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CHEMICAL FEED PUMP MECHANISM

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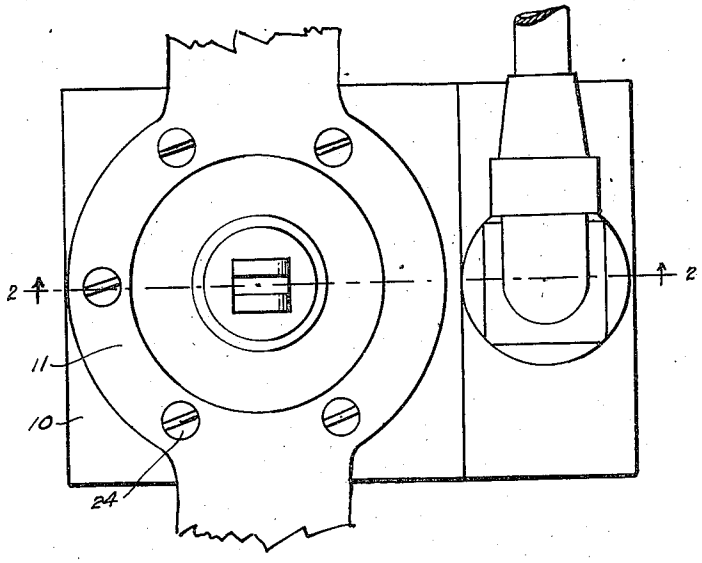


FIG 1

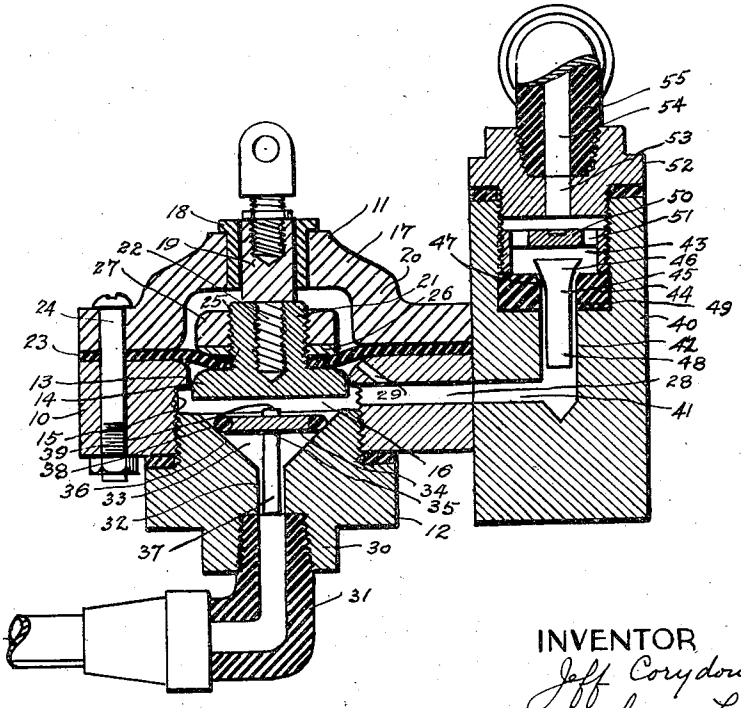


FIG 2

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CHEMICAL FEED PUMP MECHANISM

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7 Claims. (Cl. 103—153)

1

The present invention relates to fluid processing systems and arrangements, and has particular reference to a novel pump mechanism therefor.

The principal object of the invention is to provide a chemical feed pump mechanism which is particularly designed for high speed operation.

Another object of the invention is to provide a chemical feed pump of the seal sheet type which combines the positive displacement action of a piston type pump with the leak-proof characteristics of a packing gland-less diaphragm pump.

Still another object of the invention is to provide a feed pump of the type described which is immune to corrosive or other deteriorating chemicals and has extremely long life.

A further object is to provide a novel check valve construction for preventing valve lag in high speed pump operation.

With the above and other objects and advantageous features in view, the invention consists of a novel arrangement of parts more fully disclosed in the detailed description following, in conjunction with the accompanying drawing, and more specifically defined in the claims appended thereto.

In the drawing,

Fig. 1 is a top plan view of the novel feed pump mechanism; and

Fig. 2 is a vertical section on the line 2—2 of Fig. 1.

It has been found desirable to provide a very compact light weight pumping mechanism for pumping chemicals for fluid processing such as the hypochlorination of water supplies by the addition of calcium hypochlorite or sodium hypochlorite in measured quantities. The pump mechanism must be resistant to the pumped chemicals and the pump parts must be simple in structure and positive in operation and have long and effective life.

The preferred pumping mechanism is of the piston pump type, and includes a pump cylinder 10, a cylinder cap 11, and a cylinder base 12. The cylinder 10 has a central piston bore 13 in which a piston 14 reciprocates, and an enlarged lower recess 15 which functions as a pump chamber 16, the base 12 being removably secured within said lower recess, as by threading.

The cylinder cap 11 is cup-shaped, as illustrated, the upper portion 17 being bored to receive a bushing 18 in which the piston pump rod 19 is slidingly received, and the lower portion 20 of the cap being sufficiently large to house the upper

2

end 21 of the piston 14, this upper end being reduced in thickness and internally bored and threaded to receive the correspondingly reduced and threaded end portion 22 of the piston rod.

A flexible seal sheet 23 is mounted between the cylinder and its cap, and is locked in place by the cap and cylinder bolts 24, the seal sheet having a central opening 25 which seats over the upper end 21 of the piston and being clamped to the piston by a lock washer 26 and a lock nut 27 which threadedly engages the correspondingly threaded outer surface of the upper piston end 21.

The pump cylinder is provided with a lateral outlet passage 28 which freely communicates with the pump chamber 16. The piston 14 is preferably of the cylindrical disk type to obtain accurate feed volumes, and fits within the walls of the cylinder bore 13. Any air accumulated in the space between the piston and the seal sheet acts as a damping device or a dash pot, with resultant interference with the accuracy of feed volumes and possible stoppage of the pumping action because of the alternate compression or expansion of the trapped air. An air duct or vent 29 is therefore provided at the top portion of the pump cylinder to communicate the upper portion between the piston and the seal sheet with the outlet passage 28 and eject or release any accumulated air.

The base 12 has a depending boss 30 to which an inlet nipple 31 is attached, as by threading, for conveying treatment fluid to a vertical inflow passage 32 which communicates with a conical inlet chamber 33. A check valve 34 is positioned in the inlet chamber with its valve disk 35 adapted to seat on the conical walls 36 of the inlet chamber, which form a valve seat, the valve stem 37 of the check valve depending downwardly into the vertical inflow passage 32, which acts as a guide for the valve stem. The disk edge 38 is preferably of rubber or other resilient and chemically resistant material, secured to the periphery of the disk in any suitable manner, and the valve disk is provided with a central upstanding abutment or projection 39 which is positioned directly in the path of the piston movement. The use of the upstanding abutment reduces the clearance between the lower surface of the piston and the inlet valve; the inlet valve cannot lift too much and is contacted by the piston on down movement, thus ensuring quick correspondence of the piston and inlet valve movements and preventing valve flutter or lag.

An out-flow casing 40 is secured to one side of the pump cylinder, provided with a flow pas-

sage 41 communicating with the pump cylinder outlet passage 28 and leading to a vertical passage 42 for conveying the treatment fluid to an outflow chamber 43. A valve seat 44 is positioned in the outflow chamber over the upper portion of the vertical passage 42, the valve seat being preferably of rubber or similar resilient and chemical resistant material, and a check valve 45 is mounted in the casing with its valve head 46 adapted to engage the preferably conical walls 47 of the valve seat, the stem 48 of the valve extending through the central opening 49 of the valve seat and depending into the vertical passage 42, which acts as a valve stem guide.

A valve loading disk 50 is provided with flow passages 51 and is threaded or otherwise secured to the inner walls of the outflow chamber, and a closure top 52 is threaded into the upper portion of the outflow chamber, the closure top having a flow opening 53 which communicates with the flow conduit 54 of an outflow nipple 55 which is threaded into the upper portion of the closure top. The valve loading disk ensures valve closing even if no back pressure is available to seat the outlet check valve, and thus provides proper operation even when feeding into negative pressures.

The improved piston pump mechanism is particularly suitable for constant stroke length operation at variable high speeds, from 150 strokes per minute up. At such speeds the parts must be light in weight and yet positive in action; to this end the valve parts are preferably made of condensation products, resins, and the like. Preferably the pump parts are made of transparent material, so that the flow of treatment chemical may be seen and followed at all times, and are of simple construction to permit rapid separation for cleaning, repair and replacement.

Accurate and quick feeding of chemical is ensured by the light weight inlet valve, which moves in exact correspondence with the piston movement, and which has a resilient rim engaging the valve seat, the outflow check valve seating on a resilient seat. Further, all entrapped air above the piston is released to the outflow passage. These structural features provide a very accurate and uniform feed. As shown in the drawing, the flow passages are arranged for direct flow to the fullest possible extent and eliminate all labyrinth passageways, thus reducing the burden on the pumping mechanism.

While I have described a specific constructional embodiment of the invention, it is obvious that changes in the size, shape and material of the pump parts, and in their relative arrangement, may be made to suit the requirements for different chemical feeding systems, without departing from the spirit and the scope of the invention as defined in the appended claims.

I claim:

1. A pump mechanism for chemical feeding, comprising a cylinder, a cap and a base, a piston movable in said cylinder, a piston rod for said piston slidably guided in said cap, a flexible seal sheet mounted between said cap and said cylinder and secured to said piston, said base having an inflow chamber, an inlet check valve in said inflow chamber for controlling passage of fluid to said cylinder, and outlet passage from said cylinder, a casing having an outflow chamber positioned adjacent said cylinder, a passageway in said casing communicating said outlet passage and said outflow chamber, and an outlet check valve in said casing for controlling passage of fluid from said outflow chamber.

2. In the structure of claim 1, said cylinder having a relief duct communicating the cylinder space between said seal sheet and piston with the cylinder outlet passage.

3. In the structure of claim 1, said inlet check valve being positioned in the path of movement of the piston and having an abutment extending therefrom for limiting its lift and expediting the valve closure.

4. In the structure of claim 1, said inlet check valve having means associated therewith for limiting its lift.

5. In the structure of claim 1, said outlet check valve having means associated therewith for providing a pressure thereon.

6. A pump mechanism for chemical feeding, comprising a cylinder, a cap, and a base, a piston movable in said cylinder, a piston rod for said piston slidably guided in said cap, a flexible seal sheet mounted between said cap and said cylinder and secured to said piston, said base having an inflow chamber, an inlet check valve and a cooperating valve seat in said inflow chamber, one of the engaging faces of said inlet check valve and its valve seat being made of rubber, an outlet passage from said cylinder, said cylinder having a relief duct communicating the cylinder space between said diaphragm and piston with said outlet passage, a casing having an outflow chamber positioned adjacent said cylinder, said casing having a passageway communicating the outlet passage and the outflow chamber, and an outlet check valve and cooperating valve seat in said casing for controlling passage of fluid from said outflow chamber, one of the engaging faces of said outlet check valve and its valve seat being made of rubber.

7. In the structure of claim 6, said inlet check valve having means associated therewith for limiting the extent of its movement.

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