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SEAL FOR SHAFT BEARINGS

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This invention relates to seals for shaft bearings, and has reference more particularly to the bearings of shafts of bilge pumps and other submerged pumps. The principal object of the present invention is to provide a novel assembly for the seal, whereby the same may be held against displacement upon the impeller while assembling the impeller with the shaft and when the impeller is removed from the shaft.

Another object is to provide a seal which may be employed between the impeller and the case of a submerged pump to guard against leakage to the shaft bearing. In accordance with the present invention, the seal is mounted on the impeller hub against accidental disconnection therefrom, whereby the impeller may be detached from the shaft without any danger that the seal will become detached.

With these and other objects and advantages in view, this invention consists in a seal for shaft bearings held against accidental removal on the hub of a pump impeller. It further consists in a seal for sealing the joint between the impeller and pump case, whereby leakage to the shaft bearing is prevented.

It further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the drawing accompanying this specification in which—

Figure 1 is a central vertical longitudinal section through a pump with the hanger pipe and shaft partly broken away and illustrating a simple embodiment of the invention;

Fig. 2 is an enlarged fragmental central vertical section showing the impeller partly detached from the shaft; and

Fig. 3 is a detail horizontal section through the shaft and showing the hub and seal in plan, the line of section being indicated at 3—3 in Fig. 1.

Referring to said drawing, which illustrates a simple embodiment of the present invention, the reference character 5 designates the hanger pipe of a bilge pump or other submerged pump, which hanger plate is usually suspended from a floor or basin plate

(not shown). On the lower end of the hanger pipe is secured the pump case 6 in which an impeller chamber 7 having an inlet 8 and a liquid passage 9 connected with a discharge pipe (not shown), as is customary. The lower side of the case is closed by a head 6^a bolted thereto. In the chamber 7 is an impeller 10 having in its lower wall 17^a an eye 11 through which liquid may pass into the impeller from the inlet.

The chambered part of the case is connected to the hanger pipe by a neck portion 12 having a flange 13 secured to the pipe and a flaring part 14 which connects the neck portion 12 with the chambered part of the case. In the neck portion 12 is secured a bearing bushing 15 for the impeller shaft 16. On one wall 17 of the impeller 10 is a hub 18 which projects upwardly from the wall 17 and extends into the cavity contained in the flaring part 14, and is formed with a tapered hole 19 for the reception of the tapered end 20 of the impeller shaft 16. The impeller shaft may be keyed to the hub by a key 21 and may be additionally secured thereto by a screw 22 threaded in the end of the shaft and having a head bearing against the underside of the wall 17 of the impeller.

The hub may be tapered part way as at 23 and its upper end may be made cylindrical as at 24, and, conveniently, the neck portion 12 may contain an annular flange 25 surrounding the cylindrical end 24 of the hub. The lower face of said flange is flat, whereby the seal (hereinafter described) may have a close contact therewith.

Surrounding the hub 18 below the flange 25 is a hardened steel ring 26, the upper face of which is ground flat and bears against the flat face of the flange 25. The ring 26 is formed with an internal cylindrical face 27 spaced away from and surrounding the cylindrical face of the hub 18. In the drawing, the ring 26 is shown as formed with an annular flange which contains the internal cylindrical face 27.

Held under compression between the internal cylindrical face 27 of the ring 26 and the cylindrical face of the hub is a rubber or other resilient seal ring 28 which grips

the hub tightly, and below the seal ring is a flanged washer or other shoulder 29 against which bears one end of a coiled spring 30, the other end of which bears against the upper face of the impeller wall 17. The rubber seal ring 28 has a peripheral rib 28^a interposed between the flanges of the ring 26 and washer 29, whereas the sides of the seal ring are free, thereby permitting the seal ring to move with the hub in case of any oscillation or reciprocation of the shaft. The seal ring is held under compression between the hub and the internal faces of the flanges of the ring and washer. As shown, the wall 17 of the impeller is formed with an upstanding annular flange 31 spaced away from the hub 18 to form an annular channel or groove therebetween, and the lower end of the spring 30 is contained in said groove.

In the form of seal shown, the flanges of the ring 26 and washer 28 grip the rib of the seal ring between them and the spring holds the ring 26 in close contact with the flange 25. The sealing members rotate with the shaft and because of the close fit between the ring 26 and flange 25 and between the seal ring and hub, a leak proof joint is provided between the chamber of the case 6 and the bearing bushing, thereby guarding against the passage of liquid to the clearance space between the shaft and bearing bushing.

Above the sealing members and in close proximity thereto is a shoulder or stop member 32 for limiting the outward thrust of the spring when the impeller is disconnected from the shaft. Said shoulder is here shown in the form of a split ring held by its own elasticity in a circumferential groove 33 formed in the cylindrical face of the hub. It will be observed that when the parts are assembled, the sealing members are pressed down from the retaining ring 32 by reason of the engagement of the ring 26 with the flange 25. Whenever the impeller is disconnected from the shaft, the retaining ring 32 acts as a stop or shoulder preventing the spring from forcing the sealing members off the hub.

In assembling the pump, the shaft is placed in the bearing bushing 15 and the impeller 10, with the sealing members held in place thereon by the retaining ring 32, is inserted into the pump case and fastened to the pump shaft. The sealing rings are consequently forced down from the retaining ring as they encounter the flange 25, and said sealing rings are thereafter held in close contact with the flange 25 by the spring 30, thereby preventing leakage from the interior of the pump case to the bearing bushing. It will be understood that after the impeller has been secured in place, the head of the impeller case is bolted in place. It will be observed from the above, that the impeller may be secured to the pump shaft, with the sealing members in place on the impeller, and that the impeller may be

disconnected from the shaft without any danger that the sealing members will become disconnected from the impeller and lost.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention. I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

I claim as new, and desire to secure by Letters Patent:

1. In a seal for shaft bearings, the combination with an impeller having a hub portion, a shaft for said impeller and a member in which said shaft is journaled, of a sealing member surrounding the hub and rotating therewith, said sealing member being spring pressed against the member in which the shaft is journaled, and a shoulder on said hub located beyond the effective position of the sealing member and arranged to retain said sealing member on the hub against the outward thrust of the spring when the impeller is disconnected from the shaft.

2. In a seal for shaft bearings, the combination with an impeller having a hub projecting laterally therefrom, a shaft upon which said impeller is removably secured, a bearing bushing in which said shaft is journaled, and a case in which said bushing is secured, of a sealing member surrounding the hub and rotating therewith, said sealing member being spring pressed in an outward direction from the impeller and held in close contact with said case, and a shoulder on said hub located beyond the effective sealing position of the sealing member and arranged to retain the latter on the hub against the outward thrust of the spring when the impeller is disconnected from the shaft.

3. In a seal for shaft bearings, the combination with an impeller case, an impeller therein having a hub projecting laterally therefrom, a shaft upon which said impeller is removably secured and a bearing in said case for said shaft, the case being formed with a recess at one end of said bearing adapted to receive the adjacent end of the hub, of a sealing member surrounding the hub and rotating therewith, one element of said sealing member having a flat ground face contacting with a flat face of the impeller case, another element of said sealing member being compressible and frictionally held between the first mentioned element of the sealing member and the shaft, a coiled spring surrounding the hub and bearing against one element of the sealing member and against the impeller, and a shoulder on the hub located on that part of the hub entering the recess in the case and beyond the effective position of the sealing member and adapted to retain the latter on the hub against the

outward thrust of the spring when the impeller is disconnected from the shaft.

4. In a seal for shaft bearings, the combination with an impeller case, an impeller
5 therein having a hub projecting laterally therefrom, a shaft upon which said impeller is removably secured and a bearing in said case for said shaft, said case having a flat annular face surrounding the shaft and a
10 recess extending in from said flat face and adapted to receive the adjacent end of the hub, of a sealing member surrounding the hub and rotating therewith, one element of said sealing member having a flat ground face
15 contacting with the flat face of the impeller case, another element of said sealing member being compressible and frictionally held between the first mentioned element of the sealing member and the shaft, a coiled spring
20 surrounding the hub and bearing against one element of the sealing member and against the impeller, and a split ring removably secured upon the free end of the hub at a place beyond the effective position of the sealing
25 member and adapted to retain the sealing member on the hub against the outward thrust of the spring when the impeller is disconnected from the shaft.

5. In a seal for shaft bearings, the combination with an impeller case, an impeller
30 therein having a hub projecting laterally therefrom and formed with a cylindrical end portion, a shaft upon which said impeller is removably secured, a bearing bushing for said shaft secured in the case, said case being
35 formed with a housing enclosing the hub and having in its interior a flange surrounding the end of the hub and defining a recess, of sealing rings surrounding the cylindrical part
40 of the hub and rotating therewith, one of said sealing rings having a ground flat face contacting with a flat face of said flange, a coiled compression spring surrounding the hub and arranged to hold said ring in close contact
45 with said flange, and a removable shoulder on said cylindrical portion of the hub located in said recess and beyond the effective position of the sealing rings and adapted to retain the latter on the hub against the outward
50 thrust of the spring when the impeller is disconnected from the shaft.

6. A seal for shaft bearings comprising an impeller formed with a laterally projecting hub having a cylindrical end portion, a sealing member surrounding said cylindrical portion of the hub and spring pressed in an outward direction, and a split ring removably secured in a circumferential groove located beyond the effective position of the sealing
60 member.

7. A seal for shaft bearings comprising a case wall, a rotatory cylindrical member extending through said wall, a flanged seal ring having a flat ground face contacting
65 with a flat face of the case wall, a flanged

annular member, and a resilient seal ring loosely confined between said flanged ring and flanged annular member and having a peripheral rib gripped between said flanged ring and flanged member, and a coiled compression spring bearing against said flanged annular member and acting to hold the flanged seal ring in close contact with said case wall.

8. A seal for shaft bearings, comprising
75 a case wall, a rotatory cylindrical member extending through said wall, a flanged seal ring having a flat ground face contacting with a flat face of the case wall, a flanged washer, and a resilient seal ring between the flanged seal ring and washer and having
80 a peripheral rib gripped between the flanges of said seal ring and washer, the seal ring being held under compression solely between said flanges and the rotatory cylindrical member, and a coiled compression spring bearing against said washer and serving to hold the flanged seal ring in close contact with said case wall.

9. In a seal for shaft bearings, the combination with a shaft and a member in which
90 said shaft is journaled, of an impeller having a hub portion removably secured on said shaft and sealing means rotating with said shaft and including sealing rings and a
95 spring for holding said sealing rings in close contact with the member and the shaft, and means for securing the sealing means on the hub against disconnection therefrom when the impeller is disconnected from the shaft.

10. In a seal for shafts, the combination with an impeller, a shaft therefor upon which the impeller is removably secured, and a casing surrounding said impeller, said
105 shaft being journaled in said casing of sealing means rotating with the shaft and being spring pressed against the casing, and a shoulder removably carried by the shaft and located beyond the effective position of said sealing means and arranged to retain the
110 sealing means on the hub against the outward thrust of the spring when the impeller is disconnected from the shaft.

11. In a seal for shaft bearings, the combination with a case having a shaft bearing
115 therein, a shaft journaled in said bearing and projecting therefrom, and an impeller having a hub projecting therefrom and removably secured on said shaft, of spring pressed seal ring members for preventing leakage through the clearance space between
120 said bearing member and shaft, said seal ring members being locked on said hub and bodily removable and replaceable with said impeller.

12. In a seal for shaft bearings, the combination with a case having a shaft bearing
therein, a shaft journaled in said bearing and projecting therefrom, and an impeller

having a hub projecting laterally therefrom,
of spring pressed seal ring members sur-
rounding the hub and frictionally held there-
on to rotate therewith and having a rubbing
5 fit against the case for preventing leakage
between the case and shaft, said seal ring
members being locked on said hub and bodily
removable and replaceable with said im-
peller.

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