

June 9, 1964

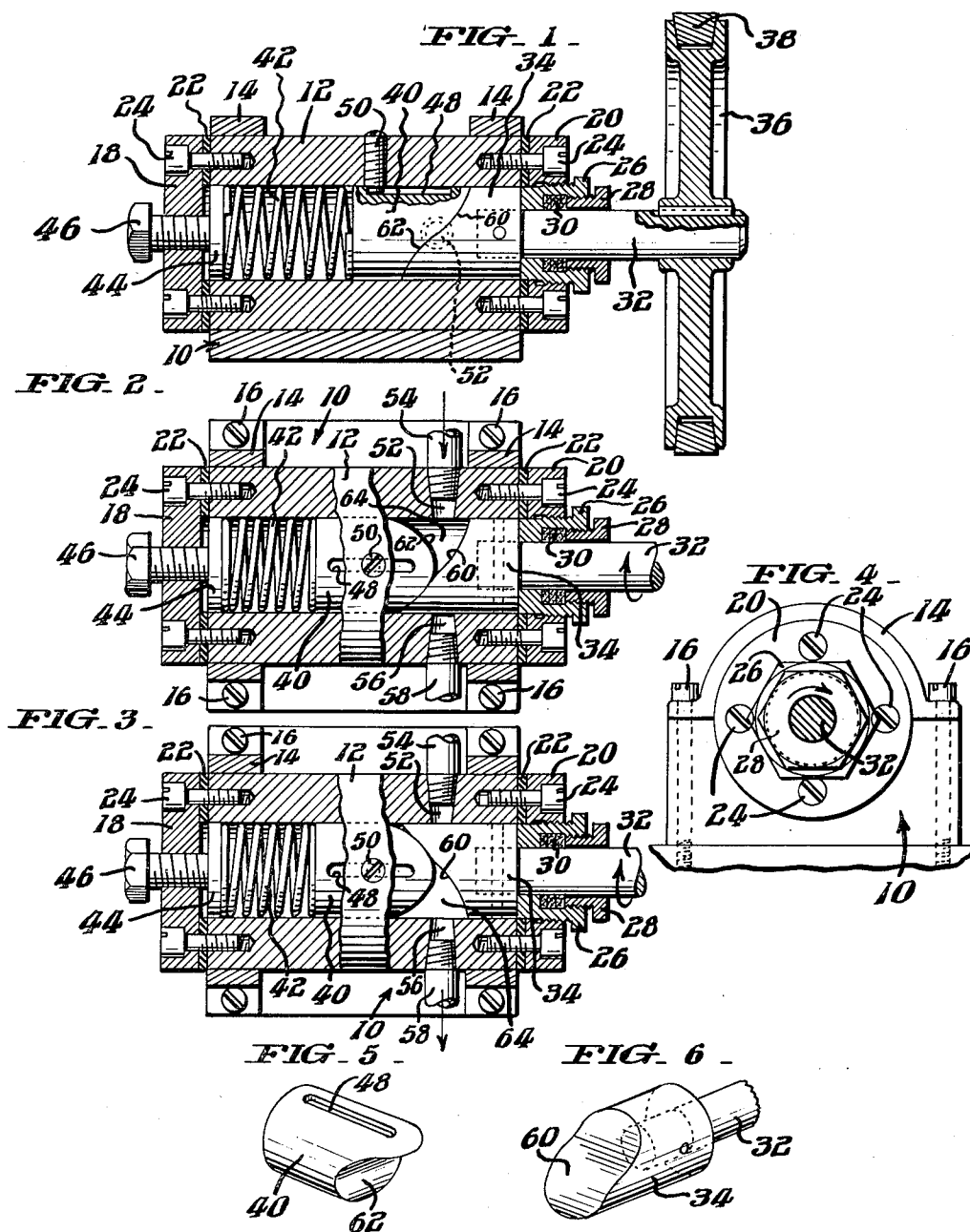
V. VON PLATO

3,136,255

ROTARY PUMP

Filed Feb. 7, 1962

4 Sheets-Sheet 1



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FIG. 7-

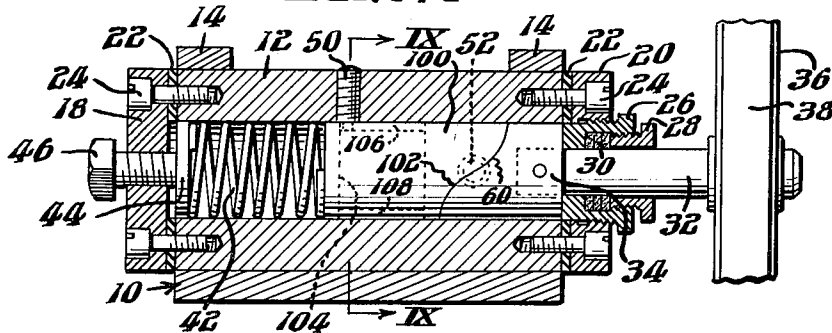


FIG. 9 -

FIG. 10 -

FIG. 8 -

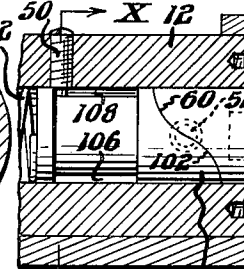
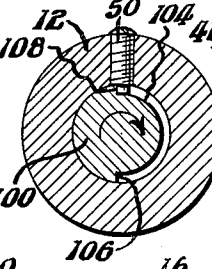
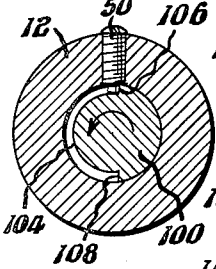


FIG. 11 -

FIG. 13 -

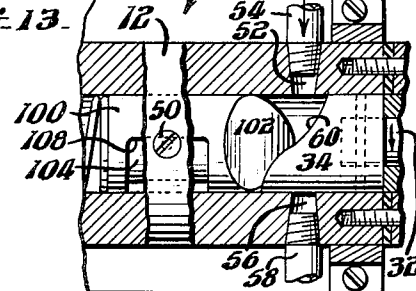
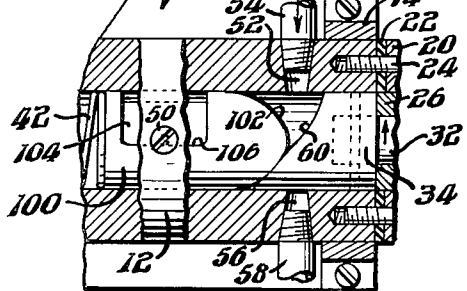


FIG. 12 -

FIG. 14 -

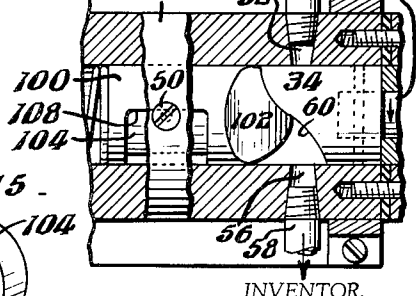
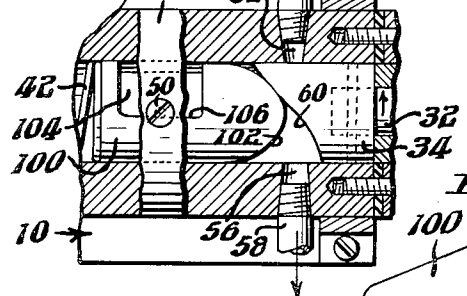
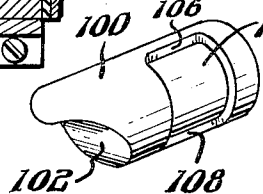


FIG. 15 -



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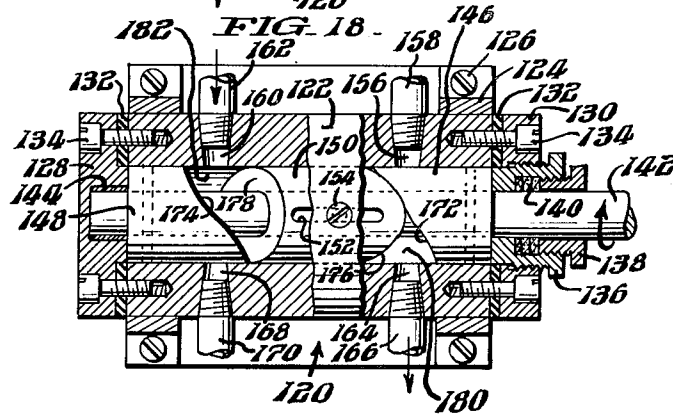
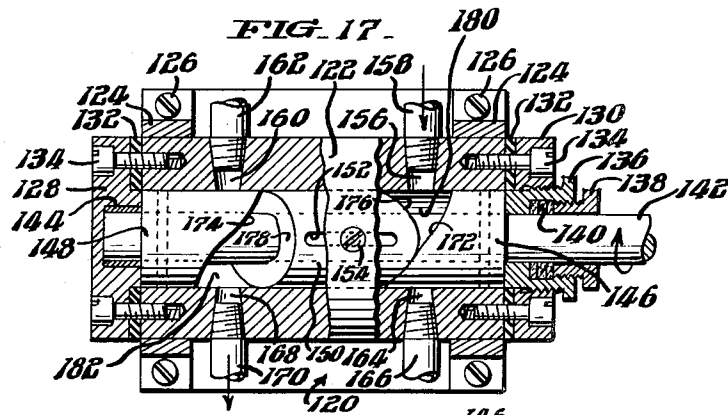
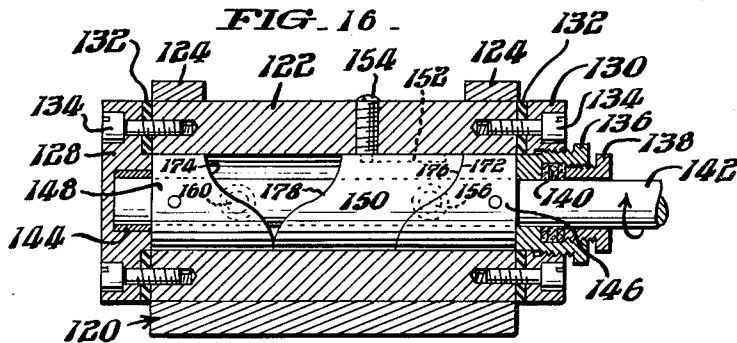
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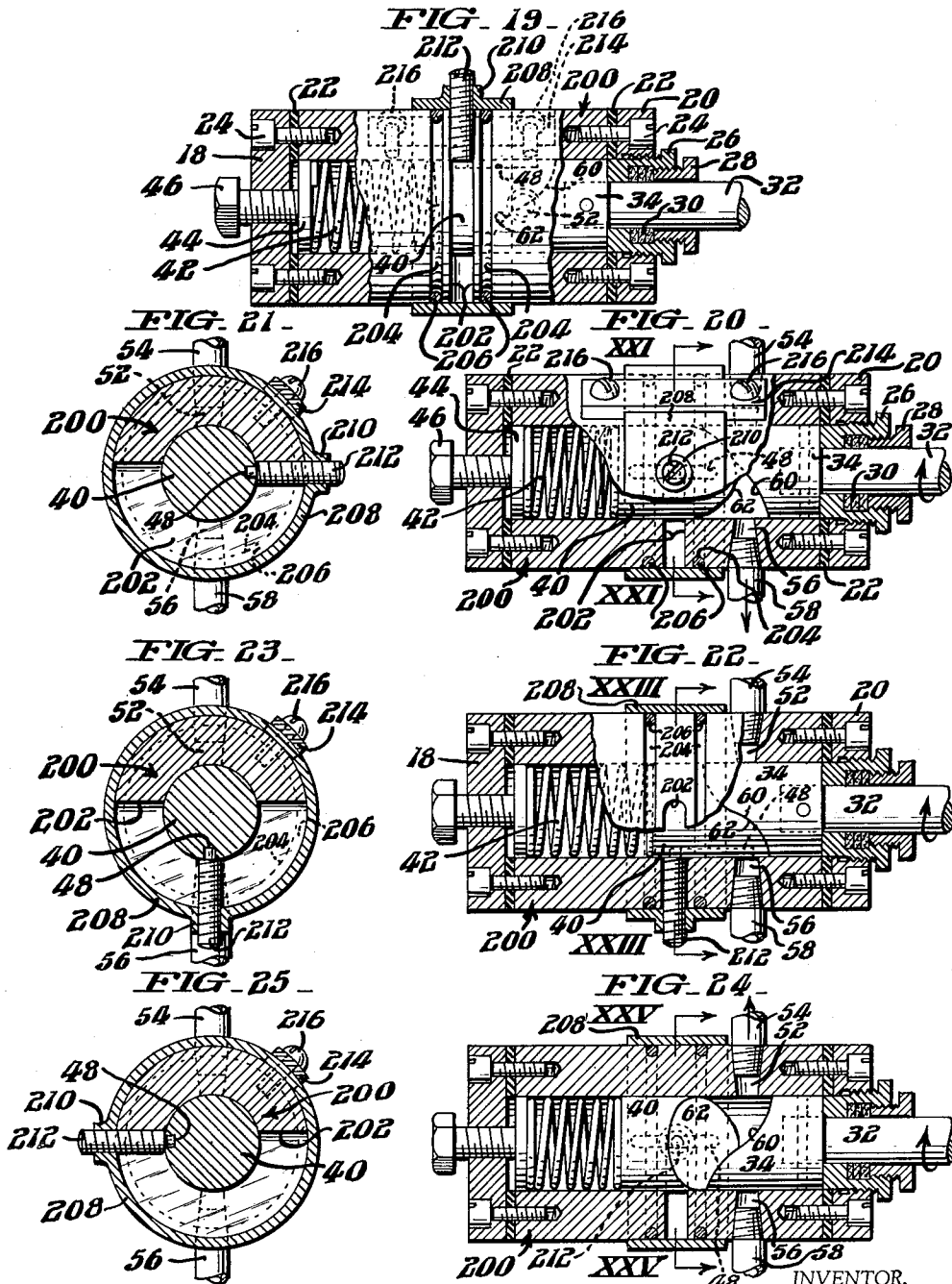
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4 Sheets-Sheet 4



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ROTARY PUMP

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1 Claim. (Cl. 103—3)

This invention relates generally to fluid pumps, and particularly to improvements in rotary fluid pumps.

A principal object of the invention is to provide a rotary fluid pump which maintains a constant discharge pressure under ordinary operating conditions.

Another object is to provide such a pump wherein the discharge pressure may be selectively varied during operation of the pump.

Another object of the invention is to provide such a pump wherein the direction of fluid flow is not reversed when the direction of operation is reversed.

Another object is to provide such a pump which may be adjusted for full or partial fluid flow in either direction.

Another object is to provide an improved rotary fluid pump having dual fluid chambers.

Another object is to provide such a pump which is simple in construction, relatively inexpensive to manufacture and service, and easy to operate.

Other objects of the invention will become apparent when the following description is read with reference to the accompanying drawings, in which:

FIG. 1 is a vertical longitudinal section through a pump constructed in accordance with the invention;

FIGS. 2 and 3 are plan views of the pump, with parts broken away and sectioned, showing various operating conditions;

FIG. 4 is an end view of the pump, with the pulley omitted;

FIGS. 5 and 6 are perspective views of certain pump parts;

FIG. 7 is a vertical longitudinal section through a second form of the pump;

FIG. 8 is a fragmentary vertical longitudinal section through the pump shown in FIG. 7, showing a different operating condition;

FIGS. 9 and 10 are transverse sections respectively on lines IX—IX in FIG. 7 and X—X in FIG. 8;

FIGS. 11, 12, 13, and 14 are plan views of the modified form of the pump shown in FIG. 7, with parts broken away and sectioned, showing various operating conditions;

FIG. 15 is a perspective view of one of the modified pump parts;

FIG. 16 is a vertical longitudinal section through a third form of the pump;

FIGS. 17 and 18 are plan views of the modified form of the pump shown in FIG. 16, showing various operating conditions;

FIG. 19 is a vertical longitudinal section through a fourth form of the pump;

FIGS. 20, 22, and 24 are horizontal sections of the modified form of the pump shown in FIG. 19, showing various operating conditions; and

FIGS. 21, 23, and 25 are transverse sections respectively on line XXI—XXI in FIG. 20, line XXIII—XXIII in FIG. 22 and line XXV—XXV in FIG. 24.

Referring particularly to FIGS. 1–6, the exemplary rotary fluid pump constructed in accordance with the invention comprises a base, generally designated 10, upon which is mounted a hollow cylindrical casing 12 secured in position by a pair of straps 14 fitted respectively over opposite end portions of the casing 12 and bolted to the base 10, as at 16.

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Extending respectively across the opposite end portions of the casing 12 are end plates 18 and 20. Interposed between each end plate and the casing is a gasket 22. Securing the end plates and the gaskets to the casing are studs 24. Threaded into the end plate 20 is a sleeve 26, and in turn threaded into the sleeve 26 is another sleeve 28. The sleeves 26 and 28 are arranged to accommodate packing 30, which embraces a shaft 32 extending through the sleeves and into the interior of the casing.

Affixed to the inner end of the shaft 32 is a cylindrical rotor member 34, and affixed to the outer end of the shaft 32 is a pulley 36, adapted for actuation by a belt 38. Also disposed within the casing 12 is a cylindrical member 40, which is urged toward the rotor 34 by a coil spring 42. The spring is seated against a disc 44, which is shiftable by manipulation of a bolt 46 threaded through the end plate 18. The member 40 is provided with a longitudinally extending narrow groove 48, and extending into this groove is the inner end of a screw 50, which is threaded into the wall of the casing 12.

The casing is provided on one side with a suction port 52 from which extends a suction line 54. The opposite side of the casing is provided with a discharge port 56 from which extends a discharge line 58. The ports 52 and 56 are diametrically opposed and their common axis lies between the opposed complementary surfaces 60 and 62 respectively of the members 34 and 40, which are axially inclined and disposed in face to face abutting relation, as shown in FIG. 1. While these opposed surfaces are shown curved, it will be understood that they may be straight.

Now referring particularly to FIGS. 7–15, the second form of the pump is identical in most respects with the form of the pump already described. Corresponding identical parts of the two pumps are identified by the same numeral. In this second form of the pump, a cylindrical member, generally designated 100, replaces the corresponding member 40 of the embodiment of FIG. 1. The end surface of the member 100 corresponding to the end surface 62 of the embodiment of FIG. 1 is designated 102. Instead of being provided with a narrow groove for receiving the end of the screw 50, the member 100 is provided with a wide recess 104 having shoulders 106 and 108 respectively on opposite sides thereof.

Now referring to FIGS. 16–18, the third form of the pump comprises a base, generally designated 120, upon which is mounted a hollow cylindrical casing 122 secured in position by a pair of straps 124 fitted respectively over opposite end portions of the casing 122 and bolted to the base 120, as at 126.

Extending across the opposite end portions of the cylindrical casing 122 are end plates 128 and 130. Interposed between each end plate and the casing is a gasket 132. Securing the end plates and the gaskets to the casing are studs 134. Threaded into the end plate 130 is a sleeve 136, and in turn threaded into the sleeve 136 is another sleeve 138. The sleeves 136 and 138 are arranged to accommodate packing 140, which embraces a shaft 142 extending through the sleeves and the casing into a bushing 144 embedded in the end plate 128.

Affixed to the shaft 142, next to the end plate 130, is a cylindrical rotor 146, and affixed to the shaft 142, next to the end plate 128, is a cylindrical rotor 148. Interposed between the members 146 and 148 is a cylindrical member 150. The member 150 is provided with a longitudinally extending narrow groove 152, and extending into this groove is the inner end portion of a screw 154, which is threaded into the wall of the casing 122.

On one side of the casing are a suction port 156 from which extends a line 158 and a suction port 160 from which extends a line 162. On the opposite side of the

casing are a discharge port 164 from which extends a discharge line 166 and a discharge port 168 from which extends a discharge line 170. The ports 156 and 164 are diametrically opposed and their common axis lies between the opposed complementary surfaces 172 and 176 respectively of the members 146 and 150, which are axially inclined and disposed in face to face abutting relation, as shown in FIG. 16. The ports 160 and 168 are diametrically opposed and their common axis lies on the surface 174 of the member 148, which is axially inclined, as shown in FIG. 16. The surfaces 174 and 178 are complementary so that when the members 148 and 150 are turned 180 degrees relative to each other the surfaces 174 and 178 may be disposed in face to face abutting relation.

Continuous contact is maintained between the surface 172 of member 146 and the surface 176 of member 150 and between the surface 174 of member 146 and the surface 178 of member 150 throughout the movement of the rotors, the cam action of the opposing surfaces causing the member 150 to shift axially back and forth to alternately provide and then exhaust a pair of fluid chambers.

The angle of opposing surfaces 172 and 176 and 174 and 178 may be varied to govern capacity of the fluid chambers in relation to the requirements of the type of work to be performed by the pump.

Now referring particularly to FIGS. 19-25, the fourth form of the pump is identical in most respects with the embodiment of FIG. 1. Corresponding identical parts of the two pumps are identified by the same numeral. In this fourth form of the pump, the hollow cylindrical casing, generally designated 200, is provided with a slot 202 in one side thereof extending approximately half way around the casing. A pair of grooves 204 respectively upon opposite sides of the slot 202 are fitted with O-rings 206. Extending about the casing is an annulus 208 upon which is formed a boss 210. Threaded through the boss 210 is a screw 212, the inner end of which extends into the groove 48 formed in the member 40. Extending across the annulus 208 is a member 214 which is secured to the casing 200 by screws 216 and which clamps the annulus in an adjusted position.

Referring to the first form of the pump, and particularly to FIG. 1, in the operation of the pump, the suction port 52 and the discharge port 56 are both closed conjointly by the opposed end portions of members 34 and 40. The belt 38 actuates pulley 36, shaft 32, and rotor 34 turning the same as a unit in the direction indicated by arrows. Initially, the rotor 34 cams the member 40 to the left (as viewed in FIG. 1) against the influence of coil spring 42, the member 40 being secured against turning about its axis by reason of the inner end of the screw 50 working in the groove 48. During approximately the first one-half turn of the rotor 34, the opposing surfaces 60 and 62 spread and form a gap 64. Simultaneously, port 56 is closed by rotor 34 independently of member 40. As the gap 64 becomes progressively larger, suction is induced and fluid flows into the gap or fluid chamber 64 through port 52. Thereafter the surfaces 60 and 62 approach each other and the gap 64 recloses, the member 40 returning to its initial position under the influence of spring 42. As the gap 64 recloses, the resulting pressure on the fluid causes it to be expelled from between the members 34 and 40 through the port 56. In this form of the pump, normally the discharge pressure is dependent upon the spring 42, and the force which the spring exerts upon the fluid may be regulated by manipulating the screw 46 to compress the spring 42 more or less. This adjustment may be made while the pump is operating. In the event that the direction of operation is reversed, the direction in which the fluid flows is reversed, i.e., port 56 becomes the suction port and port 52 becomes the discharge port.

Referring to the second form of the pump, i.e., to the

embodiment of FIG. 7, the mode of operation is identical with the mode of operation of the embodiment of FIG. 1, except in the respect now to be set forth. When the direction of operation is reversed, initially member 100 turns with the rotor 34, shoulder 106 moving away from the screw 150 and shoulder 108 moving toward the screw 150 until, after approximately one-half a turn, it finally engages the same, as in FIG. 10. Thereafter, only the rotor 34 turns. As a consequence of the foregoing construction, the direction of fluid flow is not reversed when the direction of operation is reversed.

Referring to the fourth form of the pump, i.e., to the embodiment of FIG. 19, again the mode of operation is identical with that of the embodiment of FIG. 1, except in the respect now to be set forth. When the clamp 214 is loosened, the annulus 208 may be turned about the casing 200 and the screw 212 positioned in a selected position within the slot 202. The member 40 turns about its axis with the screw 212. When the annulus 208 holds the screw 212 at one end of the slot 202, as shown in FIGS. 19, 20 and 21, the pump operates to deliver a full flow of fluid in the direction indicated by the arrow in FIG. 20. When the annulus 208 is given a one-quarter turn, as shown in FIGS. 22 and 23, ports 52 and 56 are both closed, and no fluid can flow through the pump. When the annulus 208 holds the screw 212 at the opposite end of the slot 202, as shown in FIGS. 24 and 25, the pump operates to deliver a full flow of fluid in the opposite direction, i.e., in the direction indicated by the arrow in FIG. 24. The fluid flow may be selectively varied by moving the screw 212 to intermediate positions between those already mentioned. It will be noted that the direction of operation is always the same.

Referring to the third form of the pump, i.e., to the embodiment of FIG. 16, the suction port 156 and discharge port 164 are both closed conjointly by the opposed end portions of members 146 and 150. The suction port 160 and discharge port 168 are each half closed by member 148. Shaft 142 is turned in the direction indicated by the arrows, and initially the rotors 146 and 148 cam the member 150 to the left. The member 150 is secured against turning with the rotors by the inner end portion of the screw 154 working in the groove 152. Throughout approximately the first one-half turn, the surfaces 172 and 176 spread apart to form a gap or fluid chamber 180. Port 164 is closed by rotor 146. As the gap 180 becomes larger, fluid is sucked into the space between the rotor 146 and member 150 through the port 156. Simultaneously, the surfaces 174 and 178 approach each other, closing the gap or fluid chamber therebetween, designated 182. Port 160 is closed by member 148. As gap 182 closes, the pressure on the fluid forces it out through port 168. During the remainder of the turn, surfaces 172 and 176 approach each other, reclosing gap 180, whereupon fluid is discharged therefrom through port 164. Port 156 is closed by member 146. Simultaneously, surfaces 174 and 178 spread apart, opening gap 182 again, whereupon fluid is sucked into the gap 182 through port 160. Port 168 is closed by member 148. It will be noted that the action is a dual action, that is, fluid is sucked in at one end of the pump while it is being discharged simultaneously at the opposite end of the pump.

A pump constructed in accordance with the invention is particularly suited for handling lubricants, such as oils and greases, and coolants for the application thereof to lathes, presses, etc. Such pumps are also particularly suited for handling liquids of high viscosity, such as molasses, liquid sugar and crude oil.

It will be understood, of course, that the present invention, as described and shown, is susceptible to various changes and modifications which may be made without any departure from the general principles or real spirit of the invention. Accordingly, it is intended to

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claim the present invention broadly, as well as specifically, as indicated in the appended claims.

Having thus described my invention, I claim as follows:

A pump comprising a hollow cylindrical casing, an axially fixed member revolvably housed in said casing, an axially shiftable member housed in said casing for movement about its axis between predetermined extreme positions, said members conjointly substantially fully occupying a section of said casing having suction and discharge ports formed in said casing respectively on opposite sides thereof, and said members having axially inclined opposed end surfaces disposed in abutting relation, means for actuating said axially fixed member to close said discharge port independently of said axially shiftable member and simultaneously move said axially shiftable member to open a gap between said abutting surfaces and open said suction port whereby to induce suction for drawing fluid into said gap through said suction port and alternately to close said suction port independently of said axially shiftable member and simultaneously open said discharge port and move said axially shiftable member to reclose said gap whereby to apply pressure on said fluid for expelling the same from said gap through said discharge port, and means for main-

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taining said axially shiftable member in a selected position between said extreme positions including a pair of axially spaced O-rings fitted over and disposed on opposite sides of a slot in said casing extending approximately half way around said casing, an annulus covering said slot and embracing said O-rings, an element carried by said annulus and extending radially inwardly therefrom freely through said slot and slidably into a groove extending longitudinally of the axially shiftable member, and means for releasably securing said annulus against turning about said casing.

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