

[54] HYDRAULIC PISTON PUMP ASSEMBLY

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[57] ABSTRACT

A piston pump with a hydraulic drive for conveying concrete has two concrete conveying cylinders having alternately operating pistons which suck concrete in through a rotary valve and discharge it through the same valve. A suction port for the two cylinders is arranged in the body of the rotary valve and is located between two discharge ports appertaining to the body of the rotary valve.

4 Claims, 6 Drawing Figures

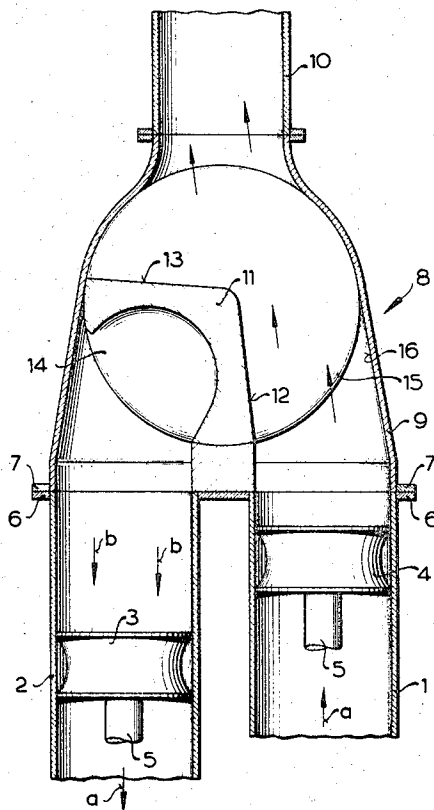
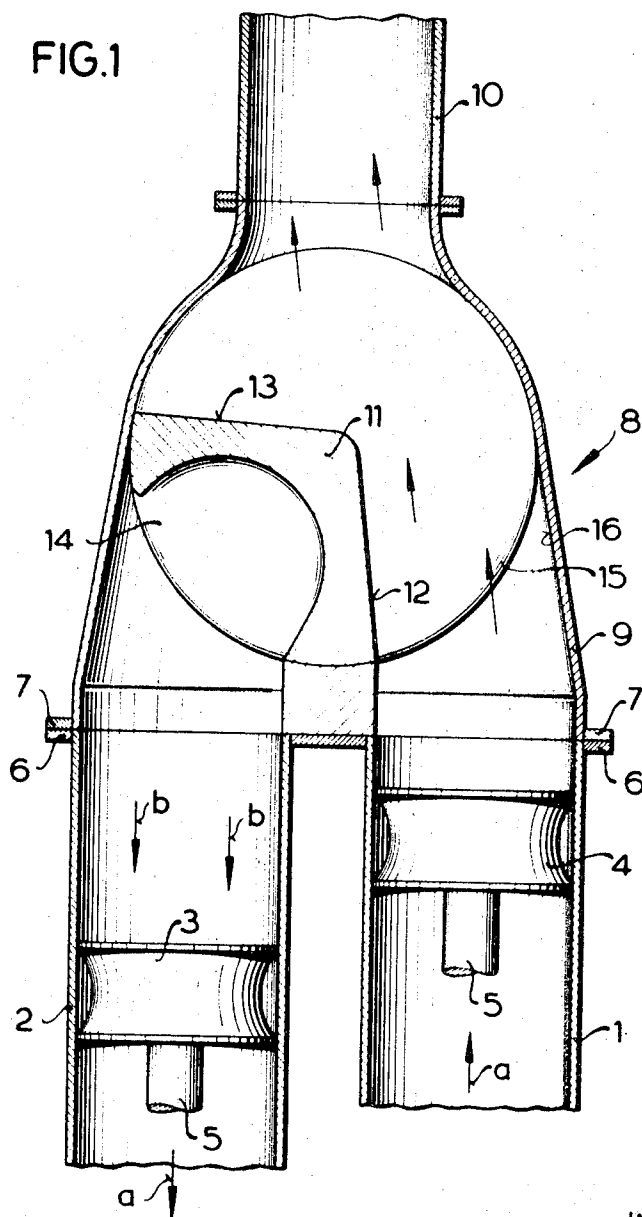


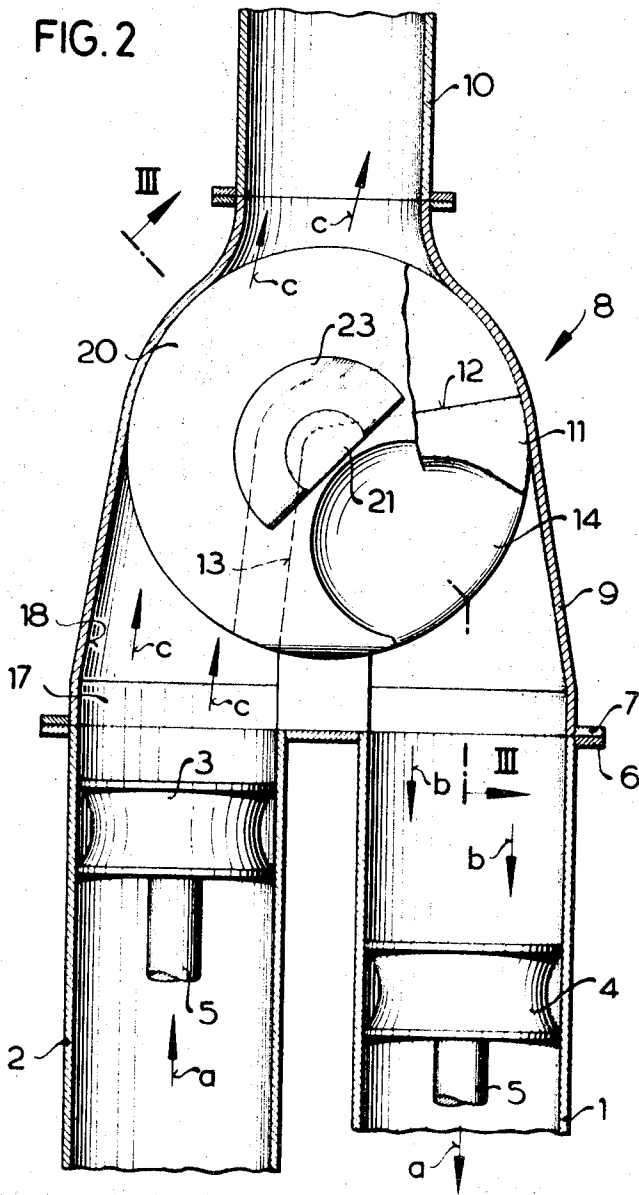
FIG.1



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FIG.3

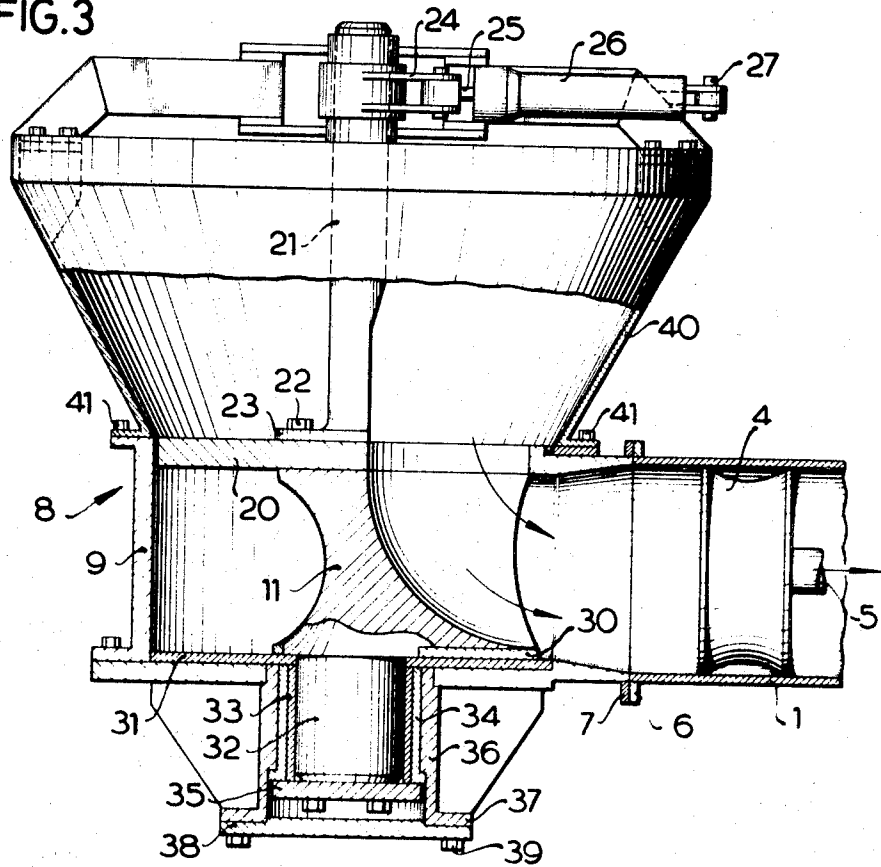
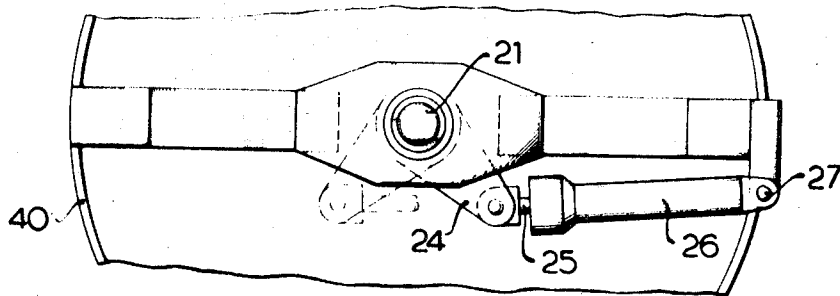


FIG.4



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FIG.5

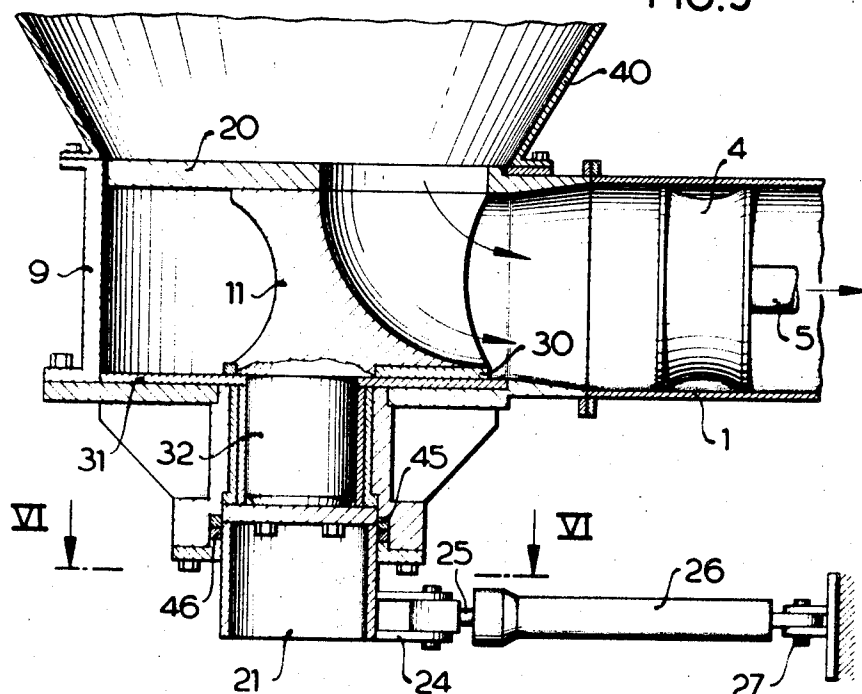
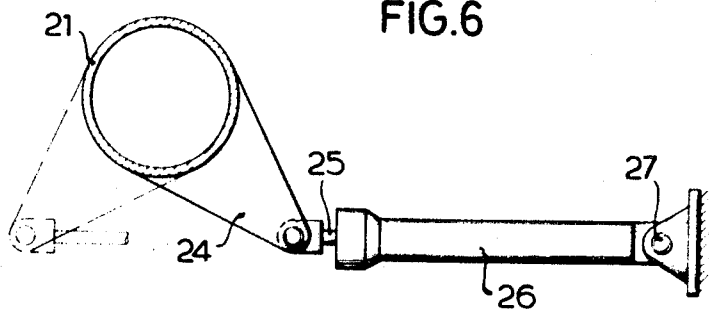


FIG.6



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HYDRAULIC PISTON PUMP ASSEMBLY

BACKGROUND OF THE INVENTION

The invention concerns a piston pump with hydraulic drive for moving concrete with two feeder cylinders whose alternating pistons pump the concrete through a rotary valve and force it out through the same rotary valve into a concrete feed pipe.

Piston pumps of this type are superior to single cylinder piston pumps, because they, with a double number of strokes, not only can move more concrete but also move the concrete in the feed pipe more frequently and thus act against the segregation tendency of the concrete which occurs between the two strokes. To be sure, this requires sufficiently accurate control of the up and over steering of the concrete input channels and the concrete-moving channels produced in each feeding cylinder.

It is known that one rotary valve can be used for the pumping and feeding of each cylinder. Then in a two-cylinder piston pump, four rotary valves are necessary which must be steered up and over in the rhythm of the opposing pistons. This relatively large number of rotary valves signifies a comparatively high engineering cost. This concerns not only the construction and design of the steering and the rotary valves but is also conditioned by the properties of the material being transported. Concrete as is known tends to harden. The cleaning work necessitated by long stand-down times of the pump are correspondingly difficult and protracted in the case of such a pump.

It is further known that the pumping channel and the feeding channel can be steered up and over with one rotary valve. This reduces the number of rotary valves and rotary valve drives by one half and simplifies the control considerably, because only two rotary valves are now being operated in alternation. A drawback, on the other hand, is the fact that the diameter of the two rotary valves is considerably greater than the diameter of four rotary valves. Such rotary slide valves possess considerable flywheel mass. Moreover, the areas located between the bodies of the rotary valves and the rotary slide valve housing belonging to them, between which hardening concrete accumulates are correspondingly enlarged thus causing considerable difficulties.

Finally, there is nothing new in controlling a two-cylinder piston pump for moving concrete by means of a rotary valve. This rotary valve has a suction port and a discharge port for each cylinder. The discharge ports are formed by radial ducts in the rotary valve which run toward the cylinder and branch in the direction of the concrete feed pipe. The suction ports on the other hand are radial-tangential recesses in the cylindrically formed body of the rotary valve. The diameter necessary for such a rotary valve is also significantly greater than that for a rotary valve that has to control only one feed cylinder. Accordingly, the difficulties evoked by the driving mechanism and the hardening concrete multiply correspondingly.

On the other hand, the control of such a pump is a great deal simpler than that for other pumps. From the standpoint of construction, it also has the advantage that the two feed cylinders usually arranged coaxially move more closely together than is ordinarily the case and thus contribute to a more compact pump construction

and shortening of the pumping and discharging paths of the cylinder.

The invention has for its object to improve piston pumps for moving concrete with two feed cylinders and one rotary valve by reducing the size of the rotary valve and the extent of the surfaces on which hardening concrete can accumulate.

SUMMARY OF THE INVENTION

According to the invention, it is provided that a suction port lies midway between two discharge ports of the rotary valve body.

The desired reduction in diameter of the rotary valve is due to the fact that in such a piston pump, the suction port is installed in the fork between the two discharge passages in the body of the rotary valve.

A further improvement is achieved if the suction port is formed from a radial-tangential recess in the body of the rotary valve and the discharge ports constitute ducts bounded by the body of the rotary valve and the valve housing. In this case it is no longer necessary to arrange a Y fitting at the discharge side of the rotary valve housing, because the rotary valve reduced to the proportions required for sealing the suction port against the discharge port needs now only to seal the two cylinders from each other, but no longer has to separate the discharge passages from each other and from the rotary valve housing.

The drive mechanism for turning the rotary valve can be connected through the rotary valve housing. Then, a rotary bearing will be located under the rotary valve body in the valve housing which is not sealed against the concrete-transporting space but is sealed to the exterior by a cover. This has considerable advantages, because in this way the seals are eliminated that are otherwise required for the rotary valve bearings.

The body of the rotary slide valve can be reduced to a disk mounted on a shaft of the rotary valve and a formed part fastened to this disk with a base shaped as a segment of a circle. Then the suction port is located within the radial limits of this shaped piece.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal section through a piston pump in a partially cut away view of the feed cylinders of the piston and the concrete feed pipe,

FIG. 2 is a view, corresponding to FIG. 1 showing an alternate form in which the section taken in part above the center line at the left hand side of the rotary valve body.

FIG. 3 is a sectional view of the piston pump of FIG. 2 taken along line I - II of that Figure,

FIG. 4 is a fragmentary a top view of the piston pump shown in FIG. 3,

FIG. 5 shows a section corresponding to the section along the line I - II in FIG. 2 and taken now through the piston pump shown in FIG. 1, and

FIG. 6 is a sectional view on the line A-B in FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the figures, the same reference symbols refer to corresponding parts.

As FIG. 1 shows, the piston pump shown has two feed cylinders 1 and 2 with operating pistons 3 and 4, the direction of operation being indicated by arrows a. The pistons are actuated via piston rod 5 from a hydraulic

drive mechanism that is not shown. The cylinders are provided with flanges 6 and connected to counter flanges 7 of a rotary valve 8. The rotary valve has a housing 9 and a rotary valve body which can assume two positions in the housing: one of these positions is shown in FIG. 1 and in this position the piston 3 sucks in concrete from above as shown by arrow b in FIG. 1. The other position of the valve body is shown in FIG. 2 and makes possible the discharge of the previously drawn-in concrete out of the cylinder with the aid of piston 3, the direction of movement being opposite to the direction of arrows a, the discharge being into the concrete feed pipe 10 as shown by arrow c.

In the example shown in FIGS. 1 and 2, the rotary valve is formed as a shaped unit 11 which possesses a certain axial dimension. The base surface of the shaped unit is a segment of circle so that two radial outer surfaces 12 and 13 are produced. In the shaped unit 11, there is a radial-tangential recess 14 through which the concrete is pumped from above into cylinders 1 and 2. The radial surfaces 12 and 13 of the shaped unit 11 form the boundaries for two discharge ports of which one each is associated with the cylinders 1 or 2, respectively.

As FIG. 1 shows, the discharge port 15 for cylinder 1 is bounded on one side by the radial surface 12 and by surface 16 of housing 9 on the other side. FIG. 2 shows that the discharge port 17 is bounded by the radial surface 13 and the opposite housing surface 18.

It is thus apparent that a suction port 14 in the body of the rotary valve is installed for two feed cylinders 1 and 2, the port lying in the center between two discharge ports 15 and 17 respectively.

In the example shown in the FIGS. 2 and 3, the drive mechanism for oscillating the rotary valve is installed through the valve body. The body of the rotary valve is formed as a disc-shaped plate 20 and has a shaped unit 11 attached to it. A shaft 21 is firmly connected by screws 22 in a flange 23 to plate 20 and carries an arm 24 to which is attached a piston rod 25 of a hydraulic thrust piston mechanism 26. The cylinder of this mechanism is pivoted at 27.

A wearing plate 30 sits on the body of the rotary valve and moves with the rotary valve. In the bottom of the housing 9 of the rotary valve is, a fixed wear plate 31. A shaft stud 32 is connected to the body unit 11 and is enclosed by a wear bushing 33 which swivels with the shafts stub 32. The wear bushing 33 lies in a fixed wear bushing 34. A cover plate 35 is attached by screws 39 to the end of the stub 32.

The rotary bearing described is mounted in a housing 36 by a flange 37 which is attached to a sealing plate 38 with the aid of screw 39.

In the example shown in FIGS. 2 and 3, it is possible to manage without main seals. The internal concrete-carrying chamber of the rotary valve 8 which is attached by flanges at 41 underneath a concrete supply-

ing hopper 40, is not sealed against the housing 36 which is sealed only by the cover plate 38.

The example shown in FIGS. 1, 5 and 6 differs from the other example in the installation of the rotary valve drive under the valve housing. Seals 45 and 46 are required in the example according to FIGS. 1, 5 and 6.

I claim:

1. A piston pump for conveying concrete, comprising:

- A. a pair of concrete-conveying cylinders,
- B. a pair of alternately operating pistons reciprocable respectively in the cylinders,
- C. a concrete-conveying output pipe communicating with the cylinders,
- D. a valve housing between the cylinders and the pipe,
- E. a hopper located above the valve housing for supplying concrete, and
- F. a rotary valve body located within and turnable in the valve housing on an axis at right angles to a plane containing both of the concrete-conveying cylinders, the valve further comprising

F 1. a radial-tangential recess forming a concrete input suction port recurrently exposed to the hopper for suction of concrete from the hopper into the conveying cylinders in alternation and, F 2. a radial surface on each side of the radial-tangential recess, forming, together with the valve housing, an output port which is continuously open to the output pipe and which, in alternation, is open to the conveying cylinder which is not then open to the radial-tangential recess, whereby, on a suction stroke of each cylinder, the valve is positioned to place the radial-tangential recess in communication therewith, and, during a pressure stroke of each cylinder, the valve is positioned with the output port formed by the radial surface in communication therewith.

2. A piston pump according to claim 1 further comprising:

- A. a drive means for the valve body including a shaft through the valve body,
- B. a pivot bearing in the valve housing beneath the valve body, and
- C. means for closing off the pivot from the outside of the valve housing.

3. A piston pump according to claim 1 wherein the valve body further comprises:

- A. a rotary disc,
- B. a drive shaft fixed to the disc, and
- C. a shaped unit connected to the disc and comprising the radial-tangential recess and the radial surfaces.

4. A piston pump according to claim 1, further comprising hydraulic thrust piston means for oscillating the valve body within the valve housing.

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