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TECHNOLOGIES
CARRIER**

Commercial Division
Carrier Corporation

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DATE: 8/4/59
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SERVICE BULLETIN

SUBJECT:

INTERNAL VANE SHAFT SEAL

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PURPOSE

To transmit information on internal vane shaft seal.

DESCRIPTION

The vane shaft seal is a John Crane type of seal. Its purpose is to prevent oil leakage from the hydraulic cylinder into the refrigerant gas side of the machine. Any oil which may leak past this seal will be carried with the refrigerant to the condenser and eventually down to the cooler where it will remain until the refrigerant charge is distilled. Leakage at this seal would normally be due to faulty installation or physical damage to the seal.

LEAK TESTING

1. Operate the oil pump and run the hydraulic motor to the fully open position. This can be accomplished by installing a jumper between terminals J-1 and J-18 on the control terminal panel and depressing the "Higher" manual button.
2. Shut off oil pump and remove the jumper between J-1 and J-18.
3. Remove and plug the oil line to the top of the hydraulic motor.
4. Open the valve on the bottom of the cylinder to the full open position.
5. With the machine under vacuum the piston will be forced to the closed position. This will drain all the oil from the bottom of the cylinder.
6. Remove the cover plate from the side of the hydraulic motor and syphon out the oil which is on top of the piston.
7. Remove and plug the oil line and the opening at the bottom of the hydraulic motor.
8. Reinstall the cover plate on the side of the piston.
9. Install a compound gauge, close-coupled to the top opening of the hydraulic motor, being very careful to avoid leakage at any of the fittings.
10. The vacuum in the machine should be at least 10 inches.

TO MAKE A GOOD TEST ALL OF THE ABOVE STEPS MUST BE FOLLOWED.



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If there is leakage at the seal, the compound gauge will indicate a vacuum after a short period of time. If no vacuum is indicated on the compound gauge within two hours the seal can be considered tight.

CAUTION--If the hydraulic motor is above room temperature at the time of the test, it may show a false indication of leakage as the air in the cylinder cools down.

SEAL REMOVAL

The seal should not be removed for inspection unless the leak test indicates it is leaking. To remove seal, proceed as follows:

1. Remove vane follow-up potentiometer, item 1, Fig. 1.
2. Remove oil piston inspection cover, item 2, Fig. 1.
3. Using a puller as shown in Figs. 2 and 3, jack the shaft out of the assembly. To prevent binding the gear segment, item 3, Fig. 1, should be held in position by reaching through the piston inspection opening. The jacking plate should not bear against the outside bushing, item 1, Fig. 2, as this part will move out with the shaft.
4. Using puller as shown in Fig. 3, pull shaft coupling, item 2. The shaft seal, item 3, and internal bushing, item 1, will be forced out ahead of the coupling.

CHECKS TO BE MADE BEFORE INSTALLATION

1. Using a 6" depth gauge, check the distance between point A and B, in Fig. 4.
2. Place the outside bushing, item 1, Fig. 2, in the normal position over the shaft and also place the shaft seal, both rotating and stationary parts, item 3, Fig. 3, over the other end of the shaft and with all of these parts out of the machine, measure the distance between points C and D, as shown on Fig. 5. This should be between 1/32" and 3/32", greater than the measurement taken in step 1, above.
3. The seal spring has a maximum movement of 1/8". Minimum compression on this spring is 1/32" and maximum is 3/32". The above measurement should put it within this range. If too little spring compression is indicated, then shims should be inserted at point A, Fig. 1. If too much spring compression is indicated, shims should be inserted at point B, Fig. 1.
4. The rotating seal face, stationary seal face, "O" rings and shaft should be examined very closely. Damaged parts should be replaced.
5. Carefully inspect the inside of the seal housing for burrs or other damage.



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SEAL INSTALLATION

1. The most important consideration in replacing a seal is CLEANLINESS. The seal faces should be protected at all times. They should never be handled in such a manner that the faces will be touched by hand or fingers. Body acids can cause seal failure. The use of wiping rags containing lint should be avoided.
2. Use oil or vaseline on "O" rings to make sure they are not torn at assembly. The seal faces should be covered with clean oil.
3. Be sure key for gear segment is in position.
4. Be sure center punch marks on rack and gear line up so vane movement and piston travel will be correct.
5. The vane potentiometer coupling must be re-installed in shaft slot in original position.
6. Check newly installed seal for leakage as described under "Leak Testing" above.

POSSIBLE CAUSES OF SEAL LEAKAGE

1. CAUSE - Seal housing too deep resulting in too little spring compression on seal.
CORRECTIVE ACTION - See steps 1, 2 and 3 under "Checks To Be Made Before Installation".
2. CAUSE - Seal housing too shallow resulting in excessive spring compression and wear on seal.
CORRECTIVE ACTION - Same as 1, above.
3. CAUSE - Flaw in one of the "O" rings.
CORRECTIVE ACTION - Carefully inspect the two "O" rings found in the seal assembly. Any sign of damage to either of these "O" rings could be the cause of leakage. If damaged "O" rings are discovered, the damaged ring should be replaced with a Buna-N-159-70 or Neoprene "O" ring purchased locally. The nominal dimensions of the two "O" rings used on the seal are as follows: Internal "O" ring - 1-1/4" I.D. X 1-7/16" O.D. X 3/32" thick; outer "O" ring - 1-3/4" I.D. X 2" O.D. X 1/8" thick.
4. CAUSE - Bad surface or foreign matter on vane shaft under the internal "O" ring.
CORRECTIVE ACTION - The surface of the vane shaft in the area under the internal "O" ring on the seal should be thoroughly cleaned and polished to remove any scratches or burrs. The OD of the vane shaft at this point should be 1.124 - 1.125". Polishing should be done with a very fine crocus cloth and oil. If the shaft is damaged to such a degree that polishing would reduce the OD to less than 1.124" the shaft should be replaced. (Part No. 19C47-2042). If dirt and foreign material is found in the seal area, the hydraulic cylinder and hydraulic lines to the cylinder should be thoroughly cleaned. The oil filter should be cleaned out and the element replaced.



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- 5. CAUSE - Bad surface or foreign matter in housing under the outer "O" ring on the seal.
CORRECTIVE ACTION - The housing should be cleaned out thoroughly and any burrs removed. Replace "O" ring if damaged. The diameter of the seal housing is 1.999" - 2.001".
- 6. CAUSE - Bad surface on rotating seal face (Carbon face).
CORRECTIVE ACTION - Replace seal (Part No. 19Ch7-2052).
- 7. CAUSE - Bad surface on stationary (Steel) seal face.
CORRECTIVE ACTION - Same as 6; above.
- 8. CAUSE - Accumulation of looseness between the vane shaft and the inner and outer bushings causing vertical movement of the rotating seal face.
CORRECTIVE ACTION - The maximum clearance between mating parts should not exceed the following:

<u>Mating Parts</u>	<u>Maximum Clearance</u>
Between outer bushing and housing	.004
Between outer bushing and shaft	.003
Between inner bushing and housing	.004
Between inner bushing and shaft	.003

- 9. CAUSE - Coupling connecting the vane shaft to the driver pulley in the prawnirl vane mechanism too tight in the shaft slot or the pulley slot. The fit between the coupling and the shaft and the fit between the coupling and the driver pulley slot should be loose enough to allow free movement between the mating parts. If these joints are too tight, binding will occur causing the vane shaft to be pulled off center within the housing.
CORRECTIVE ACTION - Check the fit and if too tight use a fine file to get free movement between the mating parts. Fit must not be too loose.
- 10. CAUSE - Sharp edges on end of vane shaft causing damage to the seal's internal "O" ring during assembly.
CORRECTIVE ACTION - Any sharp edges should be removed with a fine file and polished. Replace "O" ring.

IMPORTANT:- Be very careful not to scratch the shaft surface which will mate with the internal "O" ring on the seal.



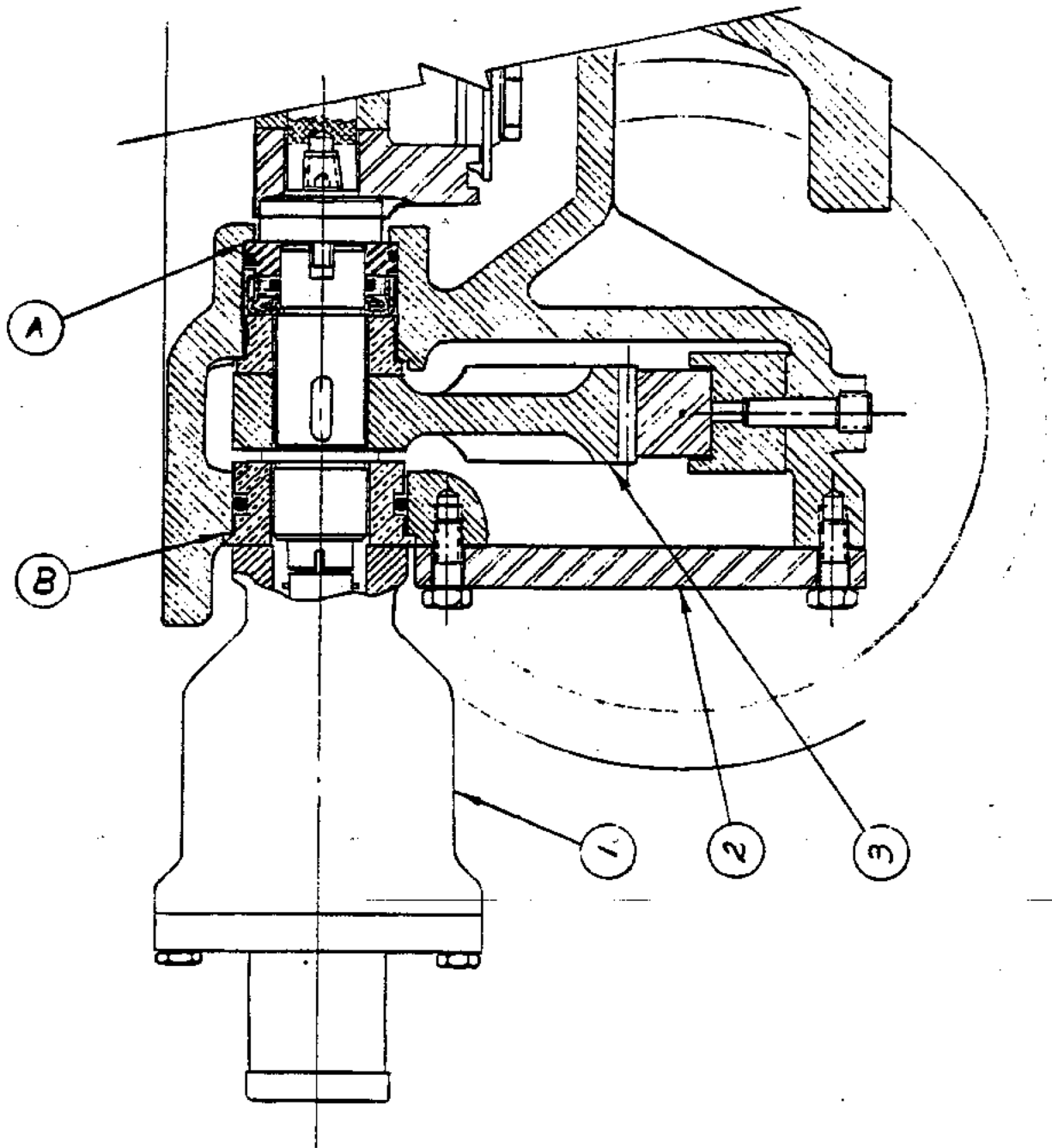
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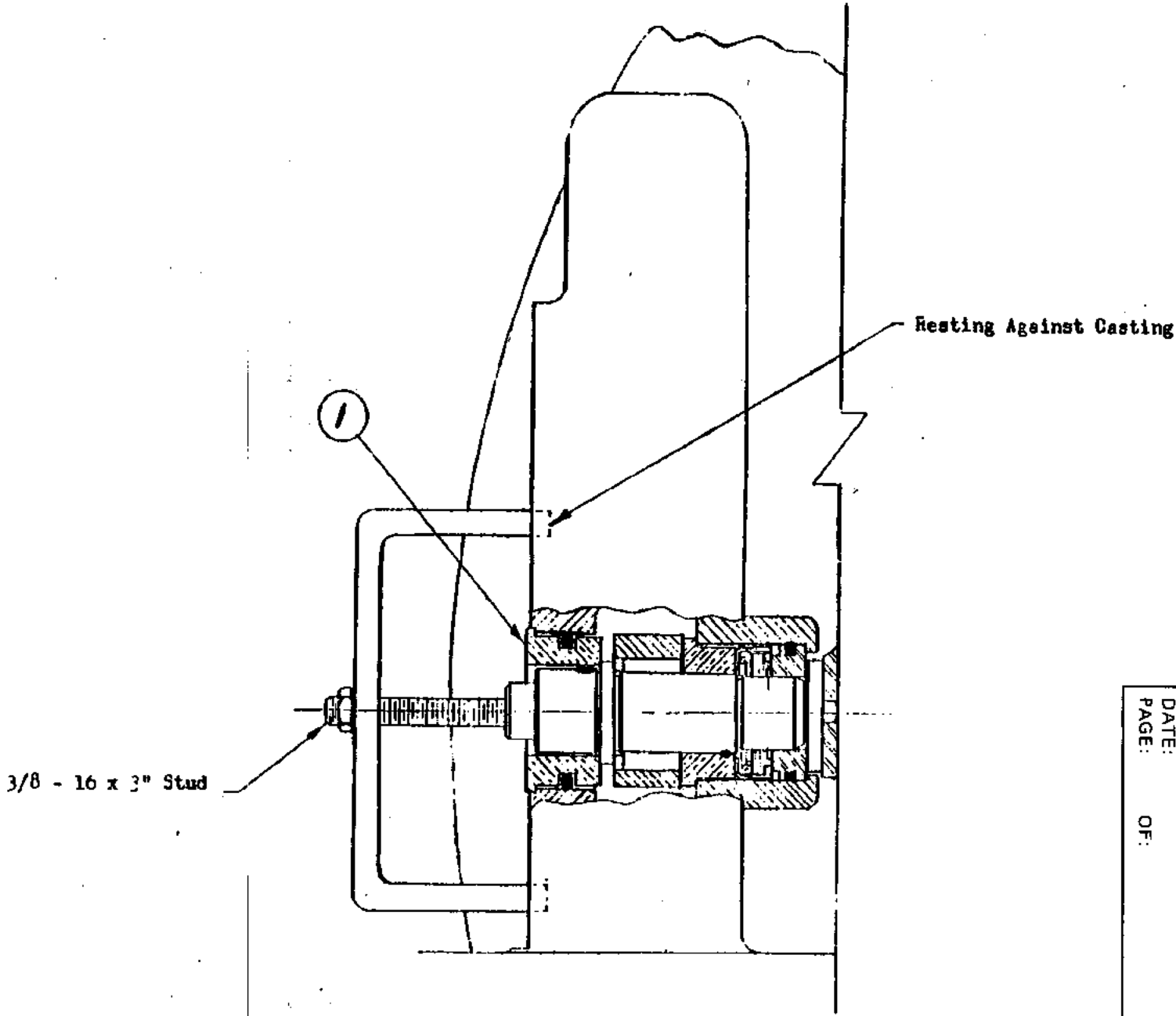


Fig. 2



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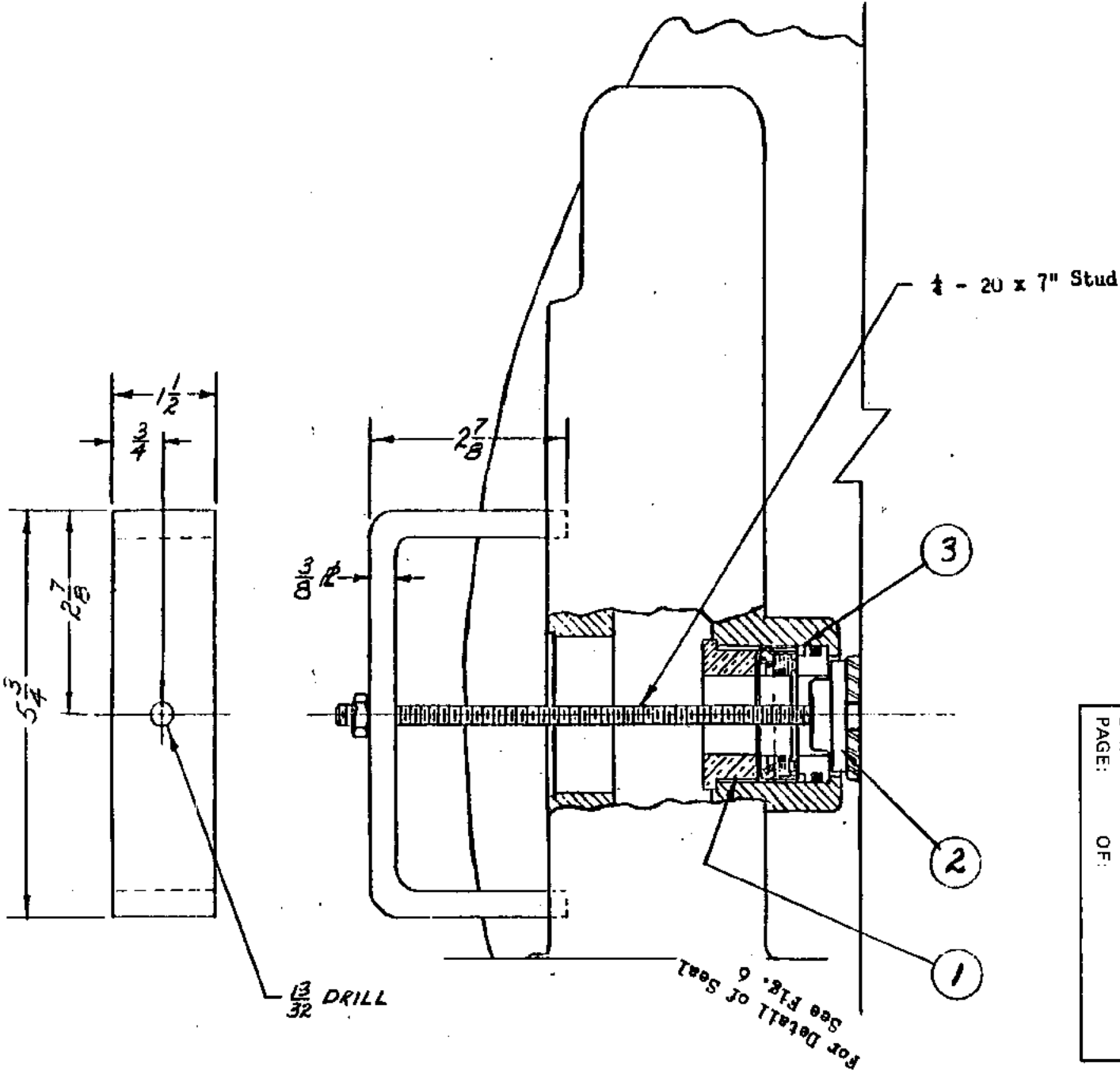


FIG. 3



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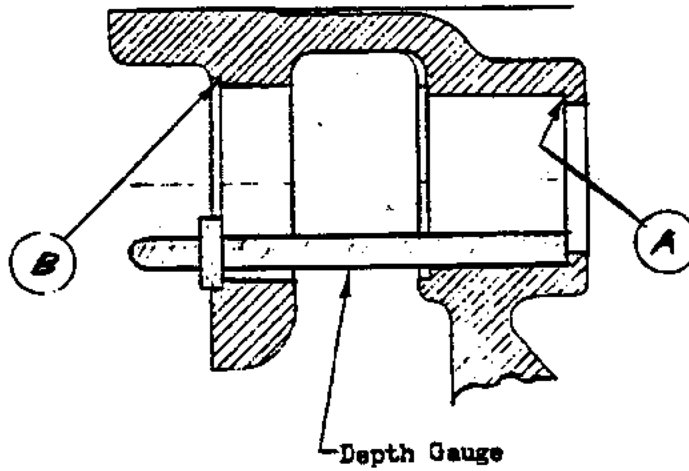


Fig. 4

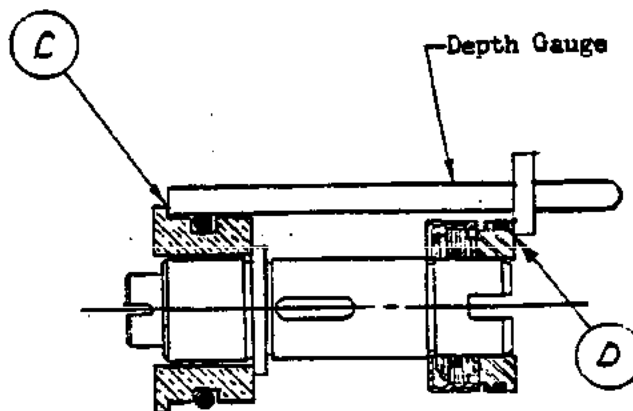


Fig. 5



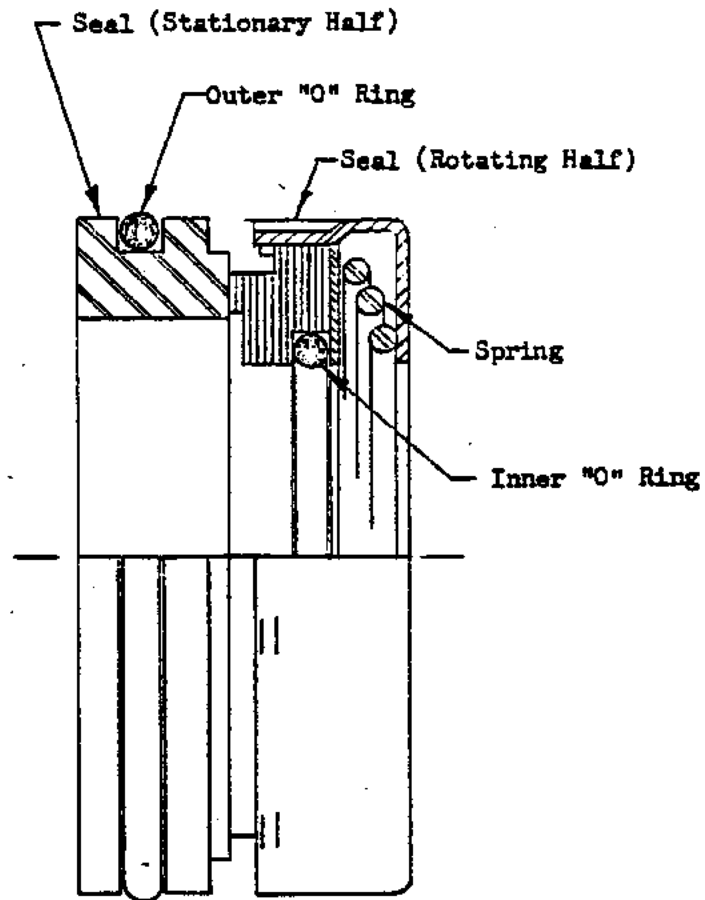
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Shaft Seal

Fig. 6