

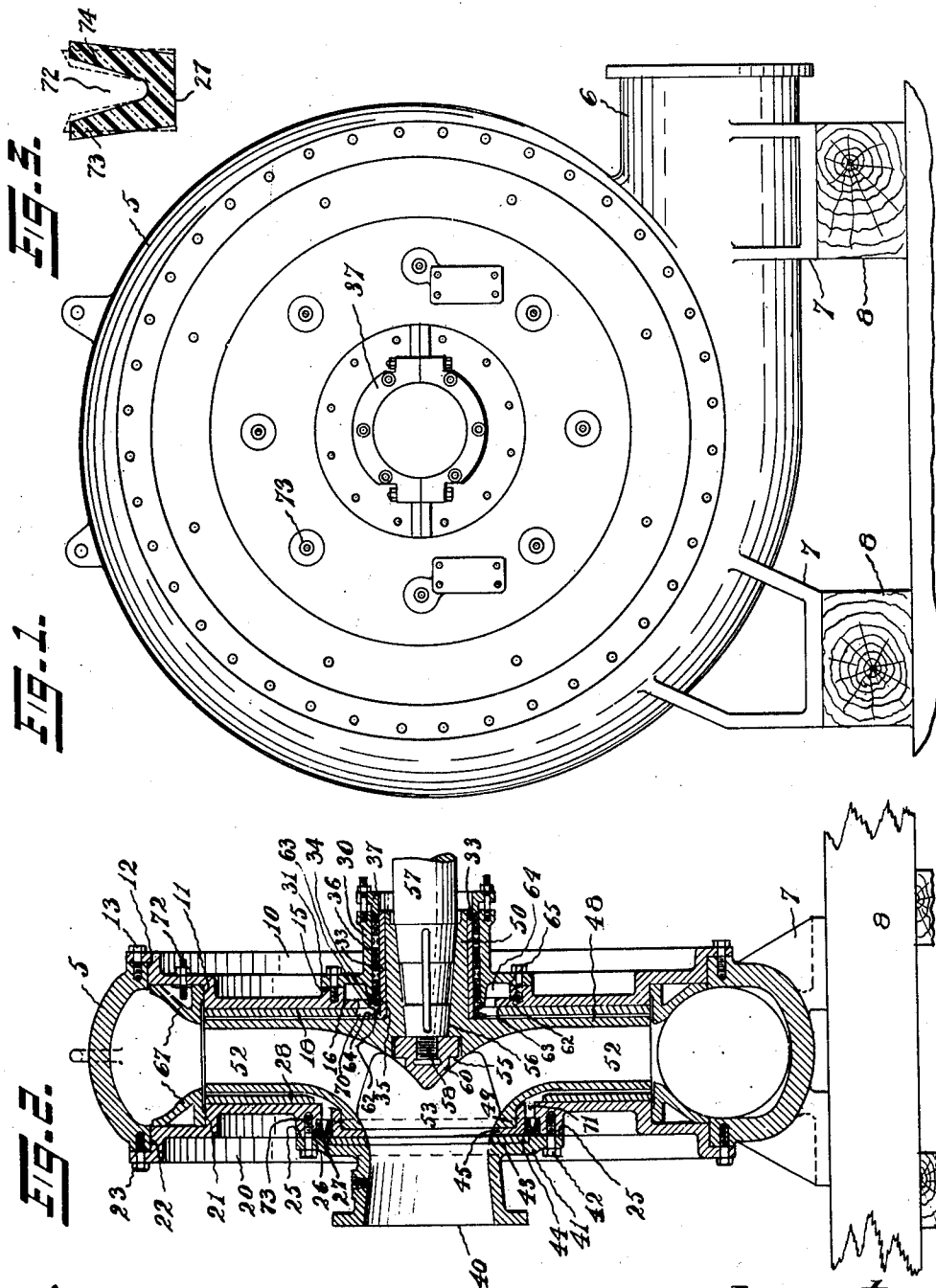
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FLEXIBLE PACKING FOR CENTRIFUGAL PUMPS

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FLEXIBLE PACKING FOR CENTRIFUGAL PUMPS.

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To all whom it may concern:

Be it known that I, IVAN M. PROKOFIEFF, a citizen of the United States, residing in New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Flexible Packings for Centrifugal Pumps, of which the following is a specification.

This invention relates to centrifugal pumps and water sealing devices therefor though it is noted that the invention is not limited to pumps nor even in some respects to water seals.

One object of the invention is to provide in an apparatus of this kind an improved water seal which is sealed by the pressure of the water in the pump.

Another object of the invention is to prevent water circuits between the impeller and inboard head and suction spool of the pump to prevent lowering of the efficiency of pump and quick wearing of the impeller and liners.

Another object is to prevent leakage of water through the stuffing box of the pump, which leakage is extremely harmful when handling dirty water as in dredging.

Another object of the invention is the preservation of the impeller from quick wearing out, a wearing sleeve being provided that is adapted to be replaced as soon as said sleeve is worn.

Another object is to provide such a wearing sleeve of suitable elastic material, and of a shape to eliminate the necessity of accurate fittings.

Another object of the invention is to provide in an apparatus of this kind an improved arrangement of bearings for the impeller and linings for the casing.

Other objects of the invention are to improve generally the simplicity and efficiency of such pumps or devices and to provide a device or apparatus of this kind which is durable, economical to manufacture and operate and which will not get out of order.

The inventive features for the accomplishment of these and other objects are shown in connection with an improved centrifugal pump which, briefly stated, comprises a casing ring carrying an annular outboard head secured to one edge of the

ring and an annular inboard head secured to the other edge of the casing. A stuffing box secured axially on the outboard head carries a bearing sleeve therein; while a suction spool is secured axially on the inboard head. An impeller between the heads has a bearing hub in said sleeve, and impeller conduits are joined at the center to form an intake conduit in an intake hub registering with the spool. A rubber sealing ring secured to the inner edge of the outboard head presses on said sleeve to make a water tight seal; and a rubber bushing or sealing ring is interposed between the intake hub and the inboard head.

Other objects of the invention will appear as the description proceeds; and while herein details of the invention are described, the invention is not limited to these, since many and various changes may be made without departing from the scope of the invention as claimed.

In the accompanying drawing, showing by way of example, one of many possible embodiments of the invention,

Fig. 1 is a side elevation of the pump;

Fig. 2 is a substantially vertical axial sectional view, partly in elevation, of the pump, and

Fig. 3 is a transverse sectional view of the bushing or sealing ring.

My invention is shown in combination with a pump comprising a casing having thereon a casing ring 5 formed with a lower tangential discharge conduit 6 and feet 7 for resting on suitable supports 8. Said ring supports an annular outboard head 10 formed on its inner face with an annular outwardly disposed shoulder 11, and an annular peripheral recess 12 receiving one edge of the ring, the head being secured in place by bolts 13. The outer face of the head 10 is formed near the inner edge with a raised annular seat 15 providing an annular groove 16 next to said edge. An outboard lining 18 is secured on the inner face of the outboard head and terminates at said shoulder 11 and the inner edge of the head.

An annular inboard head 20 is formed on its inner face with an intermediate outwardly disposed shoulder 21 of the same diameter as said annular shoulder, and an

annular peripheral recess 22 receiving the other edge of the ring, the head being held in place by bolts 23, the outer face of the inboard head is formed at the inner edge with a boss-seat 25 provided with an annular groove 26 in its inner face receiving an inwardly opening channel shaped bushing or sealing ring 27 (Fig. 3) of rubber or other flexible material and of approximately U-shaped cross-section. An inboard lining 28 is secured on the inner face of the inboard head and terminates at said shoulder 21 and near the inner edge of the inboard head.

15 A stuffing box 30 comprising upper and lower halves is provided with an inner in-turned end flange 34, and an intermediate flange 31 bolted on the annular seat 15. This stuffing box 30 receives a wearing sleeve 33 which is engaged on the outer side by the end flange 34 and on the other by the bronze glands 35 in the inner portion. A neck bushing comprising blocks 36 in said stuffing box 30 is engaged by the packing ring 37 secured to the box and pressing the neck bushing into position.

A suction spool piece 40 is provided with a lateral inner end flange 41 secured by bolts 42 on said boss seat 25 and has an inner groove 43 therearound receiving a spool liner or bearing means 44 against which is disposed a wearing ring 45 engaging said sealing ring 27.

An impeller 48 disposed between said linings 18 and 28 peripherally flush therewith is provided with an intake hub 49 on which is received said ring 45. The impeller is also provided with a bearing hub 50 journaled in said wearing sleeve 33, and impeller conduits 52 disposed outwardly from center to the periphery of the impeller and joined at the intake end to form an intake conduit 53 registering with said spool 40.

The purpose of the sealing ring 27 is to prevent a water circuit between the impeller and the inboard head 20 and suction spool 40. This circulation is harmful for efficiency of pump and causes rapid wearing of the impeller and liners.

50 A nut-receiving recess 55 joins a tapered bore 56 of the bearing hub receiving the tapered end of a drive shaft 57 provided with a threaded reduced end 58 receiving a cone shaped nut 60 filling said nut-receiving recess and pointing toward the intake end of the intake conduit.

A channel shaped rubber sealing ring 62 having its bottom portion engaging around the inner end of said sleeve has its outer wall 63 engaging around said end flange 34 of the stuffing box and its inner wall 64 engaging the side of the impeller.

The purpose of the sealing ring 62 is to prevent the leakage of water through the stuffing box. This leakage is extremely

harmful in case of handling dirty water like in dredging, because any dirt that might pass into the stuffing box will produce a very quick wearing out of the impeller hub.

For the purpose of preserving the impeller from quickly wearing out, the wearing sleeve is readily removable and interchangeable so that as soon as the wearing sleeve becomes worn a new one may be put in its place, thus preventing any harm to impeller.

The wearing sleeve 33, which is a principal feature of this invention, is constructed of any suitable elastic material, and is of a shape that eliminates all necessity of precise fittings in parts which in other constructions of pump are to prevent local water circulation and the leakage through the stuffing box.

Both sealing rings 27 and 62 are channel-like in shape with the side flanges or walls 73 and 74 tending to spread apart, as shown in the solid lines of Fig. 3 when said ring is not in place; but when the ring is in place said flanges are forced together but tend to spring outward and thus insure safe contact with the rotary parts; and sealing of water is thereby secured.

Annular casing liners 67 having their outer edges adjacent to the edges of the casing ring 5 have their inner edge portions disposed over the outer edges of said liners 18 and 28 and the edges of the impeller but clearing the impeller conduits 52.

The operation of the pump is simple, and is obvious from the foregoing. The impeller is rotated in the ordinary way to draw the water or other fluid in at the spool 40 and force it out at the conduit 6.

The water which leaks between the impeller and the liner 18 passes into the chamber 70 formed by the seat 15 and flange 31 and thence into the channel of the sealing ring 62 and presses the walls 63 and 64 against the flange 34 and the side of the impeller respectively making a joint which is practically water tight and at the same time allows for some flexibility of movement of the parts.

In like manner, the wearing ring 45 is water tight on the hub 49; and water which leaks between the impeller and the lining 28 passes into the chamber 71 (Fig. 2) formed between the ring 45 and the inner edge of the inboard head, and thence into the channel 72 (Fig. 3) of the sealing ring 27 and exerts pressure upon the walls 73 and 74 thereby to force them more tightly against the seat 26 and the ring 45 respectively, making a joint which is practically water tight and at the same time allows for some flexibility of movement of the parts.

The various parts of the pump are easily disassembled and replaced. The parts 5, 18, 28 and 67 may be removed and replaced

by removing the necessary bolts, including the bolts 13, 23, 75 and 76.

I claim:

1. In a centrifugal pump, the combination with a casing having an opening, of an impeller in said casing, said impeller having a hub in said opening, bearing means in said casing, a wearing ring engaging said bearing means and receiving said hub, and a channel shaped sealing ring having one flange thereof disposed on said wearing ring, and the other flange being disposed against the casing in said opening whereby to form a fluid-tight seal.

2. In combination, a casing having an opening; an impeller in the casing having a hub in the opening; a wearing sleeve, a bearing means mounted on the casing and receiving the hub; a flange surrounding said wearing sleeve, and a channel shaped flexible seal mounted on the casing adjacent the impeller and pressed on said means by fluid pressure in the casing, the sides of said seal being adjacent the impeller blade and flange whereby to prevent leakage.

3. In combination, a casing having axial openings on opposite sides; a stuffing box over one opening having a bearing sleeve therein; an impeller in the casing having its impeller conduits communicating with the other opening; and a channel shaped sealing ring around said sleeve having one wall resting against the end of said stuffing box and the other wall resting against the impeller and adapted to receive fluid pressure from fluid pressing between the casing and impeller.

4. In combination, a casing having axial openings; an impeller in the casing having an intake registered with one opening and a hub in the other; a bearing means mounted on the casing and having a sleeve receiving the hub; and a channel shaped flange ring mounted on the casing and between the impeller and the sleeve member for forming a water seal upon application of fluid pressure thereon.

5. In combination, a casing having axial openings on opposite sides; a stuffing box forming an annular chamber over one opening and having its inner end in said chamber; a bearing sleeve in said stuffing box; an impeller in the casing having its impeller conduits communicating with the other opening; a shaft in said sleeve; and a channel shaped rubber sealing ring in said chamber having its bottom around said sleeve and its walls resting against said end and the impeller respectively and adapted to receive fluid pressure from fluid pressing between the casing and impeller.

6. In combination, a casing ring; an annular outboard head secured to one edge of the ring; an annular inboard head secured to the other edge of the ring; a stuffing box

secured axially of the outboard head; a flange on said stuffing box; a suction spool secured axially on the inboard head; a bearing sleeve in said stuffing box; an impeller between the heads and having a bearing hub in said sleeve, and impeller conduits joined at the center to form an intake conduit registered with the spool; and a channel shaped flexible ring disposed between said impeller and flange pressing on the inner end of the stuffing box and the impeller to form a water seal.

7. In combination, a casing ring formed with a lower tangential discharge conduit and feet for resting on suitable supports; an annular outboard head secured to one edge of the ring; an annular inboard head secured to the other edge of the casing ring; said heads having axial openings; an impeller in the casing having an intake registered with one opening and a hub in the other; a bearing means mounted on the casing and having a sleeve receiving the hub and a channel shaped flexible ring between said impeller and sleeve to form a water seal therebetween.

8. In combination, a casing ring; an annular outboard head formed on its inner face with an annular outwardly disposed shoulder, and an annular peripheral recess receiving one edge of the ring; an outboard lining secured on the inner face of the outboard head and terminating at said shoulder and the inner edge of the outboard head; an annular inboard head formed on its inner face with an intermediate outwardly disposed shoulder of the diameter of said annular shoulder; an inboard lining secured on the inner face of the inboard head and terminating at said shoulder and near the inner edge of the inboard head; an impeller between said linings peripherally flush with said shoulders and provided with impeller conduits joined at the center to form an intake conduit co-axial with the inboard head; and annular casing liners each having its outer edge adjacent to the edges of the casing ring and the peripheral edges of the heads, and having its inner edge portion disposed over the outer edges of said liners and the impeller but clearing the impeller conduits.

9. In combination, a casing ring; an annular inboard head secured to the one edge of the casing; an annular outboard head formed on its inner face with an annular peripheral recess receiving the other edge of the ring; the outer face of the head being formed near the inner edge with a raised annular seat providing an annular groove next to said edge; a stuffing box comprising an intermediate flange secured on said annular seat; a bearing sleeve therein; a suction spool secured axially on the inboard head; an impeller between the heads and

having a bearing hub in said sleeve, and impeller conduits joined at the center to form an intake conduit registered with the spool and a channel shaped flexible ring pressing on said impeller and the inner end of the stuffing box to form a water seal.

10. In combination, a casing having axial openings on opposite sides one of which is surrounded by an annular seat forming an annular chamber; a stuffing box mounted over one opening and comprising upper and lower halves provided with an intumed end flange and with an intermediate flange secured on said annular seat; a wearing sleeve in said stuffing box; bronze glands in the inner end of the box and engaging said intumed flange and the sleeve; a neck bushing comprising blocks in said box; a packing ring secured to the box and pressing the neck bushing in place; an impeller in the casing having a hub in said sleeve and its impeller conduits communicating with the other opening; and a sealing ring in said chamber and having its edge outwardly turned and resting on said flange and impeller respectively adapted to receive fluid pressure from fluid pressing between the casing and impeller.

11. In combination a casing ring, a casing comprising an annular outboard head secured to one edge of the ring, and an annular inboard head secured to the other edge of the casing ring; the outer face of the outboard head being formed near the inner edge with a raised annular seat; a suction spool secured axially on the inboard head; a stuffing box provided with an intermediate flange secured on said annular seat and forming an annular chamber around said groove; a wearing sleeve in said stuffing box having its inner end in said chamber; an impeller between the heads and having a bearing hub in said sleeve, and impeller conduits joined at the center to form an intake conduit registered with the spool; a rubber sealing ring in said chamber having its bottom disposed around said sleeve and its edges out-turned and engag-

ing said impeller and the inner end of said stuffing box.

12. In combination, a casing ring; an annular outboard head secured to one edge of the ring; an annular inboard head formed on its inner face with an annular peripheral recess receiving the other edge of the ring; the outer face of the inboard head being formed at the inner edge with a boss-seat provided with an annular groove in its inner face; a channel shaped sealing ring having inwardly pointing side walls one of which is disposed in said annular groove; an impeller between said heads and having an intake hub, and impeller conduits joined at the center to form an intake conduit; a suction spool piece provided with a lateral inner-end flange secured on said boss-seat and having an inner groove therearound; a spool liner in said inner groove; and a wearing ring disposed on said hub against said liner and engaging the inner wall of said sealing ring.

13. In combination, a casing comprising an annular outboard head and an annular inboard head having a ring axial therefor; a stuffing box secured axially on the outboard head; a wearing sleeve in said box; an impeller between the heads and having a bearing hub in said ring, a taper-bored bearing hub in said sleeve, and impeller conduits disposed outwardly from center to periphery of the impeller and joined at the intake end to form an intake conduit registered with said ring; said conduit being provided centrally with a nut-receiving recess joining the tapered bore of the bearing hub; a drive shaft having a tapered end engaged in said bore and provided with a threaded reduced end; a cone shaped nut on said end filling said nut-receiving recess and pointing toward the intake end of the intake conduit and a cup shaped flexible ring disposed between the impeller and the stuffing box to form a water seal therebetween.

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