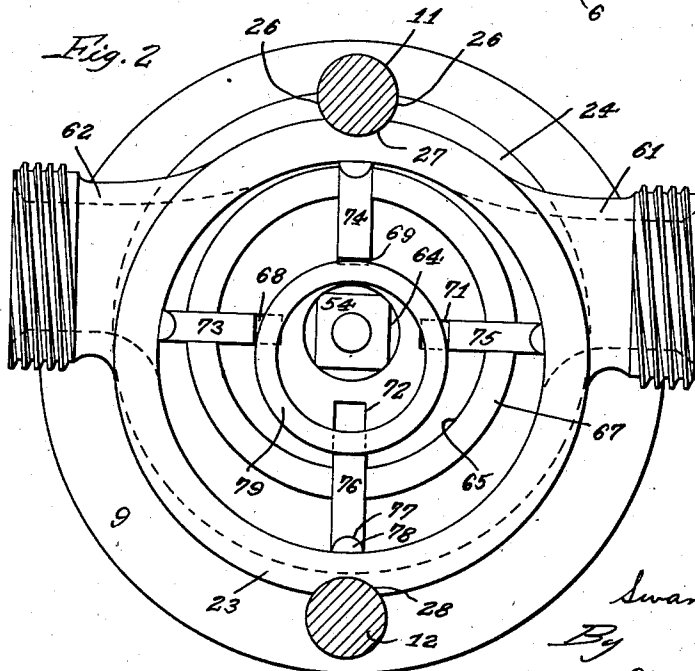
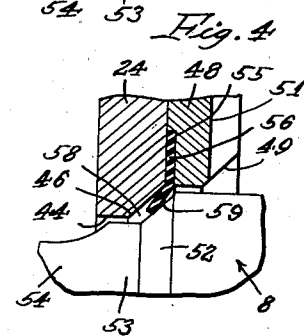
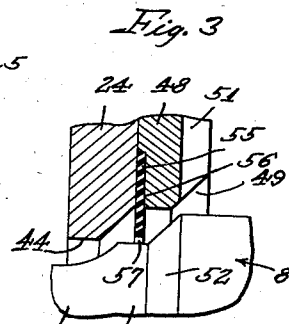
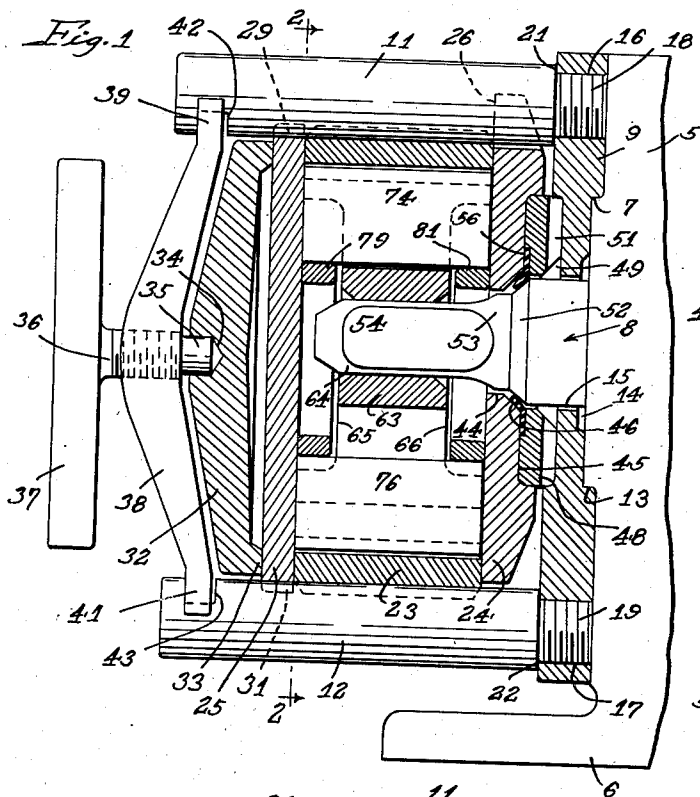


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PUMP AND SEAL THEREFOR

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PUMP AND SEAL THEREFOR

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7 Claims. (Cl. 103—218)

This invention relates to pumps of the general class known as sanitary pumps designed primarily for use in connection with foods, such, for example, as ice cream, cream, milk, candies and the like, and further relates to the combination therewith of a seal for sealing the interface around the driving shaft.

An object of the invention is the provision of a sanitary pump of generally improved structural characteristics in which, among other advantages, the parts are shaped and assembled for easy dismantling and cleaning, and wherein the parts are susceptible of convenient sterilization. The construction is further so arranged that the parts are held in rigid assembled relationship by quick releasable clamp means, the pump cylinder and the cylinder heads constituting separate elements of the pump and being assembled on a frame between spaced bars.

Another object of the invention is the provision in a pump or the like of an improved seal construction for preventing the egress of liquid along the driving shaft, which is easily assembled and disassembled, can be re-used repeatedly, and which provides a simple yet effective seal.

Other objects and advantages will appear from the following description and the accompanying drawing, in which—

Figure 1 is a vertical section longitudinally through the pump;

Fig. 2 is a view taken on the line 2—2 of Figure 1; and

Figs. 3 and 4 are enlarged fragmentary sections showing the manner in which the elements of the seal are brought into operative relationship.

The embodiment of the invention herein shown includes a support designated generally by the numeral 5 having a base 6 for attachment of the pump to a suitable supporting construction such as a table or floor, though it will be recognized that this pump support may equally well be the gear casing of a geared motor or the like. The support 5 in this instance has a boss 7 positioned thereon through which a driving shaft 8 projects in a concentric fashion. Positioned against the support 5 is a plate 9 forming part of a frame structure which includes the plate 9 and spaced parallel disposed rods 11 and 12. The plate 9 has a recess 13 for reception of the boss 7 in locating arrangement, and likewise has a recess 14 around the shaft 8 and an opening 15 for the passage of the shaft 8. The plate 9 also has threaded openings 16 and 17 into which threaded reduced ends 18 and 19 of the rods 11 and 12

are received, the rods being threaded therein until shoulders 21 and 22 thereof seat against the outer face of the plate 9 so as to produce a rigid frame structure. The plate 9 is attached to the support 5 in any suitable manner.

Disposed between the rods 11 and 12 and against the outer face of the plate 9 is a pump housing or casing comprising a pump cylinder 23 and cylinder heads 24 and 25 seated in metal-to-metal contact against the opposed ends of the cylinder. The head 24 is, in this instance, circular in shape, though this is by no means essential, and has a semi-circular notch in its upper edge providing upstanding ears 26 between which the rod 11 of the frame is received. In other words, the head member is slid into the space between the rods 11 and 12 with the rod 11 received in the notch so that the ears 26 locate the head against rotation. Likewise, the cylinder 23 is in this instance substantially cylindrical in configuration and has arcuate grooves 27 and 28 at its upper and lower sides for reception of the arcuate faces of the rods 11 and 12 as best shown in Fig. 2, so that these interfitting shape characteristics prevent rotation of the cylinder with respect to the frame. In a similar manner the cylinder head 25 has arcuate grooves 29 and 31 at its opposite sides to interfit with the rods 11 and 12 in a similar manner so as to prevent relative rotation. It will be seen that these interfitting shape characteristics permit of assembly and disassembly of the housing by sliding the parts longitudinally with respect to the rods 11 and 12, and when the parts are thus disassembled, the cylinder heads and the cylinder constitute parts of simple configuration free of sharp inside corners within which food may lodge and from which it is removed only with difficulty.

The pump casing is held in assembled relationship by an end member 32 in the form of a disk having an annular rim 33 adapted to bear against the cylinder head 25 adjacent its periphery to apply a compressive force thereagainst in the area opposite the end of the cylinder 23. The end member 32 has a centrally disposed opening 34 for the reception of the end 35 of a screw 36, the screw having a relatively long transverse bar 37 at its ends and passing through a clamp bar 38, which clamp bar has ends as shown at 39 and 41 seated in slots 42 and 43 disposed adjacent the ends of the rods 11 and 12. The clamp bar 38 and the slots 42 and 43 are so arranged that when the screw 36 is backed out of the opening 34 a distance such as to relieve the pressure on the elements of the casing, the bar can be rotated

transversely with respect to the frame rods 11 and 12 so as to move the clamp bars out of the slots and thus remove the bar and the end member from the frame for the subsequent removal of the casing elements. Likewise when the screw is rotated in the opposite direction, pressure is applied between the various elements slidably supported on the rods 11 and 12 so as to compress the elements therebetween and seal the junction between the cylinder and the cylinder heads.

The cylinder head 24 has a central opening 44 and a recess 45 disposed annularly thereof, the two being joined by a conical face 46. Likewise the plate 9 has a recess 47 opposite the recess 45, these two recesses serving for the reception of a disk 48, the disk having an opening for the passage of the shaft 8 and having a conical counterbore 49 facing the plate 9. Radiating from the center of the plate are a plurality of grooves 51 of slightly greater depth than the depth of the recess 47 so as to provide points of communication between the conical opening 49 around the shaft and the atmosphere. The disk 48 is of slightly greater thickness than the sum of the depths of the recesses 47 and 45 so that the grooves 51 communicate with the atmosphere in the space between the cylinder head 24 and the plate 9. The shaft 8 has a frusto-conical shoulder 52 opposite the conical portion 46, the diameter of the shaft stepping down to a portion 53 of smaller diameter, which in turn terminates in a squared portion 54, the portion 53 normally occupying the space in the opening 44 of the cylinder head 24. The disk 48 has a recess 55 in the face thereof extending annularly of the central opening therein for the reception of a washer 56, which washer has a central opening 57 for the passage of the portion 53 of the shaft, as best shown in Fig. 3, the opening 57 being of such size that the washer extends into the space between the shaft and the surrounding parts. The depth of the annular recess 55 is such as to confine the washer between the disk 48 and the cylinder head 24, as will be apparent from Figs. 3 and 4. This washer is preferably of synthetic rubber such as Neoprene, and its flexibility is such as to be relatively stiff, and to resist distortion. From Figs. 3 and 4 it will be seen that the opening 44 and the surface 46 of the cylinder head is such as to leave a substantial amount of clearance as indicated at 58 in Fig. 4, and the space characteristics of the parts are such that when the cylinder head 24 and the disk 48 are moved into seated position against the plate 9, the frusto-conical portion 52 of the shaft is disposed in substantially coaxial relationship with the surface 46 and in spaced relation thereto, and so that the washer is distorted sidewise as indicated at 59 in Fig. 4 so that the inner edge thereof wipes against the frusto-conical portion 52 of the shaft. In this manner the interface between the shaft and the openings through which it passes is sealed against the egress of liquid from within the cylinder chamber, the effect appearing to be that the pressure of the material within the pump against the inner face of the washer portion 59 urges this portion against the frusto-conical portion 52, thus effectively sealing the pump at this point. However, in case leakage should occur past the seal, the radial grooves 51 permit the material passing the seal to be discharged into the atmosphere and not pressed back through the opening 15 into the bearings and other portions of the pump.

The cylinder 23 has inlet and outlet connections 61 and 62, in this instance integral with the cylinder, the ports or connections being threaded as shown for attachment of conduits for supplying liquid to and from the interior of the cylinder. Disposed within the cylinder is a rotary vane type impeller, in this instance comprising a web having a central or hub portion 63 provided with a squared interior opening 64 for reception on the squared portion 54 of the shaft to establish driving relationship with the shaft, centrally disposed recesses 65 and 66 on opposite ends of the web and an outer rim portion 67 of substantially lesser diameter than the internal diameter of the cylinder 23, the web being disposed eccentrically with respect to the cylinder as best shown in Fig. 2. The web is in this instance provided with four longitudinally extending slots at its periphery at 68, 69, 71 and 72 disposed substantially at 90° with respect to each other for the reception of vanes 73, 74, 75 and 76 adapted to slide in and out of the slots with rotation of the web to accomplish the pumping operation. The vanes are each provided with a longitudinally disposed groove 77 at its outer end for the reception of a rocker member 78, the inner side of which has a curvature corresponding to the curvature of the groove 77, and the outer surface of which has a curvature corresponding to that of the inner surface of the cylinder to facilitate the sealing of the vanes against the inner surface of the cylinder. The vanes and the outer portion 67 of the web are of a length such as to span the space between the cylinder heads 24 and 25 so that sealing of the pump occurs between the cylinder heads and the ends of these elements, as will be apparent from Figure 1. The vanes are held in sealing engagement with the inner surface of the cylinder by means of rings 79 and 81 disposed in the recesses 65 and 66 and bearing against the inner edges of the vanes adjacent their opposite ends, as best shown in Figure 1. In this particular instance the web and the rockers 78 are preferably formed of synthetic resin, such, for example, as that sold under the trade name of "Micaarta," whereas the vanes 73 to 76 and the rings 79 and 81, together with the remainder of the pump structure, is preferably made of a non-corrosive metal such as the so-called Monel metal or stainless steel.

In operation it will be seen that rotation of the shaft 8 in the conventional manner rotates the web and causes the vanes to move over the inner surface of the cylinder, thereby moving fluid from one of the ports 61 or 62 into the other port. In order to disassemble the pump, the operator simply rotates the handle 37 to loosen the screw from the plate 32 and thereupon rotates the bar 38 to remove the ends 39 and 41 from the slots 42 and 43. Thereupon the plate 32 is loosened from the frame and is withdrawn from between the rods 11 and 12. Thereafter the cylinder head 25, the cylinder 23 and the cylinder head 24 are slid longitudinally of the rods 11 and 12 free of the frame and of the shaft 8. The web, the vanes, the rings, and the rocker 78 then fall into disassembled relationship when the web is slid out of the cylinder 23, thus completing the disassembly of the pump and reducing the same to a plurality of parts of simple configuration for washing and sterilization. A reversal of the operation serves to reassemble the pump.

I claim:

1. The combination in a sanitary pump of a 75 frame comprising a plate and spaced parallel

disposed rods projecting from one side thereof, said plate having an opening for the passage of a shaft therethrough, a pump casing disposed between said rods and against said plate comprising a pump cylinder and a separate cylinder head positioned against each end of said cylinder in abutting relationship therewith, one of said heads adjacent said plate having an opening for the passage of said shaft, said casing having inlet and outlet ports communicating with the interior of said cylinder, said cylinder and heads and said rods having key and slot connections therebetween for assembly by sliding said cylinder and said heads longitudinally of said rods into position against said plate and for preventing rotation of said cylinder and said heads, an end member having peripheral engagement against the other of said heads, a clamp acting between said rods and said end member to press said cylinder and said heads into assembled relationship against said plate, a shaft passing through the openings in said plate and said one of said heads, and a rotary vane type impeller in said casing driven by said shaft for moving material therethrough.

2. The combination in a sanitary pump of a frame comprising a plate and spaced parallelly disposed rods projecting from one side thereof, said plate having an opening for the passage of a shaft therethrough, a pump casing disposed between said rods comprising a pump cylinder and separate cylinder heads positioned against the ends of said cylinder in abutting relationship therewith, one of said heads having an opening for the passage of said shaft, said casing having inlet and outlet ports communicating with the interior of said cylinder, said cylinder and heads and said rods having key and slot connections therebetween for assembling by sliding said cylinder and said heads longitudinally of said rods into assembled position therebetween and for preventing rotation of said cylinder and said heads, a spacing member disposed between said plate and said one of said heads having an opening for the passage of said shaft, said plate and said head having means for locating said spacing member in concentric relationship with said shaft, said spacing member having drainage grooves disposed adjacent said plate for the drainage of material leaking from said pump around said shaft, an end member having peripheral engagement against the other of said heads, a clamp acting between said rods and said end member to press said cylinder, said heads and said spacing member into assembled relationship against said plate, a shaft passing through said openings in said plate, said spacing member and said one of said heads, and a rotary vane type impeller in said casing driven by said shaft for moving material through the pump.

3. The combination in a pump of a pump casing having an end wall, said end wall having a bore and a counterbore connected by a sloping annular wall, a shaft projecting through said bore, said shaft having a portion of smaller diameter disposed in said bore, a portion of larger diameter disposed in said counterbore, and a sloping shoulder complementary to said annular wall, and a normally flat washer of stiff gasket material having an opening for the passage of said portion of said shaft of smaller diameter secured at its outer margin at the junction between said counterbore and said sloping annular wall, the portion of said washer adjacent said shaft being conically

flexed by contact of said sloping shoulder thereagainst and angularly disposed thereby into the space between said wall and said shoulder, the corner of the washer at the edge of said opening bearing against said shoulder by its inherent stiffness to prevent the egress of liquid along said shaft.

4. The combination in a pump of the type having a pump casing comprising a pump chamber and an end wall having an outer surface with respect to said chamber, said end wall having a bore communicating with the pump chamber of a seal structure comprising a sloping annular wall disposed between said bore and the outer surface of said end wall, a disk positioned against the outer surface of said end wall, said disk having a bore of larger diameter than the bore of said end wall, a shaft disposed in said bores and projecting into said chamber, said shaft having a portion of larger diameter positioned in the bore in said disk, a portion of smaller diameter disposed in the bore of said end wall, and a sloping shoulder connecting said portions, said shoulder being complementary to said sloping annular wall, and a normally flat washer of stiff gasket material having an opening for the passage of said shaft portion of smaller diameter secured at its outer margin between said end wall and said disk and projecting into the bore of said disk, the size of said opening being so proportioned with respect to the size of said shoulder that the portion of said washer adjacent said shaft is annularly flexed by said shaft into the space between said shoulder and said sloping annular wall with the angular junction between the side of said washer and said opening bearing against said shoulder to seal the opening between said shaft and said end wall against the egress of liquid.

5. The combination recited in claim 2 wherein the opening in said head is of smaller diameter than the opening in said spacing member, said head having an outwardly flared connecting wall between the opening in said head and the opening in said spacing member, and wherein said shaft has a portion of larger diameter received in the opening of said spacing member, a portion of smaller diameter in said smaller opening, and a connecting shoulder complementary to said connecting wall, and a washer of stiff gasket material having an opening for the passage of said shaft portion of smaller diameter secured at its outer margin between said one of said heads and said spacing member, the portion of said washer adjacent said shaft being angularly displaced into the space between said wall and said shoulder to seal the space around said shaft.

6. The combination in a sanitary pump of a frame comprising a plate and spaced parallelly disposed supporting members projecting from one side thereof, said plate having an opening for the passage of a shaft therethrough, a pump casing disposed between said supporting members comprising a pump cylinder and separate cylinder heads positioned against the ends of said cylinder in abutting relationship therewith, one of said heads having an opening for the passage of said shaft, said casing having inlet and outlet ports communicating with the interior of said cylinder, said cylinder and heads and said supporting members having key and slot connections therebetween for assembling the same together by sliding said cylinder and said heads longitudinally of said supporting members into assembled position therebetween and for

preventing rotation of said cylinder and said heads, a spacing member disposed between said plate and said one of said heads having an opening for the passage of said shaft, sealing means secured between said one of said heads and said spacing member to seal the interface between said shaft and said openings, said plate and said spacing member being shaped in the contacting areas thereof to provide at least one groove for the passage of liquid leaking past said seal outwardly to the atmosphere from around said shaft, an end member having peripheral engagement against the other of said heads, a clamp acting between said support members and said end member to press said cylinder, said heads and said spacing member into assembled relationship against said plate and to confine said sealing means in located position therebetween, a shaft passing through said openings in said plate, said spacing member and said one of said heads, and a rotary vane type impeller in said casing driven by said shaft for moving materials through the pump.

7. The combination in a sanitary pump of a frame comprising a plate and spaced parallelly disposed supporting members projecting from one side thereof, said plate having an opening for the passage of a shaft therethrough, a pump casing disposed between said supporting members comprising a pump cylinder and separate cylinder heads positioned against the ends of said cylinder in abutting relationship therewith, one of said heads having an opening for the

passage of said shaft, said casing having inlet and outlet ports communicating with the interior of said cylinder, said cylinder and heads and said supporting members having key and slot connections therebetween for assembling the same by sliding said cylinder and said heads longitudinally of said supporting members into assembled position therebetween and for preventing rotation of said cylinder and said heads, a spacing member disposed between said plate and said one of said heads having an opening for the passage of said shaft, sealing means secured between said one of said heads and said spacing member, said plate being shaped to provide locating abutment for said spacing member in concentric relationship with said shaft, said spacing member having a plurality of grooves on the face thereof abutting said plate for draining from the interface between said shaft and said openings any fluid leaking past said sealing means, an end member having peripheral engagement against the other of said heads, a clamp acting between said support members and said end members to press said cylinder, said heads and said spacing member into assembled relationship against said plate and to compress said sealing means therebetween, a shaft passing through said opening in said plate, said spacing member and one of said heads, and a rotary vane type impeller in said casing driven by said shaft for moving material through the pump.

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