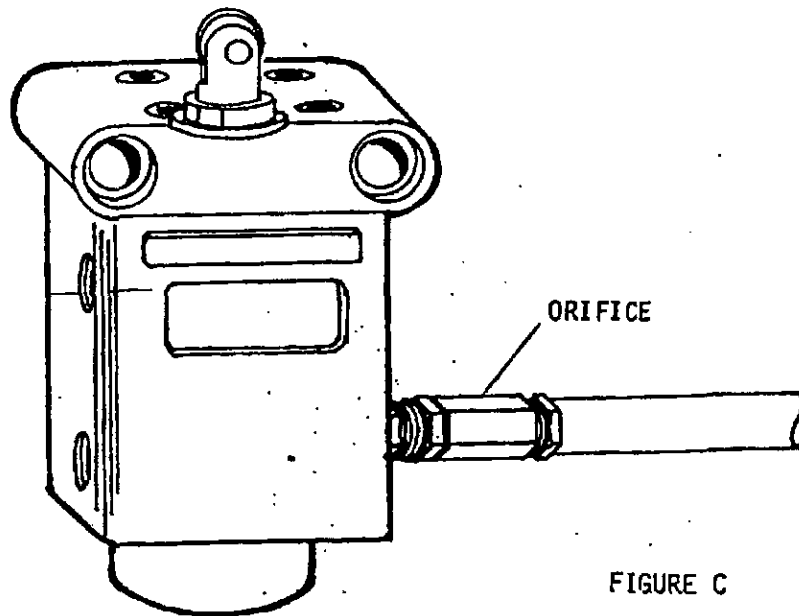


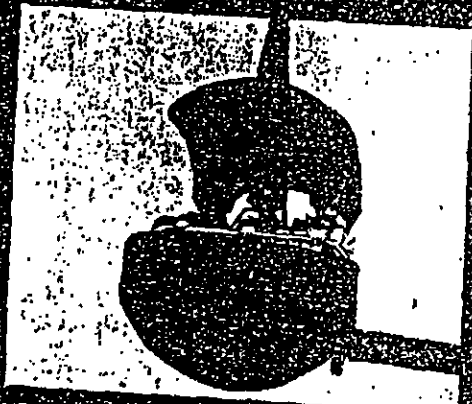
FIGURE C

Install the orifice kit as per Figure C and the following steps:

1. Disconnect hose coming from bottom of cylinder to valve (Vickers C-572) mounted on sweep.
2. Insert close nipple.
3. Insert orifice on close nipple.
4. Re-connect hose.

All work must be performed by competent, qualified mechanics capable of understanding the function of the parts and their proper installation.

Helicopter



HELICOPTER CABS are made of spun aluminum reinforced with steel tubing. Each of the eight cabs holds three children, or two adults, or one adult and two children. In the picture above, the children have their hands on the control bar which regulates the rise and fall of the cab.

DRIVE MECHANISM is compactly mounted on a rugged center frame. Magnetic motor starter, timer and fluid drive assure smooth, effortless operation. For easy portability, choose the trailer mounted center drive unit. Tows behind 18-foot stake truck containing cabs.

Specifications

SIZE AND WEIGHT

Overall outside diameter, 37'.
Height (raised position), 15' 0".
Diameter of Helicopter path, 30' 0".
Weight (crated), approximately 8700 lbs.

CAPACITY

24 children.
Eight cabs, easily accommodating three children each, or 2 adults each, or one adult and 2 children each.

DRIVE MECHANISM

All power for Helicopter ride is supplied by one 10 HP three phase or single phase motor. Motor is started and stopped by timer and magnetic motor starter, both mounted in an all-weather, cast aluminum control box. Rotational movement of ride comes through a smooth operating, fluid drive and automatic brake, assuring quick, gentle starts and stops. The rise and fall of the Helicopter cabs as they rotate is accomplished hydraulically with an oil pump powered by the same motor which powers the fluid drive. Passengers themselves control the rise and fall motion by moving a control bar in each cab. Operator can control movement of all cabs when starting and stopping ride.

CONSTRUCTION

The drive and hydraulic mechanisms are contained in a rectangular center frame. This frame is constructed of 4-brains and rugged tubing and is mounted on heavy duty casters for easy portability. Platform of ride is centered on radius rods from center frame. Chain fence encloses platform. Helicopter cabs, made of spun aluminum reinforced with steel tubes, are mounted at ends of the eight tubular sweeps. Tops of the Helicopter cabs are hinged. When tops are raised, cabs can be stacked for easy and compact portability. Riders on the tops and tails of the cabs are quickly assembled and disassembled. All wiring is rubber-covered cord with quick disconnects.

LIGHTING

Ride is illuminated by 20 150-watt floodlights. Five floodlights are at top of four tubular light poles mounted on outside of platform.

DECORATION

Helicopter cabs are vividly colored with bright, durable paint. Center canvas banners decorate center drive frame.

PORTABILITY

Ride can be set up by two men in four hours. No hydraulic connections to make or break. Ride can be loaded on a single 18-foot truck body with a minimum truck height of 6' 5". At extra cost, Allan Herschell can supply a special 2-wheel trailer for pulling center drive behind automobile or truck.

STANDARD EQUIPMENT

All necessary crates and tools needed to set up and operate are supplied as standard equipment. Center canvas banners also are standard.

*Mr. Allen Herschell
Knee Bees "Bees Helicopter"
Knee Kiddie*

HELICOPTER

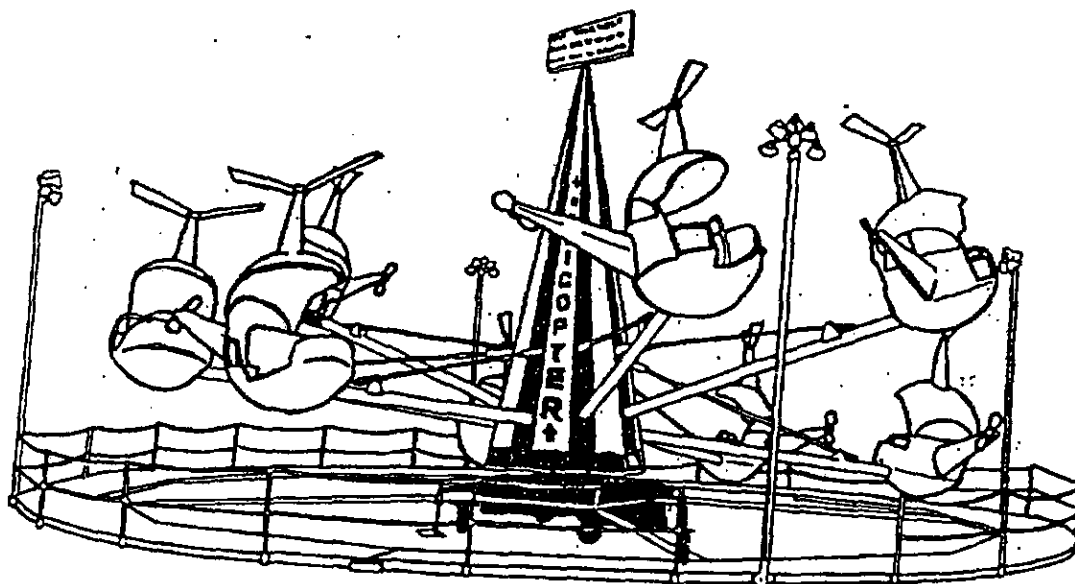
Ride Serial Number _____

Owner _____

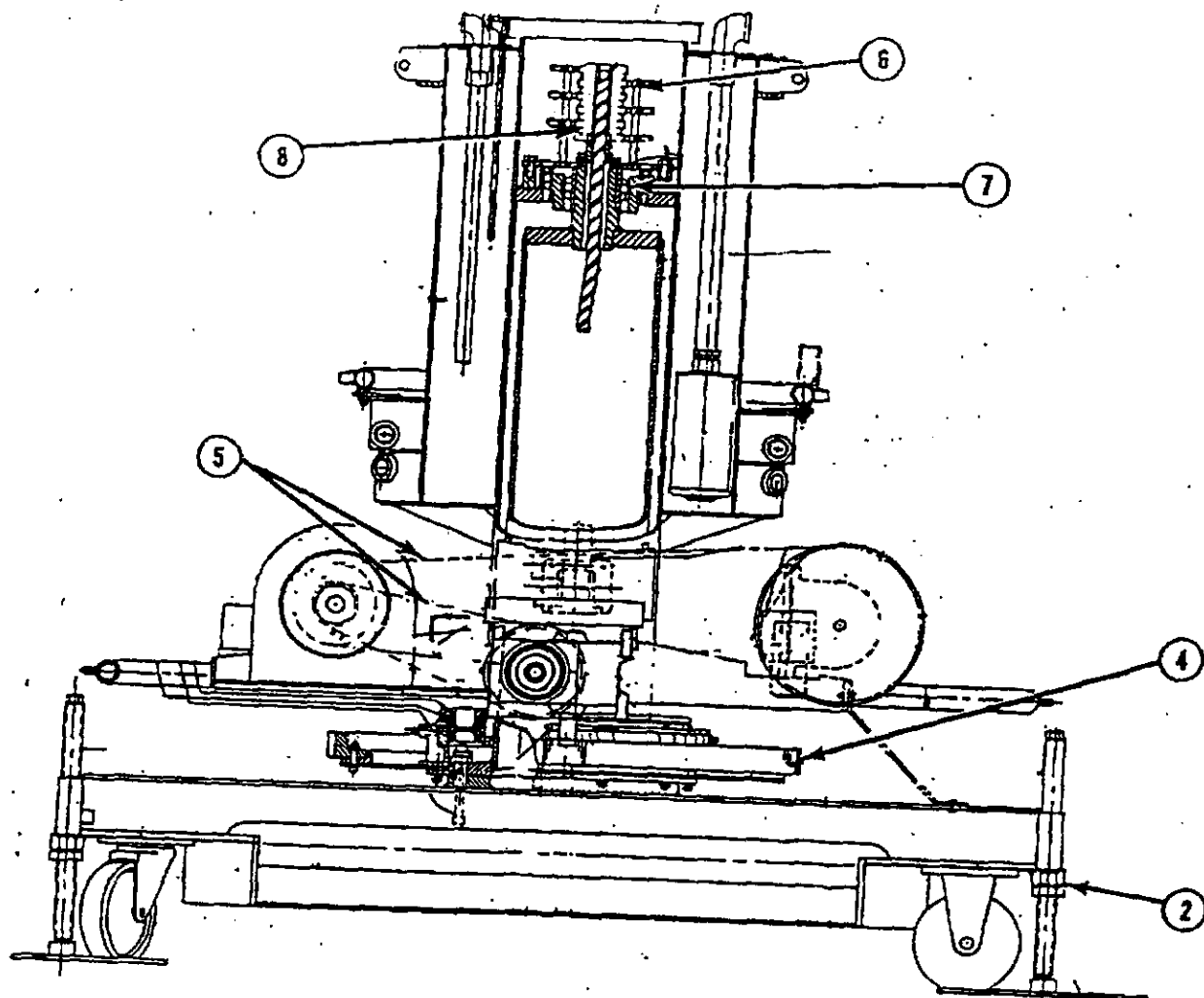
Date _____

FIELD INSPECTION POINTS

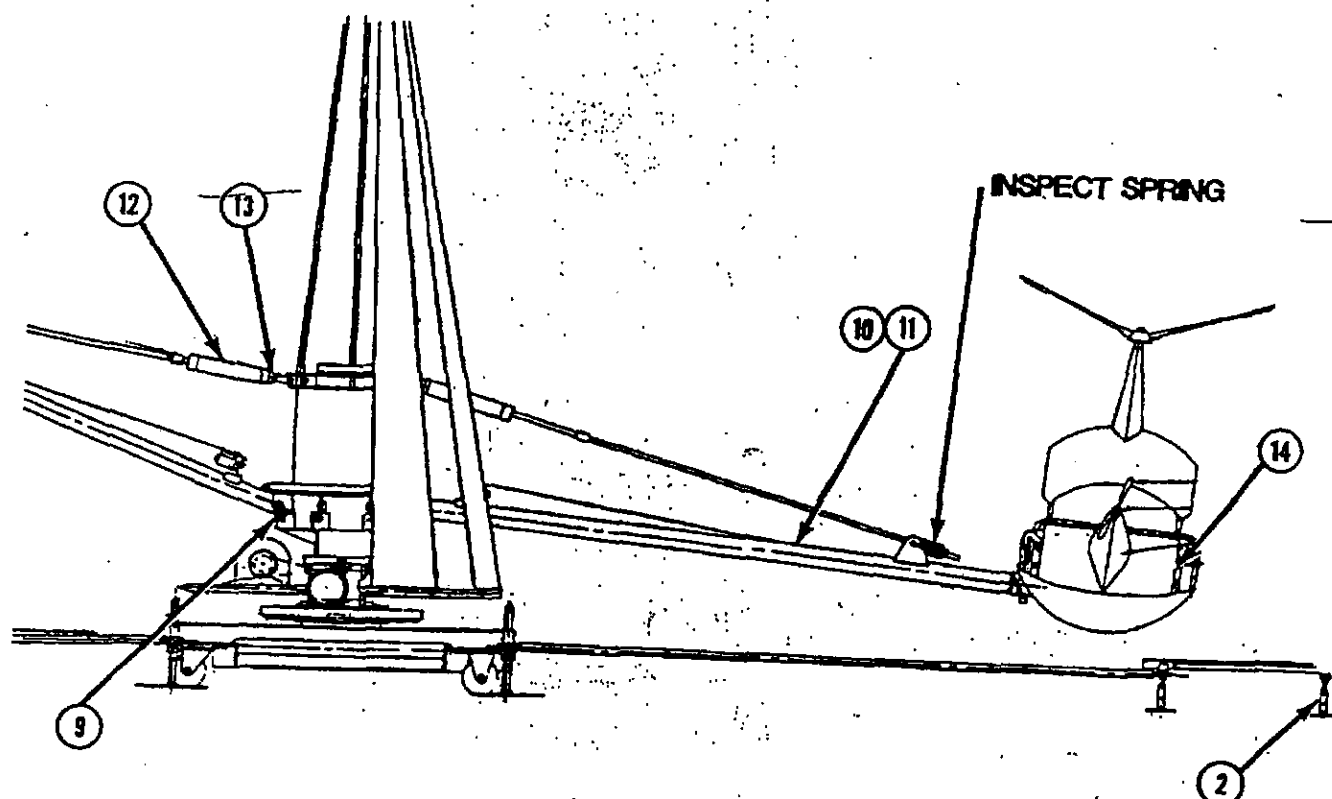
1. () Inspect blocking and leveling.
2. () Inspect jack screws and lock nuts.
3. () Inspect cable leads, electrical connections and grounding per local code.
4. () Inspect pinion and gear for proper mesh with ring gear.
5. () Inspect drive belts for proper tension or deflection (Deflection = belt span in inches / 64).
6. () Inspect all brushes for tension and wear.
7. () Inspect top bearing for sheared or loose mounting bolts.
8. () Check all electrical connections to the commutator.
9. () Inspect sweep bearings for signs of wear.
10. () Inspect all sweeps for any signs of fatigue or cracking. Check wall thickness and replace 1/8" wall with 3/16" wall.
11. () Inspect all sweep pins and hairpins for wear.
12. () Inspect hydraulic cylinder to be sure both end caps are fully screwed in and locked in place with lockwasher on lower end (rod end) and locknut on upper end (clevis end).
13. () Inspect clevis end of hydraulic cylinder. Locknut must be in place and locked against clevis.
14. () Inspect seat belts and hand control lever.
15. () Check ride speed: Maximum 7 rpm.
16. () Check ride for excessive vibration.
17. () Inspect structure for cracks, bad welds, etc. (Bulletin 194).
18. () Inspect the electrical circuit for shorts, bad wires, etc.
19. () Inspect for hydraulic leaks (Bulletin 16).
20. () Inspect overall appearance of ride for cleanliness and general overall upkeep.



15. () Check ride speed: Maximum 7 rpm.

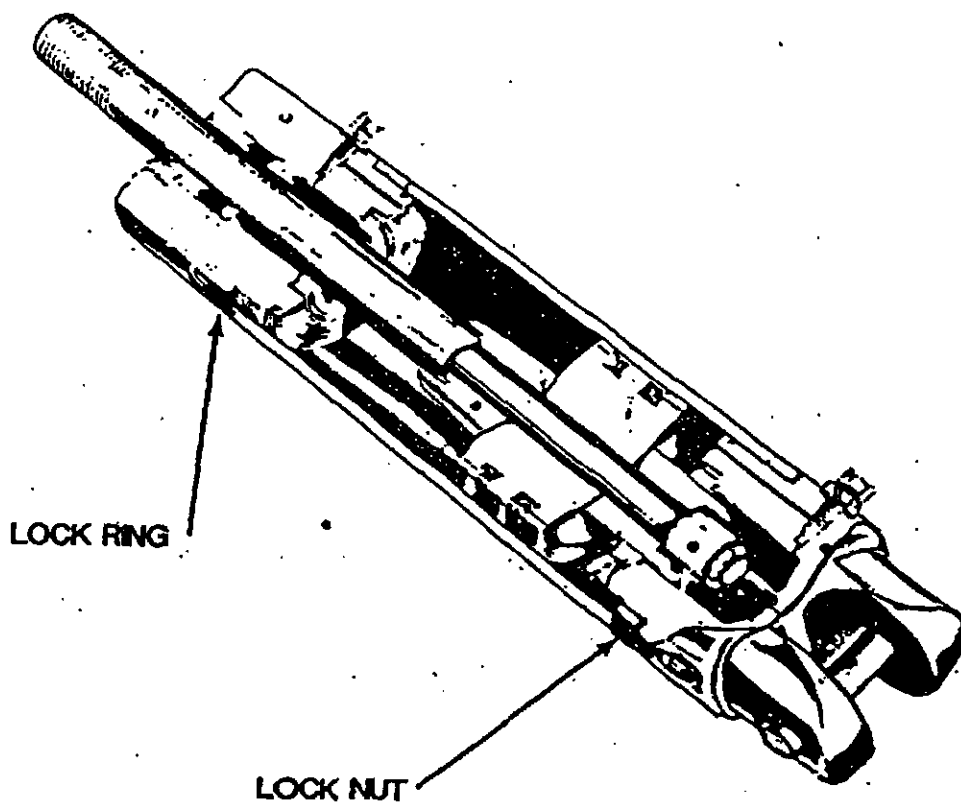


4. () Inspect pinion and gear for proper mesh with ring gear.
5. () Inspect drive belts for proper tension or deflection (Deflection = belt span in inches / 64).
6. () Inspect all brushes for tension and wear.
7. () Inspect top bearing for sheared or loose mounting bolts.
8. () Check all electrical connections to the commutator.



2. () Inspect jack screws and lock nuts.
9. () Inspect sweep bearings for signs of wear.
10. () Inspect all sweeps for any signs of fatigue or cracking. Check wall thickness and replace 1/8" wall with 3/16" wall.
11. () Inspect all sweep pins and hairpins for wear.
12. () Inspect hydraulic cylinder to be sure both end caps are fully screwed in and locked in place with lockwasher on lower end (rod end) and locknut on upper end (clevis end).
13. () Inspect clevis end of hydraulic cylinder. Locknut must be in place and locked against clevis.
14. () Inspect seat belts and hand control lever.

NOTE: The threads on the end caps and barrel can be damaged during disassembly and assembly. If the threads on either part become damaged, discard the part.

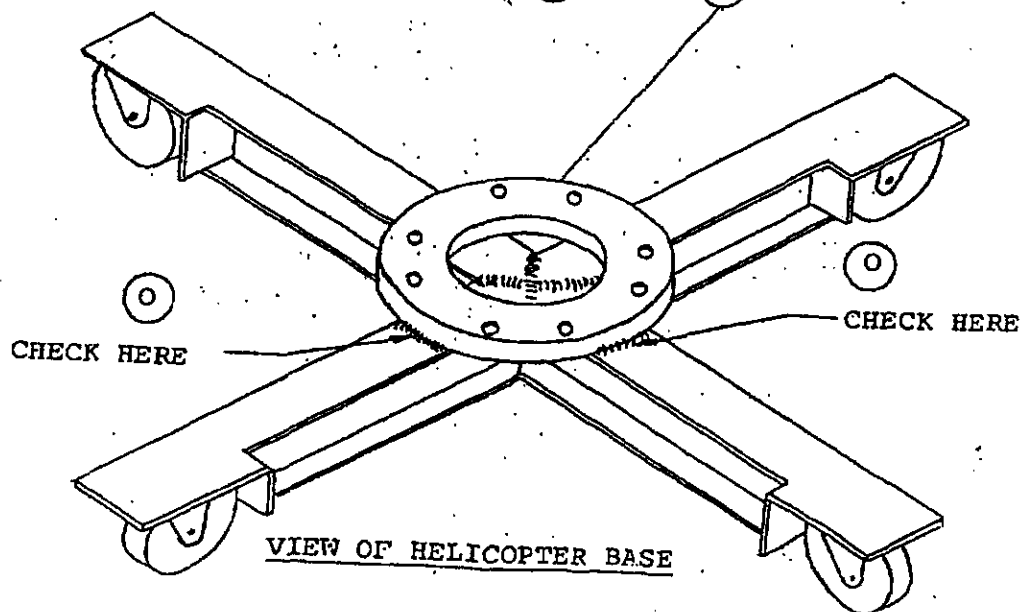
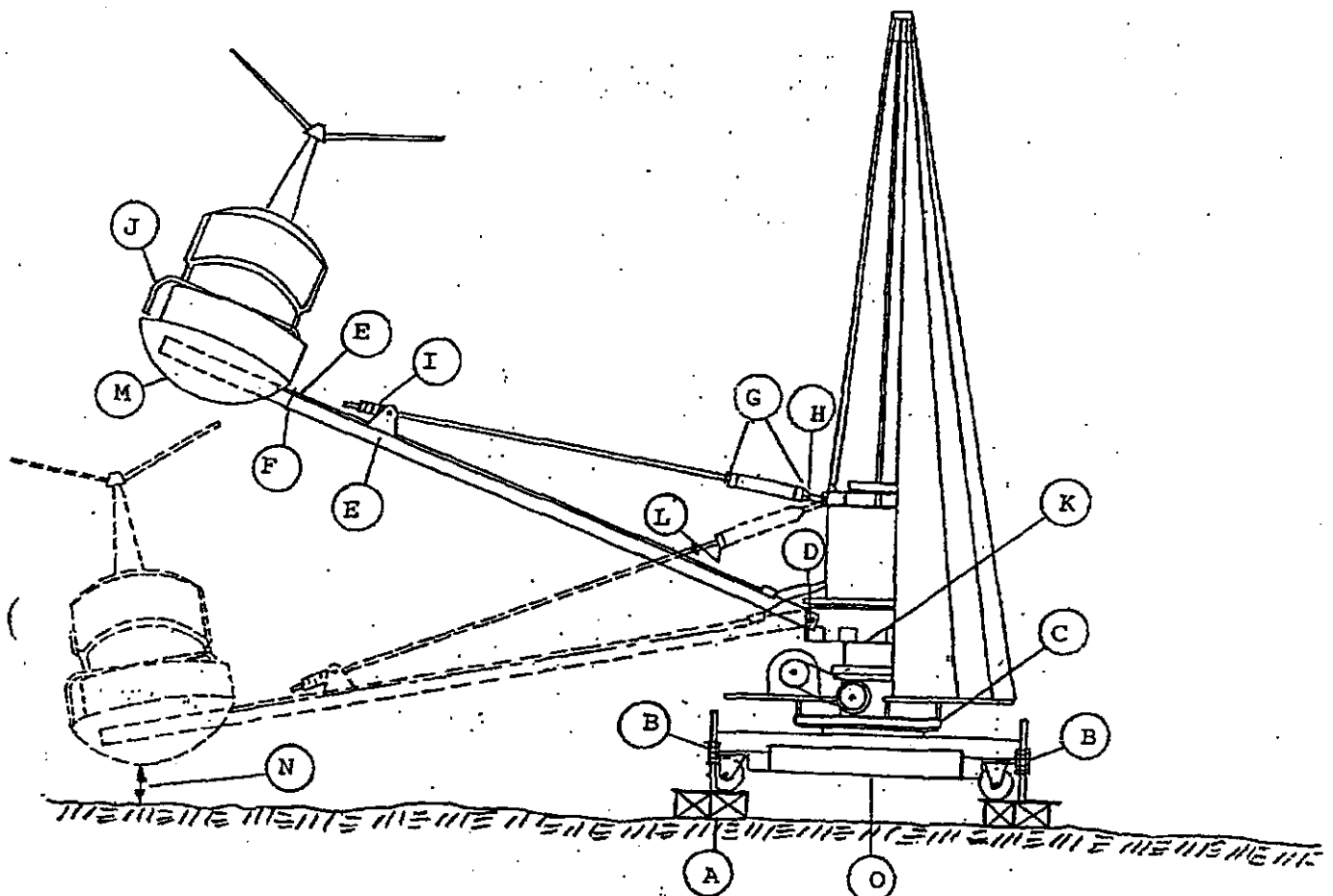


12. () Inspect hydraulic cylinder to be sure both end caps are fully screwed in and locked in place with lockwasher on lower end (rod end) and locknut on upper end (clevis end).

HELICOPTER
INSPECTION CHECKLIST

- A. INSPECT BLOCKING AS IT SHALL BE SECURE. THIS RIDE MUST BE LEVEL. CHECK IT WITH A LEVEL.
- B. INSPECT JACK SCREWS AND LOCKNUTS. THESE SHALL BE SECURE BECAUSE THE WEIGHT OF THE MACHINE BEARS ON THESE FOUR JACKS.
- C. INSPECT GEAR FOR PROPER MESH WITH GEAR RING. NO TEETH SHALL BE MISSING IN ANY OF THE GEARS.
- D. INSPECT SWEEP BEARINGS FOR SIGNS OF WEAR AO CRACKING.
- E. INSPECT ALL SWEEP FOR ANY SIGNS OF FATIGUE OR CRACKING. TWO LOCATIONS TO CHECK ARE NEAR THE HELICOPTER BUCKET AND NEAR THE CONNECTION TO THE ROD. ALSO MEASURE THE WALL THICKNESS: IF THE WALL THICKNESS IS 1/8 INCH THICK, THEN THE ATTACHED HELICOPTER BUCKET SHALL NOT BE LOADED WITH PASSENGERS. RED TAG THE BUCKET UNTIL THE SWEEP IS REPLACED WITH A SWEEP WITH A 3/16 INCH THICK WALL. FINALLY, IF ANY WELDING HAS BEEN DONE TO THE SWEEP, CALL THE REYNOLDSBURG OFFICE TO DISCUSS THE QUALITY OF THE WELD.
- F. INSPECT ALL SWEEP PINS AND HAIRPINS FOR WEAR.
- G. INSPECT HYDRAULIC CYLINDERS TO BE SURE BOTH END CAPS ARE FULLY SCREWED IN AND LOCKED IN PLACE WITH A LOCKWASHER ON THE LOWER END (ROD END) AND A LOCKNUT ON THE UPPER END (CLEVIS END).
- H. INSPECT CLEVIS ON END OF THE HYDRAULIC CYLINDER. A LOCKNUT SHOULD BE IN PLACE AND LOCKED AGAINST THE CLEVIS.
- I. INSPECT SPRINGS ON ENDS OF RODS. ANY BROKEN SPRING SHALL BE REPLACED OR THE ATTACHED HELICOPTER BUCKET SHALL NOT BE LOADED WITH PASSENGERS. THIS IS NON-NEGOTIABLE.
- J. INSPECT SEAT BELTS AND HAND CONTROL LEVER ON EACH HELICOPTER BUCKET. SEAT BELTS SHALL NOT HAVE SHARP EDGES TO CATCH CLOTHING OR SKIN. CHECK EACH SEAT BELT TO SEE THAT IT LATCHES. TIED ROPE IS UNACCEPTABLE.
- K. INSPECT ELECTRICAL CIRCUITS FOR BARE WIRES, SHORTS (BURNED WIRES) AND OTHER EVIDENCE OF DAMAGE THAT MAY CAUSE ELECTRICAL SHOCKS.
- L. INSPECT ALL HYDRAULIC CYLINDERS FOR LEAKING FLUID. THIS IS DONE BY TOUCHING THE LOWEST CORNER OF THE CYLINDER. IF IT IS MOIST, THERE IS PROBABLY A LEAK. THIS LEAK CAN RUN DOWN THE SWEEP AND INTO THE HELICOPTER BUCKET. FOR THIS REASON, LEAKING HYDRAULIC CYLINDERS JUSTIFIES RED TAGGING A HELICOPTER BUCKET. ALSO, ANY HYDRAULIC CYLINDER WHICH DOES NOT RAISE THE HELICOPTER BUCKET SHALL BE RE TAGGED UNTIL THE CYLINDER IS OPERABLE.
- M. ALL HELICOPTER BUCKETS SHALL BE CLEANED OF TRASH.
- N. CLEARANCE BETWEEN EARTH AND BOTTOM OF BUCKET SHALL BE A MINIMUM OF 6 INCHES UNLOADED.

HELICOPTER RIDE



Refer to print HC-215 showing cylinder parts.

In time, through normal wear, it will become necessary to replace the packing washers (No. 5070-20) in the hydraulic lift cylinders of your Helicopter Ride.

The packing washers should be replaced whenever excessive oil leakage is noted around the piston rod.

NOTE: There should be a sufficient amount of oil by-passing the packing washers for normal lubrication of the piston rod.

The following is a step by step procedure for the installation of the packing washers. Use this procedure, referring to print HC-215 for the correct identification of the parts and for the order that they are to be assembled.

1. Disconnect tension rod at clevis pin.
Remove the clevis and piston rod nut.
2. Disconnect supply line cylinder. (To prevent loss of oil, keep end of line above oil level in tank).
3. With spanner wrench, remove packing nut.
4. Push piston rod in a few inches, hold thumb over supply line inlet. A quick pull on the piston rod will pull out three packing washers and one packing adapter (bronze). Packing adapter is to be re-used.
5. Thoroughly clean the piston rod and all parts being re-used before reassembling.
6. Replacing packing adapter (bronze), assemble three new Neoprene packing washers on the protector sleeve and slide it over threaded part of piston rod. (Note the direction of the washer cup). New washers must not touch the sharp threads of piston rod.
7. Remove protector sleeve. Use special driving tool, then push the packing adapter and packing washers firmly in place.
8. Install packing nut. Use spanner wrench to draw nut up snugly.
9. Re-install supply line, piston rod nut, tension rod and clevis pin.

How to Keep Hydraulic Systems Clean

P. H. EMRICH

Vickers Incorporated, Detroit, Mich.

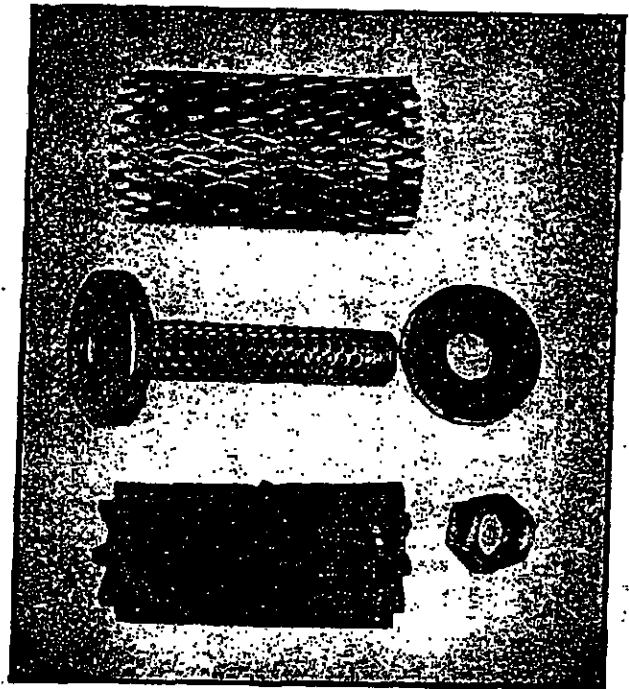
To obtain maximum life from the components of a hydraulic system involves not only the proper design of the system and selection of fluid cleaning elements, but also a rigorous maintenance schedule and the intelligent selection and care of the hydraulic fluid. The operating components of a system are well lubricated, usually protected from overload and can be stalled without damage. Since the hydraulic fluid serves the dual function of a power medium and lubricant, successful operation basically depends on keeping the complete hydraulic system clean and free of contaminants.

System contaminants can consist of metallic grit, particles of packing, moisture, carbon deposits, sludge from the fluid and many other similar items. The following material considers the various elements of a typical hydraulic system, with recommendations on service and maintenance procedures to keep the system clean and operating properly.

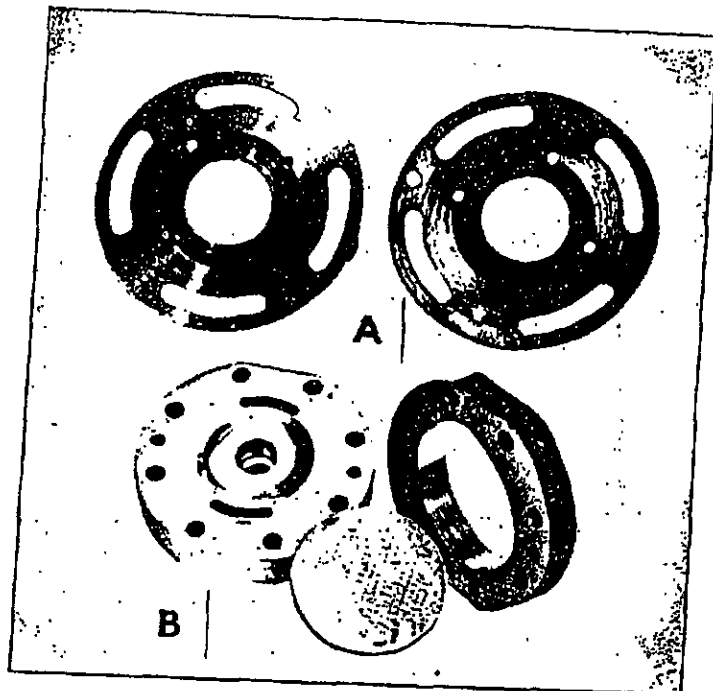
1. Control and power components. The operating components of a hydraulic system, including pumps, valves and motors, usually have close fitting parts that tend to wear in. The resultant wear particles or metallic grit must be removed or trapped to prevent additional (regenerative) wear. When regenerative wear occurs, early assembly and system failure can result. In (A) is shown two vane pump bushings that have been worn and scored from metallic grit.

Other system contaminants that usually come directly from the operating components are sand from castings, burrs from machining and fragments from damaged seals, packing and gaskets. (B) shows typical particles on a screen used for trapping this type of contaminant.

OVER



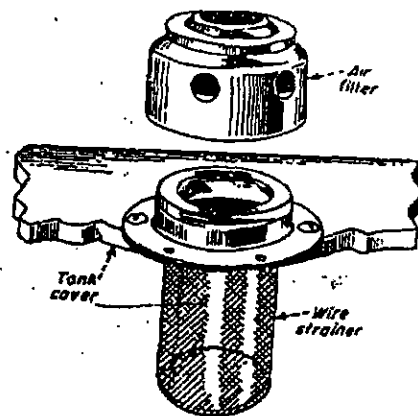
2. Inlet filters and strainers at pump. Filters, strainers, coolers, heaters and magnetic plugs are accessory components. They do not generate wear particles and are used to condition the fluid. Pump inlet filters usually have many small openings (about 0.005 in. dia) and are therefore easily clogged. The accompanying illustration shows a typical filter after removal from the system. A cleaning schedule of every three months is recommended for average usage. If the filters are not kept clean, the pump will be starved for oil (make noise like pumping rocks) and an early failure will result.



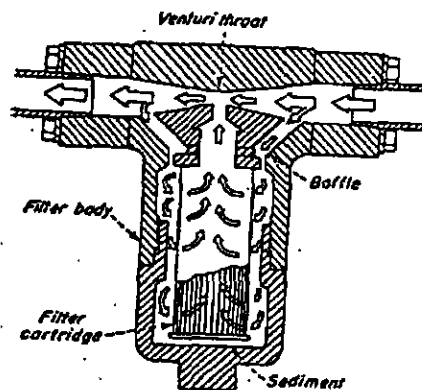
4. *Lines and fittings.* New lines and fittings must be properly cleaned and burred. If welded or brazed pipe or tube is used it should be pickled and neutralized.

Hydraulic leaks must be repaired immediately. Pressure lines can be subjected to pressures below atmospheric at some points. This is caused by high velocity flows that introduce a venturi action. The wet condition of a hydraulic leak attracts solid particles and the venturi action pulls them into the hydraulic system. The valve in the figure shows an accumulation of particles caused by a wet condition of the external surface.

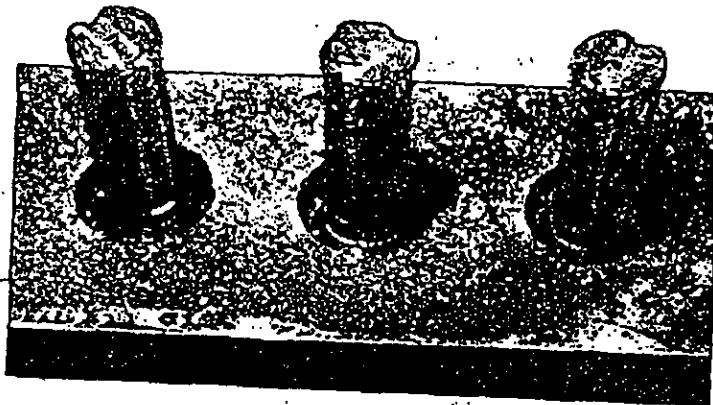
Leaks in the pump intake line will cause severe pump wear from cavitation as well as from contaminants that are drawn in.



3. *Combination filler cap, strainer and air cleaner.* A strainer and air cleaner (breather) keep solid contaminants from entering the fluid reservoir during operation and during filling with hydraulic fluid. Breathers should be cleaned monthly. Frequently, oil bath type air cleaners are used where the air is unusually dirty. These require the same attention as the auto type air cleaner.



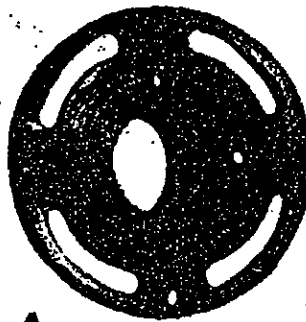
5. *Pressure and return line filters and strainers.* These are usually edge type filters or micron type filters that strain or filter continuously. They must be cleaned or have cartridge replaced about every three months for best results. Sufficient clogging can result in a ruptured filter. If a proportional micron type filter is used (see figure) less maintenance is required since only a part of the flow (proportional to flow) is filtered.



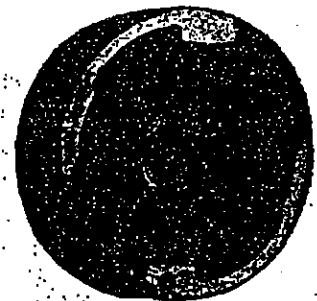
7. *Magnetic plugs.* Magnetic plugs can be used effectively to trap particles of magnetic materials. These plugs require removal and cleaning after the first three months of operation and about every six months thereafter. The figure shows typical magnetic plugs after several months of use.

6. *Heat exchangers.* These are used to heat or cool a hydraulic system for best performance. Heaters can scorch or char the hydraulic fluid and the resultant carbon and fluid breakdown can cause abnormal wear or malfunction of operating components. (A) shows pump cartridge elements with both wear and carbon deposits caused by burned oil. Conditions such as this can be prevented by completely submerging the heater and controlling with a thermostat close to the heater element. This avoids localized overheating.

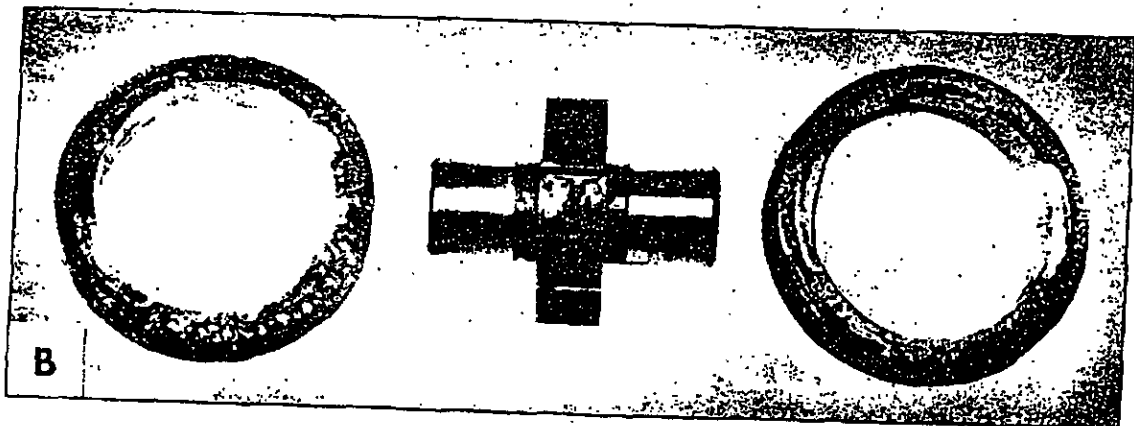
Coolers can leak water into the hydraulic system and cause corrosion of the operating components. (B) shows typical pump elements that were subject to entrained moisture. Hydraulic fluids should be checked frequently for water content and a low pres-



A

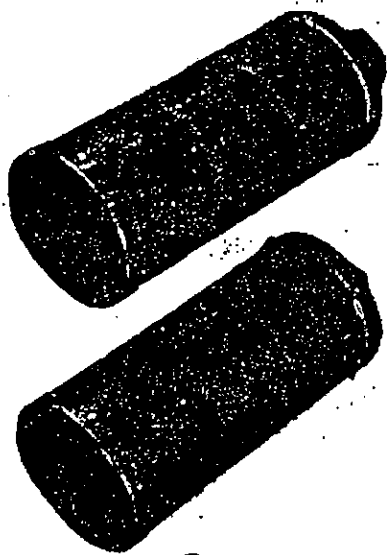
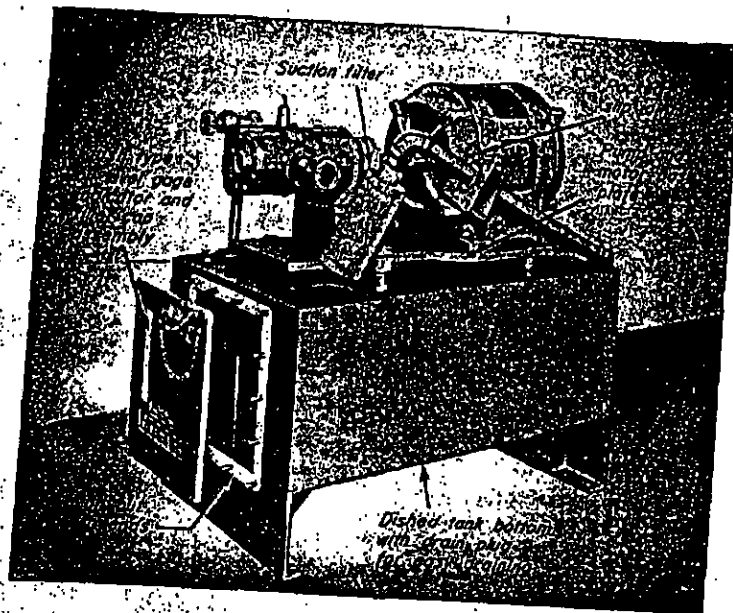


sure relief valve used to protect the cooler from hydraulic pressure surges and subsequent internal failure and leakage. If cooling coils are used inside a reservoir, they must be completely submerged at all times to prevent sweating since this condition introduces undesirable moisture into the system.



B

8. *Reservoirs.* Properly designed reservoirs have baffles to trap contaminants and to prevent fluid agitation. They must also have adequate openings for proper cleaning. Reservoirs should be cleaned and refilled at least every six months. Paint condition inside the reservoir must be checked since peeling paint can clog filters, valves and other components. Paint also helps prevent internal rust and corrosion.



9. *Hydraulic fluids.* These should be selected in accordance with the specifications and recommendations of the component manufacturer and the fluid supplier. At least every three months the fluid should be checked to make sure it still meets the specifications. The important points are viscosity (shows sludging tendency), viscosity index (effected by contaminants and fluid breakdowns), and neutralization (acidity increases with fluid breakdown). The fluid should be replaced if these properties test outside of the specification limits.

Sludge from fluid breakdown through overheating, contaminants or excessive component wear can cause sticking of the operating components. While a number of "de-sludging" agents are available, they should be used with care and never in large amounts since complete fluid breakdown can be caused by the excessive use of these agents. (A) shows a pump element almost completely clogged with sludge. Under normal operating conditions, sludging can be prevented by using a premium grade fluid and cleaning the system at regular intervals.

The use of a premium grade fluid will also prevent the formation of lint. Lint is an undesirable result of the manufacturing process of some hydraulic fluids and can stick valves and clog filters as shown by the lint filled filter in (B).

In some applications a portable filtering rig is used that continuously filters the system fluid while the equipment is operating. It can be taken from machine to machine and the filter element changed frequently without losing operating time.

A good general rule is to flush and refill the system after the initial breaking in period (24 to 48 hours).



S-4 217-09171-1" Bore
10 Lbs. Force

INSTRUCTION SHEET For Bulletin 511 Type "S" 4" A-c Brake

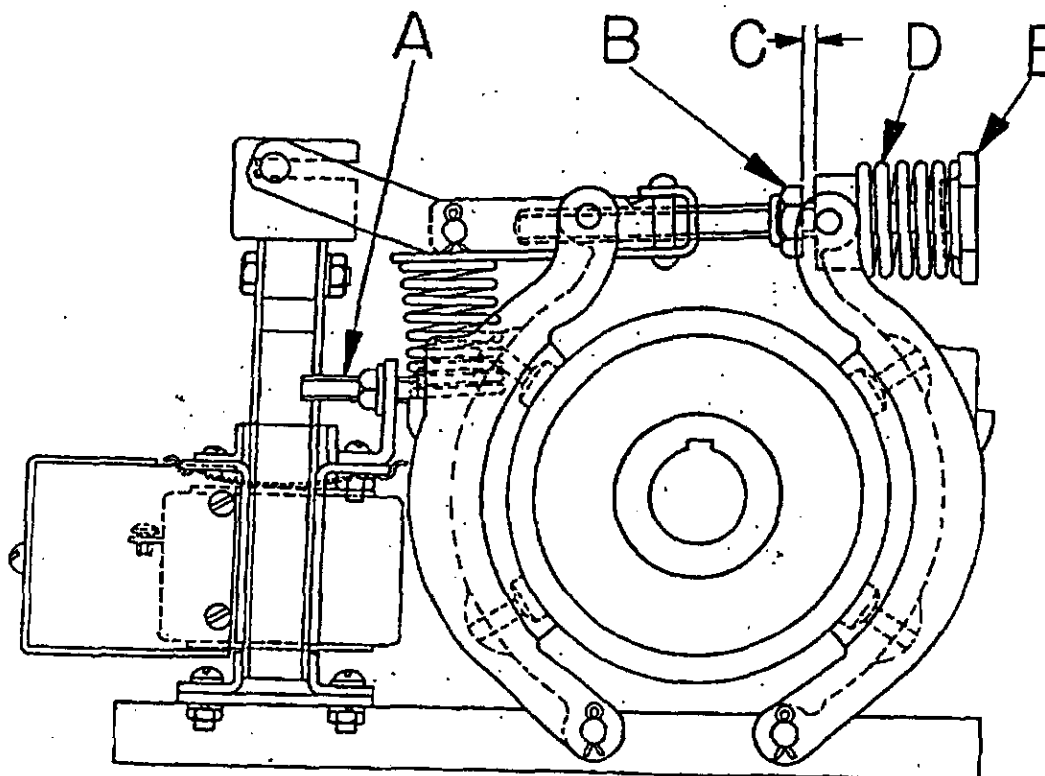


FIG. 1

INSTRUCTIONS (See Fig. 1)

1—MOUNTING: Clamp the brake on the wheel by compressing torque spring "D" by tightening the adjusting nut "E". Insert shims between the mounting stand and the base of the brake until the brake is setting solid on base.

2—ADJUSTMENT: a. Compress the torque spring "D" until the desired torque is obtained. The approximate compressed length of this spring, to obtain rated torque, is 1-1/16 inch. Further minor adjustment may be necessary.

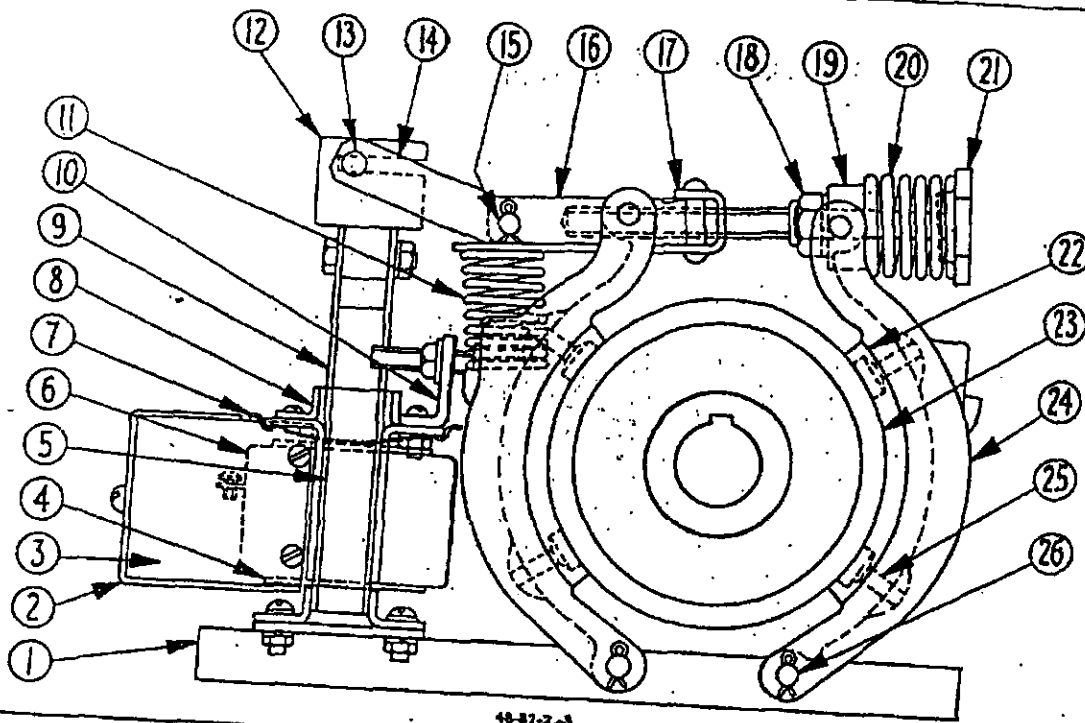
While making this adjustment maintain a clearance

of 1/64" at "C" when the brake is applied. When the desired torque is obtained be sure that the clearance "C" is 1/64". The lock nut "B" will secure itself in this position.

b. Equalize the clearance between the shoes and wheel when the brake is released by setting screw "A".

3—RE-ADJUSTMENT: When the lining wears, the clearance "C" decreases. Never permit this clearance to become zero since complete loss of braking torque will result. When the clearance "C" becomes low, again adjust to 1/64" by turning screw "E". No change in torque will result from this adjustment if nut "B" is not changed.

Torque Rating	Compressed Length of Spring "D"
10 Lbs. Ft.	1-1/16"



RENEWAL PARTS — Information Required

Parts CANNOT be sent promptly unless you include the FOLLOWING with your order: PUBLICATION NO., 9069, ITEM NO., DESCRIPTION, PART NUMBER and NUMBER STAMPED ON THE BRAKE NAME PLATE.

Item No.	Description of Part	No. Req.	Part No.
1	Base	1	17-2479
2	Terminal Cover (when used)	1	47-762
3	Terminal Case (when used)	1	39-480
4	Insulating washer	2	18-231
5	Solenoid Frame (Includes Item 8)	1	88-45-5
▲ 6	Coil (Give No. on Coil) <i>220-44 220-17416</i>	1	
7	Spring for Coil	1	
▲ 8	Plunger Guide	1	
9	Plunger	2	09-253
10	Bracket	2	54-273
▲ 11	Spring	1	51-82
12	Link	1	79-3302
13	Pin for plunger	1	69-269
	Washer	1	81-1045
14	Spring pin	1	13-3196
15	Lever	2	916-120
	Pin	2	13-3186
16	Adjusting Stud Nut	1	24-548
17	Spring Gland	1	13-433
18	Lock Nut	1	15-130
19	Pivot Block	1	49-375
▲ 20	Spring	1	15-298
21	Adjusting Stud	1	17-473
22	Brake Lining <i>220-75127</i>	1	69-202
▲ 23	Brake wheel (see below)	1	14-135-2
24	Brake Shoe Complete (Includes Items Nos. 22 and 25) <i>220-67128</i>	2	48-80-2
25	Rivet for Lining	1	48-510-3
26	Pin for Brake Shoe	8	13-4762
▲ 27	Renewal Set of Linings consisting of Items 22 and 25	2	13-431
28	Solenoid without coil (includes items 4, 5, 7 and 9)	1	6-166
		1	48-87-9

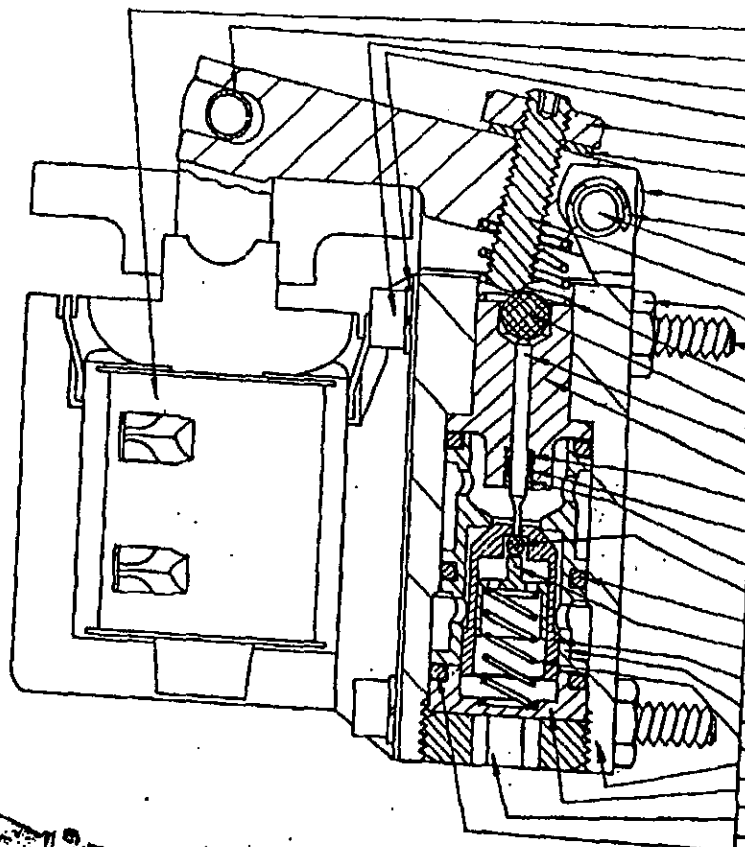
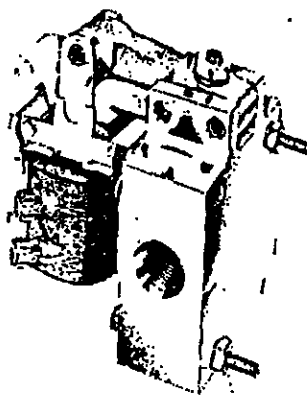
*Give Catalog "H" No. when stamped on the wheel or, if this No. does not appear on the wheel, give complete brake nameplate data and bore and keyway dimensions.
We recommend that these items be stocked. The quantity to be stocked will depend upon the total number in use.

CUTLER-HAMMER, Milwaukee, Wis.

Made in U. S. A.

WATERMAN HYDRAULICS CORPORATION
 3737 CHASE AVENUE • SKOKIE, ILLINOIS 60076 • PHONES 312-338-5200

SA 6.1



SOLENOID SUB ASSY. (XX VOLTAGE)	110978-XX	1
ROLL PIN		
SOC. HD. CAP SCREW, (2-REQD)	10-24x3/8	
SPRING LOCKWASHER, (4-REQD)	10	
HEX. JAM NUT	1/4-20	
MED. LOCKWASHER	1/4	
LEVER	110966	
WALDES E RING (2-REQD)	5133-18	
PIN	111314	
SOC. HD. SET SCREW, OVAL POINT	1/4-20x1	
HEX. NUT (2-REQD)	10-24	
SOC. HD. CAP SCREW, (2-REQD)	10-24x1-3/4	
SPRING	47108	
STEEL BALL, GRADE 1	1/4 DIA.	
ROD	44010	
PLUNGER GUIDE	SUB ASSY.	47313
LEATHER WASHER		
O-RING PACKING		
RETAINER		
STEEL BALL, GRADE 1	3/32 DIA.	
O-RING PACKING (2-REQD)	A-113	
SPRING GUIDE	31012	
VALVE	SUB ASSY.	44142
VALVE SEAT		
SPRING		
BLOCK	44125	2
RETAINER	110965	
SCREW	44009	
O-RING PACKING	44008	
	A-114	

ADJUSTMENT PROCEDURE:
 TO RE-ADJUST FOR PROPER OPENING, HOLD SOLENOID PLUNGER DOWN BY HAND. LOOSEN JAM NUT AND TURN SOCKET HEAD SET SCREW IN UNTIL IT BOTTOMS. RELEASE SOLENOID PLUNGER. BACK OFF SET SCREW UNTIL THERE IS CLEARANCE OF APPROXIMATELY 1/3 TURN BETWEEN SET SCREW AND 1/4" DIA. BALL. CONTACT BETWEEN SET SCREW AND BALL CAN BE DETERMINED BY FEEL WHEN PLUNGER IS DEPRESSED SLOWLY BY HAND. TIGHTEN JAM NUT.

- 1 MODEL 491N-3 uses Solenoid Sub-assembly 47174-XX (give voltage)
 - 2 MODEL 491E-3 uses an additional spring, part 47172
- For MODEL 491E-3 a metal Enclosure Assembly is used, part 47116

MODEL 491-3
NORMALLY CLOSED
2-WAY A.C. SOLENOID VALVE

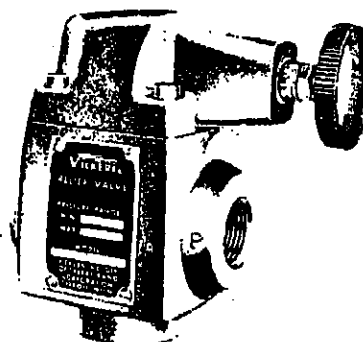
WATERMAN

INFORMATION

DELIVER WITH THE RELIEF VALVES

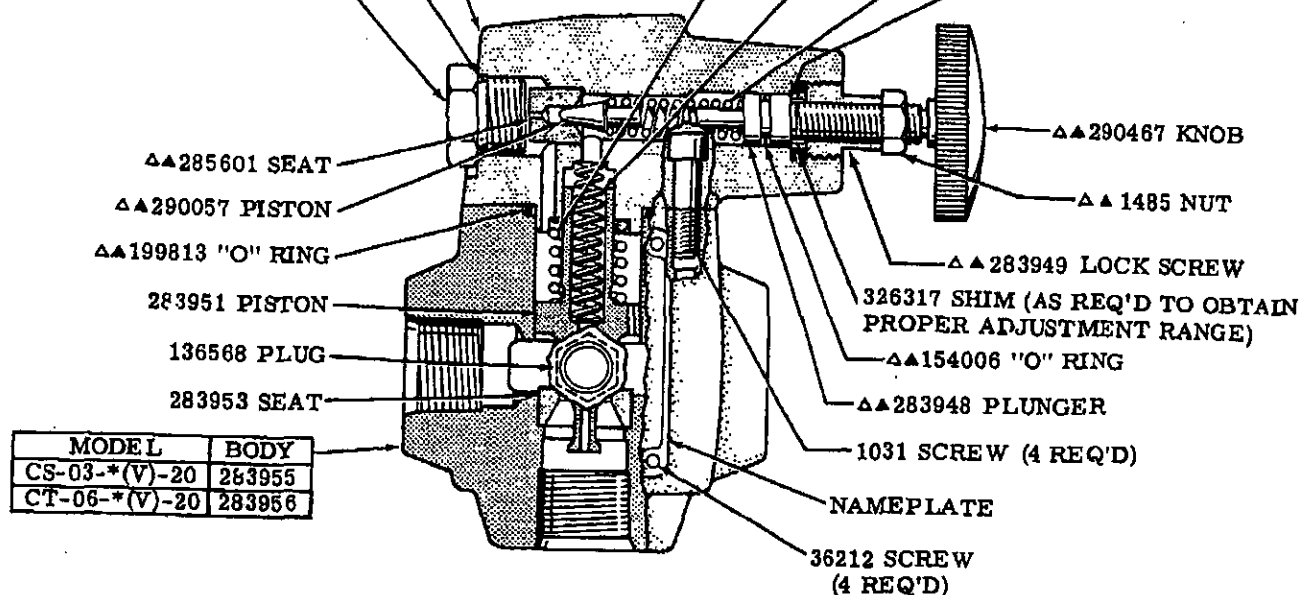
VICKERS

CS-03-*(V)-20
CT-06-*(V)-20



PLUG	"O" RING	COVER	MODEL
Δ307354	Δ154129	Δ292938	CS-03-*(V)-20
Δ7078	—	Δ283946	CT-06-*(V)-20

MODEL	SPRING	SPRING	SPRING	WASHER (2 REQ'D)	PRESSURE RANGE
C*-0*-B-20	—	2077	—	—	125-1000 PSI
C*-0*-BV-20	184458	—	ΔΔ2280	—	—
C*-0*-C-20	—	2077	—	—	500-2000 PSI
C*-0*-CV-20	184458	—	ΔΔ2282	—	—
C*-0*-F-20	—	2077	—	—	1500-3000 PSI
C*-0*-FV-20	184458	—	ΔΔ2281	ΔΔ64520	—



MODEL	BODY
CS-03-*(V)-20	283955
CT-06-*(V)-20	283956

MODEL	COVER S/A INCLUDES PARTS MARKED Δ
CS-03-B(V)-20	941623
CS-03-C(V)-20	941623
CS-03-F(V)-20	941624

MODEL	COVER S/A INCLUDES PARTS MARKED Δ
CT-06-B(V)-20	941625
CT-06-C(V)-20	941626
CT-06-F(V)-20	941627

Revised 9-1-73

INDUSTRIAL DIVISION
TROY, MICHIGAN 48064

I-3301-S

3743 2-4004-WAY
SERIES 3-532 28-312

217-84340

VICKERS



NOMINAL CAPACITY-3 GPM
PIPING CONNECTIONS-1/4 IN.

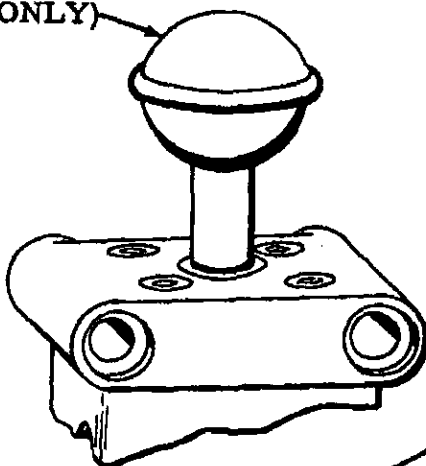
USED ON "E" SUFFIX
MODELS ONLY

36276 PIN

5460 PIN

2556-X ROLLER

3312 KNOB (USED ON
"K" SUFFIX MODELS
ONLY)



1052 SCREW (4 REQ'D)

36141 COVER

36484 BUSHING
217-10220

6475 SEAL
217-64470

34822 WASHER

39339 GASKET
217-29267

7077 PLUG

MODEL	BODY	SPOOL
C-552-E	36115	36132
C-572-E		36131
C-552-K	36074	39991
C-552-K-NS		
C-572-K		39993
C-572-K-NS		

217-71810

35529 GUIDE
18578 SPRING
NOT USED ON "NS"
SUFFIX MODELS

To insure sustained efficiency and maximum trouble-free life of this precision equipment, initial and continuous filtration of the fluid medium to 25 microns or less is essential. (For information pertaining to Vickers economical 10 micron filters, see installation drawing I & M 229847.)

Revised 10-15-63

I-462-S

INDUSTRIAL DIVISION
TROY, MICHIGAN 48064

SELECTION TABLE--AGMA LUBRICANT NUMBER

DRIVE TYPE	USE	USE	USE	OIL CHANGES	
	AGMA NO.	AGMA NO.	AGMA NO.	INITIAL	PERIODIC
ROLLER CHAIN	2	3	5	500	2500
SILENT CHAIN					
P.I.V. VARIABLE SPEED ▲	3	7■	8■	150	2500
V.R.D. VARIABLE SPEED	1	3	5	150	2500

DRIVE TYPE	AMBIENT TEMPERATURE		OIL CHANGES	
	15° TO 60°F USE AGMA NO.	50° TO 125°F USE AGMA NO.	IN HOURS	
IN-LINE MOTOGEAR	2	4	150	2500
GEARMOTOR				
ELECTROFLUID MOTOGEAR				

PARALLEL SHAFT UP TO 1800 RPM				
H-41 TO H-81	2	3	150	2500
HD-36 TO HD-61				
HT-41 TO HT-61				
H-101 TO H-180	2	4	150	2500
HD-70 TO HD-130	3	4	150	2500
HT-70 TO HT-130				
S-200 TO S-330				
D-150 TO D-250				
T-150 TO T-250	4	5	150	2500
1800 TO 3600 R.P.M.	2	3	150	2500
ALL SIZES ABOVE				
OVER 3600 R.P.M.	1	2	150	2500
ALL SIZES ABOVE				

WORM GEAR				
UP TO 6° CTRS.				
* WORM SPEED UP TO 700 R.P.M.	7 COMP.	8 COMP.	150	2500
* WORM SPEED OVER 700 R.P.M.	7 COMP.	8 COMP.		
OVER 6° CTRS. TO 12° CTRS.				
* WORM SPEED UP TO 450 R.P.M.	7 COMP.	8 COMP.	150	2500
* WORM SPEED OVER 450 R.P.M.	7 COMP.	7 COMP.		
OVER 12° CTRS. TO 18° CTRS.				
* WORM SPEED UP TO 300 R.P.M.	7 COMP.	8 COMP.	150	2500
* WORM SPEED OVER 300 R.P.M.	7 COMP.	7 COMP.		
SPIRAL BEVEL GEAR	3	5	150	2500

- NO.7 TO BE STRAIGHT MINERAL OIL OF SAME VISCOSITY AS NO.7 COMP.
 NO.8 TO BE STRAIGHT MINERAL OIL OF SAME VISCOSITY AS NO.8 COMP.
- * WORM SPEED IS THE R.P.M. OF THE INPUT SHAFT ON SINGLE REDUCTION DRIVES AND THE R.P.M. OF THE SECONDARY WORM SHAFT ON DOUBLE REDUCTION DRIVES.
- AGMA LUBRICANT NUMBERS SHOWN IN THE ABOVE TABLE APPEAR ON INDIVIDUAL NAMEPLATES ATTACHED TO POWER TRANSMISSION DRIVES OR CASINGS. REFER TO DWG 342Y171 FOR LISTING OF NAMEPLATES.
- POUR POINT OF LUBRICANT MUST BE LESS THAN THE AMBIENT TEMPERATURE -
 SEE DATA SHEET 342Z151
- ▲ SEE DATA SHEET 342Y170, FOR TYPICAL MANUFACTURER'S OILS.

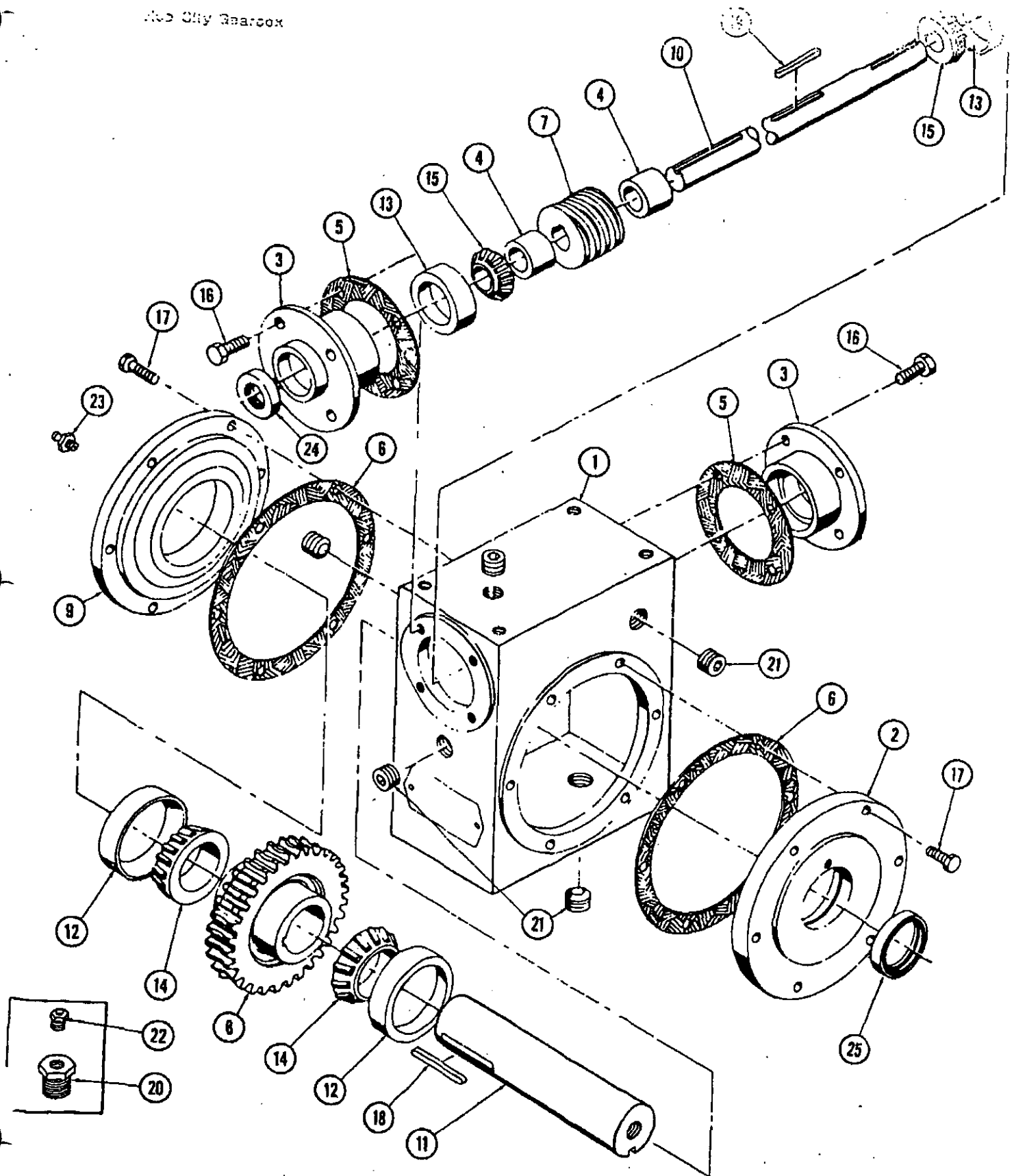
Book No.

DATE	REV.	3-4-57	9-5-57
1-25-57			

LINK-BELT COMPANY

342Y152

Автоматический выключатель



HUB CITY HELICOPTER GEAR BOX #02-21-04621-1127

CHANCE D.P. NO.

<u>REF.</u> <u>NO.</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>CHANCE D.P. NO.</u>	<u>QTY.</u>
1	02-23-01844-320	HOUSING		1
2	02-23-01845-320	CAP, OPEN		1
3	02-23-01847-320	CAP, OPEN		2
4	02-23-01901-320	SEALER		2
5	02-23-01909-320	GASKET		10
6	02-23-01910-320	GASKET		10
7	02-23-01944-320	WORM	217-88416	1
8	02-23-02977-320	GEAR, WORM	217-30136	1
9	02-23-03098-320	CAP, CLOSED		1
10	02-25-07337-1121	SHAFT, INPUT	217-65806	1
11	02-25-07338-1127	SHAFT, OUTPUT	217-65807	1
12	8-32-20-58-006	CUP, BEARING TIMKEN LM48510	217-04559	2
13	8-12-20-58-074	CUP, BEARING TIMKEN 1220	217-04560	2
14	8-32-20-58-005	CONE, BEARING	217-04561	2
15	8-32-20-68-074	CONE, BEARING TIMKEN 1280	217-04562	2
16	8-47-14-04-023	SCREW, HEX CAP 3/8 NC x 1		8
17	8-47-14-04-027	SCREW, HEX CAP 5/16NC x 3/4		12
18	8-47-17-05-058	KEY, P & W 5/16 SQ. x 2		1
19	8-47-17-05-103	KEY, P & W 3/16 SQ. x 1 3/4		1
20	8-63-17-51-002	BUSHING, PIPE 1/2 x 1/8 NPT		1
21	8-63-17-61-004	PLUG, PIPE, SOCKET 1/2 NPT		4
22	8-63-12-71-001	PLUG, VENTED ALEMITE 317400		1
23	8-63-12-91-005	FITTING, GREASE ALEMITE 1610RJ		1
24	8-74-21-25-006	SEAL C/R 8060	217-64375	2
25	8-74-21-25-017	SEAL C/R 13535	217-64376	1