

Feb. 5, 1952

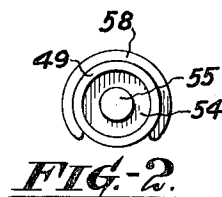
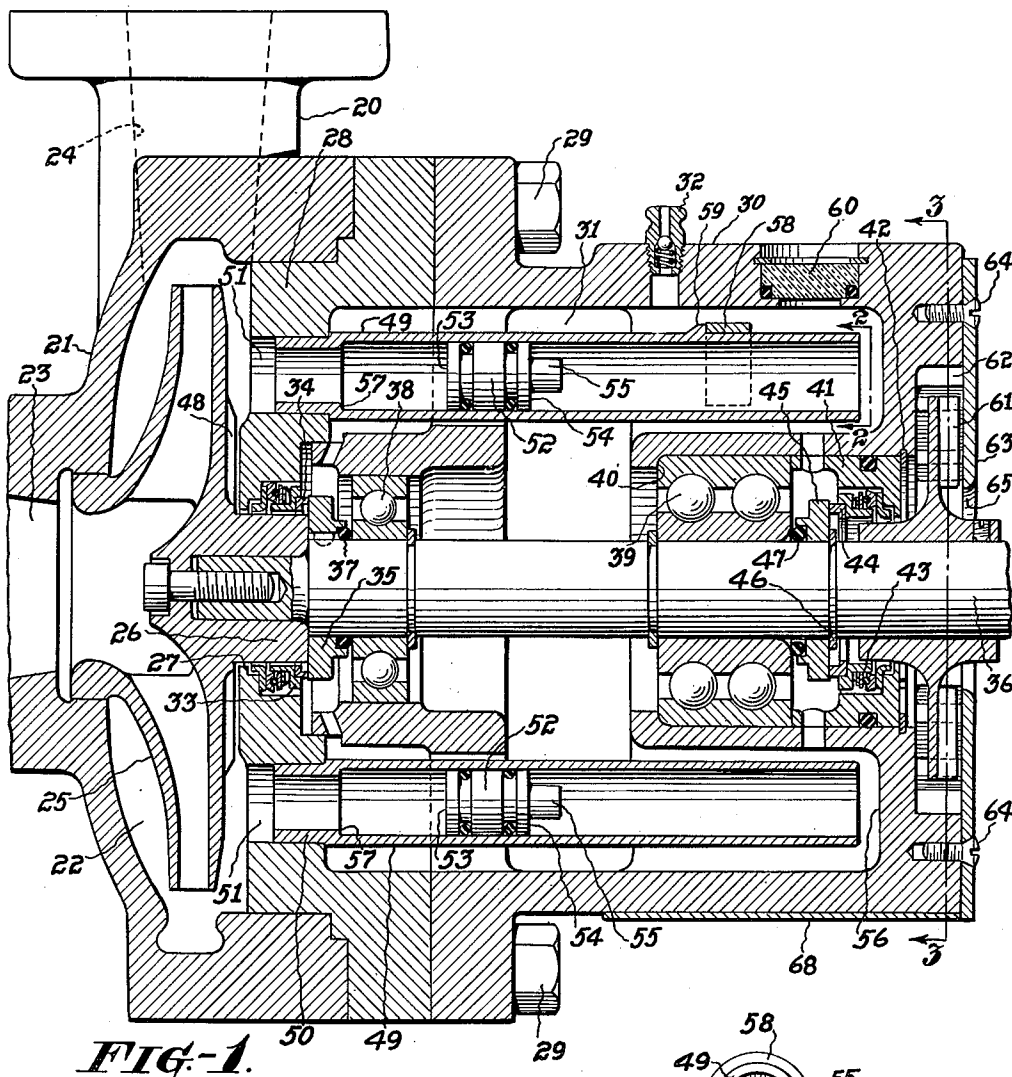
H. HORNSCHUCH

2,584,705

SEALING DEVICE FOR PUMPS

Filed Nov. 6, 1946

2 SHEETS--SHEET 1



Feb. 5, 1952

H. HORNSCHUCH
SEALING DEVICE FOR PUMPS

2,584,705

Filed Nov. 6, 1946

2 SHEETS—SHEET 2

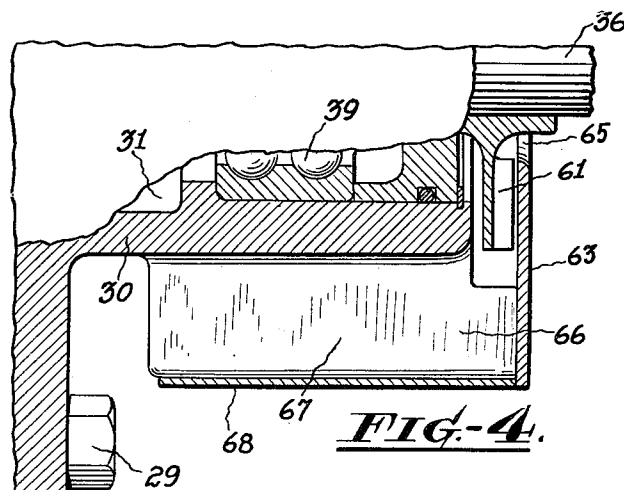
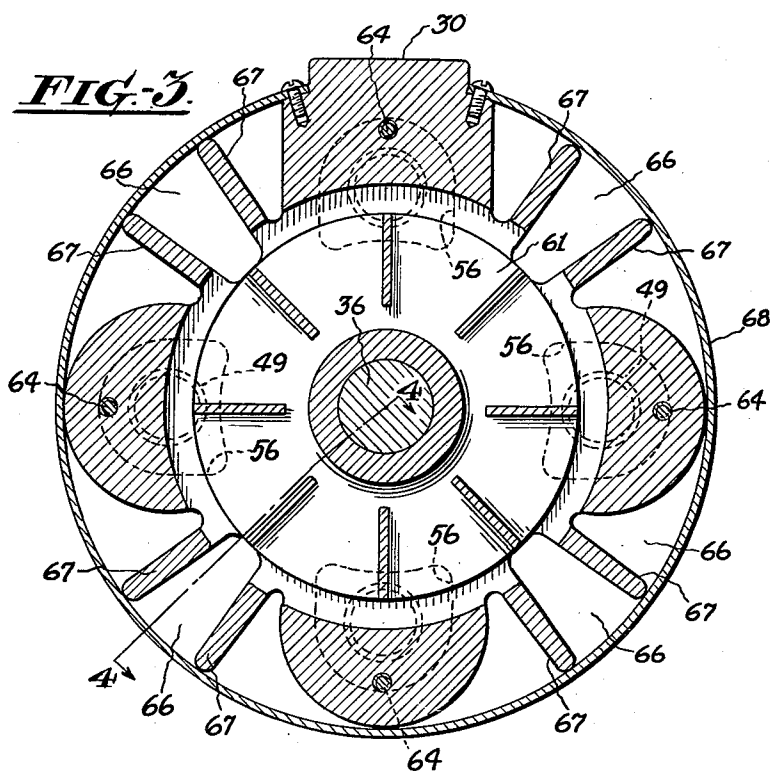


FIG. 4.

INVENTOR
Hanns Hornschuch

BY *Chadwick*
HIS ATTORNEY.

UNITED STATES PATENT OFFICE

2,584,705

SEALING DEVICE FOR PUMPS

Hanns Hornschuch, Easton, Pa., assignor to
Ingersoll-Rand Company, New York, N. Y., a
corporation of New Jersey

Application November 6, 1946, Serial No. 708,010

2 Claims. (Cl. 103-111)

1

This invention relates to pumps, and more particularly to a sealing device for pumps of the centrifugal type serving to pump volatile liquids which are difficult to restrain with the conventional type of stuffing boxes using plastic packing material.

One object of the invention is to obviate the chances of leakage of fluid from the impeller chamber of the pump.

A more specific object is to subject the opening in the pump casing through which the impeller shaft extends to a sealing fluid under a pressure in excess of the pressure existing in the impeller chamber adjacent the opening.

Another object is to utilize the discharge pressure of the pump impeller as a medium for imparting the requisite pressure to the sealing fluid.

Other objects will be in part obvious and in part pointed out hereinafter.

In the accompanying drawings and in which similar reference numerals refer to similar parts,

Figure 1 is a longitudinal elevation of a centrifugal pump equipped with a sealing device constructed in accordance with the practice of the invention.

Figures 2 and 3 are transverse views taken through Figure 1 on the lines 2-2 and 3-3, respectively, and

Figure 4 is a transverse view taken through Figure 3 on the line 4-4.

Referring more particularly to the drawings, 20 designates a centrifugal pump comprising a casing 21 that is recessed to define an impeller chamber 22 having an inlet opening 23 and a discharge opening 24 for the passage of fluid from the impeller chamber 22 to a discharge conduit (not shown).

Within the chamber 22 is an impeller 25 having a hub portion 26 that extends through an aperture 27 in a head 28 forming a closure for one side of the impeller chamber 22. The head 28 is secured to the casing 21 by bolts 29 that also serve to clamp a housing 30 against the outer side of the head 28. The housing 30 encircles the outer end of the aperture 27 and its interior constitutes a reservoir 31 for sealing fluid, oil for example, which may be introduced into the reservoir through a check valve 32 threaded into the wall of the housing. The reservoir 31 extends part way into the outer portion of the head 28 and overlies the adjacent end of the aperture 27 which contains a mechanical sealing device 33 for controlling the leakage of fluid through the said aperture.

2

The sealing device 33 may be of a well known type and has a stationary sealing member 34 and a rotary member 35 having sealing surfaces that cooperate with each other to effect a seal. In the arrangement shown, the rotary member is in the form of a collar keyed to the shaft 36 of the impeller and abuts the end of the hub 26. The collar 35 is held thus by a packing member 37 embedded partly in the collar to prevent leakage of fluid along the surface of the shaft and engaging an inner race of an anti-friction bearing 38 for the shaft 36. The shaft 36 is additionally supported by a second anti-friction bearing 39 which, like the bearing 38, is completely immersed in the sealing fluid in the reservoir.

The bearing 39 is held against endwise movement in the direction of the impeller by a shoulder 40 in the housing 30 and is held against movement in the opposite direction by a sleeve 41 which bears against the outer race of the bearing and is retained in position by a split ring 42 seated in the surface of the bore containing the sleeve 41 and the bearing 39. The sleeve 41 contains a mechanical sealing device 43 the non-rotating sealing member 44 of which cooperates with a collar 45 keyed to the shaft 36 and held against movement in the direction of the sealing member 44 by a ring 46 interlocked with the shaft. The collar 45 is held against the ring 46 by a sealing ring 47 interposed between the collar and the inner race of the bearing 39.

Means are provided for maintaining the sealing fluid in the reservoir 31 at a pressure in excess of that normally existing in the impeller chamber 22 at its juncture with the aperture 27 or such pressure as may be induced by radially extending vanes 48 on the outer side of the impeller 25 adjacent the aperture 27. To this end the sealing device is provided with a compressor, or compressors, each consisting, in the example shown, of a cylinder 49 that extends longitudinally of the reservoir 31. The cylinder is supported at one end 50 in an aperture 51 that opens into the impeller chamber 22 and the opposite end is suitably spaced from the bounding surfaces of the reservoir to assure an ample area of communication between the cylinder 50 and the reservoir.

The cylinder is hollow throughout its entire length so that fluid may enter it from the impeller chamber 22 through the aperture 51, and within the cylinder is a plunger 52 having a pressure surface 53 against which the fluid from

3

the impeller chamber 22 acts for expelling sealing fluid from the cylinder. The opposite end 54 of the plunger and which acts against the sealing fluid carries a projection 55 for engagement with the end wall 56 of the reservoir to limit the working stroke of the plunger, and a shoulder 57 within the cylinder extends into the path of the pressure surface 53 to limit movement of the plunger 52 in the opposite direction.

In addition to its function of imparting pressure to the sealing fluid in the reservoir one of the compressor elements also serves to indicate the need of additions to the supply of sealing fluid in the reservoir. To this end its cylinder 49 is constructed of non-magnetic material, its plunger 52 of magnetic material, and on the free end portion of the cylinder is a magnet 58 that is slidable endwise of the cylinder and will move thus with the plunger as long as the plunger remains in its magnetic field. A shoulder 59 on the outer surface of the cylinder limits movement of the magnet in the direction of the impeller chamber, and in the side of the housing is a window 60 through which the magnet 58 may be seen whenever it approaches or reaches a position indicating the need of additional sealing fluid in the reservoir.

In order that any heat generated in the sealing fluid by the bearings 38 and 39 may be quickly dissipated the sealing device is provided with a fan 61 which is mounted on the shaft 36 and lies within a cavity 62 in the end of the housing. The cavity is covered by a plate 63 secured to the housing by screws 64. In the central portion of the plate is an opening 65 for the admission of air into the cavity and the air circulated by the fan flows from the cavity through passages 66 extending longitudinally along the surface of the housing 30 and defined by ribs 67 on the housing and a casing 68 extending part way along the length of the housing 30 and resting upon the outer ends of the ribs 67.

In the operation of the device, and assuming the reservoir 31 to be completely filled with sealing fluid and the plungers 52, therefore, in abutment with the shoulders 57, the liquid discharged by the impeller will act against the pressure surfaces 53 and urge the plungers in the direction of the free ends of the cylinders 49. This force exerted upon the sealing fluid will impart thereto a somewhat higher pressure than that which exists at the juncture of the aperture 27 with the impeller chamber 22. In consequence, any fluid that may flow through the aperture will be only such small amount of sealing fluid as may pass between the cooperating surfaces of the sealing member 34 and the collar 35 of the mechanical sealing device 33.

Some of the sealing fluid will, of course, also escape from the reservoir between the cooperating surfaces of the collar 45 and the sealing member 44 of the sealing device 43, and as the supply of sealing fluid decreases in the reservoir, by

4

reason of such leakage, the discharge pressure of the pump acting against the surfaces 53 will gradually move the plungers in the direction of the free ends of the cylinders and thereby maintain the sealing fluid under a pressure in excess of that existing in the impeller chamber adjacent the aperture 27.

Whenever the plunger 52 in the cylinder adjacent the window 60 moves into the transverse plane of the magnet 58 the magnet will thereafter move abreast of the plunger along the window 60 to indicate the need of replenishing the supply of sealing fluid in the reservoir.

I claim:

1. In a sealing device for pumps, a casing having an impeller chamber and an aperture opening into the impeller chamber, a housing having a reservoir for sealing fluid to overlie the aperture, an impeller in the impeller chamber having a shaft extending through the aperture and the reservoir, a mechanical sealing device at the aperture to limit the flow of sealing fluid there-through, a cylinder of non-magnetic material within the reservoir opening at one end into the impeller chamber and at its other end into the reservoir, a plunger of magnetic material in the cylinder constantly subjected to the pressure in the impeller chamber and actuated thereby to exert a pressure on the sealing fluid in the reservoir, a magnet slidable on the cylinder to move with the plunger, and a window in the housing through which the position of the magnet may be observed.

2. In a sealing device for pumps, a casing having an impeller chamber and an aperture opening into the impeller chamber, a housing having a reservoir for sealing fluid, an impeller in the impeller chamber having a shaft extending through the aperture into the reservoir, a cylinder of non-magnetic material communicating at one end with the impeller chamber and at the other end with the reservoir, a plunger of magnetic material in the cylinder actuated by the pressure in the impeller chamber to exert a pressure on the sealing liquid, and a magnet exteriorly of the cylinder to move with the plunger for indicating the position of the plunger in the cylinder.

HANNS HORNSCHUCH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
879,484	Mortrud	Feb. 18, 1908
1,086,063	Lobnitz	Feb. 3, 1914
1,859,039	Joyce	May 17, 1932
2,107,260	Ihara	Feb. 1, 1938
2,397,012	Jepson	Mar. 19, 1946
2,397,171	Troller et al.	Mar. 26, 1946