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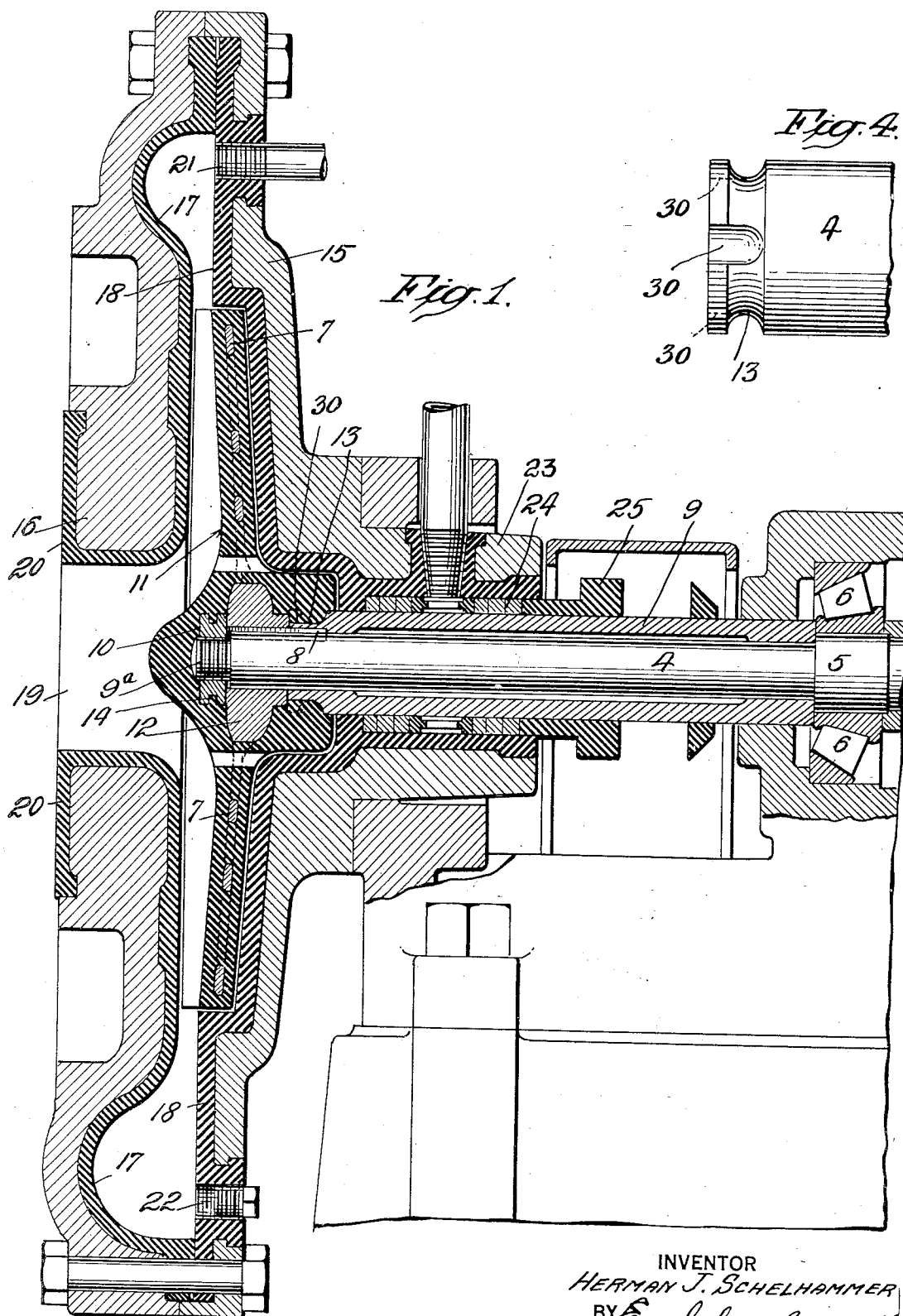
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MOUNTING FOR CENTRIFUGAL PUMP IMPELLERS

Filed Feb. 6, 1932

2 Sheets-Sheet 1



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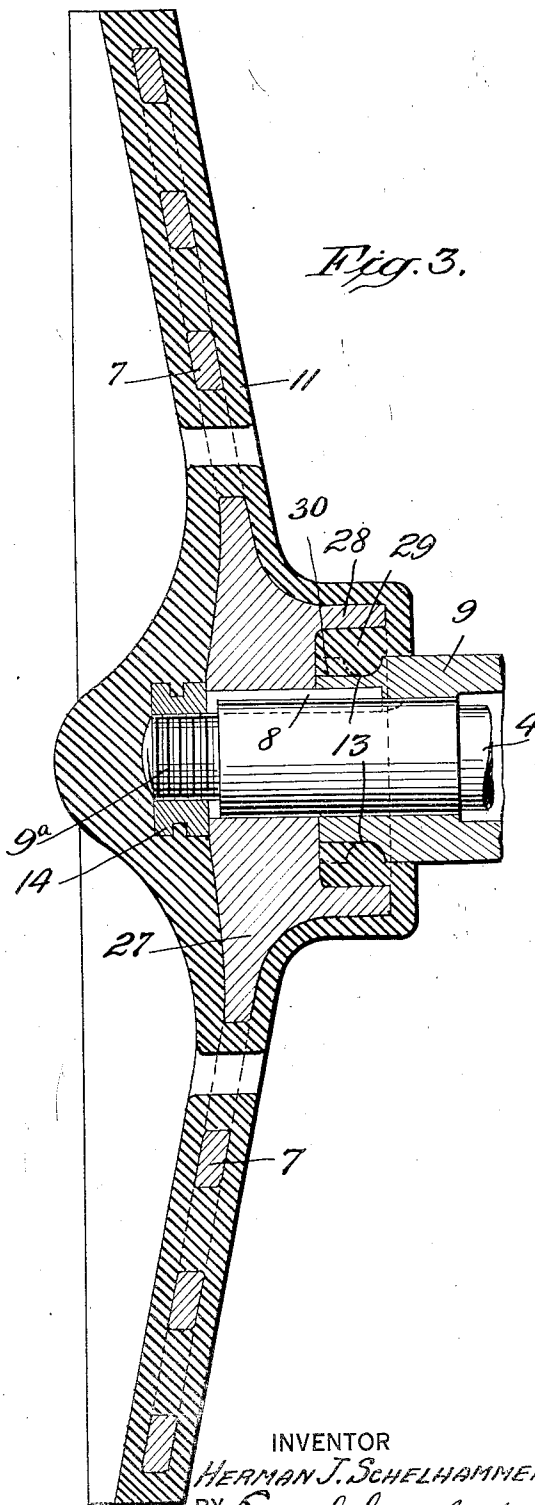
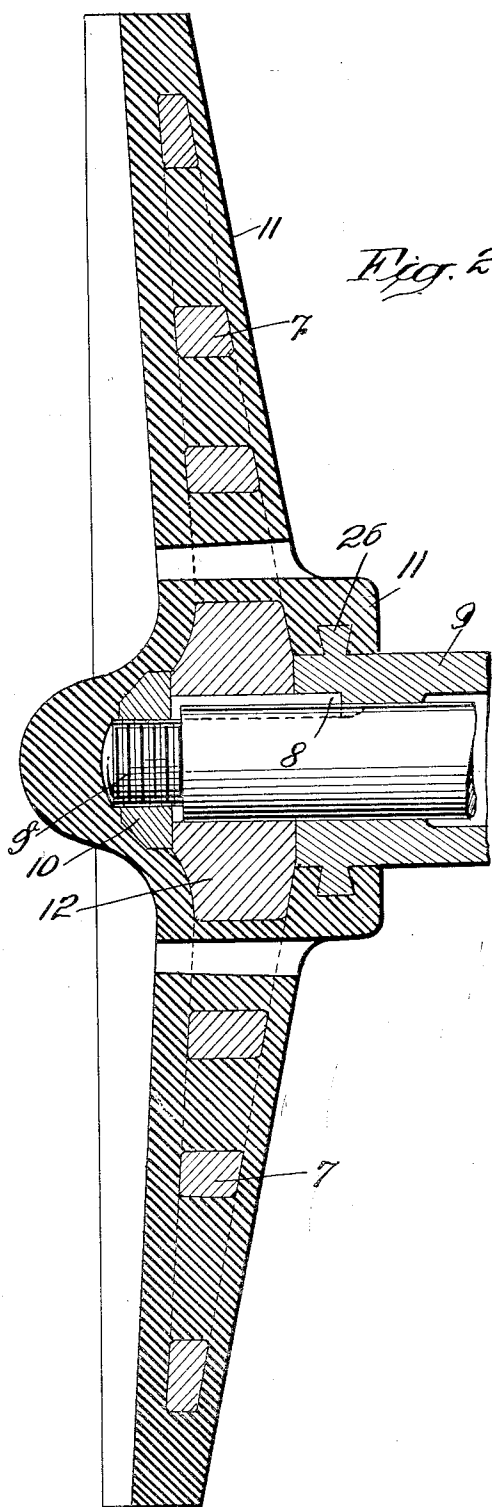
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MOUNTING FOR CENTRIFUGAL PUMP IMPELLERS

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This invention relates to the construction of a centrifugal pump impeller and the mounting therefor, and particularly to that type of centrifugal pump which is used for pumping acids or other liquids having a corrosive or deteriorating action upon the metal parts of the pump.

The general object of the invention is to provide a pump structure, and particularly those parts thereof which are subjected to the deteriorating liquids, with a covering or coating of an acid-resisting material such as hard rubber or the like. In constructing pumps intended for operation with acids, and particularly when the pumps are rubber-lined to prevent corrosion of the metallic parts thereof, it is necessary to use a metal acid-resisting alloy bushing over the ordinary steel impeller shaft at the point where this shaft would normally contact with the pump packing. The reason for not surrounding the shaft with rubber at this point is on account of the friction and grooving action of the packing on the shaft. One of the problems which arise in connection with the construction of a pump of this character, is that of making a seal between this bushing and the surrounding hard-rubber lining parts in which the shaft and bushing are mounted so that the acid or other chemical cannot enter between the bushing and shaft and attack the shaft or the impeller insert mounted thereon. In the past, efforts to meet this problem have resulted in the use of soft-rubber washers or gaskets located between the front of the impeller and the nut used for holding the impeller on its shaft. The objection to such a construction is that should the pump be operated in the wrong or reverse direction the nut would be loosened. Additionally, some chemicals attack soft rubber, so that frequent renewal of soft-rubber washers or gaskets is found necessary.

The primary object of this invention therefore is to provide an impeller mounting wherein this joint between the impeller shaft and its acid-resisting surrounding bushing is effectively sealed by the use of hard rubber or other plastic material of acid-resisting characteristics. This invention contem-

plates also the provision of means for effectively holding the impeller insert in place on its shaft and for protecting the impeller-retaining means from corrosion, as well as means for covering those inner parts of the pump casing which are subjected to the action of the chemical, with a hard-rubber or similar acid-resisting protective covering.

In the accompanying drawings I have shown several embodiments of my invention, Fig. 1 being a longitudinal sectional view of a part of the impeller shaft, the impeller mounted thereon and associated parts; Fig. 2 is a sectional view of an impeller and a part of the shaft, showing the manner in which the hard-rubber covering for the impeller is arranged in interlocking engagement with a peripheral flange or ridge provided on the impeller shaft bushing; Fig. 3 is a sectional view of a further modification showing a portion of the hard-rubber covering extending into locking engagement with a circumferential groove and axially extending recesses formed on the impeller shaft bushing, and projecting in a cup-shaped part of the impeller hub; and Fig. 4 is a side elevation of one end of the bushing shown in Figs. 1 and 3.

In the embodiment of the invention shown in Fig. 1, the impeller shaft is indicated at 4, and is provided with a shoulder portion 5 mounted in the conventional roller bearing 6. Adjacent its end the shaft 4 receives the metal impeller insert 7 provided with a hub 12 fixed on the shaft by a key 8. A bushing 9 composed of an acid-resisting metal alloy, fits over and surrounds that portion of the shaft 4 which is located between the shoulder 5 and the impeller 7, the bushing being fixed to the shaft by the key 8. Thus one end of the bushing abuts against the shouldered portion 5 of the shaft 4 while the opposite end abuts against the hub 12 of the impeller insert and holds it in its proper location at the end of the shaft. The end of the shaft 4 is reduced in diameter and threaded at 9a to receive a nut 10 for holding the metal impeller insert 7 on the shaft.

The impeller insert 7 is completely enclosed in hard rubber 11 or some other similar

plastic acid-resisting material, such material being moulded over and enclosing the impeller hub 12, the end of the shaft 4 with the retaining nut 10 thereon and the end of the bushing 9 that is located at the impeller. This hard-rubber covering thus effectively protects the end of the shaft 4, the nut 10 and the impeller insert from corrosion by the chemical.

To provide an effective seal between the bushing 9, shaft 4 and impeller hub 12 by the applied rubber covering 11, the bushing is provided in its outer face, at its end adjacent to the impeller, with a continuous circumferential groove 13. When the rubber covering is moulded over the impeller hub and over the grooved end of the bushing, it enters into this groove 13 and upon shrinking in vulcanization it grips tightly in the groove and positively prevents the passage of the chemical between the bushing and shaft 4. The bushing 9 is also provided with several spaced axially extending recesses 30 formed in its outer face and extending from the groove 13 to the end of the bushing near the groove. The hard-rubber covering enters into these recesses 30 and prevents a turning or rotative movement of the bushing within the covering. The hard rubber covering 11 also extends over the impeller-securing nut 10 and enters into the peripheral groove 14 provided therein so that the nut will not loosen on the shaft 4 without breaking the rubber covering.

In addition to the hard-rubber covering surrounding the impeller insert and its associated parts, the two parts 15 and 16 of the pump casing are rubber-lined as shown at 17 and 18 respectively. The lining 17 for the portion 16 of the casing is moulded completely over the entire inner surface of the same. It also lines the entrance opening 19 provided in the casing part 16, and extends over and covers a portion of the outer face of the same, as indicated at 20. The hard-rubber covering 18 lines the entire inner face of the casing part 15 including the exit opening 21 and drain 22. It also lines the stuffing-box 23, wherein the conventional packing 24 is located. A hard-rubber gland-nut 25 closes the rubber-lined stuffing box in the conventional manner.

The construction shown in Fig. 2 is similar to that described with reference to Fig. 1, except that the metal alloy bushing 9 is provided with a continuous peripherally extending ridge or flange 26 in order to firmly anchor the end portion of the bushing in the rubber covering and form a seal between the bushing, the shaft and the impeller insert. This ridge 26 is preferably of dove-tail shape in cross section insuring an effective lock or bond between the rubber covering 11 and the bushing when the hard rubber shrinks during vulcanization. Although not shown in

the drawings, the recesses 30 may be employed in the bushing shown in this embodiment of the invention, if desired.

In the construction shown in Fig. 3, the bushing 9 with a groove 13 and recesses 30 similar to those shown in Figs. 1 and 4 is employed. The impeller insert 7 is provided with a hub 27 having a cup-shaped inner end 28. The internal diameter of this cup-shaped portion is greater than the external diameter of the bushing 9 so that a part 29 of the rubber covering 11 may enter the space between the walls of the cup-shaped part of the impeller hub and the bushing, and fill the groove 13 and recesses 30. When the rubber shrinks on vulcanization, it is securely locked in position and makes an extremely tight seal at this point, making the passage of chemical between the bushing and impeller shaft, except upon actual fracture of the rubber covering, exceedingly unlikely. It will be understood that other modifications in the arrangement of the cooperating parts of the bushing and impeller hub for securing the desired interlock with hard rubber may be made within the scope of the invention as defined by the following claims.

What I claim is:—

1. In a pump construction, a shaft, an impeller secured thereon, a bushing surrounding the shaft adjacent to the impeller, an acid-resisting covering enclosing the impeller and extending over the end of the bushing located adjacent to the impeller, said bushing being provided with an irregular surface adjacent its end for an interlocking engagement with the covering so that separation of the shaft, impeller and bushing, without removal or destruction of the acid-resisting coating, is prevented.

2. In a pump construction, a shaft, an impeller secured thereon, said impeller having a cup-shaped hub portion, a bushing surrounding the shaft and extending into said cup-shaped hub portion, said bushing having a recess in the outer surface of the part located in the cup-shaped portion, and a plastic acid-resisting covering extending over the impeller and projecting into the cup-shaped portion thereon and interlocking with the recess in the bushing and holding the shaft, impeller and bushing together as a covered unit.

3. In a pump construction, a shaft, an impeller secured thereon, a bushing surrounding the shaft and provided with a groove and spaced recesses in its outer face adjacent to the impeller, and a moulded acid-resisting covering enclosing the impeller and extending into and filling the groove and recesses.

4. In a pump construction, a shaft, an impeller secured thereon, a bushing surrounding the shaft and provided with a groove in its outer face adjacent to the impeller, spaced recesses in the bushing extending between

the groove and the impeller, and a hard-rubber covering enclosing the impeller and extending into and filling the groove and recesses.

5 5. In a pump construction, a shaft, an impeller mounted thereon, means for securing the impeller on the shaft, a member of acid-resisting material surrounding the shaft, a coating of acid-resisting material covering
10 the impeller and the securing means, and means on the acid-resisting member entering into interlocking engagement with the acid-resisting covering so that separation of the
15 impeller, the member of acid-resisting material and the shaft-securing means is impossible without removal or destruction of the acid-resisting coating.

6. In a pump construction, a shaft, an impeller mounted at one end of the same, a
20 bushing surrounding the shaft adjacent to the impeller, a hard rubber covering enclosing the impeller and the end of the shaft on which the impeller is mounted, and means on the bushing engaging with the part of the
25 hard rubber covering so that separation of the impeller, shaft and bushing without removal or destruction of the hard rubber covering, is prevented.

7. In a pump construction, a shaft, an impeller mounted thereon, a bushing surrounding
30 the shaft, an acid-resisting covering enclosing the impeller and extending over a part of the bushing adjacent to the impeller, a circumferential recess in the bushing entering into locking engagement with the covering
35 so that separation of the shaft, impeller and bushing, without removal or destruction of the acid-resisting coating is prevented, and recesses in the bushing extending axially
40 of the same and entering into locking engagement with the covering to prevent rotative movement of the bushing relative to the covering.

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