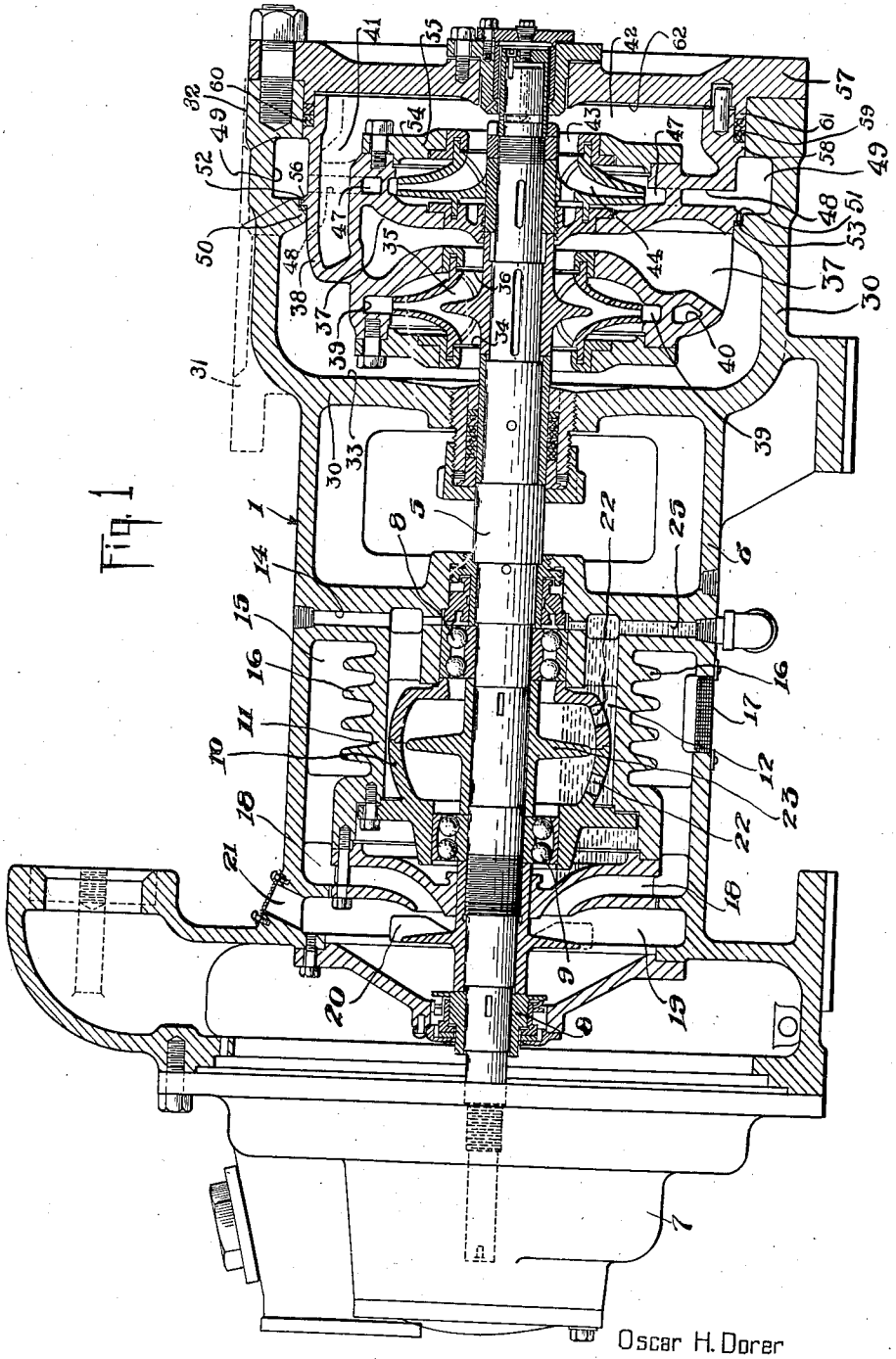
Nov. 4, 1941. O. H. DORER 2,261,236

BEARING

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Fig. 1



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Fig. 2

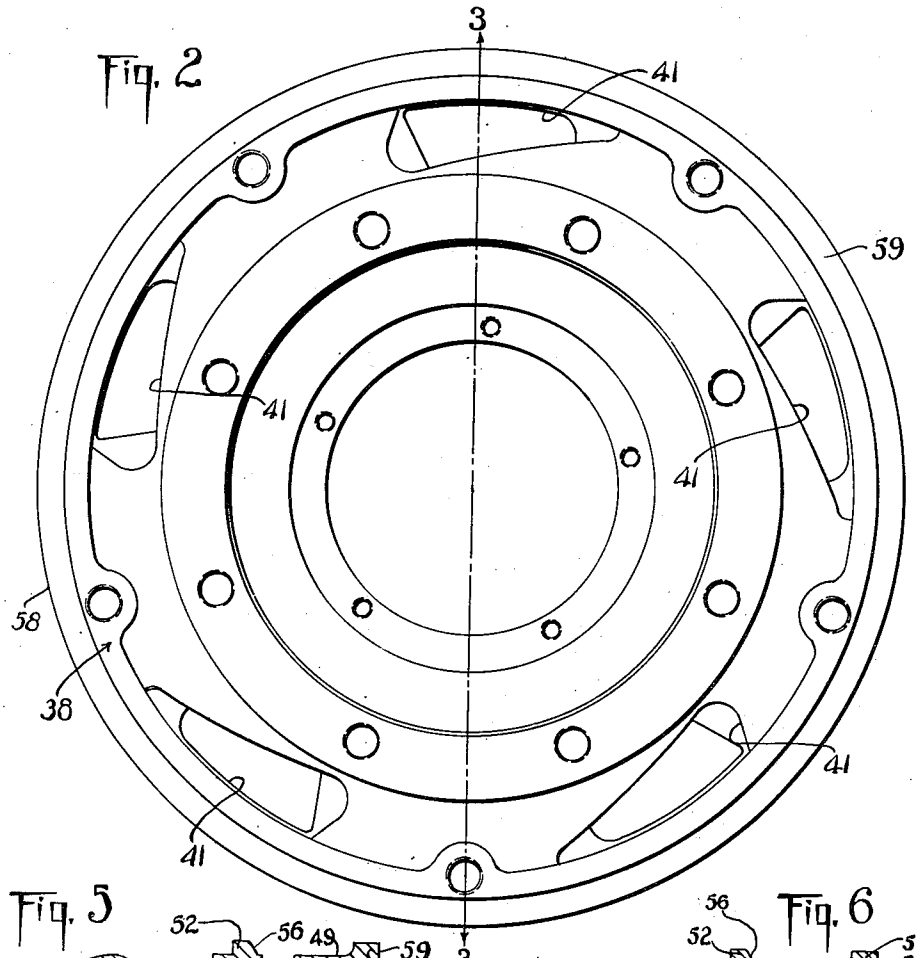


Fig. 5

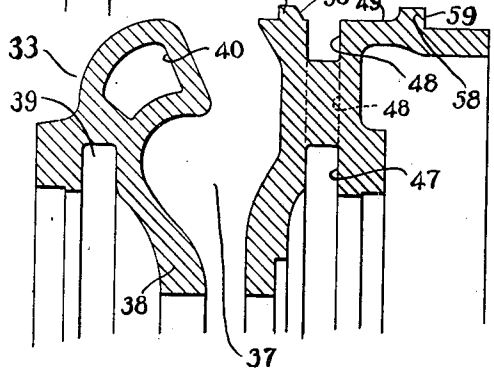
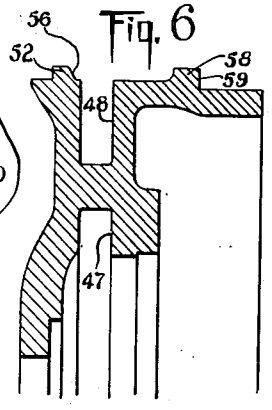


Fig. 6



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Fig. 3

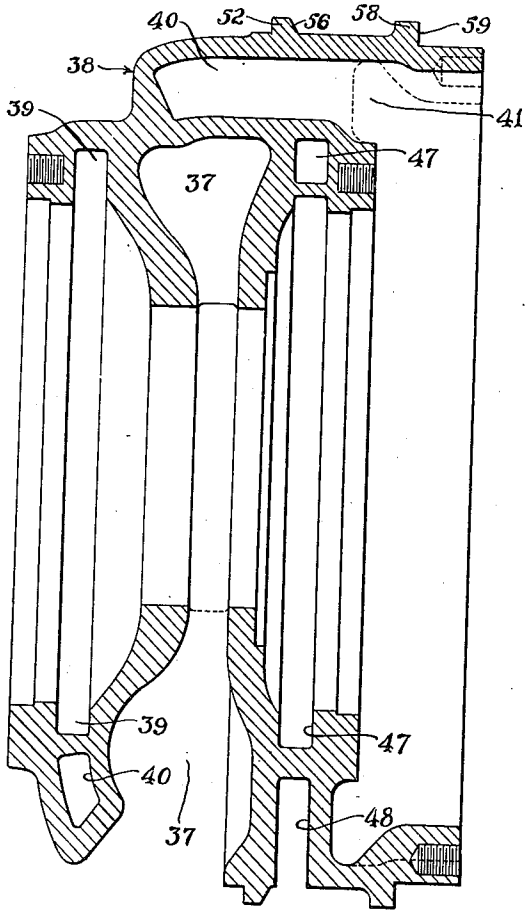
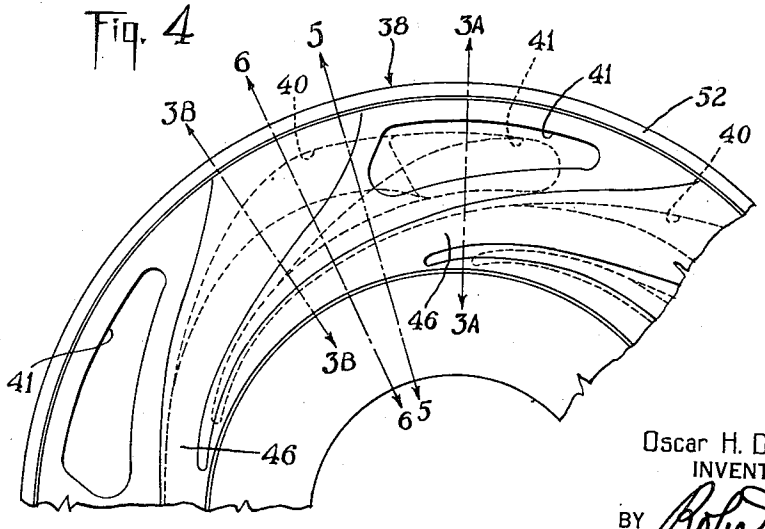


Fig. 4



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Patented Nov. 4, 1941 2,261,236

UNITED STATES PATENT OFFICE

2,261,236

BEARING

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Application May 23, 1939, Serial No. 275,160

1 Claim. (Cl. 308—76)

This invention relates to pumps and more particularly to centrifugal pumps employed for pumping hot water or other hot liquids.

In close coupled steam driven centrifugal pumps, particularly pumps on portable equipment, lubrication is a problem because of excessive heating of the lubricating oil by the heat transmission toward the middle parts of the pump, both from the steam driver and the hot liquid being pumped, and an object of the present invention is to provide means in a centrifugal pump of the type specified for cooling the lubricating oil employed in lubricating the bearings of the pump.

Another object of the present invention is to provide in a multi-stage centrifugal pump a diffusion ring formed in one piece which is provided with a plurality of radial tortuous passages for leading the discharge of the first stage impeller to the suction of the second or successive stage impeller, and also having a plurality of substantially radial discharge passages therein for the second or final stage impeller of the pump. The various passages in the diffuser ring and the surfaces thereof which are engaged by fluid under discharge pressure of the stages are constructed and arranged whereby the one piece diffuser will be held firmly against a gasketed shoulder on the pump casing to prevent interstage leakage in the pump.

Another object of the present invention is to provide an elastic connection, in the form of elastic packing rings, between the one piece diffuser and the end of the pump casing.

With these and other objects in view, as may appear from the accompanying specification, the invention consists in various features of construction and combination of parts, which will be first described in connection with the accompanying drawings showing the improved centrifugal pump, and features forming the invention will be specifically pointed out in the claim.

In the drawings:

Figure 1 is a longitudinal section through the improved pump.

Figure 2 is an end view of the one piece diffuser.

Figure 3 is a vertical section through the one piece diffuser taken on the line 3—3 of Figure 2.

Figure 4 is a fragmentary diagrammatic view of the one piece diffuser showing the interstage passages.

Figure 5 is a detail section taken on line 5—5 of Figure 4.

Figure 6 is a detail section taken on line 6—6 of Figure 4.

Referring more particularly to the drawings, the centrifugal pump structure comprises a casing 1 including the water or liquid chambers and passages, in which is positioned the various impellers. In the drawings a two-stage pump is shown employing one double suction impeller and one single suction impeller, but it is to be understood that the invention is equally applicable to other types of centrifugal pumps, regardless of the impeller structures, the number of impellers employed, or the number of stages of the pump.

The impellers are mounted upon and rotate with the impeller shaft 5 which projects out of the fluid chamber embodying portion of the casing 1 into and through the casing extension 6, as clearly shown in the drawings. The casing extension 6 serves as means of connecting the prime mover or steam actuated driver 7 to the pump structure proper so as to provide a compact, close-coupled unitary pumping unit. The shaft 5 is supported intermediate the pump structure proper and the prime mover 7 by spaced bearings 8 and 9, each of which is positioned at the opposite open ends of the oil distributor chamber 10. The oil distributor chamber 10 is mounted about the shaft 5 and is stationary, being connected to and supported from the inner casing 11. The inner casing 11 forms an oil reservoir 12 and is in turn connected to and supported by the casing extension 6. The oil reservoir 12 formed by the inner casing 11 is cylindrical in shape, and the initial supply of lubricating oil thereto is through the supply passage 14.

The inner casing 11 is spaced from the inner surface of the casing extension 6, forming an annular space 15 within the casing extension 6 and about the inner casing 11. The inner casing 11 has heat radiating fins 16 on its outer surface which project into the space 15. A screened air inlet 17 opens through the casing extension 6 into the space 15 and a plurality of passages 18, which are spaced radially about the axis of the shaft 5, extend from the space 15 into a chamber 19 which is formed in the casing extension 6. A suction fan 20, of any approved type, is mounted on the shaft 5 for rotation therewith, and is located in the chamber 20 so that upon rotation of the shaft 5 the fan 20 will create an air suction inwardly through the opening 17 to the chamber 15 and outwardly through the passages 18 and chamber 19. The chamber 19 is

provided with an outlet 21, which opens to atmosphere. The circulation of air through the space 15 will cool the inner casing 11 and fins 16, dissipating the heat transmitted to this inner casing from the lubricating oil in the reservoir 12 and consequently cooling the oil.

The distributor chamber 10 has communication with the oil reservoir 12 through suitable openings 22, so that a quantity of the lubricating oil may pass from the reservoir 12 into the chamber 10. A slinger 23 is mounted on the shaft 5 and is positioned centrally within the chamber 10. This slinger 23 picks up the oil from the bottom of the chamber 10, during rotation of the shaft 5, and creates an oil mist in the chamber which passes to the bearings 8 and 9 and thoroughly lubricates them. The oil from the bearings 8 and 9 returns to the reservoir 12 where it is cooled and subsequently picked up by the slinger 23 for recirculation. A suitable drain 25 is provided to permit draining of the lubricating oil from the reservoir 12.

Another feature of the present improved pump is the construction and arrangement of the diffuser which provides the inter-stage and discharge passages of the pump.

The pump casing proper, indicated at 30, being a part of the complete casing 1, has an inlet 31 for the fluid to be pumped and a discharge or outlet 32 for the fluid after it has passed through the impellers of the pump.

The inlet 31 opens into the inlet chamber 33 formed within the casing 30. The chamber 33 opens directly into the suction eye 34 of the double-suction, first stage impeller 35, and opens into the other suction eye 36 of the first stage impeller through the substantially radial, annular passage 37, which is formed in the diffuser 38. The discharge from the first stage impeller 35 is into the annular volute 39. The diffuser 38 has a plurality of inter-stage passages 40, shown in dotted lines in Figure 4 of the drawings. These passages 40 twist radially and laterally and progressively increase in cross sectional area from their inlet ends, which communicate with the volute 39, to their lateral opening 41 into the inlet chamber 42, formed within the end of the diffusion member 38 remote from the end in which the initial stage impeller 35 is mounted. From the chamber 42 the fluid being pumped enters the suction eye 43 of the second stage impeller 44.

As shown in the fragmentary diagrammatic Figure 4, a plurality of the inter-stage passages 40 are provided, and the progression of these passages is shown in Figure 1 of the drawings, and the fragmentary sections 5 and 6.

The passages 40 open into the annular volute 39, as shown in dotted lines at 46 in Figures 4 and 6 of the drawings, and from the point of communication of the passages, these passages gradually increase in cross-sectional area, as clearly shown in Figures 4, 5 and 6, and twist from the substantially circumferential or concentric axial line of their entrance communication to the volute into their lateral discharge 41 into the suction chamber 42. The upper half of Figure 1 of the drawings shows the passage on the section shown by the line 3A—3A of Figure 4 of the drawings, while the lower half of the view shows the section through the passages and the diffuser on the line 3B—3B of Figure 4. This deviation in the shape of the passages and the diffuser in the upper and lower parts of Figure 1 is occasioned by the fact that the section is taken through the diffuser on a continuation of the line 3A—3A, namely on the line 3—3 of Figure 2, and consequently the sectional line bisects different interstage passages at different points along their length.

From the second or final stage impeller 44 the liquid is pumped into the annular volute 47 and passes from the annular volute through a plurality of radial discharge passages 48 into the annular discharge chamber 49 formed in the casing 30 and from thence through the outlet 32.

The casing 30 has an annular ring 50 formed thereon and extending inwardly into the casing forming a shoulder 51 facing towards the discharge end of the pump. An annular ring 52 is formed upon the diffusion member 38 intermediate its ends and faces the shoulder 51. A gasket 53 is placed between the facing surfaces of the shoulder 51 and ring 52 so as to provide a fluid tight seal therebetween and prevent interstage leakage in the pump. The ring 52 is pressed or forced against the shoulder 51 by the discharge pressures of the various stages of the pump. It will be noted by particular reference to Figures 1, 4, 5 and 6 of the drawings that the interstage passages 40 have their greater areas which are subject to pressure of the fluid discharged from the first stage impeller facing towards the suction or inlet end of the pump, and also the relatively large area 54 of the removable plate 55, which is subject to discharge pressure of the first stage impeller, is positioned so that the discharge pressure of fluid pumped by the first stage impeller will act to force the ring 52 against the shoulder 51. In the final discharge chamber 49 of the pump the final discharge pressure of the fluid will also act against the surface 56 of the ring 52 to force it against the shoulder 51. Thus all of the discharge pressures in the pump act on the diffusion member 38 to force the ring 52 against the gasket 53 and shoulder 51 to provide a fluid-tight inter-stage seal to prevent interstage leakage in the pump.

The removable plate 55 is made removable for the purpose of assembly of the second stage impeller 44 within the diffuser.

The pump casing 30 has its outer end open to facilitate the impeller and diffuser member assembly within the pump and this outer open end is closed by a closure head or plate 57, which is bolted or otherwise securely attached to the casing 30.

The diffuser member 38 has an annular ring 58 formed thereon, providing a shoulder 59 which faces towards the removable head 57 and provides an annular space between the facing circumferences of the diffuser member at its outer end and the casing 30. Elastic packing 60 of any approved type is mounted in this annular space and it engages against the shoulder 59. An annular ring 61 is formed on the head 57 and extends into the annular packing receiving space, engaging the packing 60 for forcing it against the shoulder 59 and holding the packing securely in place to provide an elastic fluid-tight joint between the diffuser 38 and the casing 30 of the pump. As clearly shown at 62, the end of the diffuser member 38 is spaced from the inner face of the removable head 57.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown but that they may be widely modified within the invention defined by the claim.

What is claimed is:

In a bearing, a shaft, a housing enclosing a

portion of said shaft and forming an oil distributor chamber and bearing enclosing portions at each end of the oil distributor chamber, bearings in said bearing enclosing portions, an inner casing surrounding and spaced from said housing and forming an oil reservoir, said bearing enclosing portions having their inner ends opening into said oil distributor chamber and their outer ends opening into said oil reservoir whereby oil will pass into the bearings from said distributor chamber and out of the bearings into said reservoir, said housing having openings in the lower portion thereof to permit oil to pass from the reservoir into the distributor chamber, a casing extension surrounding said inner casing and spaced therefrom to form an air chamber about the oil reservoir, a suction fan carried by said shaft, said casing extension having an air inlet opening and having portions thereof cooperating with said oil reservoir forming casing to form a passage opening from the air space to said fan whereby the fan will draw air through the air space.

OSCAR H. DORER.