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(54) Pumps.

(57) This invention relates to pumps.

It is well established that the ease or difficulty of pumping materials or admixes of materials is directly related to the viscosity and/or the flow characteristics of the material or mixture, it being generally accepted that the higher the viscosity and/or the lower the flow characteristics the more difficult does it become to pump the material. The object of the invention is to provide an effective pump for such materials which objective is met by a construction comprising a cylinder, a piston within the cylinder, an inlet to the cylinder part-way along its length, said inlet being opened and closed by reciprocation of the piston within the cylinder, an outlet from the cylinder and valve means at the outlet from the cylinder that is open during a drive stroke and closed during a return stroke of the piston.

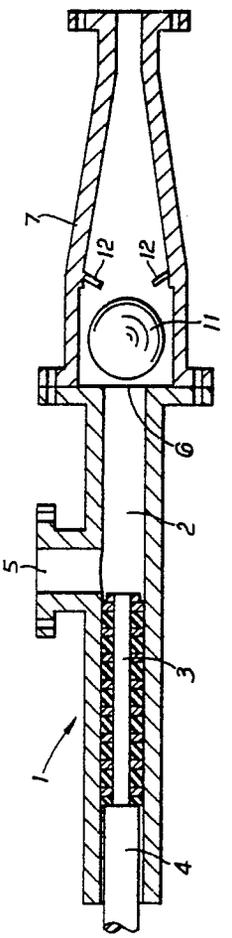

Fig. 2

EP 0 253 602 A2

PUMPS

This invention relates to pumps.

It is well established that the ease or difficulty of pumping materials or admixes of materials is directly related to the viscosity and/or the flow characteristics of the material or mixture, it being generally accepted that the higher the viscosity and/or the lower the flow characteristics the more difficult does it become to pump the material.

There are numerous instances where the provision of an effective pumping means for viscous and/or low flow characteristic materials would be of considerable advantage, either for the transport of the material to a required location, or for the delivery of the material at a point of usage. For example, high grade grouting mixes are traditionally produced in small batches at or close by the intended point of application, and are applied by hand, and yet there would be a major advantage, particularly on a large site, if such grouting mixes could be produced in larger batches, and pumped to a required location, and if such grouting mixes could be applied by a mechanical means rather than by hand.

The object of the present invention is to provide a pumping means for viscous and/or low flow characteristic materials, which has the advantage that it can readily be used as a means of applying such materials at a point of usage, and is equally capable of pumping materials of low viscosity and/or high flow characteristic materials.

According to the present invention, a pump comprises a cylinder, a piston within the cylinder, an inlet to the cylinder part-way along its length, said inlet being opened and closed by reciprocation of the piston within the cylinder, an outlet from the cylinder and valve means at the outlet from the cylinder that is open during a drive stroke and closed during a return stroke of the piston. Thus, the valve may be spring loaded towards the closed position or a ball drawn to the closed position during the return stroke of the piston. Preferably, the valve means is located within a discharge member secured to the outlet from the cylinder.

Thus, with the inlet to the cylinder connected to a source of supply of material, the piston is activated by any suitable mechanical, hydraulic, or pneumatic means. On its first drive stroke, the piston passes across and closes the inlet to the cylinder, further travel of the piston compressing air trapped in the cylinder causing the valve to open to expel the trapped air. Retraction of the piston, and with the valve now closed, creates a vacuum in the cylinder, and as the piston clears the inlet to the cylinder there is a suction effect created at the inlet to draw material into the cylinder. On the next drive stroke of the piston, the material is forced along the cylinder to open and progress beyond the valve and into the discharge member.

Thus, irrespective of the viscosity of the material or its flow characteristic, material can be pumped efficiently and at substantially any desired rate by controlling the rate of reciprocation of the piston.

The invention can therefore be used as a pump to transport material to a required location, e.g. by securing a delivery line to the end of the discharge member. It can equally be used as a means of applying material at a point of use, e.g. it can be used as a pressure discharge gun or grouting gun, and when a suitable nozzle would be secured to the end of the discharge member.

The further advantage of the invention is that by its nature it can handle high viscosity materials with poor flow characteriseics, and can handle equally well low viscosity, highly flowable materials, and could be used efficiently as, e.g. a wet spraying gun, with the selection of a suitable rate of reciprocation of the piston.

Two embodiments of the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a sectional side elevation of one embodiment of pump according to the invention; and

Figure 2 corresponds to Figure 1, but shows a second embodiment of pump according to the invention.

In the drawings, a pump 1 consists of a cylinder 2 within which is a reciprocable piston 3, the connecting rod 4 of which extends to any suitable drive means that can be mechanically, hydraulically or pneumatically activated.

The cylinder 2 has an inlet 5 to which can be attached a suitable supply line for material to be pumped, and an outlet 6 to which is secured a discharge member 7 and to which can be attached a suitable delivery line for pumped material.

As shown by Figure 1, within the discharge member 7 is a housing 8 containing spring loaded valve 9, the valve head 10 of which is urged by the spring towards the outlet 6 from the cylinder. In Figure 2, there is a freely movable ball 11 within the discharge member, with inner projections 12 on the discharge member to hold the ball in close proximity to the outlet 6 from the cylinder.

With both forms of construction, the operation of the pump is essentially the same. Thus, with the inlet to the pump suitably connected to a supply of material, and the discharge member suitably con-

nected to a delivery line, the piston is activated. On its first drive stroke, the piston compreses the air in the cylinder and drives it out of the cylinder past the valve 9 or 11. On its return stroke, the piston creates a vacuum in the cylinder causing the valve 9 or 11 to close the outlet 6, and as the piston progreses beyond the inlet 5, material is drawn into the cylinder, to be picked up by the piston on its next drive stroke to be driven towards and through the valved outlet from the cylinder. Continued reciprocation of the piston 3 thus causes a rapid succession of batches of material being first drawn into the cylinder and then driven through the valved outlet and through the dicharge member, to be progressed along the supply line as a substantially continuous stream.

A principal advantage of the invention is its ability to handle materials of high viscosity and poor flow characteriastics, and serves ideally as a pump for the supply of grouting material to a grouting gun secured to the end of the supply. It is however equally so that the pump can handle low viscosity highly flowable material when required.

Claims

1. A pump characterised in that a cylinder (2), a piston (3) within the cylinder, an inlet (5) to the cylinder part-way along its length, said inlet being opened and closed by reciprocation of the piston within the cylinder, an outlet (6) from the cylinder and valve means (9, 11) at the outlet from the cylinder that is open during a drive stroke and closed during a return stroke of the piston.

2. A pump as in Claim 1, characterised in that the valve (9) is spring-loaded towards the position to close the outlet from the cylinder.

3. A pump as in Claim 1, characterised in that the valve is a ball valve (11) where the ball is drawn to a position to close the outlet from the cylinder during a return stroke of the piston.

4. A pump as in any of Claims 1 to 3 characterised in that the valve means (9, 11) is located within a discharge member (7) secured to the outlet 6 from the cylinder (2).

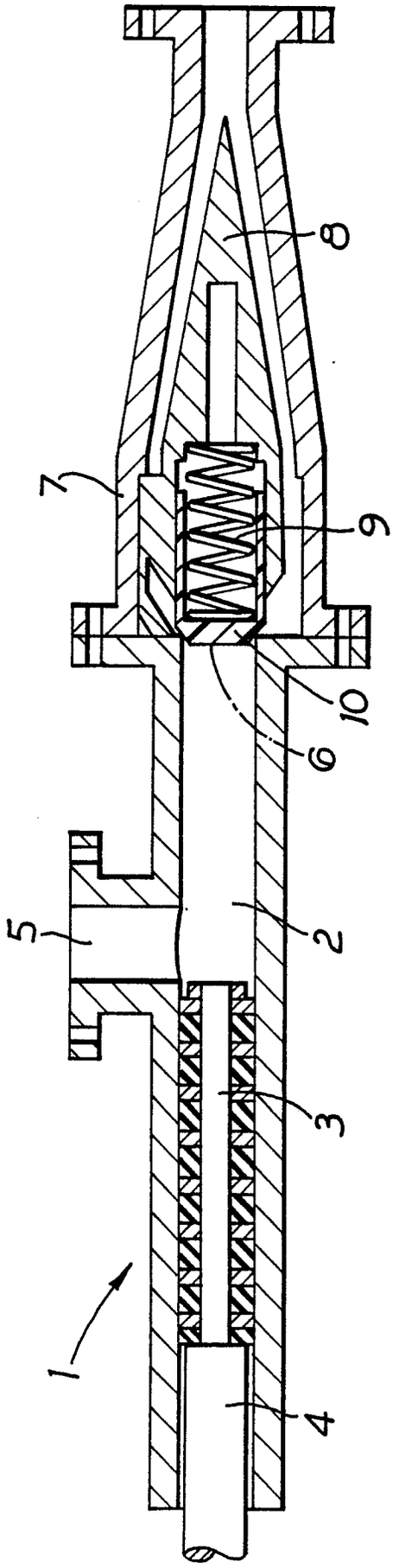

Fig. 1

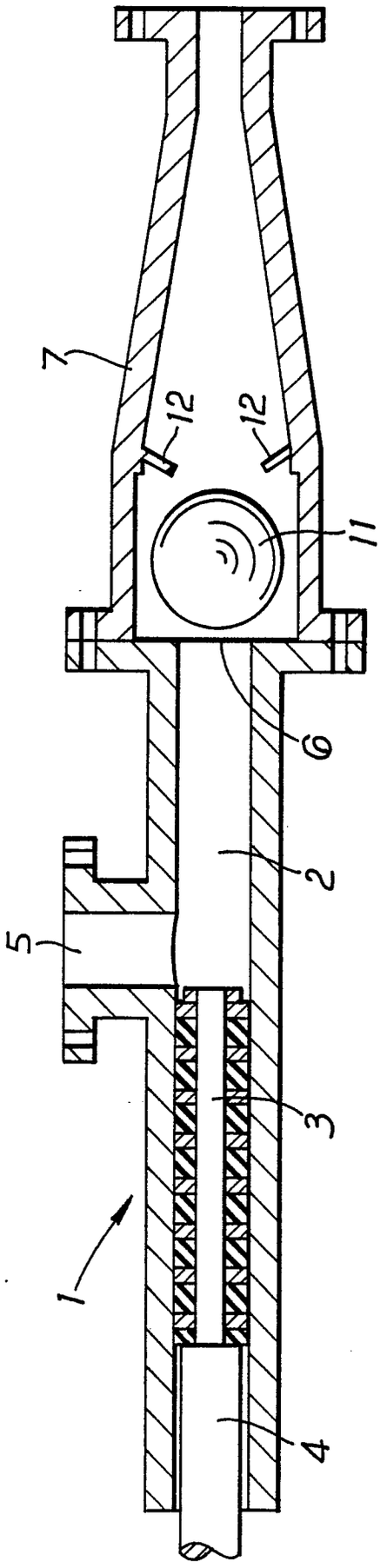

Fig. 2