

2,671,408

2 Sheets-Sheet 1



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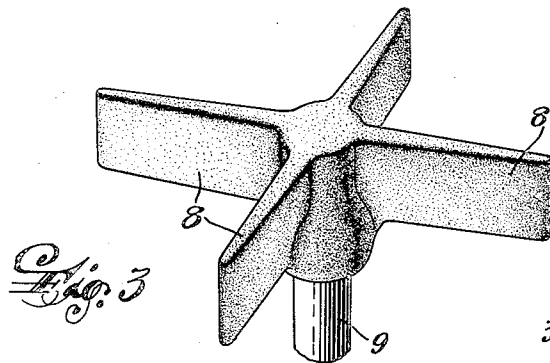
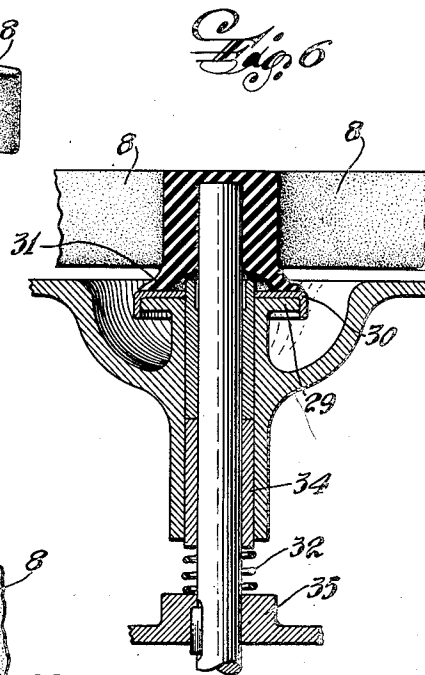
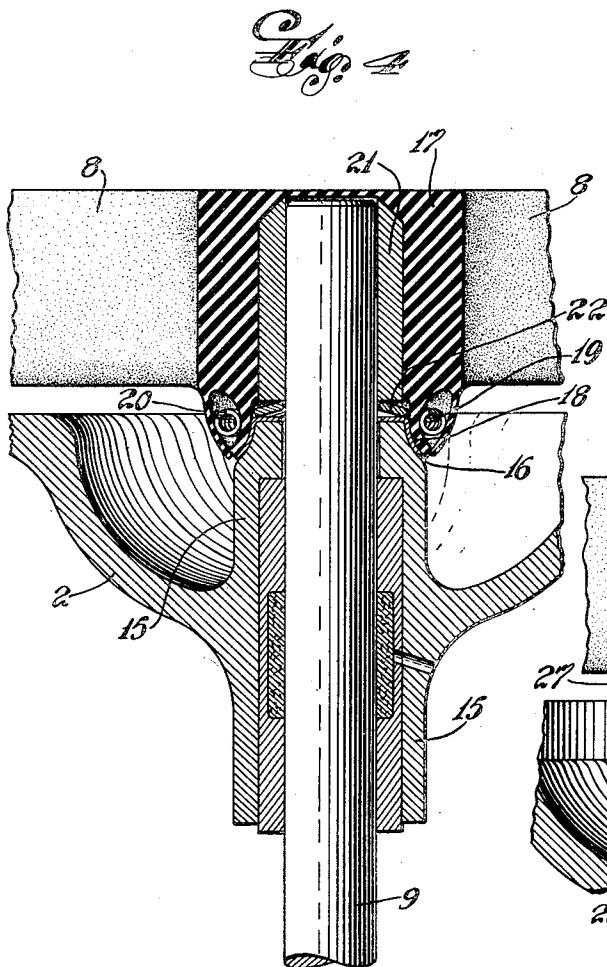
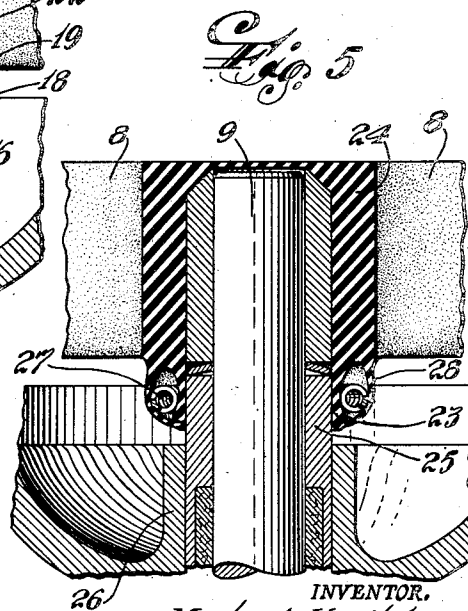
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6 Claims. (Cl. 103—111)

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The present invention relates to a new and novel means for retaining water in a pump chamber and more particularly to a pump impeller in a pump casing with a shaft to rotate the pump impeller and a sealing means between the pump impeller and pump casing or bearing to prevent leakage from the pump chamber to the exterior.

In the use of washing machines, a pump mechanism having an inlet and outlet attaches to the main washing tub of the washing machine, in an outlet line leading from the tub, to rapidly drain the washing machine of water. The pump mechanism of the type herein described has an impeller of rubber or other resilient material. If a hard object such as buttons, buckles, etc. enters the pump chamber, the rubber vanes of the impeller being distortable pass over the hard object without injury to the pump impeller. In passing over any hard objects, the impeller exerts a drag or pull on the hard object to move it to the pump outlet without stopping the pump action and consequently without halting the draining of the washing machine tub.

Objects of the invention are to provide: a new seal between an impeller in a pump chamber and a shaft to rotate the impeller attached thereto with relation to a pump casing; a new sealing means for pump impellers which eliminates the use of stuffing boxes, packing glands or similar means for containing water in a pump chamber; a new combination impeller and seal arrangement whereby high sealing pressures are provided when the pump is not in use, which is the large percentage of the time, and the pressure on the sealing means relieved by centrifugal force when the impeller is rotated at high speed to thus insure a minimum wear on the sealing means during operation of the pump; a sealing means for pumps that is simple in construction, durable and economical; and a shaft sealing arrangement whereby an impeller shaft of ordinary material may be employed without concern for non-corrosive qualities.

The invention includes the provision of an impeller carried on a shaft for operation within the pump casing. The shaft extends through an inwardly projecting portion of the casing which forms a bearing for the shaft. The improvement in the present invention consists of a sealing means between the impeller and the bearing portion of the casing to seal the space therebetween and about the impeller shaft. The sealing means may be attached to the impeller or formed as an integral part thereof in the form of an extension of the impeller. The impeller extension is pref-

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erably thinned or feathered so that by making the inner diameter thereof smaller than the bearing portion it may be stretched to fit snugly thereover and thereby maintain a satisfactory seal. This sealing engagement with the bearing portion may thus be effected by either tension of the rubber extension stretched thereover or biased by spring pressure or pressure of fluid from the tub or both. A cap or sleeve member may be placed over the end or sides of the bearing portion to insure a smooth contacting surface for the impeller extension during rotation. A metallic bushing may be embedded in the impeller to attach the shaft to the impeller, or the shaft may be molded in the impeller material. Where the shaft is molded in the impeller with the seal of my present invention, a shaft may be selected for economic reasons without concern whether or not the shaft material has non-corrosive qualities.

With the foregoing and other objects in view, the invention will be more fully described hereinafter and will be particularly pointed out in the claims appended hereto.

In the drawings:

Figure 1 is a plan view of the pump with part of the cover broken away to show the impeller.

Figure 2 is a sectional view through the pump casing showing one species of sealing means between the impeller and bearing portion;

Figure 3 is a view in perspective of the rubber impeller;

Figure 4 is a part sectional view of the pump and another form of sealing means; and

Figures 5 and 6 are part sectional views of the pump showing still further forms of sealing means.

Figure 1 shows a pump generally represented at 1 includes a casing 2 having an inlet 3 and an outlet 4. The casing 2 has a cover plate 5 with spring latches 6 engageable with lugs 7.

An impeller 8, made of rubber or other resilient material, and having one, two or more blades, is rotatably mounted in the casing 2. A shaft 9 is rigidly connected, preferably by insert molding, to the impeller 8 at one end thereof while the other end connects with a source of motive power (not shown). The casing 2 has an inwardly extending portion 10 which forms a bearing for the shaft 9. In Figure 2 a bearing member 11 is included between the shaft 9 and bearing portion 10 of the casing.

The improvement in the present invention resides in sealing the space between the pump chamber within casing 2 and the shaft 9. In

the figure 2, the bearing portion 10 has a cap or sleeve member 12 preferably of a material such as a hard wearing plastic or stainless steel. The impeller 8 has an annular extension 13 extending outwardly to form a socket for receiving shaft 9.

A thrust bearing 14 is disposed at the bottom of the socket for contact with cap 12. As can readily be seen, extension 13 is feathered and fits snugly around bearing portion 10 to seal the space between bearing portion 10 and the impeller 8. When the impeller 8 is not rotating during the normal wash period, water from the wash tub fills inlet 3 under a static head. In this condition the feathered rubber lip or extension 13 is forced into sealing engagement with bearing portion 12 mainly due to the tension set up in stretching the rubber lip over the bearing portion. During the drain period, the pump impeller 8 is rotated and the centrifugal force induced by this rotation lessens the sealing pressure of the feathered rubber lip on the bearing portion 12, thus greatly reducing wear of the sealing surfaces. A good tight seal is maintained when the inlet 3 is under static head and the pump is not operating, which is the majority of the time, and when the pump is operating a lighter seal pressure is realized which greatly reduces heat which would be generated under the much higher pressure.

In the species of Figure 4, the bearing portion 15 has a cap member 16 thereon, and the impeller 17 has an integral feathered extension 18 similarly as described for Figure 1 which seals with cap member 16 on the end of bearing portion 15. A coil spring 19 is placed around extension 16 to force or distort the resilient extension into sealing engagement with the bearing portion 15. A second extension 20 integral with impeller 17 extends from the outer edge of the impeller to provide a cover for coil spring 19. A metallic bushing 21 is embedded in impeller 17 and shaft 9 is rigidly attached thereto. A flat spring member 22 is placed between bushing 21 and cap 16 to serve as a wear plate due to relative rotary motion between the two members.

Figure 5 is another embodiment similar in many respects to the embodiment shown in Figure 4. The extension 23, in this embodiment, extends coaxially of the impeller 24 and is adapted to overlie the cylindrical surface of bearing member 25 supported by portion 26 of the casing. To ensure adequate sealing pressure, a coil spring 27 is placed over the extension 23.

Figure 6 shows a further variation wherein the bearing portion of the casing is provided with an annular abutment 29 capped over with a sheet of metal 30 such as stainless steel. The impeller is provided with an annular extension 31 adapted to engage and form a seal with the metal cap 30. To ensure adequate engagement, a spring 32 is placed on the shaft 9 between bearing 34 and an abutment 35 keyed to the shaft. The spring 32 urges the shaft in a direction to force the extension 31 against the metal surface 30.

While the invention has been described in connection with several specific embodiments, it is to be understood that the words which have been used are words of description rather than of limitation, and that practice of the invention within the scope of the appended claims may be resorted to without departing from the true scope of the invention in all its aspects.

I claim:

1. In a pump structure, the combination comprising: a pump having a housing, a rotary resilient pumping element of deformable material cooperating with the internal walls of the housing, bushing means in said housing, said bushing means having a circular projection extending into said resilient pump element and encircled by said element to deform said material radially outward and to thereby be resiliently engaged.

2. A pump having in combination, a casing including inlet and outlet ports, a shaft disposed within said casing and rotatably mounted in respect thereto, an impeller of resilient material including an annular lip portion encircling said shaft, a bearing element interposed between said shaft and said lip portion, said lip portion being inherently biased for fluid sealing engagement with said bearing element during impeller actuated fluid flow through said casing and adapted to more firmly engage said bearing element upon static hydraulic pressure built-up within said casing.

3. A pump having in combination, a casing including inlet and outlet ports, a shaft partially disposed within said casing and rotatably mounted in respect thereto, an impeller of resilient material including an annular lip portion encircling said shaft, a bearing element interposed between said shaft and said lip portion, said lip portion being inherently biased for fluid sealing engagement with said bearing element during impeller actuated fluid flow through said casing and adapted to more firmly engage said bearing element upon static hydraulic pressure build-up within said casing.

4. The pump of claim 3 wherein the sealing surface of said bearing element comprises a metal offering high resistance to wear due to rotation of said resilient impeller lip portion in respect thereto.

5. The pump of claim 3 wherein a bearing sleeve is interposed between said bearing element and said lip portion.

6. A pump structure including a casing provided with inlet and outlet ports and a shaft receiving aperture, a drive shaft extending through said aperture to the interior of said casing, means journaling said driving shaft in respect to said casing, said means including a packing member fixed to said casing and a bearing sleeve snugly engaged between said member and said shaft and including a portion extending into said casing beyond said packing member, an impeller of resilient material fixedly mounted on said shaft within said casing for rotation therewith and including a hub portion provided with an axially extending annular skirt-like integral extension receivable about said sleeve element and inherently biased for light contractile engagement with the surface thereof, said skirt-like impeller portion being adapted to sealingly engage said sleeve as the result of said inherent contractile biasing during periods of fluid flow through said casing rotation of said impeller and to engage said sleeve under substantially increased pressure during periods of non-rotation of said impeller due to inwardly directed pressure thereon resulting from increased static pressure build-up of fluid within said casing during said latter periods.

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