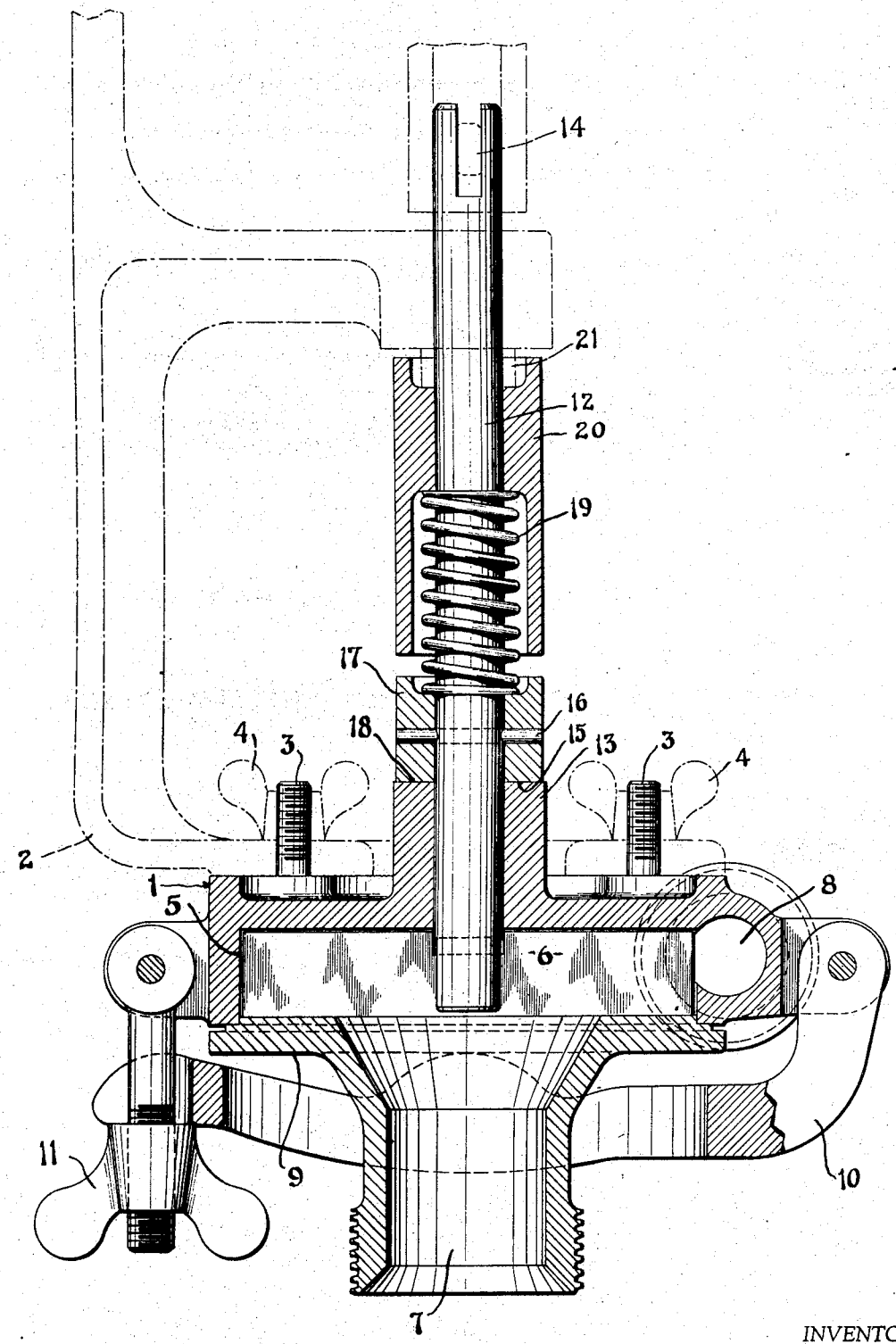
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CENTRIFUGAL PUMP

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CENTRIFUGAL PUMP

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1 Claim. (Cl. 103—103)

This invention relates to a new and useful packingless shaft bearing seal. Its object is to effectively seal a shaft-bearing against leakage therethrough under conditions where packing of any sort is undesirable. It was devised expressly for use in dairies and ice-cream plants, in connection with pumps for circulating milk, ice-cream mix and other liquid dairy products, but may be used with equal advantage in any situation in which the presence of a packing is detrimental to the product, or is otherwise unsatisfactory or undesirable.

Another feature of the invention, also of extreme importance where frequent removal of the shaft occurs, is that such operations are in no way affected by and are not detrimental to the seal.

Another advantage is that the seal, unlike most packing materials, has a practically unlimited life and consequently eliminates the necessity of frequent renewal. In addition, the seal in use tends to become more effective as time goes on. It is also very inexpensive to make and costs nothing whatsoever for maintenance.

In dairies and ice-cream plants, milk and other liquid dairy products are usually transported from one point to another through pipe lines, the propelling impulse being provided by pumps. To avoid contamination by bacteria and dirt, the maximum of sanitary conditions must be maintained. This requires that all parts of the apparatus coming in contact with the milk or other material be sterilized at least daily. As a general rule, sterilization can be effected only by disassembling the apparatus; therefore, all parts thereof must be readily detachable, separable, and replaceable. These requirements and the advantages enumerated above are found in this invention, one form of which is illustrated by the drawing, which is a front elevation, partly in section, of a pump adapted for the propulsion of milk, or other liquids, to the shaft of which the packingless seal of this invention has been applied.

As shown, the pump consists of a housing 1, attached to any suitable fixed support 2 by means of studs 3 and wing-nuts 4. In the interior of housing 1 is a pump-chamber 5. The liquid, derived from a tank, or other source, enters the pump through inlet 7 and is discharged through outlet 8. The inlet side of the pump-housing consists of a removable plate 9 held tightly in position by a hinged yoke 10 and bolt and wing-nut 11. The impeller 6 is driven by shaft 12 connected to any suitable source of power (not shown). Shaft 12 before entering the pump-chamber also passes through a bearing 13 in housing 1. Preferably, the connection between shaft 12 and impeller 6 and also between shaft and the source of power is such that the impeller can be easily separated from the shaft and the shaft from the source of power. For example, as shown, both ends of shaft 12 are slotted, one end slipping over the impeller 6 and the other engaging with a suitable pin or key in the coupling between it and the source of power.

To prevent leakage through bearing 13 of the liquid being pumped, the bearing would ordinarily be provided with some sort of a packing. This is rendered unnecessary by this invention. Instead, the face 15 of bearing 13 is carefully formed, preferably by grinding smooth and at right-angles to the shaft 12. Shaft 12 is provided with a collar 17 which may be integral with the shaft or shrunk or pressed thereon, and permanently secured in position by a pin 16, or otherwise. The face 18 of the collar 17 is adapted to bear accurately against surface 15 of bearing 13. The opposite face of collar 17 is engaged by one end of a spring 19, the other end of which engages another collar 20 slidably mounted upon shaft 12. Pressure is maintained upon collar 20 in any suitable way so that through spring 19 collar 17 will be forced against bearing 13 with sufficient force to insure an adequate liquid seal between them. The means shown in the drawing for applying this pressure is a simple bushing 21 fixed to the bracket 2 and surrounding shaft 12.

With this construction not only is the bearing made liquid-tight without the use of the packing materials, but the pump with its shaft may be detached from its support by removing wing-nuts 4 and the shaft may be separated from the pump simply by pulling it out of bearing 13, which will also separate its end from impeller 6. On the other hand, impeller 6 can be disconnected from the shaft and the interior of the pump-chamber exposed by removing cover 9, which leaves the rest of the assembly undisturbed. Thus every part of the apparatus which can come in contact even remotely with the liquid being pumped can be separated from every other part for sterilization or other purpose, and can be reassembled by simply reversing the process.

Since collar 17 is fixed to shaft 12 and must, therefore, rotate with it, whereas bearing 13 is stationary, the collar 17 is self-seating so that if the seal between the two is not absolutely per-

fect at first, due to imperfections in manufacture, the seal will become perfect very shortly and will, thereafter, be automatically maintained. This will be assisted by making the bearing 13 of brass, cast iron, or other metal which is soft as compared with steel, which is the suggested material for collar 17. Any wear resulting from friction between the two surfaces is automatically taken up by spring 19, as will also be the case with respect to wear between the other collar 20 and bushing 21 and the surfaces engaged by spring 19.

Adequate lubrication prevents excessive wear between faces 15 and 18 of bearing 13 and collar 17, respectively, and is furnished by the liquid itself, which, since shaft 12 must be loose enough to turn freely in bearing 13, will creep along the shaft until it is stopped by collar 17 and then outwardly between faces 15 and 18. The amount of this seepage may be so small that no observable leakage occurs. Friction between faces 15 and 18 may also be maintained at a minimum by limiting the pressure of spring 19 to that required to maintain the above condition.

I claim:

A pump for milk and other dairy products, which includes a pump-housing attached to a support by manually-removable fastenings, an impeller chamber in said housing, a shaft bearing in one side of said housing, a shaft rotatably mounted in said bearing and projecting into said impeller chamber, an impeller in said chamber operably associated with the end of said shaft projecting thereinto, a manually-openable closure closing the other side of said housing, a sleeve attached to said shaft and making a substantially liquid-tight joint with the end of the bearing in said housing, another sleeve slidably mounted on said shaft and engageable at one end with said support, a spring surrounding said shaft and positioned under tension between said sleeves so as to urge said first-mentioned sleeve against the end of said bearing, and a coupling between said shaft and a source of motive power which will permit the shaft to be uncoupled from said source of power and from said impeller and to be removed from said pump housing when said pump housing is disconnected from the support.

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