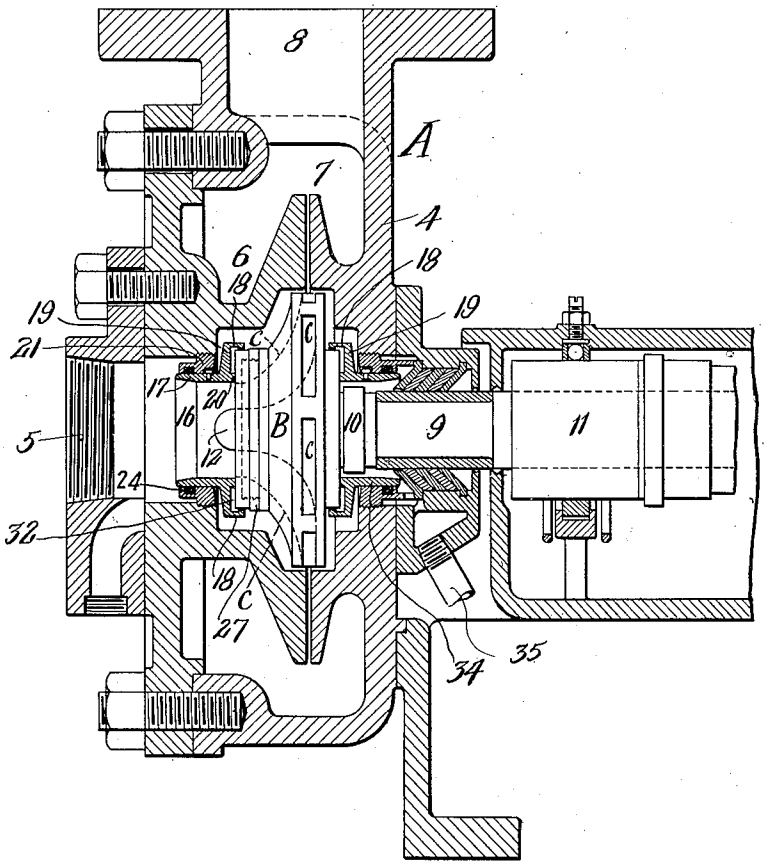
Nov. 28, 1933. C. A. SCHELLENS 1,936,771

PACKING FOR CENTRIFUGAL PUMPS

Filed Jan. 31, 1930 3 Sheets-Sheet 1

Fig. 1.



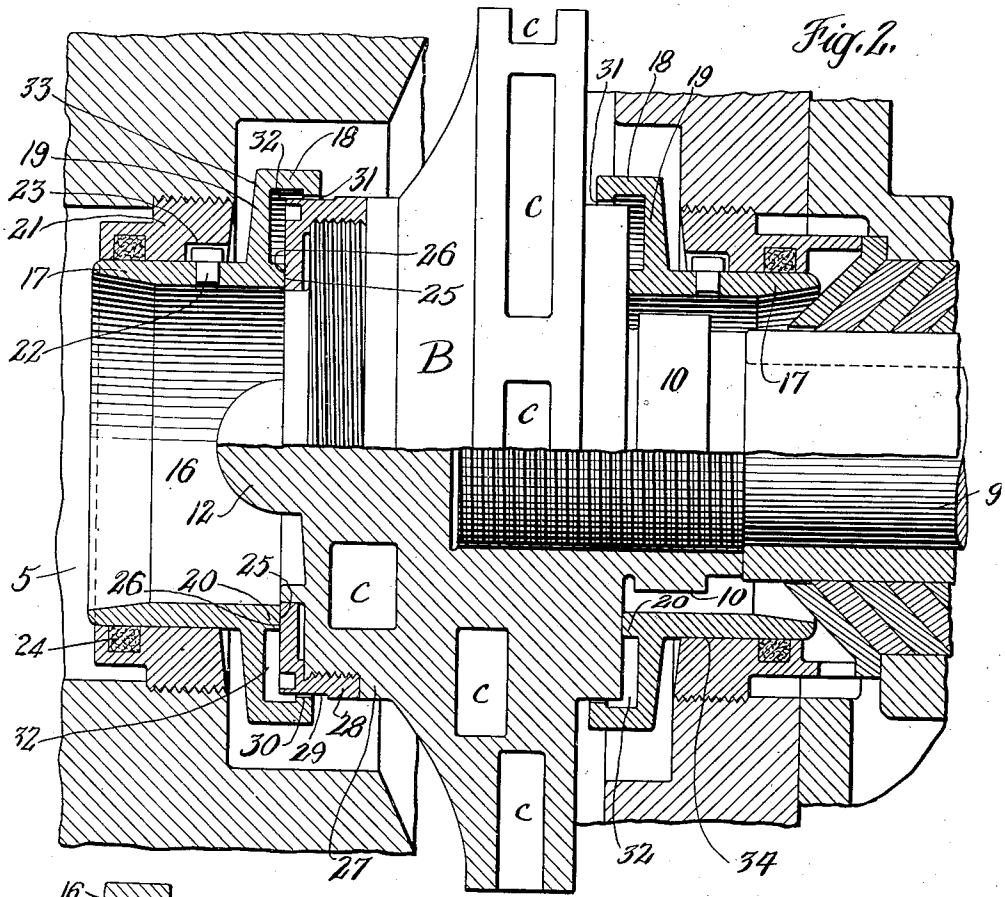
INVENTOR
Christopher A. Schellens
BY
Symmestedt & Lechner
ATTORNEYS

Nov. 28, 1933. C. A. SCHELLENS 1,936,771

PACKING FOR CENTRIFUGAL PUMPS

Filed Jan. 31, 1930 3 Sheets-Sheet 2

Fig. 2.



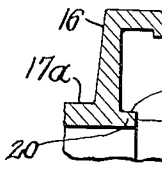


Fig. 4.

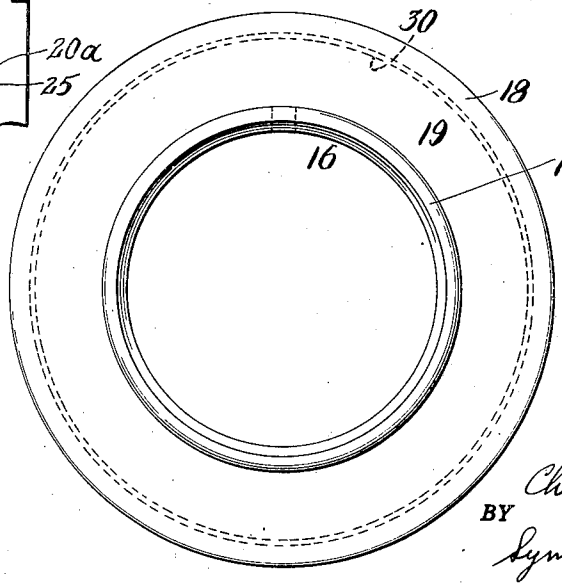


Fig. 3.

INVENTOR
Christopher A. Schellens
BY
Symmetwedt & Lechner
ATTORNEYS

Nov. 28, 1933. C. A. SCHELLENS 1,936,771

PACKING FOR CENTRIFUGAL PUMPS

Filed Jan. 31, 1930 3 Sheets-Sheet 3

Fig. 5.

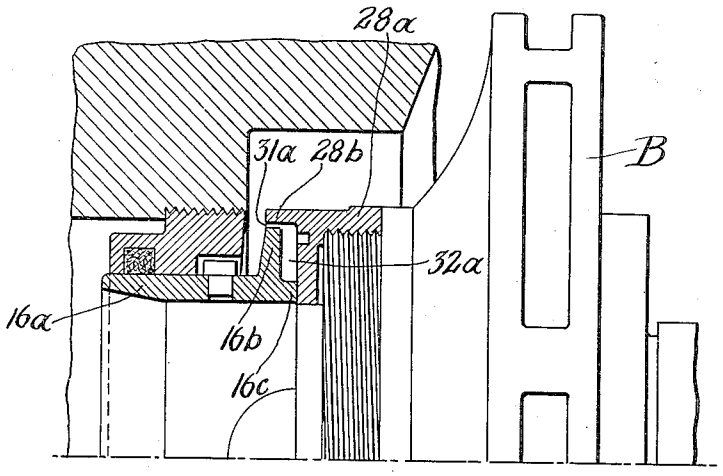
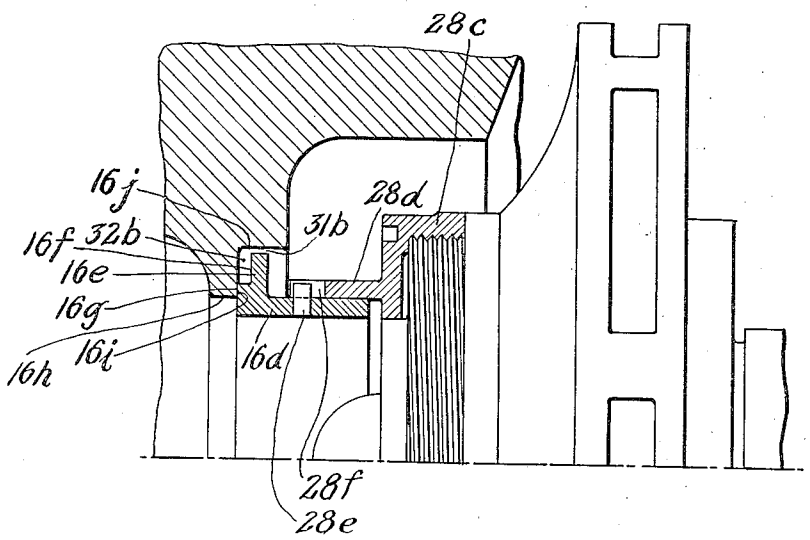


Fig. 6.



INVENTOR
Christopher A. Schellens
BY
Symmestvedt & Lechner
ATTORNEYS

Patented Nov. 28, 1933 1,936,771

UNITED STATES PATENT OFFICE

1,936,771

PACKING FOR CENTRIFUGAL PUMPS

Christopher A. Schellens, Marblehead, Mass., assignor to C-S Engineering Company, Englewood, N. J., a corporation of Delaware

Application January 31, 1930. Serial No. 424,752

8 Claims. (Cl. 286—9)

This invention relates to centrifugal pumps and particularly to improvements in packing or sealing means for such pumps.

The invention is especially useful in connection with high speed pumps, such as disclosed in my Patent No. 1,664,488, issued April 3, 1928.

In pumps of this character difficulties are encountered from leakage. It is especially difficult to overcome leakage at the inlet side of such pumps owing to the overhung or outboard arrangement of the impellers.

The primary object of my invention is to overcome these difficulties.

More specifically stated, it is an object of my invention to provide effective sealing means in pumps of the character described whereby high pressure leakage is prevented.

Another object of my invention is to provide effective sealing means having long life.

A further object of my invention is the provision of sealing means of such character that ordinary wear of the sealing portion will not destroy the effectiveness thereof.

How the foregoing, together with such other objects and advantages as may hereinafter appear, or are incident to my invention, are realized, is illustrated in preferred form in the accompanying drawings, wherein—

Fig. 1 is a section through a pump constructed in accordance with my invention with certain of the parts appearing in elevation.

Fig. 2 is an enlarged view showing the runner partly in elevation and partly in section, and illustrating my improved sealing means in association therewith.

Fig. 3 is a face view of a sealing ring.

Fig. 4 is a fragmentary view of a modification of the sealing ring illustrated in Figs. 1 to 3 inclusive.

In the drawings, the pump A, in general, comprises a casing 4 having a water inlet 5 to the pump bowl 6, around which there is the discharge chamber 7 having an outlet 8 for connection to a boiler or the like; and a runner or impeller B secured to the end of the drive shaft 9, the shaft being threaded into the face of the runner casting opposite the intake side and the runner having a hub 10 for this purpose. The shaft 9 is supported by suitable bearing means 11 and may be driven by a high speed motor, such as a high speed steam turbine motor.

It is to be observed that the shaft 9 extends only partly into the runner B from the face opposite the intake side thereof which enables me to arrange the inlet ends of the fluid passages on a small radius.

The runner B has an axial intake and a radial discharge from its periphery. It has a plurality of water passages c terminating at the entrance or intake side in a plane perpendicular to the axis of rotation, the intake ends of said passages being arranged in a circular group on a small radius around the central boss or crown 12. The walls between the passages constitute cutting blades.

By employing such a runner having an inlet eye of small diameter, I am enabled to employ a correspondingly small diametered inlet throat or nozzle, and thus I am enabled to cut down the amount of leakage very materially.

In the drawings the nozzle or throat is in the form of a floating packing member 16 arranged to prevent leakage because of the following provision.

Referring to Figs. 1 to 3, the packing member 16 is of ring-like or cylindrical form and comprises a sleeve portion 17, an outer annular flange portion 18, and a web portion 19 connecting the sleeve and flange portions. The web 19 is so located as to provide an inner annular rib 20 in the packing member. Stated in another way the packing member 16 has an enlarged end portion provided with an inner annular rib or flange, an outer annular flange, and a connecting web. The outer flange, rib, and web are so disposed and of such proportions as to provide a cup-shaped end for the member 16 having an inner flange or rib of less depth than its outer flange. In other words the outer flange 18 overhangs the inner rib 20.

The sleeve portion 17 of the packing member slidably fits a ring 21 secured in the inlet portion of the pump casing, and, therefore, the packing member may shift axially. However, the packing member is prevented from rotating as by means of a pin 22 carried thereby and fitting an elongated groove 23 in the ring 21. Packing material 24 may be provided in the ring 21.

The enlarged end portion of the packing member lies in the pressure space of the pump bowl and the face 25 of the inner annular rib 20 is adapted for possible contact against the end face 26 of the impeller B. The outer annular flange 18, however, is disposed in surrounding and spaced relation to the end portion of the impeller.

In this connection it is pointed out that the impeller has a cylindrical axial inlet portion 27 which, in this instance, is provided with a ring-like nut 28 carrying the end face 26 above men-

tioned. The outside diameter of the nut 28 at 29 is slightly smaller than the inside diameter of the annular flange 18 at 30, and, therefore, a small annular inlet 31 is provided through which pressure fluid from the pump casing enters into the annular chamber 32 located between the packing member 16 and the impeller.

In operation, the packing member 16 is held in equilibrium in a definite axial position relative to the impeller B in the following manner. Assume, first, that the packing member is in a position in which axial forces acting on it are balanced. Next imagine it to be moved away from the impeller by some external force. It is apparent that in such position the fluid pressure in the chamber 32 will be reduced, since the outlet from the chamber, namely, the clearance between the face 25 of the rib 20 and the face 26 of the impeller, has been increased, while the inlet 31 to the chamber 32 has remained the same. Due to this decreased fluid pressure, the packing member will tend to be forced back to its position of equilibrium.

It is pointed out that when the outer diameter 20*a* of the rib 20 is substantially equal to the outer diameter 17*a* of the sleeve 17, as illustrated in Figs. 1 and 2, the packing member 16 will be in equilibrium when in substantial contact with the member 28 of the impeller, and with substantially no leakage taking place between them. However, I also contemplate making the diameter 20*a* larger than the diameter 17*a* in which case the packing member 16 will rest against the member 28 with a bearing pressure determined by the difference in diameters—the larger the diameter 20*a* the larger the bearing pressure with which the packing member rests against the member 28 of the impeller.

I further contemplate making the diameter 20*a* smaller than the diameter 17*a*, as illustrated in Fig. 4, in which case the packing member 16 will assume a position in which the face 25 of the rib 20 will be removed from the face 26 of the member 28, and the smaller this diameter is made, the larger will be the clearance by which the packing member is removed from the impeller.

While I prefer to so proportion the diameters just referred to that the packing member will be removed from the impeller by a fine clearance, permitting of a small leakage, or film of fluid between them, I have found that satisfactory results may be obtained when the packing member bears against the impeller with a light pressure.

From the foregoing it will be seen that the packing device may be so proportioned as to permit of small leakage or substantially no leakage even though the radial clearance 31 may be of substantial amount.

In Fig. 5 I have illustrated a modification in which the impeller B is provided with an annular flange 28*b*, in this instance formed on the member 28*a*, which flange overhangs a flange 16*b* on the packing member 16*a*, there being an annular clearance 31*a* between the adjacent cylindrical surfaces of the flanges 28*b* and 16*b*. The member 16*a* is provided with an inner rib 16*c* and the arrangement of parts is such as to form a chamber 32*a* having annular inlet at 31*a*. The similarity between the forms shown in Figs. 2 and 5 is obvious and, therefore, the operation of this modification will be clear from the foregoing.

In Fig. 6 a modification is illustrated in which the packing member 16*d* is supported from the impeller, the impeller being provided with a nut-like member 28*c* having a sleeve portion 28*d* in which the packing member is axially movable. A pin 28*e* working in a slot 28*f* causes rotation of the packing member with the impeller while permitting the axial movement referred to.

The packing member in this instance is provided with a flange 16*e* having a cut-away portion 16*f* and an end face 16*g*, and the pump casing is provided with a shouldered inlet bore 16*h* having a face 16*i* and cylindrical surface 16*j*. The packing member is so associated with the inlet bore 16*h* that an annular clearance 31*b* is formed between the cylindrical surface 16*j* of the bore and that the end face 16*g* is arranged for possible contact with the face 16*i*. In this modification a fluid chamber is formed at 32*b* to which pressure fluid is admitted through the annular inlet or clearance 31*b*. The packing member is so proportioned as to be held against the face 16*i* of the casing with a light bearing contact under the influence of fluid pressures.

The provision of the annular inlet or clearance between cylindrical surfaces constitutes an important feature of my invention, because with such an arrangement, wear of the end faces of the device does not change the annular clearance and, therefore, such wear does not alter the relationship of the pressures necessary to a proper functioning of the device, it being pointed out, for example, that the rib 20 may wear practically back to the web 19 without disturbing the relationship of pressures. The importance of this is easily understood when it is considered that even with the most rigid inspection, at the high speeds involved, it is very difficult to have the impeller run exactly true. If the initial concentricity is out very slightly, this will be greatly exaggerated after the pump reaches a very high speed, resulting in wear of the packing member. Through the practice of my invention such wear is taken care of for a considerable period without disturbing the proper functioning of the packing device, which makes for a very long life.

While I have only described the arrangement at the inlet end of the impeller, it is to be understood that a similar arrangement may be employed at the other end of the impeller as indicated at 34. The operation of the arrangement at 34 will be understood from the foregoing description. Any leakage at this inboard side of the impeller may be drained off through a pipe 35.

What I claim is:—

1. The combination with a rotatable member having a cylindrical end portion and a casing therefor, of a floating packing member guided in the casing and operating to maintain a seal against high pressure leakage past the rotatable member, said packing member having an inner annular rib, an outer annular flange and a connecting web arranged to form a chamber having communication with high pressure fluid, the outer annular flange being in surrounding and spaced relation to the cylindrical end portion of the rotatable member to afford such communication and the face of the rib being adapted to coact with an end face of the rotatable member to form the aforesaid seal.

2. The combination with a casing and a rotatable member having a circular end portion, of a ring-like floating packing member associated with the rotatable member and being guided in the casing, said packing member having an en-

larged end with an annular flange in surrounding and spaced relation to the circular end portion of the rotatable member and having an inner annular rib pressure held away from the face of the circular end portion of the rotatable member by a small clearance through the medium of pressure fluid admitted through the annular space between the annular flange of the packing member and the circular end portion of the rotatable member.

3. The combination with a casing member and a rotatable member, of a packing member having a leak restraining connection with one of said members permitting axial motion relative thereto, said packing member and one of the other members having cooperating faces adapted for substantial contact under the influence of fluid pressures, and a fluid passage for applying fluid pressure formed by a cylindrical surface of the packing member spaced from a cylindrical surface of one of the other members.

4. In a pressure fluid device having a casing with an axial fluid inlet and a discharge chamber, and an axial inlet peripheral discharge rotary impeller receiving fluid from said inlet and delivering fluid to said discharge chamber, the combination of a member axially movable by fluid pressures to maintain a seal against leakage from said discharge chamber to the inlet side of the impeller, said member having a portion adapted to cooperate with an adjacent part to provide a chamber having communication with said discharge chamber, and an annular space between two cylindrical surfaces affording such communication.

5. In a pressure fluid device having a casing with an axial fluid inlet and a discharge chamber, and an axial inlet peripheral discharge rotary impeller receiving fluid from said inlet and delivering fluid to said discharge chamber, the combination of an axially movable member associated with said fluid inlet and impeller, said member having an enlarged end portion provided with a cylindrical surface, an end face, and a recess; a face cooperating with said end face to provide a seal against leakage from the discharge chamber to the inlet side of the impeller; a cylindrical surface cooperating with said first mentioned cylindrical surface to provide an annular passage, and a chamber between said seal and annular passage formed by said recess to which fluid under pressure is led through the annular passage.

6. In a pressure fluid device having a casing with an axial fluid inlet and a discharge chamber, and an axial inlet peripheral discharge rotary impeller receiving fluid from said inlet and delivering fluid to said discharge chamber, the combination of a member axially movable by fluid pressures to maintain a seal against leakage from said discharge chamber to the inlet side of the impeller, said member having a raised surface providing said seal, and having other portions cooperating with an adjacent part to provide a fluid chamber with a fixed inlet from the aforesaid discharge chamber.

7. The combination with a rotatable member and a chamber associated therewith, of an axially movable sleeve-like packing member having a surface adapted to be presented toward a face of an adjacent part to provide a seal, said packing member also having portions cooperating with an adjacent part to provide a fluid pressure chamber with an inlet establishing communication between the first mentioned chamber and fluid pressure chamber, the surfaces providing said inlet being non-contacting and so disposed with reference to the aforesaid faces which are presented toward one another that wear of the latter does not alter the size of said inlet, and said packing member also having surfaces subjected to pressure from the first-mentioned chamber and to pressure in said fluid pressure chamber proportioned to maintain the presented faces together under predetermined pressure.

8. The combination with a rotatable member and casing of a packing therefor comprising a packing element cooperating with the rotatable member and casing and having an inner annular rib, an outer annular flange, and a connecting web arranged to form a fluid chamber between the rotatable member and packing element, said outer annular flange being spaced from the rotatable member to provide an annular inlet to said fluid chamber, and said inner annular rib being pressure held removed from the rotatable member by a small clearance.

CHRISTOPHER A. SCHELLENS.