

[54] PUMP FOR CONCRETE AND THE LIKE
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[57] ABSTRACT
A pump for concrete, cement, or like fluent medium having two oppositely-acting piston/cylinder units which alternately feed the fluent medium from a hopper to a delivery conduit. A pivotal tube is used to connect the discharge ends of the cylinders in turn to the delivery conduit.

6 Claims, 4 Drawing Figures

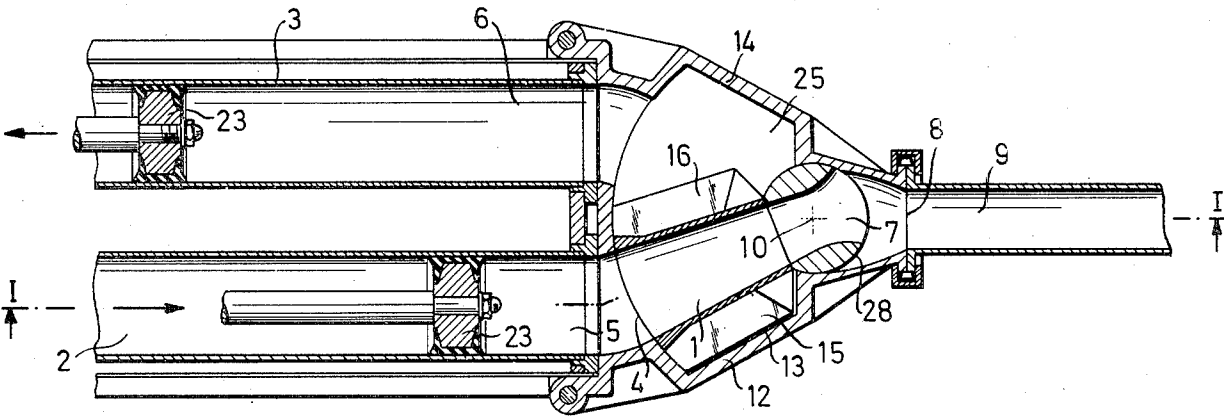
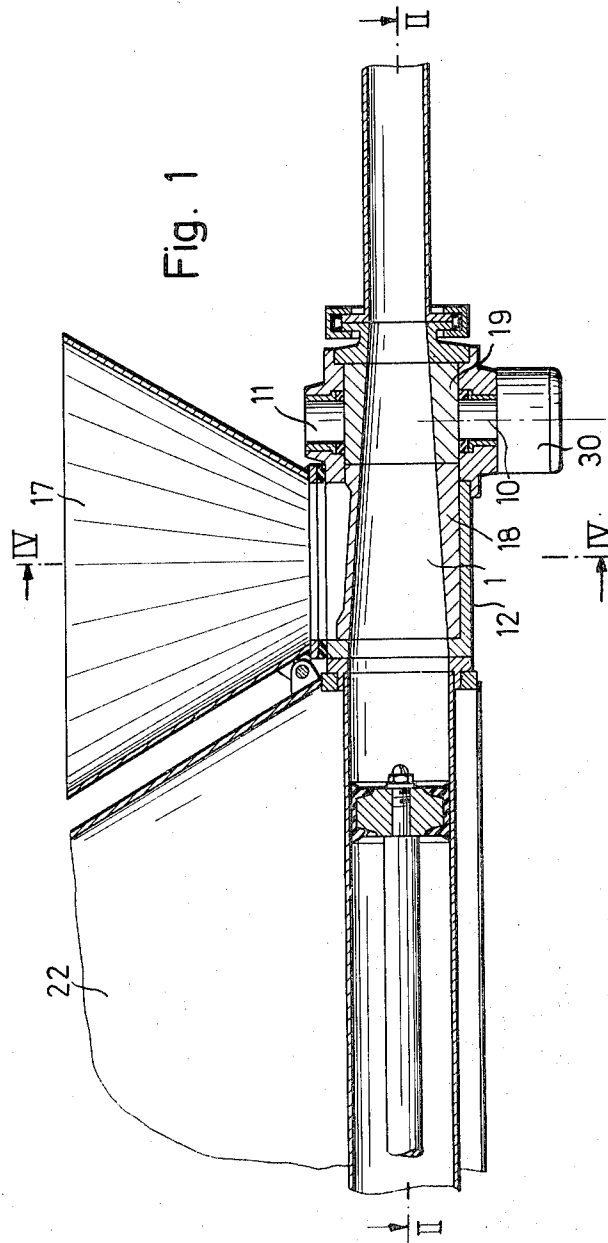


Fig. 1



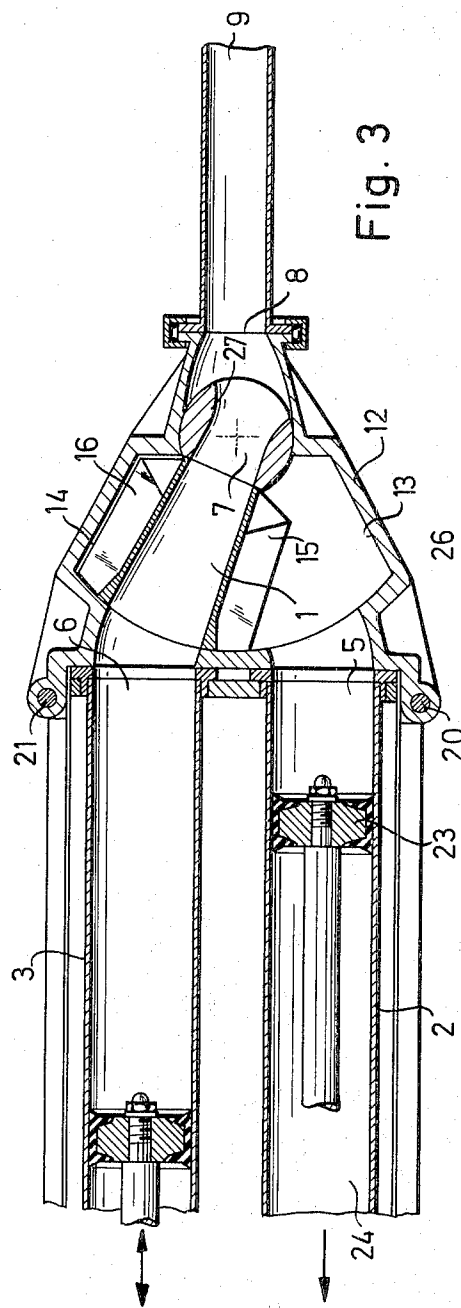
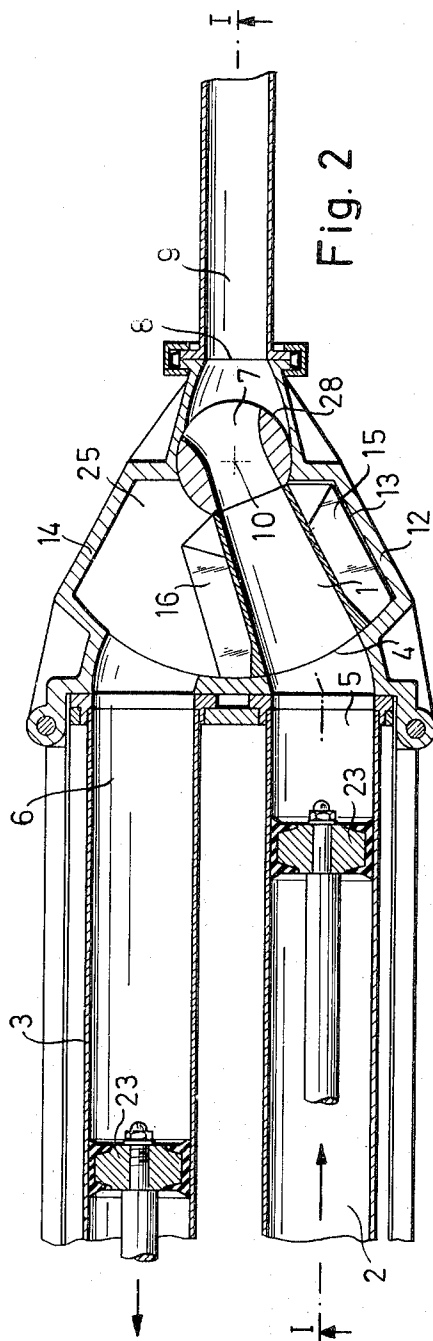
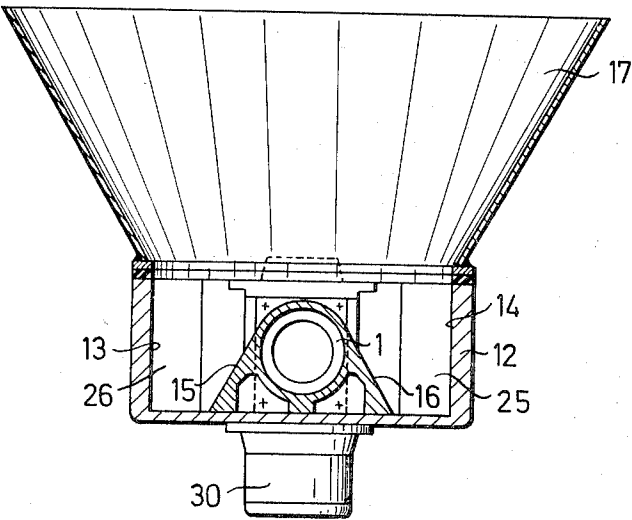


Fig. 4



PUMP FOR CONCRETE AND THE LIKE

This invention relates to a pump for concrete or other media which can be pumped, for example cement or the like.

Concrete pumps generally comprise two piston/cylinder units which are arranged parallel to one another and have their pistons driven oppositely so that the pressure stroke of one piston follows on the pressure stroke of the other. The aim is to achieve as uniform a delivery of concrete or the like as possible because it is important to keep variations in the speed of travel of the delivered concrete to a minimum. In particular the aim is to avoid the pumped material coming to rest and causing blockages.

Valve units associated with the cylinders are disposed at the ends of the latter and as a rule are located above the inlets from the supply container, which may for example be of hopper form, from which the concrete or the like flows to the valves. This arrangement has to be used because the reduced pressure set up during the suction strokes is not adequate to fill the cylinders rapidly enough and the weight of the pumped medium in the supply container is required to assist this procedure.

In order to ensure a uniform flow of concrete, particularly in the zone of the valve units, it is necessary to keep the flow cross-sections approximately equal and to avoid changes of direction with narrow radii of curvature. To comply with these requirements a pipe system is frequently provided behind the valve arrangement which connect the cylinders alternatively with the supply container and the delivery conduit, and the purpose of this pipe system is to unite the two partial streams from the two cylinders.

This pipe system, which is of the hose type, involves various disadvantages. Whereas the pumped medium only pauses for a short period in the zone of the valve unit and a cylinder, namely only during the time that the piston takes to reverse from the suction stroke to the pressure stroke or vice versa, the period of arrest of the pumped medium in the parts of the hose-pipe is substantially longer. The material is stationary during the whole of the suction stroke of the cylinder concerned.

There are constructions which should avoid the use of the hose-type pipe. In these use is made of a rotary flap valve, but this still has the aforementioned disadvantage of a substantial variation in the flow cross-section and small radius changes in direction of flow of the medium. Moreover, the pumped medium flows at high pressure over the sealing surfaces of the valve arrangement or the rotary flap valve, and these surfaces are therefore subject to heavy wear. Because of the then insufficient sealing effect fine components of the concrete, namely concrete slurry, are forced out and this increases the danger of blockages.

The object of the present invention is to provide a pump for concrete or other expressed media in which the disadvantages of the hose-type pipe are avoided as are also the undesirable rapid changes in cross-sectional flow area in the direction of travel of the medium, and abrupt changes in direction of this medium.

In pursuance of this object, the present invention provides a pump for concrete or the like comprising two cylinders and pistons which are adapted to be

driven in opposite directions to withdraw the pumped medium under suction from a supply container and to forward it to a delivery conduit, a valve arrangement for the two cylinders adapted to alternately connect the supply container with one or the other cylinder with the delivery conduit and vice versa, and an arrangement for forwarding the pumped media delivered from the two piston-cylinder arrangements to a common delivery conduit, characterised by the fact that the valve arrangement comprises a pivot tube disposed between the discharge ends of said pistons and the entrance to said delivery conduit, this pivot tube being pivotable between positions in which it alternately connects the discharge end of one and the other of said discharge ends of the pistons to the entrance of the delivery conduit.

The pivot tube used in accordance with the invention thus fulfils the same function as the known type of valve and the function of the known hose-type pipe. The pivot tube may be of substantially uniform cross-section, but it is also possible in the invention for it to be varied uniformly, for example tapered, in the direction of flow.

The uniformity in internal cross-section of the pivot tube prevents any blockages and depositing of medium in this zone. Since only a single pivot tube is provided for the pump with its two cylinders, this tube being associated firstly with one cylinder and then with the other during the pressure strokes thereof, there is a continuous flow through the pivot tube apart from the very short transitory periods when it is changed over from one position to the other. This provides a positive means of preventing segregation out of the medium and blockages which would be associated with this.

Effective results are obtained where the axis of rotation of the pivot tube is arranged in the vicinity of the end thereof adjacent the entrance to the delivery conduit. There will then be practically no relative motion at this end and this will greatly simplify the problems of sealing at this part. The pivot tube may be slightly curved, or it can be rectilinear.

In a preferred embodiment of the invention the pivot tube is pivotable substantially in the common medial plane to the two cylinders. This enables a rectilinear pivot tube to be used and the amount of diversion of the stream of pumped medium is determined only by the distance of the two cylinders from the central plane between them. If the pivot tube is of adequate length the angle of diversion is relatively small.

The pivot tube can be moved in standard fashion through a linkage. It is however preferred to operate the pivot tube through its pivot shaft because the sealing surfaces then involved need only be very small.

The arrangement whereby the supply container is connected to a cylinder during the suction stroke of this cylinder can be implemented in various ways. In a preferred form of the invention the pivot tube is movable in a housing and part of the inner wall of this housing defines with the adjacent outer surface of the pivot tube a duct which connects the supply container to the cylinder during the suction stroke of the latter. It is of advantage to make the outer surface of the pivot tube of inclined wedge form so that it will slide beneath the pumped medium at the end of the suction stroke. When the pressure stroke terminates, the end of the pivot tube which moves away from the cylinder in this construction creates a vacuum in front of this cylinder and

this assists the after flow of the pumped medium out of the supply container.

Advantageously the pivot tube is made in two parts, namely one part which is of tubular form and has the wedgeform outer surface referred to, and a second part which fits over the pivot shaft.

An embodiment of the invention is diagrammatically illustrated in the accompanying drawings, in which

FIG. 1 is a longitudinal section on the line I—I of FIG. 2 through a pump constructed in accordance with the invention,

FIG. 2 is a horizontal section through the pump taken on the line II—II of FIG. 1,

FIG. 3 is a horizontal section corresponding to that of FIG. 2 but showing the pump in another operating condition, and

FIG. 4 is a cross-section on the line IV—IV of FIG. 1, with the pivot tube in a central position.

A pivot tube 1 is mounted in the valve housing 12 and is movable through the agency of a shaft 11 which rotates about an axis 10. Shaft 11 is operated by an oil-hydraulic pivot motor 30, but the latter could be replaced by any other convenient hydraulic arrangement or other operating mechanism. The valve housing 12 is connected to a concrete pump housing 22 by means of hinge bolts 20 and 21, and cylinders 2 and 3 are arranged in this housing. A piston 23 is provided in each cylinder and is operated in known fashion by a piston rod 24, the pistons of the two cylinders 2 and 3 being arranged to move oppositely to one another. The pivot tube 1 is alternately connected to the ends 5 and 6 of the cylinders 2 and 3 respectively.

In the operative condition illustrated in FIG. 2, the piston 23 of cylinder 3 is performing a suction stroke, whilst the piston of cylinder 2 is performing a pressure stroke. The piston of cylinder 3 thus applies a suction effect to duct 25 primarily defined between the part 14 of the valve housing 12 and the outer surface 16 of tube 1. As is clear from the illustration of FIG. 4 that this connecting duct 25 is in communication with the supply container 17 so that the piston of cylinder 3 can draw in pumped medium in the operative position shown in FIG. 2.

Simultaneously with the aforementioned suction stroke of the piston of cylinder 3, the piston 23 of cylinder 2 is performing a compression stroke and forces the previously indrawn pumped medium from the interior of tube 1 in the direction of the delivery conduit 9.

In the embodiment illustrated in the drawing, the end 4 of the pivot tube has a larger internal cross-section than the end 7 of this pivot tube 1 facing the entrance 8 of the delivery conduit 9. This provides a smooth transition between the differing cross-sections of the cylinders and the delivery conduit 9.

The outer surfaces 15 and 16 of the pivot tube are of inclined wedge form, as can be seen from FIG. 4. This facilitates the shifting of the pivot tube beneath the pumped medium in duct 25 or in duct 26. Duct 26 is associated in the same way with the cylinder 2 during the suction stroke of the latter as is duct 25 with cylinder 3.

The arrangement of the pump parts in the present invention has the advantage that the substantial pressure which is exerted by the pump does not act, or only acts to a negligible extent, on the sealing surfaces and the bearing surfaces of the valve arrangement. In the arrangement illustrated the pivot tube 1 has substantially

the same cross-sectional areas exposed at both ends to pressure, the surfaces 27 and 28 which partially act as sealing surfaces having a pressure function at the end 7 to balance the pressure effect.

As is particularly seen from FIGS. 1 to 3, the pivot tube is practically in two parts, being largely made up of part 18 of tubular form and the part 19 which also carries the pivot shaft 11.

We claim:

1. In a pump for pumping concrete and the like, fluent media having a supply container for supplying the fluent media to the pump, two cylinders in communication with said supply container each cylinder having a discharge opening and a piston movably disposed therein, means for operating said pistons in mutually opposed motion so that as the piston in one of said cylinders performs a delivery stroke the piston in the other of said cylinders performs an intake stroke, a delivery conduit for delivering the fluent media from the pump, said delivery conduit having an entrance end, and a valve arrangement for alternately directing the fluent media from respective ones of said discharge openings of said cylinders the pistons of which are performing a delivery stroke, to the entrance end of said delivery conduit the improvement wherein said valve arrangement comprises: housing means fixedly disposed between said cylinder and said delivery conduit and communicating with said supply container; a pivot tube movably mounted within said housing means, said pivot tube having one end in permanent communication with the entrance end of said delivery conduit and downwardly depending skirt portions, the outside surface of which are of inclined wedge shape; means for pivoting said tube about an axis of rotation so that the other end thereof is alternately brought into a registering position with the discharge ends of respective ones of said cylinders the pistons of which are performing a delivery stroke whereby fluent media is conveyed from said respective ones of said cylinders through said tube to said delivery conduit, and delivered to the other respective ones of said cylinders the pistons of which are performing an intake stroke, from said supply container through connecting ducts which include a planar surface substantially perpendicular to said axis of rotation of said pivot tube and defined between a respective one of said skirt portions of said tube when said tube is in said registering positions, and an adjacent inner wall of said housing means, said skirt portions acting to slide beneath and scrape fluent media in said connecting ducts along said planar surface and prevent clogging therein as said tube is alternately pivoted between said registering positions.

2. A pump according to claim 1, wherein the pivot tube is rotatable about an axis adjacent the entrance of the delivery conduit.

3. A pump in accordance with claim 1, wherein the pivot tube is pivotable substantially in the common medial plane of the two cylinders.

4. A pump in accordance with claim 1, wherein the pivot tube incorporates a pivot shaft for operation thereof.

5. A pump in accordance with claim 1, wherein the internal cross-section of the pivot tube is tapered uniformly in the direction of flow of pumped media there-through.

6. A pump in accordance with claim 1, wherein the pivot tube comprises two parts, namely a tubular part with said wedge-shaped skirt portions and an actuating part formed to fit over a pivot shaft.

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