Feb. 11, 1941. L. S. SHELDRICK ET AL 2,231,690

FLUID PUMP SEAL

Filed July 25, 1938 2 Sheets-Sheet 1

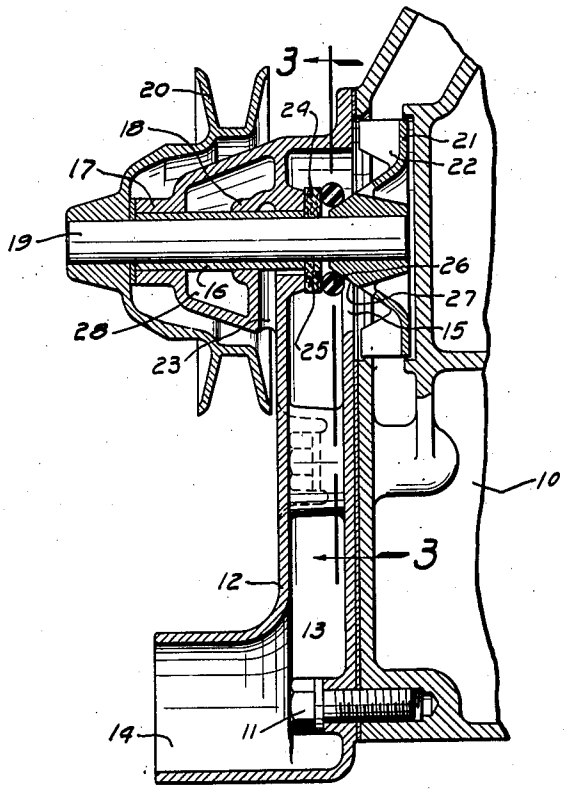

FIG. 2

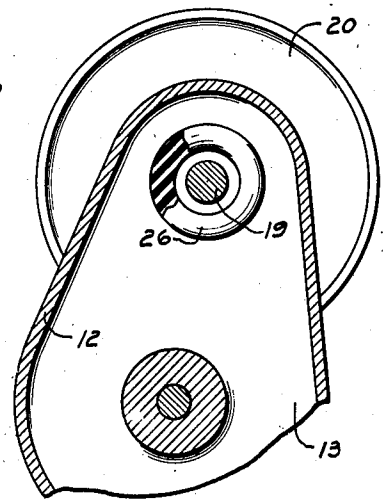

FIG. 3

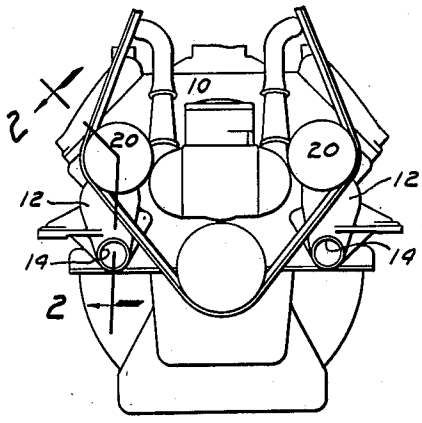

FIG. 1

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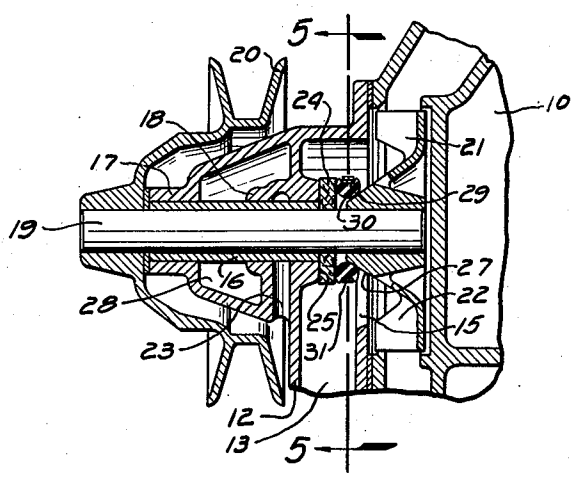

FIG. 4

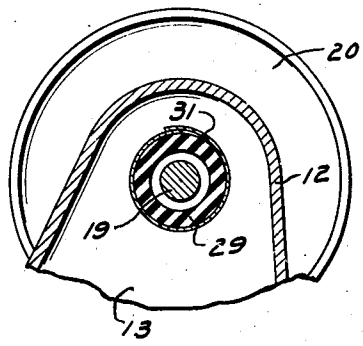

FIG. 5

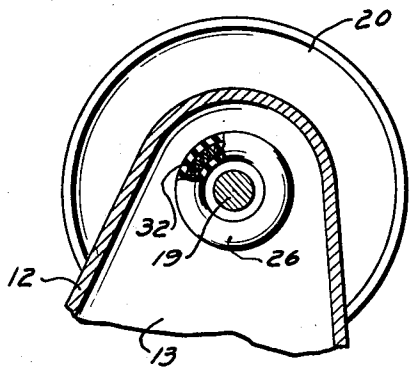

FIG. 6

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UNITED STATES PATENT OFFICE

2,231,690

FLUID PUMP SEAL

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Application July 25, 1938, Serial No. 221,118

1 Claim. (Cl. 286—7)

The object of our invention is to provide an improved pump seal especially adapted for use in connection with the water pumps which circulate the cooling fluid used in internal-combustion engines. Our improved seal is adapted for use in place of the conventional stuffing box or in place of other types of packless seals.

The advantage of this construction is that the seal is of simple, durable and inexpensive construction.

A further advantage of our improved construction is that the pump parts may be assembled by relatively unskilled labor and still the seal will be uniformly correct in operation.

With these and other objects in view, our invention consists in the arrangement, construction and combination of the various parts of our improved device, as described in the specification, claimed in our claims and illustrated in the accompanying drawings, in which:

Figure 1 is a front view of a V-type engine having water pumps equipped with our improved seals secured to the front ends of the cylinder blocks.

Figure 2 is a sectional view, taken on the line 2—2 of Figure 1.

Figure 3 is a sectional view, taken on the line 3—3 of Figure 2.

Figure 4 is a fragmentary sectional view, similar to Figure 2, showing an alternate construction.

Figure 5 is a sectional view, taken on the line 5—5 of Figure 4, and

Figure 6 is a sectional view, similar to Figure 3, showing still another alternate construction.

Referring to the accompanying drawings, we have used the reference numeral 10 to indicate the cylinder blocks of an internal-combustion engine. Our improved pumps are detachably secured to the front ends of the blocks 10 by means of a plurality of cap screws 11. Our pump comprises a housing 12 having a water intake passageway 13 cored therein which passageway extends the full height of the housing 12. The lower end of the housing 12 is provided with a cylindrical flange 14 formed thereon for the ready attachment of a hose from the vehicle radiator. The upper end of passageway 13 terminates in an opening 15 in the face of the housing which abuts the cylinder block, which opening is aligned with a similar opening in the wall of the cylinder block 10 so that water may circulate freely through the passageway 13, opening 15 and into the water jacket of the cylinder block.

A bushing 16 extends through the upper end of the housing 12, which bushing is in axial alignment with the opening 15. The ends of the bushing are mounted in bosses 17 and 18, respectively. A shaft 19 is rotatably mounted in the bushing 16 and projects from each end thereof, the outer end of the shaft having a pulley 20 fixed thereto while an impeller 21 is secured to the inner end of the shaft. The impeller 21 is adapted to rotate within an annular recess in the water jacket of the block 10, the impeller having radially extending blades 22 formed thereon, the edges of which closely abut the housing 12 around the opening 15. Thus, rotation of the shaft 19 causes fluid to be drawn through the passageway 13 and opening 15 and be discharged by the blades 22 into the water jacket of the cylinder block.

A drain 23 is formed in the boss 18 around the periphery of the bushing 16 so that any fluid which may have leaked through the fluid seal, which is about to be described, will flow from around the bushing out through the drain passageway 23. That portion of the housing between the bosses 17 and 18 forms a lubrication reservoir 28 and it is to prevent even small amounts of water from entering this reservoir that the drain passageway 23 is provided.

The fluid seal which forms the basis of this invention is interposed between the impeller 21 and the inner face of the boss 18. It will be noted that the inner face of the boss 18 and the inner end of the bushing 16 are machined to a flat radially extending surface 25 and that a carbon disc 24 is fitted over the shaft 19 in position abutting the surface 25. The side of the impeller 21 adjacent to the disc 24 is machined to a conical shape, as shown at 27. A toroidal shaped ring 26 of resilient rubber is interposed between the conical portion 27 of the impeller and the rear face of the carbon disc 24. The parts are so proportioned that when the inner side of the pulley 20 is abutting the boss 17, the conical end 27 will push the ring 26 against the adjacent side of the disc 24 and also tension the ring. When the ring 26 is under tension it attempts to move towards the left in Figure 2 to thereby urge the disc against the adjacent face of the boss 18. A unique feature of this construction is that the ring 26 serves not only to resiliently press the carbon disc against the boss 18 to form a fluid seal between these members, but also forms a seal between the outer face of the carbon disc and the conical end of the impeller. Thus,

fluid cannot enter around the shaft 18 from between the impeller and the disc 24.

The coefficient of friction between the impeller and the rubber ring 26 and between the disc 24 and the ring 26 is considerably greater than the coefficient between the disc 24 and the relatively smooth surface of the boss 18. The ring 26 is therefore used as a driving member to rotate the disc 24. In all other packless seals wherein a rubber member coacts with the rear face of the sealing disc and with the shaft to exclude water therebetween auxiliary driving means have been required to rotate the sealing disc. Further, in all of such constructions a spring was required to press the disc against the seat. The applicants, by the provision of a single toroidal shaped resilient ring, provide means for driving the carbon disc, means for sealing the space between the disc and the impeller, and means for urging the disc against the radial sealing surface to thereby materially reduce the cost of the structure.

It may be well to mention that the cost of this fluid seal is still further reduced because of the elimination of driving teeth heretofore required on such seals. The full area of the applicants' carbon disc is used as the sealing surface. The carbon used in such discs is relatively expensive so that the saving thus accomplished is material.

A further advantage results in that the pump can be assembled in less time than other types of pumps. To assemble, it is only necessary to fasten the impeller to the shaft and then, with the ring 26 and disc 24 loosely mounted thereon, to insert the shaft through the bushing 16 and fasten the pulley in place. No adjustment is required.

Referring to Figure 4, we have shown an alternate form of our invention in which an auxiliary spring is used to assist in tensioning the toroidal ring member. The ring member is shown by numeral 29 from which it will be seen that a flat bottomed groove 30 is molded around the periphery of the ring. A spring 31, formed of flat clock spring wire, is snapped into place in the groove 30, the ends of which spring overlap to resiliently augment the tension of the rubber of the ring.

In Figure 6, we have shown still another form of toroid in which a coil spring 32 is molded within the rubber to assist in tensioning the member.

Some changes may be made in the arrangement, construction and combination of the various parts of our improved device without departing from the spirit of our invention and it is our intention to cover by our claims such changes as may reasonably be included within the scope thereof.

We claim as our invention:

A fluid seal especially adapted to seal the joint between a rotating shaft and a stationary housing, said shaft having a rotor fixed thereon in position adjacent to said housing, and said rotor having a cone shaped surface thereon positioned with its small end adjacent to said housing, a flat carbon disk loosely mounted upon said shaft between said impeller and said housing, one flat face of said disk coacting with a corresponding face on said housing to form a seal therebetween, and a toroidal shaped ring of resilient rubber interposed between the other face of said carbon disk and said cone, said ring being so expanded by said cone that it is moved bodily in an axial direction against the adjacent flat face of said disk so as to urge said disk against said housing, for the purpose described.

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