June 13, 1939. R. G. LE TOURNEAU 2,162,486

SEALING MEANS FOR CENTRIFUGAL PUMP IMPELLERS

Filed June 21, 1937

Fig. 1

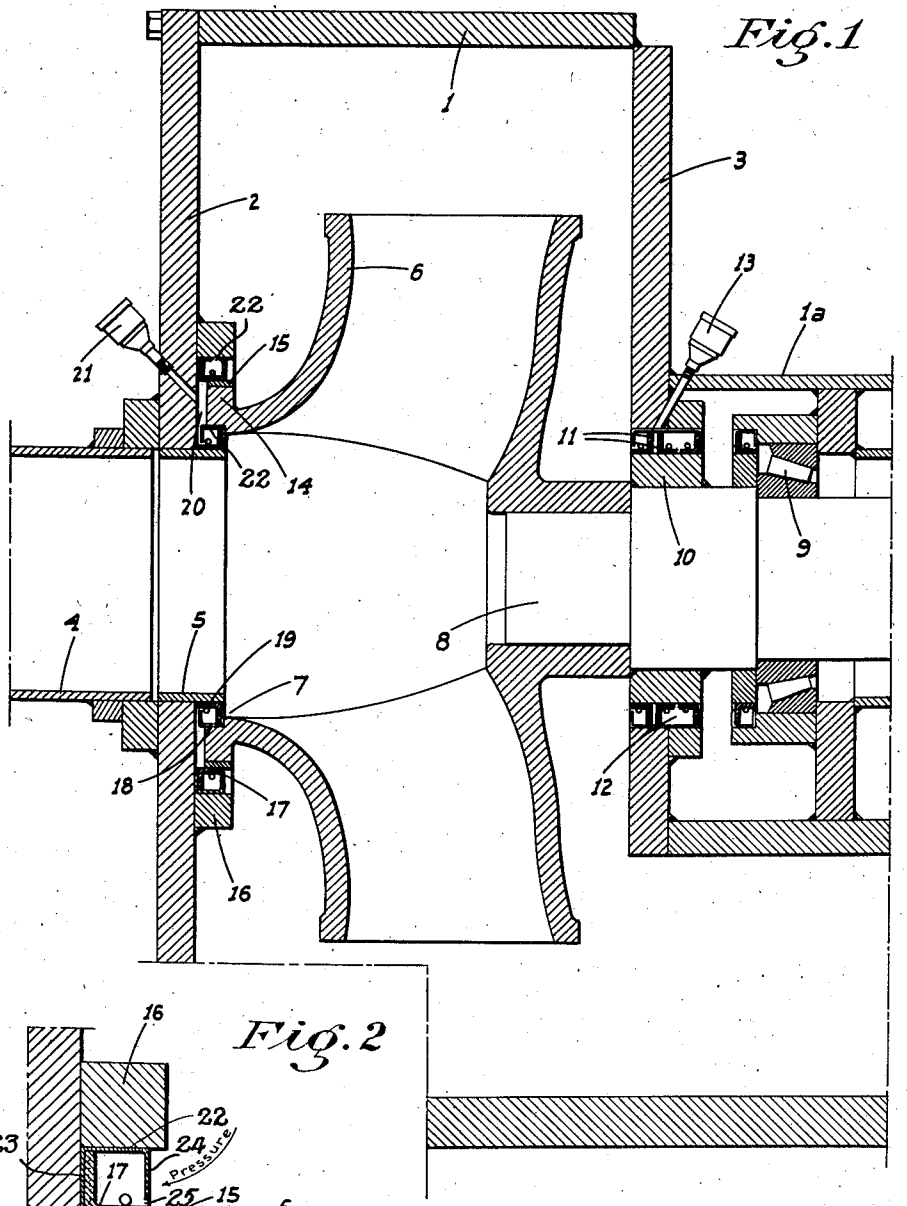
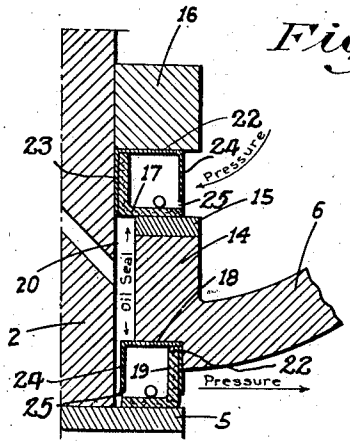


Fig. 2



INVENTOR

R. G. LeTourneau

BY

ATTORNEY

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SEALING MEANS FOR CENTRIFUGAL PUMP IMPELLERS

Robert Gilmore Le Tourneau, Peoria, Ill., assignor to R. G. Le Tourneau, Inc., Peoria, Ill.

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2 Claims. (Cl. 103—111)

This invention relates to centrifugal pumps and particularly to a means for preventing leakage between the suction end of the impeller and the pump casing.

The principal object of my invention is to provide a sealing means for the purpose arranged so that the different pressures on the suction and discharge side of the impeller will both aid in maintaining the desired leak-proof seal, and in which oil is used in addition to aid in the sealing action, while being prevented from escaping in any measurable quantities into the pump chamber.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawing similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a fragmentary sectional elevation of a centrifugal pump equipped with my improved sealing means.

Figure 2 is a fragmentary enlarged section of the impeller at its suction end, and the cooperating sealing devices.

Referring now more particularly to the characters of reference on the drawing, the pump casing 1 is preferably fabricated from a number of plates welded together to provide great strength and rigidity, and includes parallel front and back walls 2 and 3 respectively.

Projecting from the front wall 2 is the intake conduit 4. Alined with said intake conduit and projecting a short distance into the casing from and secured on said wall is a short sleeve 5. This is preferably made of an alloy containing chromium, cobalt and tungsten, which provides an extremely hard metal and is rust proof.

The impeller 6 of the standard shrouded type is disposed in the casing concentric with the sleeve 5 and has a central intake opening 7 as usual somewhat larger than the external diameter of the sleeve. On its opposite side the impeller is secured on a drive shaft 8 which is made relatively large to eliminate vibration and which is mounted on roller bearings 9 or the like disposed in an extension 1a of the casing 1.

Between the forward bearing 9 and the interior of the casing, a collar 10 is secured on the shaft which is engaged by oppositely disposed sealing cup leathers 11 seated in a chamber 12 formed in the end of the casing about the collar and which, between adjacent cup leathers, is in communication with a source of oil such as an oil cup 13.

The most annoying and usual source of pressure leakage however is between the suction end of the impeller and the adjacent end of the casing, and my improved sealing means to prevent leakage at this point will now be described. The impeller at its intake end is formed with an outwardly projecting flange 14 fixed on its periphery with a band 15 of the same alloy as is used for the sleeve 5. This flange is spaced from the casing wall 2 somewhat and surrounds the inwardly projecting portion of the sleeve 5, being disposed in spaced relation to and between said sleeve and an outer ring 16 concentric therewith and secured on the inner face of the wall 2.

The band 15 is engaged by one face of a caged cup leather 17. This is of right angle form in cross section and is disposed with its opposite face parallel to and adjacent the wall 2. In this manner, the angle included between the sides of the leather is open to the high pressure area of the casing outwardly of the impeller, so that such pressure forces the two sides of the leather into firm sealing contact with the band 15 and the wall 2, and holds the leather against rotation with the impeller. A sealing gland is thus provided which is maintained in sealing relation by the pressure in the pump casing, and which allows of any slight axial movement of the impeller without destroying the seal.

The flange 14 of the impeller about the opening 7 is circumferentially recessed as at 18 so as to form a flat shoulder adjacent the plane of the inner end of the sleeve 5, for engagement with one side of another caged right angle cup leather 19. The other side of this leather rides on the band 5, so that another sealing gland, inwardly disposed relative to the gland 17, is thus provided. The angle included between the sides of the leather 19 thus faces toward the wall 2, or away from the interior of the impeller. The suction within the impeller in the intake opening can thus act to draw the leather against the shoulder 18 of the impeller, making a firm seal at this point and holding the leather so that it rotates with the impeller while maintaining a proper sealing joint with the sleeve 5.

Additional means to prevent leakage past the glands is provided by means of oil, maintained in an enclosed chamber 20 formed between the flange 14, the wall 2 and the glands, from an oil

cup 21 or the like. The gland 17 closes the outer periphery of the chamber and is partly exposed to the oil so that the contacting surface of the gland and the band 15 are maintained lubricated. The oil also enters between the sides of the gland 19 similarly lubricating the contacting faces of the gland and the sleeve 5.

The surrounding cages for the cup leathers each comprises an annular member indicated generally at 22, which is of channel shape in cross-section and opens inwardly; one projecting flange or side 23 of this annular member being disposed between the radial flange of the corresponding cup leather and the adjacent parallel surface of the assembly, while the other or opposite projecting flange or side 24 of the member 22 extends to a point adjacent but spaced from the free end portion of the other and longitudinally extending flange of the cup leather. This arrangement thus provides an annular slot 25 of limited width, which permits water to enter the cage and exert a force on the cup leather, but prevents any foreign matter of substantial size from entering the cage and then being driven against the cup leather with probable damage thereto. The sealing means herein described is especially designed for pumps on suction dredges, and through which pumps much mud and debris, etc., passes. It is therefore necessary that the cup leathers be protected in the manner above described.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A sealing gland for a pump including a housing, a rotary impeller in the housing and having an annular portion, the housing including an alined corresponding portion spaced from and parallel to said annular portion of the impeller, an annular cage of channel shape in cross section mounted on one of said portions and open in the direction of the other portion, and an annular cup leather of right angle form disposed in the cage with one flange of the leather engaging said other portion in sealing relation, and the other flange of the leather engaging the inner face of one side of the cage in sealing relation.

2. A device as in claim 1, in which the other side of the cage terminates in spaced relation to but adjacent the free end portion of said one flange of the cup leather.

ROBERT GILMORE LE TOURNEAU.