

June 21, 1955

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2,711,136

SEAL

Filed June 2, 1947

Fig. 1

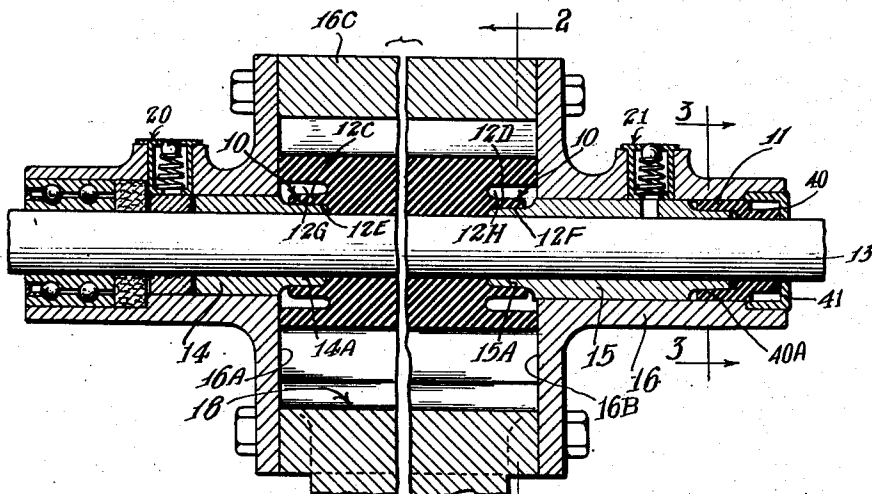


Fig. 2

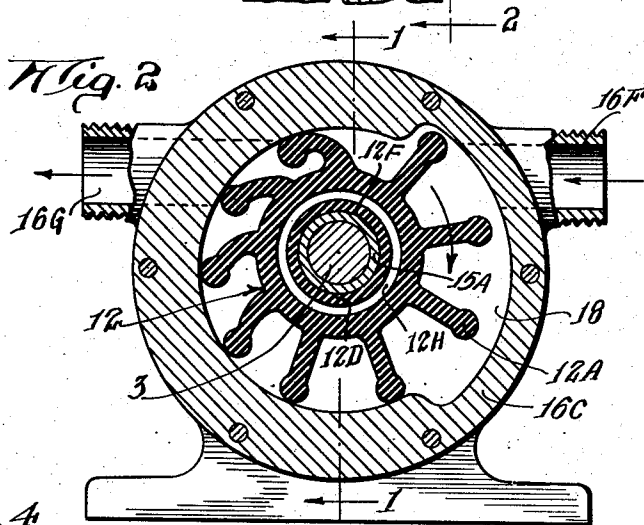


Fig. 4

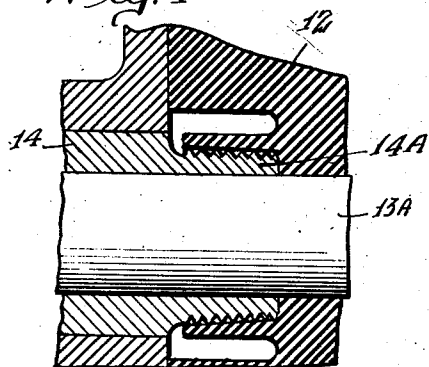
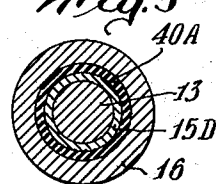


Fig. 3



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2,711,136

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Application June 2, 1947, Serial No. 751,771

9 Claims. (Cl. 103—117)

The present invention relates to seal structures particularly useful in rotary pumps of the type shown in my copending application Serial Number 710,210 filed November 15, 1946 now Patent Number 2,599,600.

An object of the present invention is to provide an improved seal structure characterized by its simplicity and inexpensiveness of manufacture and by the small number of elements necessary.

Yet another object of the present invention is to provide an improved sealing arrangement in rotary pumps of the type utilizing a resilient rotary member in which the rotary element itself and the bushing upon which the rotary element rotates is arranged to provide a seal of effectiveness increasing in proportion to the active fluid pressure tending to cause leakage of the fluid past the bushing.

Still another object of the present invention is to provide an improved rotary pump having a novel seal between its rotary shaft and housing.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a longitudinal sectional view of a portion of a pump embodying the present invention taken substantially on the line 1—1 of Figure 2.

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

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 1.

Figure 4 is a view showing a modified arrangement.

In accordance with the present invention, a novel shaft seal 10 is applied at both the right hand and left hand ends of the rotary pump shown in Figure 1, there being another seal 11 also embodying the present invention at the right hand end of the machine shown in Figure 1.

The present invention is particularly applicable in rotary pumps of the type in which a multi-fingered or multi-vaned resilient rotary member 12 is affixed to a rotary shaft 13 which is journaled for rotation in the bushings 14 and 15 stationarily mounted in the housing 16. The rotary member 12, cooperating side walls 16A, 16B and circular enclosing member 16C is arranged to pump fluid entering at 16F passing through the internal cavity 18 and leaving at 16G the resilient rotary member 12 being arranged to snugly engage the side walls 16A, 16B and the vanes 12A being arranged to engage the inner wall of encircling member 16C.

While I have shown in Figure 2 the rotary member 12 with its fingers or vanes 12A cooperating with the inner surface of the encircling member 16C in the form shown in my copending application Serial Number 710,210 now Patent Number 2,599,600, these fingers or vanes 12A may cooperate with the inner surface of the housing 16 in other conventional manners, as is well understood

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in this art. The particular coaction of the fingers or vanes 12A with the end members 16A, 16B or encircling member 16C form, per se, no part of the present invention, the invention being in the seals 10 and 11.

5 The resilient rotary member 12 which may be of rubber and preferably of neoprene is fastened to the rotary shaft 13 either mechanically by a pin passing therethrough or by bonding thereto in which cases the member 12 rotates with the shaft 13.

10 The shaft 13 is rotatably mounted in the bushings 14 and 15, each of which has a portion 14A, 15A thereof of reduced diameter extending inwardly into the chamber 18 for cooperative engagement with the resilient rings 12C and 12D integrally formed with the rotor 12. Preferably, these resilient rings 12C and 12D are within the confines of the general outline of the rotor 12, with an annular space 12E, 12F below the rings 12C and 12D, respectively, for the insertion therein of the bushing noses 14A and 15A; and, annular openings 12G and 12H on the outside of the resilient rings 12C and 12D, respectively, are provided to allow movement of the rings 12C and 12D upwardly therein when the noses 14A and 15A are inserted into the restricted openings 12E and 12F in the assembling operation, after which these resilient rings 12C and 12D are pressed firmly by fluid pressure within spaces 12G and 12H onto the stationary noses 14A and 15A to thereby provide a good seal. It is noted that in order for fluid to leak out between the rotary member 12 and bushing 14, it is necessary that the flow of fluid reverse its direction and also that the greater the pressure of fluid within the spaces 12G and 12H tending to cause such leakage, the greater is the engagement between the annular rings 12C and 12D and bushing noses 14A and 15A, respectively.

35 Preferably, as shown in Figure 4, each one of the noses 14A, 15A has a diameter decreasing with its distance into the rotor 12 and is provided with serrations to reduce the amount of frictional resistance set up between the rotor 12 and the respective nose 14A and 15A when and as the rotor 12 rotates and to simultaneously increase the effectiveness of the seal thus provided.

The shaft 13 may be lubricated in conventional manner by the provision of conventional oilers 20 and 21 arranged to provide the flow of lubricating oil therefrom to a space 45 between the inner circular wall of bushings 14, 15 and the rotary shaft 13. The film of oil between the shaft 13 and bushings 14, 15 serves also, to a certain extent to prevent the leakage of fluid from the interior 18 of the pump.

50 As explained previously, the annular rings 12C and 12D serve to provide increased pressure on the noses 14A, 15A respectively, in response to the increased pressure in the annular spaces 12G and 12H. In the event that the pressure within the annular space 12G and 12H is subatmospheric, it may be desirable to provide the supplementary seal 11 which comprises in similar manner an annular resilient sealing member 40 of rubber or preferably neoprene firmly secured to the shaft 13 with its integrally formed ring 40A resiliently pressing the nose 15D of bushing 15. The annular member 41 pressed within the housing 16 is stationarily mounted thereon and serves as a dust shield.

While I have shown the bushings 14 and 15 as elements distinct from the housing 16, these are all stationarily mounted together and it is evident that the bushing noses 14A, 15A may comprise integrally formed annular members of the housing 16 itself.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended

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claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. In combination, a rotary pump having a housing defining a pump chamber, a resilient rotor of deformable material in said chamber and cooperating with the internal walls of the pump housing to deform said material and to pump fluids, conduit means in said housing and in communication with said chamber and forming an inlet therefor, bushing means in said housing having a sleeve portion extending into said resilient rotor, a shaft mounting said resilient rotor and rotatably supported in said bushing means, said rotor having an inner circular resilient ring of deformable material defined by an annular recess in said rotor, said ring being in resilient engagement with said sleeve portion, said ring encircling said sleeve portion and being deformed when in engagement with said sleeve portion to provide a seal therewith, said rotor and said housing providing a leakage means from said chamber into said annular recess so that fluid pressure from said chamber is exerted on said ring to increase the effectiveness of said seal.

2. The arrangement set forth in claim 1, in which the said sleeve portion has a diameter decreasing with its distance into the resilient rotor.

3. The arrangement set forth in claim 1 in which said sleeve portion has a diameter decreasing with its distance into said ring and said sleeve portion has peripheral serrations thereon for engagement with said ring.

4. In a pump structure, the combination comprising: a pump having a housing defining a pump chamber, a rotary resilient pumping element of deformable material in said chamber and cooperating with internal walls of the housing to be deformed thereby, bushing means in said housing, a shaft mounting said pumping element and rotatably supported in said bushing means, conduit means in communication with said chamber and forming an inlet therefor, said bushing means having a circular projection extending into said resilient pump element, and encircled by said element to deform said material radially outwardly and to thereby be resiliently engaged said resilient pumping element having an annular recess concentric with that portion encircling the projection of said bushing means, said resilient pumping element and said housing providing a leakage means from said chamber into said annular recess to increase the effectiveness of the seal between said bushing and encircling portion.

5. The arrangement set forth in claim 4, in which said circular projection has a diameter decreasing with its distance into the rotary pumping element.

6. In a pump, a resilient rotor element of deformable material having two circular radially spaced grooves therein, said grooves being concentrically arranged about the rotational axis of said element to define a deformable

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sealing ring therebetween, a pump housing with inner walls cooperating with said rotor element and defining a pump chamber, conduit means in said housing in communication with said chamber and forming an inlet therefor, said housing having bushing means extending therein, a shaft mounting said rotor element and journaled in said bushing means, and said bushing means extending into the innermost one of said circular grooves in concentric relationship to contact and to deform said ring radially outwardly and form a seal therewith, and leakage means extending from said chamber to the outermost of said grooves so that pressure developed in said chamber may be exerted through said leakage means to said ring to increase the effectiveness of said seal.

7. The arrangement set forth in claim 6, in which said bushing means has a diameter decreasing with its distance into said ring.

8. In a pump, a resilient rotary element of deformable material having formed therein two circular radially spaced grooves which are concentrically arranged about the axis of rotation of the element to define an annular deformable ring between said grooves, a housing having internal walls cooperating with said rotary element and defining a pump chamber, conduit means in said housing in communication with said chamber and forming an inlet therefor, means mounting said rotary element for rotation within said housing, said means including bushing means extending concentrically into the innermost one of said grooves to contact and to deform said ring radially outwardly and form a seal therewith, said resilient rotary element and said housing providing a leakage means from said chamber into the outermost of said circular grooves so that fluid pressure from said chamber is exerted on said sealing ring to increase the effectiveness of the seal.

9. The arrangement set forth in claim 8, in which said bushing means has a diameter decreasing with its distance into said ring.

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