Nov. 10, 1953 T. F. DREYER 2,658,485

PISTON ACTUATED VALVE FOR FLUID MOTORS

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Fig. 1.

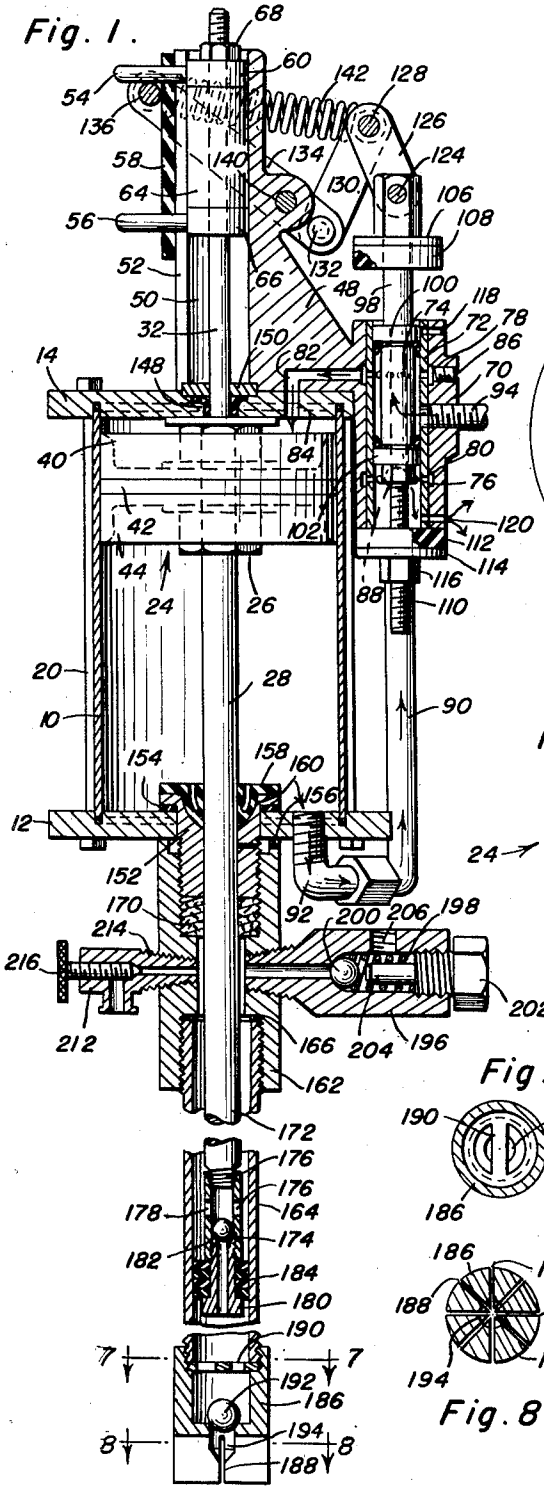

Fig. 2.

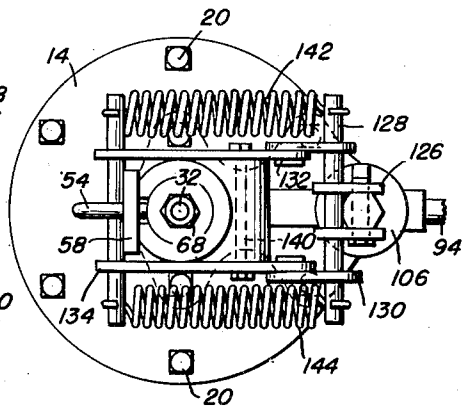

Fig. 6.

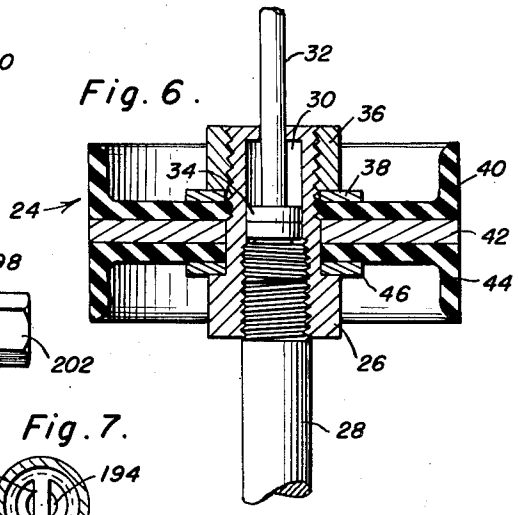

Fig. 7.

Fig. 8

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Fig. 3.

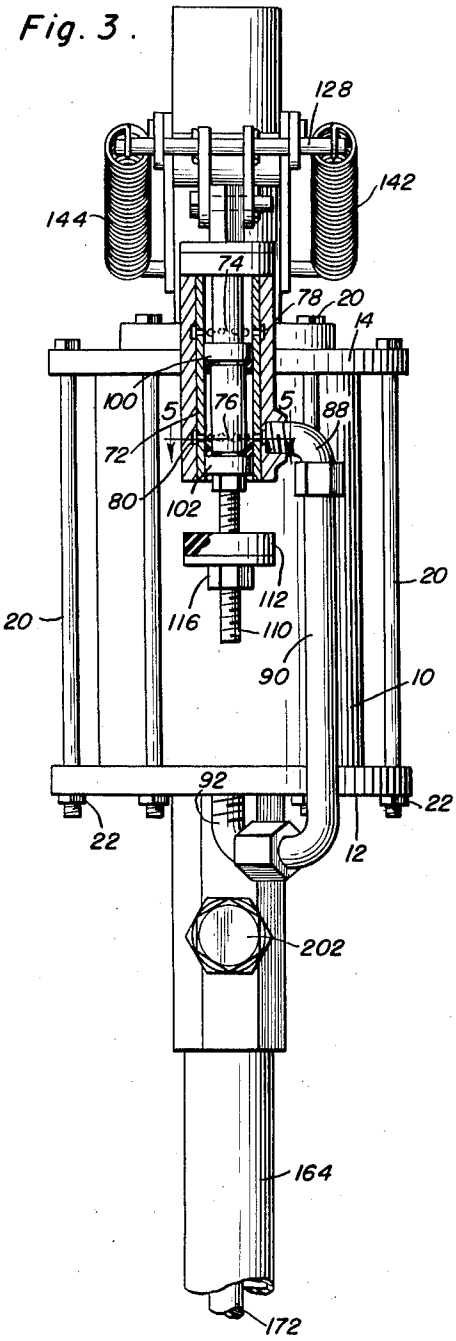
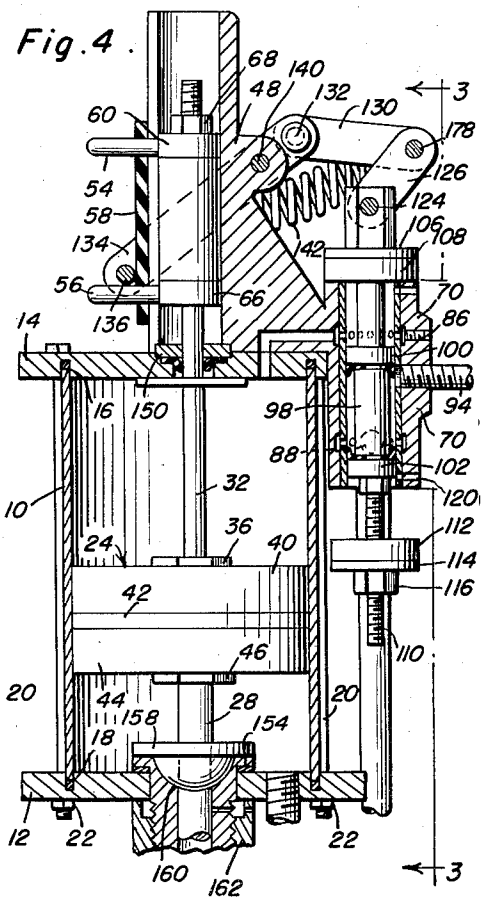


Fig. 4.



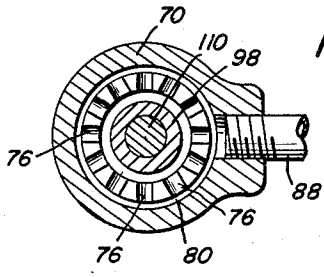


Fig. 5.

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UNITED STATES PATENT OFFICE

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PISTON ACTUATED VALVE FOR FLUID MOTORS

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2 Claims. (Cl. 121—164)

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This invention appertains to novel and useful improvements in devices for lifting charges of relatively viscous material and discharging the same.

An object of this invention is to lift and separate a charge of material from a supply by an improved pump which includes means for directing a supply of compressed air to alternate faces of a piston thereby separating and lifting selected amounts of viscous material from the supply, and discharging the same.

Another object of this invention is to provide a simplified structure of the character to be described which performs its attendant functions smoothly and economically.

Ancillary objects and features of novelty will become apparent to those skilled in the art, in following the description of the invention, illustrated in the accompanying drawings, wherein:

Figure 1 is a longitudinal sectional view of the preferred form of the invention;

Figure 2 is a plan view of the invention shown in Figure 1;

Figure 3 is an elevational view of the preferred form of the invention, the valve structure being shown in section to illustrate the detail thereof;

Figure 4 is an elongated sectional view of the cylinder and valve mechanism;

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 3 and in the direction of the arrows;

Figure 6 is an enlarged sectional view of the piston head used in connection with the invention;

Figure 7 is a sectional view taken on the line 7—7 of Figure 1; and

Figure 8 is a sectional view taken on the line 8—8 of Figure 1.

This invention has been developed to provide a device for performing normal pumping operations in an improved manner. It is one of the prime purposes of the present invention therefore, to provide a device for performing this function.

In handling materials of a high viscosity such as grease, a pump must be provided of such a construction as to withstand shock, harsh treatment and must operate under conditions of high stress. The present invention includes a pump construction having these qualities.

The specific structure characterizing the present invention includes mechanical elements which may be made of any material, preferably those materials having high anti-corrosion qualities. A cylinder 10 is provided with detachable end plates 12 and 14 respectively. These end plates are formed with grooves 16 and 18 respectively

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therein wherein the cylinder seats. By this construction, it is quite obvious that an efficacious seal is produced between the end plates and cylinder. Further, if it is found desirable a suitable gasket may be supplied at this junction, such a gasket being of either conventional material or in the form of a sealing material. It is noted at this point that throughout the preferred form of the invention any type of conventional gasket may be supplied wherever it is found desirable and in those instances wherein sealing compounds may be used, this expedient may be resorted to. Stay bolts 20 extend from the spaced plates 14 and 12 and have conventional nuts 22 maintaining the cylinder construction in position.

A double acting piston generally indicated at 24 is reciprocatingly mounted within the cylinder 10 and may be of the construction seen in Figure 6. A boss 26 is internally threaded for reception of the piston rod 28 and also has a smooth bore portion 30 for reception of the opposed piston rod 32. The said piston rod 32 has an enlargement 34 slidingly received in the smooth portion 30 thereby allowing a predetermined amount of lost motion in the piston rod 32 upon actuation of the double acting piston.

An internally threaded member such as a nut 36 is supplied on the externally threaded portion of the boss 26 and a washer 38 is interposed between the nut 36 and flexible seal 40. A spacer disk 42 is supplied on the boss 26, separating a second identical flexible (preferably leather) seal 44.

It is noted that the boss 26 is formed with an enlargement at the end opposite the said nut 36 whereon a second washer 46 is seated bearing against this enlargement and the second seal 44. It is now readily apparent that upon tightening the internally threaded member or nut 36 the piston head is fabricated.

Attached to the plate 14 is a support 48 having a bore 50 therein. Communicated with this bore 50 is a slot 52 which has a pair of pins 54 and 56 respectively extending therethrough. This pair of pins is connected by means of a resilient member 58 which acts as a bumper. The upper end of the said piston rod 32 has a collar 60 secured thereto, said pin 54 extending therefrom. A spacer sleeve 64 rests on the said collar 60 and engages the lower collar 66 thereby spacing the two collars a predetermined amount. It is noted from inspection of Figure 1 that the said collars 66 and 60 and consequently the pins 54 and 56 are adjustably mounted on the said piston rod 32 through the medium of a nut 68 which is threadedly received on the said piston rod 32, this nut bearing on the upper collar 60. When it is de-

sired to change the stroke of a valve construction, to be described subsequently, in order to obtain optimum operational conditions, the nut 68 may be simply adjusted, the collars may be shimmed or other conventional expedients may be resorted to in this connection.

Valve means is supplied in association with the invention for directing compressed air to opposite sides of the double acting piston for actuation thereof. The valve means may be seen best in Figures 3, 4 and 1 wherein there is disclosed a block 70 having a bore therein. This block is integral with the support 48, thereby being attached to the cylinder 10 through the medium of the intermediate structure. A sleeve 72 is secured in the said block 70 and has two sets of ports generally indicated at 74 and 76 respectively formed therein. Passages 78 and 80 are formed in the said block 70 communicating with each set of ports. Another passage 82 extends through a portion of the support 48 and terminates in a port 84 formed in the said upper plate 14. In order to form the passage 82, the block 70 may be drilled and then plugged by means of a conventional closure plug 86 (see Figure 1).

The said passage 80 communicates with an outlet elbow 88 which in turn has a conduit 90 attached thereto. This conduit 90 terminates in a fitting 92, communicating with the lower portion of the cylinder 10.

An inlet conduit 94 communicates with an opening in the block 70 and sleeve 72 for allowing the ingress of compressed air to the valve structure, whence it is directed selectively to the upper surface and the lower surface of the said double acting piston 24. Through this expedient, it is readily apparent that the piston is actuated in the cylinder 10 for separating and lifting charges of relatively viscous material from a supply.

A valve core 98 is reciprocatingly mounted in the sleeve 72 and has a pair of integral piston heads 100 and 102 spaced on the valve core, forming a portion thereof. It is now apparent that upon reciprocation of the core 98, the piston heads 100 and 102 respectively will control the ports 74 and 76 for permitting the compressed air entering through the conduit 94 to flow to either the top portion or the lower portion of the piston 24. By this selection in direction of compressed air flow, the piston 24 is reciprocated. In order that the invention be smoothly and quietly operative, a collar 106 may be formed integral with or secured to the valve core 98 and a resilient bumper 108 may be seated thereon for reaction against the upper portion of the block 70 and the said washer or collar 106. The lower portion of the valve core is reduced to a stem 110 having threads thereon. This stem also receives a resilient bumper 112 engaging a collar 114, maintained in place through the medium of a conventional nut 116. Since the lower bumper 112 is maintained in place through the medium of a nut 116 it is readily appreciated that this collar is adjustable on the stem 110 thereby rendering a control for the stroke of the valve core. Selectivity is thus produced.

Exhaust ports 118 and 120 respectively extend not only through the block 70 but also through the sleeve 72 within the block. When the piston is in the position shown in Figure 1, it is readily apparent that the compressed air progresses through the inlet conduit 94, thence through the said ports and through the upper portion of the piston 24. In this position, the lower portion of the cylinder 10 is open to the atmosphere through the medium of the conduit 90 which allows exhaust air to travel through the elbow 88, thence through the said ports 76 and out the exhaust port 120. When this device is utilized as seen in Figure 4 (another portion of a single cycle of operation) the port 118 is permitted to conduct exhaust therefrom, the lower ports 76 conducting compressed air to the lower portion of the cylinder 10 and consequently the undersurface of the piston construction 24.

Means for transmitting reciprocatory movement of the piston 24 to reciprocatory movement of the valve core 98 is supplied. The preferable means may be seen best in Figures 2–4, wherein a plurality of links are mutually pivotally associated with each other for this construction. The upper portion of the valve core 98 has an aperture therethrough and a pin 124 extends through this aperture. A pair of pitman links 126 are secured to alternate sides of the valve core 98 and are pivotally associated with the pin 124. The opposite end of the pitman links 126 have a pin 128 extending therethrough for reception of a second pair of pitman links 130. The opposite end of this last-mentioned pair of links 130 have pins 132 extending therethrough. Then, a final pair of pitman links 134 is associated with the said pair of pitman links 130. This last mentioned pair of links 134 has a shaft 136 interconnecting the same at the ends thereof opposite the connection at the pins 132. As seen in Figure 1, the said pin 130 bears on the resilient pad or bumper 58 in its travel. The assemblage of links thus described is connected to the support 48 by means of a shaft 140 extending through a bearing formed integral with the said support 48 and through the said pair of links 134. This linkage is so proportioned in size (each link) as to have locking positions at the upper and lower ends of the travel of the piston construction 24. Thus, a hesitation is supplied at the upper and lower extent of travel of the piston 24 for use due to the nature of the viscous material which is being separated from a supply. This hesitation permits a substantially complete filling and refilling of the plenum chamber in pumping operations.

Means for resiliently biasing the linkage construction to selected positions is provided. The preferable means may be seen best in Figure 3 wherein there is disclosed a pair of springs 142 and 144 respectively which are detachably connected to the free ends of the shafts 128 and 136 respectively.

At the position wherein the piston rod 32 extends through the upper plate 14, a seal 148 is supplied and maintained in place by means of a conventional collar 150 having a central bore formed therein. The lower end of the cylinder construction has a boss 152 received therein with packing 154 at the bottom thereof. An air vent 156 is supplied in a sleeve 162 surrounding the boss and in the said boss 52. A resilient bumper and seal 158 is received in a recess 160 formed in the boss 152. This seal also assists in maintaining the proper closure for the cylinder construction at the point wherein the piston rod 28 extends therethrough and projects therefrom.

A sleeve 162 is internally threaded at each end, being received on the boss 152 by these threads at one end and maintaining a tube 164 in the other end thereof. A suitable gasket 166 may be supplied at the junction of the tube 164 and the

sleeve 162. A packing 170 is supplied at the junction of the sleeve 162 and the boss 152. An extension 172 of the rod 28 projects through the sleeve 162 and terminates in the tube 164. Then, a sleeve 174 may be attached to a reduced threaded portion 176 of the extension rod 172. This last mentioned sleeve 174 is supplied with ports 176 and 178 forming a portion of a check valve construction. This check valve construction also includes a sleeve 180 which is threadedly received within the said sleeve 174 and has a seat formed at one end thereof for reception of a ball valve member 182. By this construction it is seen (Figure 1) that the ball 182 is floatingly received within the sleeve 174. The opposite end of the said sleeve 180 has an enlargement whereon there is seated a plurality of flexible members 184 thereby forming a piston.

Upon reciprocation of the piston 24, the piston construction at 184 is also reciprocated for receiving a viscous material therethrough.

A cap 186 is threadedly attached to the terminal portion of the tube 164 and has a plurality of slots 188 cut therein to serve the purpose of a strainer. Interposed between the cap 186 and the lower end of the said tube 164 is a spider 190 having a ball 192 engageable therewith. This ball floats in the zone defined by the spider 190 and an opening 194 in the center of the cap 186. Thus, a plenum chamber is defined by the bore of the tube 164 in this zone. Grease or other viscous material is pulled into the plenum chamber by reciprocation of the piston construction 184, after it has passed through the strainer and check valve construction at the foot of the tube 164. Also, the grease or other viscous material must extend through the check valve 182 before it is received in the discharge port construction.

This discharge port construction may be seen best in Figure 1 where a relatively heavy conduit member 196 is threadedly attached to the sleeve 162, with the bore thereof communicating with the bore of the sleeve. An enlargement of the bore of the conduit member 196 seats a spring 198 therein which reacts on a check valve member 200. This check valve member of course closes the bore of the member 196 until reacted upon by a predetermined pressure. In order to adjust the compression of the spring 198 a threaded plug 202 is received in the said member 196 which has the said spring 198 reacting thereon. A small pin 204 may be secured to the said plug 202 for firmly seating the spring in the enlargement of the bore of this member. A suitable outlet 206 may be formed in said member 196 and if it is found desirable, it may be tapped to receive a hose, flexible conduit, rigid conduit or the like thereon. In order to relieve the air which becomes trapped in the plenum chamber adjacent the discharge means thereof, a valve is supplied. This valve may be seen in Figure 1 as the valve casing 212 having the sleeve 214 integral therewith and threadedly received in the sleeve 162. A threaded core 216 is received in the valve housing 212 and upon manipulation thereof the air which is trapped under pressure in the grease discharge structure may be relieved manually.

From the foregoing a clear understanding of the invention is deemed apparent. However, it is understood that certain variations may be made without departing from the spirit of the invention. Therefore, limitation is sought only in accordance with the scope of the following claims.

Having described the invention what is claimed as new is:

1. A motor comprising a cylinder, a double-acting piston reciprocably disposed in said cylinder, a piston rod, a lost motion connection connecting said piston rod to said piston and extending slidably through one end of said cylinder, a support on said one end of said cylinder having a bore therethrough through which said piston rod slidingly extends and having a slot opening into said bore throughout the length of the bore, longitudinally spaced pins on said piston rod projecting through said slot for non-rotatably guiding said piston rod, the ends of said cylinder having fluid inlet ports for delivering fluid under pressure to the opposite faces of said piston, said support having a valve chamber therein having longitudinally spaced openings therein communicating with said ports, a fluid conduit opening into said chamber between said openings, a valve reciprocable in said valve chamber for selectively communicating said openings with said ports, a pair of links pivotally mounted intermediate their ends on opposite sides of said support, a shaft connecting one set of ends of said links and being disposed between said pins, pivotally connected members attaching the other set of ends of said links to said valve and over center snap acting spring means connecting said shaft and said connecting means to reciprocate said valve in respect to movement of said shaft by said piston rod pins.

2. A motor comprising a cylinder, a double-acting piston reciprocably disposed in said cylinder, a piston rod, a lost motion connection between said piston rod and said piston to cushion the piston adjacent each end of the cylinder, said cylinder having inlet ports at each end thereof for the introduction of fluid under pressure to opposite faces of said cylinder, a valve member having a valve chamber therein and a pair of longitudinally spaced conduit means communicating with said ports, a fluid inlet opening into said valve chamber between said conduit means, a valve reciprocably disposed in said chamber for selectively communicating conduit means with said inlet opening, longitudinally spaced pins on said piston rod, a pivotally connected linkage having one end thereof disposed between said pins and the other end thereof connected to said valve member, and an over center, snap-acting spring means connecting the ends of said linkage to reciprocate the valve in response to movement of said piston rod.

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