Dec. 16, 1924. 1,519,205

K. KIEFER

VALVE FOR FLUID MOTIVE APPARATUS

Filed June 13, 1921

FIG. 1

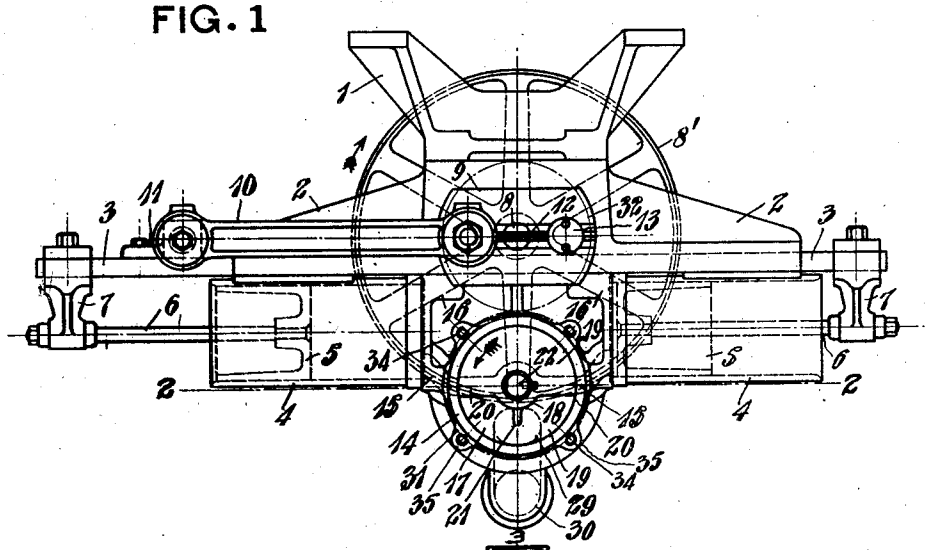


FIG. 2

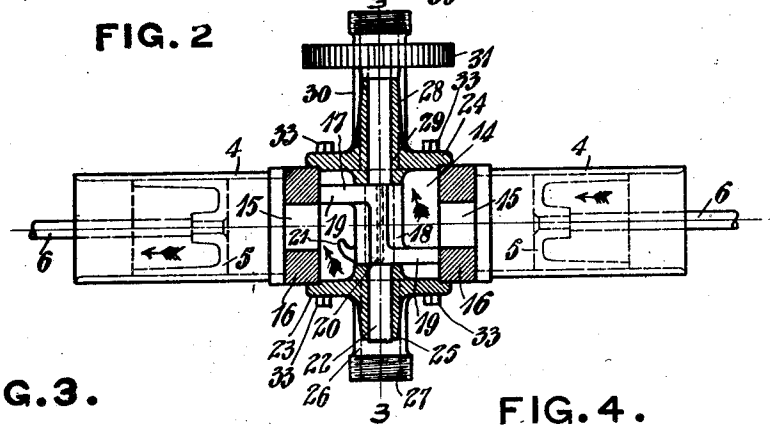


FIG. 3.

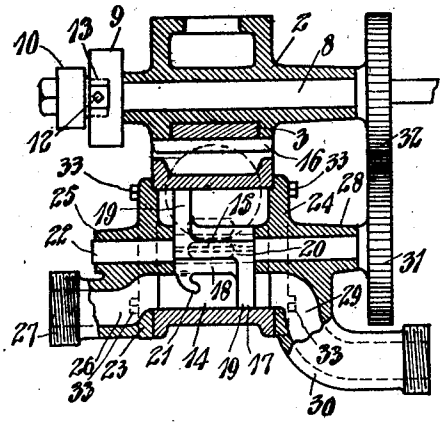
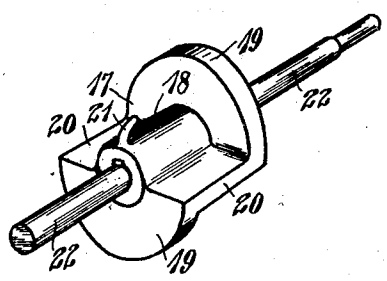


FIG. 4.



INVENTOR

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UNITED STATES PATENT OFFICE.

KARL KIEFER, OF CINCINNATI, OHIO.

VALVE FOR FLUID-MOTIVE APPARATUS.

Application filed June 13, 1921. Serial No. 477,257.

To all whom it may concern:

Be it known that I, KARL KIEFER, a citizen of the of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Valves for Fluid-Motive Apparatus, of which the following is a specification.

My invention relates to fluid motors or pumps, and more especially to those of the double-acting reciprocating kind.

The object of my invention is to simplify the construction and operation of devices of this character, to avoid leakage outside the device, and to increase the durability of the apparatus and reduce the amount of labor and attention required to keep it in proper running condition. Other objects will appear in the course of the ensuing description.

I attain these objects by the device illustrated, for example, in the accompanying drawing, in which—

Figure 1 is a side elevation of a pump embodying my invention, one side of the valve-chamber being removed to reveal its interior details;

Fig. 2 is a sectional plan view thereof, the section being on a plane corresponding to the line 2—2 of Fig. 1, but the pump having operated through an angle of ninety degrees from the positions of Fig. 1;

Fig. 3 is a vertical cross-section thereof on a plane corresponding to the line 3—3 of Fig. 2, with the parts in the positions of Fig. 1; and

Fig. 4 is a detail perspective view of the rotary valve and its shaft.

The pump chosen for illustration of my invention is one especially designed as a part of a filling-machine, for forcing substance out into containers, as disclosed and claimed in my co-pending application, Serial No. 278,287, filed February 20, 1919. This pump comprises a hanger 1 by which it is attached to the filling-machine as disclosed in said application, a guide-yoke 2 depending from the hanger 1, with a long guide in its bottom in which slides a rod 3 of rectangular cross-section. Cylinders 4 depend from the opposite ends of the yoke 2 with open ends outward, and pistons or plungers 5 in the respective cylinders 4 have rods 6 extending out of the open cylinder ends and clamped to adjacent end parts of the rod 3 by clamp-brackets 7, for adjustment along the rod 3. A crank-shaft 8 is journaled transversely in the yoke 2 midway of its length. A crank 9 is fixed on the shaft 8, with a connecting rod 10 connecting the crank wrist with a bracket 11 fixed on one end part of the rod 3. This crank wrist is adjusted radially by a screw 12 and nut 13 (Fig. 1) to vary the stroke; the plungers 5 being correspondingly adjusted along the rod 3, to clear the cylinder ends as much as desired. This varies the amount delivered at a stroke, and also may vary the clearance in accordance with various substances delivered. These are details of my pump as shown in said co-pending application; but the valve herein is an improvement over the valve therein.

The valve-chamber 14, between the inner cylinder-ends, communicates with the respective cylinders 4 through ports 15, located in the bottoms of the otherwise closed inner cylinder-ends, so that solid or more dense particles gravitate to these ports and escape being caught between the plungers and the cylinder-ends. This arrangement of ports also is shown in my co-pending application before referred to.

This valve-chamber 14 comprises the main cylindrical part with its axis at right-angles to the alined cylinder axes and a considerable distance below them; as here shown, the horizontal diameter being below the bottoms of the cylinders 4 and the ports 15 curving down and entering the chamber 14 on the horizontal diameter. These ports 15 have their greatest dimension horizontal (Figs. 2 and 3). Brackets 16 extend up from opposite sides of the cylindrical part, and contain these ports 15, these brackets joining the adjacent closed ends of the cylinders 4, and also projecting toward each other at the tops of the cylinders, serving to additionally attach the cylinders 4 and valve-chamber 14 to the bottom of the guide-yoke 2. The cylinders 4 and valve-chamber 14 may be cast in one piece.

The rotary valve 17 comprises a hub 18 with a semi-circular flange 19 at each end, concentric therewith; the flanges at the opposite ends being diametrically opposite across the hub axis. Webs 20 extend from opposite sides of the hub 18 coincident with and joining the straight edges of the flanges 19, and terminate at the peripheries of the flanges. The thickness of these webs 20 is slightly greater than the vertical width of

the ports 15. Preferably, a small hook 21 projects from the unflanged side of the hub 18 at one end, curving over toward the other end of the hub. This rotary valve 17, thus formed, may be made in a single casting, and the edges of the flanges 19 and of the webs 20 being turned concentric with the bore of the hub 18 at a single operation.

This rotary valve 17 is keyed on the valve-shaft 22; and the valve-chamber 14 also comprises heads 23 and 24 closing its ends at opposite sides of the pump. The head 23 at the near or front side has the bearing 25 for the shaft 22, and below that has the inlet port 26, in a neck 27 projecting forward past the bearing 25 for connection of a pipe or hose thereto. The head 24 at the rear side has the bearing 28 for the shaft 22, and below that has the outlet port 29, in a neck 30. A spur-gear 31 is fixed on the shaft 22 at the rear of the rear bearing 28, meshing with a spur-gear 32 of equal size, fixed on the crank-shaft 8. The neck 30 and its contained port 29 curve down to extend back under the gear 31; and the gears 31 and 32 are located far enough back to permit this. The heads 23 and 24 are secured in place by nuts 33 on studs 34 fixed in ears 35 at top and bottom of opposite sides of the cylindrical part of the chamber 17; and the bearings 25 and 28 extend in to the adjacent ends of the rotary-valve hub 18, holding the rotary valve 18 midway of the length of the chamber, in which position its opposite end flanges 19 will sweep past opposite ends of the entrances of the ports 15, alternately cutting off each port 15 from communication with the inlet port 26 and allowing it to communicate with the outlet port 29, while the other port 15 is cut off from the outlet port 29 and allowed to communicate with the inlet port 26. The peripheral edges of the flanges 19 and webs 20 being turned to sweep very close to but not touching the wall of the valve-chamber cylindrical part, these alternate connections and cut-offs are accomplished with little friction and wear. At the same time, I have found that there is practically no leakage from one side of the rotary valve 17 to the other, mounted in this way; and leakage from the valve-chamber to the outside of the apparatus is entirely avoided.

This rotary valve 17 being connected by means of the gears 31 and 32 with the crank-shaft 8 so that its webs 20 pass the respective ports 15 just as the pistons or plungers 5 reach opposite ends of their strokes, as seen in Figs. 1 and 3, it will connect the port 15 of one cylinder 4, as at the right, to the inlet port 26 just as the plunger 5 therein starts to the right in Fig. 1, and the port 15 of the other cylinder 4, at the left, to the outlet port 29 just as this plunger in this cylinder starts to the right. The one at the right thus is drawing in the fluid, by moving away from the closed end of the cylinder, while the plunger at the left is expelling fluid by approaching the closed end of its cylinder. In the next half revolution, the valve will reverse these conditions in the two cylinders. Fig. 2 shows the parts at the middle of one of these half-revolutions, when the respective ports are connected to the fullest extent; showing clearly how this is accomplished.

The rotary valve 17 preferably is made so that it will slide off its keyed connection with the shaft 22 readily; and by unscrewing the nuts 33 from the studs 34, the head 23 at the front side is removed readily, upon which the rotary valve 17 is pulled out of the chamber 14 easily, by grasping the hook 21. If only one hook 21, at one end of the hub 18, is provided, as shown, it is required that care be taken to insert the valve again with this hooked end to the front, where it may be reached. The valve will operate whichever end is inserted to the rear; and the hub 18 may have a hook 21 at each end, if desired, to avoid the necessity for care in replacing the valve in the chamber. Such removal, however, is not frequent, as the mechanism is so simple that derangement or clogging, requiring this access to the valve or the interior of the chamber, is not very liable to occur.

It will be understood that other applications of my invention are possible, and numerous modifications may be made. I do not wish to be understood as being limited to the precise showing and description herein, but what I claim as new and desire to secure by Letters Patent is:

1. A rotary valve element comprising a hub, semicircular flanges, one at each end of said hub, concentric therewith and diametrically opposite each other across the hub axis, and webs extending from opposite sides of said hub coincident with and joining the straight edges of said flanges and substantially conterminous with the peripheries of said flanges.

2. A valve chamber with a cylindrical interior and having passages opening at opposite ends of said interior and passages opening at substantially diametrically opposite sides of said interior, and a valve element rotatable in and concentric with said interior, comprising flanges near the respective ends and webs joining the flanges from end to end and sweeping past said side passages as the element rotates, whereby each side passage is alternately connected with one end passage to the exclusion of the other side passage.

3. A valve chamber with a cylindrical interior, a valve element therein comprising segmental circumferentially spaced

flanges near opposite ends of the chamber and web means joining said flanges across an axial plane of said chamber, a shaft for said element, journaled in opposite ends of said chamber, means detachably connecting said element to rotate with but slide endwise off of said shaft, one end of said chamber being removable for sliding said element endwise from said chamber, off of said shaft, and engaging means on said element near said removable end and apart from the flange near said end, to be engaged for withdrawing said element from said chamber when said end is removed.

KARL KIEFER.