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LIQUID SEALED ROTATING JOINTS

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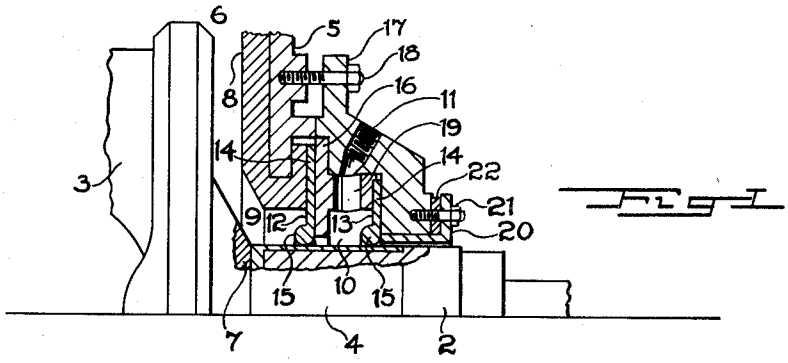


Fig I

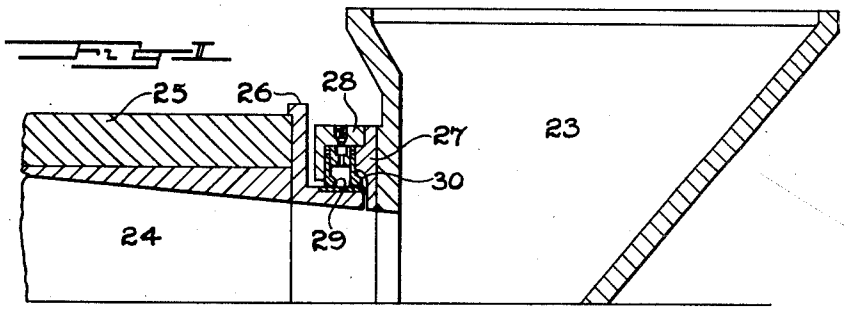


Fig II

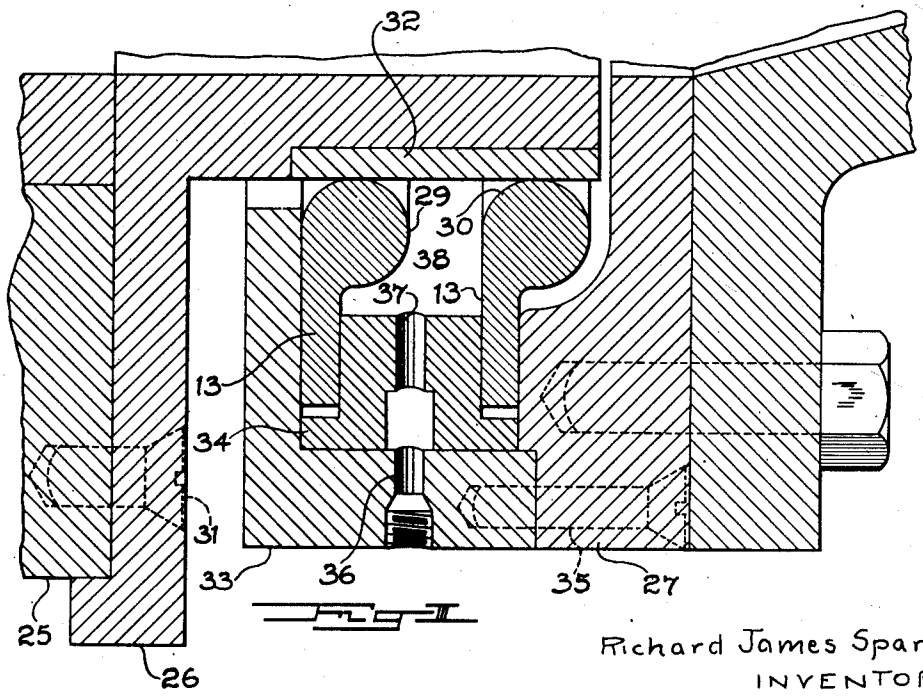


Fig III

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LIQUID SEALED ROTATING JOINTS

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Application July 2, 1936, Serial No. 88,652
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3 Claims. (Cl. 286—9)

The present invention relates to liquid-sealed rotating joints of the kind adapted for excluding ore pulp and other gritty liquids from access to the jointing surfaces, by means of water or other clean liquid which is caused to flow at a slow rate between the jointing surfaces.

A liquid sealed rotating joint according to the invention comprises the combination with relatively rotating parts, of means enclosing a chamber for the sealing liquid and including a flexible and resilient ring the cross section of which consists of a thin stem terminating in a bulb, that part of the ring which is represented by the stem in cross section being a flange which is clamped to one of the relatively rotating parts, whilst its thickened edge represented by the bulb in the cross section bears against the other of the relatively rotating parts.

A description will now be given by way of example of two embodiments of the invention, reference being made to the accompanying drawing comprising Figures I to III, in which:—

Figure I is a cross-section of portion of a centrifugal sand pump taken along the axis of the driving shaft.

Figure II shows a longitudinal section of a portion of a rotary grinding mill, whilst

Figure III is an enlarged view of the lower portion corresponding to the upper portion shown in Figure II.

In Figure I, 2 indicates a shaft structure carrying the impeller 3 and provided with a renewable wearing sleeve 4. 5 is the pump casing enclosing the pump chamber 6. The impeller and the casing are provided with rubber coverings indicated respectively by 7 and 8, in order to protect them against wear by the ore pulp or other gritty liquid which the pump is intended to propel. Also in order to avoid wear there is a wide clearance space 9 between the impeller and the casing.

A seal between the shaft and the casing is required to prevent escape of pulp at this point; and, as is usual in sand and like pumps, such seal is provided by a body of water maintained in an annular chamber 10 surrounding the shaft. The water is admitted to the chamber by a pipe connection to an inlet 11. With the object of ensuring the exclusion of the solid matter of pulp from the water chamber 10 it is usual to admit the water under a pressure somewhat higher than the normal pressure of the pulp in the clearance space 9, thus tending to set up a flow of water from the water chamber 10 into said space 9.

The means enclosing the water chamber according to the invention, includes the two rubber rings 12, 13 at the ends of said chamber. Each ring comprises an annular flange and a thickened edge portion represented in cross section respectively by the thin flexible stem 14 and the bulb 15 at which the stem terminates. The ring 12 at the left hand end of the chamber has its annular flange clamped between the lining 8 and a T-sectioned metal ring 16 held in position by an outer casing 17 which is secured to the pump casing by bolts 18. The rubber ring 13 at the right hand end of the water chamber has its similar annular flange clamped between the aforesaid parts 16 and 17. The T-sectioned metal ring 16 is perforated as at 19 to permit the water to pass from the inlet 11 to the chamber 10.

The annuli represented in cross-section by the bulbs 15 bear on the sleeve 4 of the impeller shaft and by their elasticity tend to make a close joint therewith; which however is effectively lubricated by the contiguous water. The stem section, being thin, allows the bulb section to pivot (in cross section) freely about the point where the stem section is rigidly clamped, and so accommodate itself to the shape of the shaft and to the liquid forces acting on it. Such a force is that of the water in the chamber 10 tending to escape therefrom into the pump chamber, which it does by thrusting the bulb of the ring 12 to the left and so permitting the desired restricted flow of water past it from the water chamber to the pump chamber. If however a surge in the pump delivery line causes a momentary pressure in the pump chamber greater than that in the water chamber the pulp pressure tends to thrust the bulb more closely to the shaft and thus to prevent pulp from entering the water chamber. That is to say, the rubber ring acts as a one-way valve between the water chamber and the pump chamber. This one-way action is improved by forming the bulb section 15 tangential to the stem section 14, and positioning it towards the pump chamber, as shown. With this arrangement the bulb section moves readily to the left under the pressure of the water to provide a passage for the latter around the shaft, but seats closely to the shaft when forced towards the right under the pressure of the pulp.

The same tangential arrangement of the bulb section is also useful in the case of the right hand ring 13. In this case the only function of the rubber ring is to prevent escape of water from the water chamber into the atmosphere. The tangentially bulbed ring being in this case disposed with its bulb in the same direction as that of ring 12, but oppositely thereto with reference to the water chamber 10, is pressed closely to the shaft by the water pressure. Its pressure on the shaft may however be more than is necessary to retain the water, the excess pressure setting up unnecessary friction. To reduce such excess pressure there is provided the gland-like element 20 which can be adjusted axially by the nuts 21

against the resistance of a rubber pad 22. Its inner end bears against the bulb 15 of ring 13 and by means of the aforesaid adjustment, can be made to displace the bulb to the left as much as is necessary to overcome the excess pressure of said bulb on the shaft.

In Figure II, 23 is a stationary hopper from which ore and water are fed into the hollow feed trunnion 24 of a rotary grinding mill. To the outer member 25 of the trunnion is secured an end piece 26 which rotates therewith, whilst to the stationary feed hopper is secured an annulus 27 which in turn is secured to a stationary joint 28 which makes use of two flexible packing rings 29 and 30 having the cross-section already described with reference to Figure I. The construction of the rotating joint will be seen more clearly from Figure III which is an enlarged view of the lower portion corresponding to the upper portion shown in Figure II. Members 25 and 26 are secured together by a number of screws 31 arranged around the periphery. Member 26 is provided with a renewable bearing sleeve 32 which engages the bulb ends of the packing rings 29 and 30. The packing ring 29 is placed in position in a metallic ring of L-shaped cross-section 33 and is held by a ring 34. The packing ring 30 is then placed in position and held by 27 which is attached to 33 by means of peripheral screws 35. 33 and 34 are provided with passages 36 and 37 through which clean water flows into the water chamber 38 between the packing rings 29 and 30.

It will be noted that, as in the case of Figure I the bulb ends of the packing rings are both directed in the same direction, viz. towards the chamber through which the gritty material flows. The pressure of the water in chamber 38 is maintained at a sufficiently high pressure to permit a slow flow of water between packing ring 30 and sleeve 32 so as to prevent grit accumulating adjacent to the packing ring 30.

I claim:

1. In an apparatus for handling gritty liquid of the kind comprising a stationary member, a member adapted to be rotated with respect to said stationary member and a liquid seal surrounding the joint between said two members and including a chamber adapted to be filled with a sealing liquid under a pressure somewhat higher than the pressure of the gritty liquid in the rotatable member, means within and secured to the chamber at the end of the chamber facing said rotatable member for allowing sealing liquid to pass out of said chamber and for preventing gritty liquid from entering the chamber, said means including a resilient member comprising a substantially bulb-shaped part adapted to be pressed by the pressure of the sealing liquid out of contact with said rotatable member and adapted to be pressed into contact with said rotatable member by the pressure of said gritty liquid, additional means at the other end of the chamber for preventing sealing liquid from passing out of the chamber, said means including a resilient member contacting with said rotatable member, and means for adjusting the pressure of said second resilient member with respect to said rotatable member against the pressure of the sealing liquid within said chamber.

2. In an apparatus for handling gritty liquid of the kind comprising a stationary member, a member adapted to be rotated with respect to said stationary member and a liquid seal surrounding the joint between said two members and including a chamber adapted to be filled with a sealing liquid under a pressure somewhat higher than the pressure of the gritty liquid in the rotatable member, means forming part of and secured to said chamber near the wall of the chamber facing said rotatable member for allowing sealing liquid to pass out of said chamber to said rotatable member and for preventing gritty liquid from said rotatable member from entering said chamber, said means including a resilient member responsive to the pressure of the sealing liquid within the chamber and to the pressure of the gritty liquid outside the chamber and comprising a flexible ring the cross-section of which consists of a thin stem terminating in a bulb displaced to one side of the stem so as to be tangential thereto, that part of the ring which is represented in cross-section by the stem being a flange clamped to said stationary part, whilst its thickened edge represented in cross-section by the edge of the bulb bears against the shaft of said rotatable member, said ring having its bulb directed towards the wall of the chamber to which it is attached, said bulb being adapted to be axially displaced, and additional means at the opposite wall of the chamber for preventing sealing liquid from passing out of the chamber, said means including a resilient member comprising a bulb-shaped part, said bulb-shaped part contacting with said rotatable member and being adjustable in the direction of the axis of said rotatable member, and means acting on said bulb-shaped portion for adjusting its pressure with respect to said rotatable member against the pressure of the sealing liquid in said chamber.

3. A liquid seal for joints in apparatus for handling gritty liquid of the kind comprising a stationary member and a member adapted to be rotated with respect to said stationary member, said liquid seal being adapted to surround the joint between said two members and comprising a chamber adapted to be secured to said stationary member and to be filled with a sealing liquid under a pressure which is somewhat higher than the pressure of the gritty liquid in said apparatus; a flexible ring the cross-section of which consists of a thin stem terminating in a bulb displaced to one side of the stem so as to be tangential thereto, that part of the ring which is represented in cross-section by the stem being a flange clamped to the wall of the chamber facing the rotating member whilst its thickened edge represented in cross-section by the edge of the bulb is adapted to surround and to bear against said rotatable member and is adapted to be pressed out of contact with said member by the pressure of the sealing fluid within said chamber and to be pressed into contact with said rotating member by the pressure of the gritty fluid outside said chamber, said flexible ring forming part of the wall of the chamber separating said chamber from the rotatable part; and an additional flexible ring of similar shape secured to and forming part of the opposite wall of the chamber and adapted to surround and to contact with said rotatable member and to be pressed into contact with said rotatable member by the pressure of the fluid within said chamber.

RICHARD JAMES SPARGO.