Dec. 20, 1955 R. B. SAALFRANK 2,727,533

VALVE SYSTEM

Original Filed Aug. 24, 1950

Fig. 1.

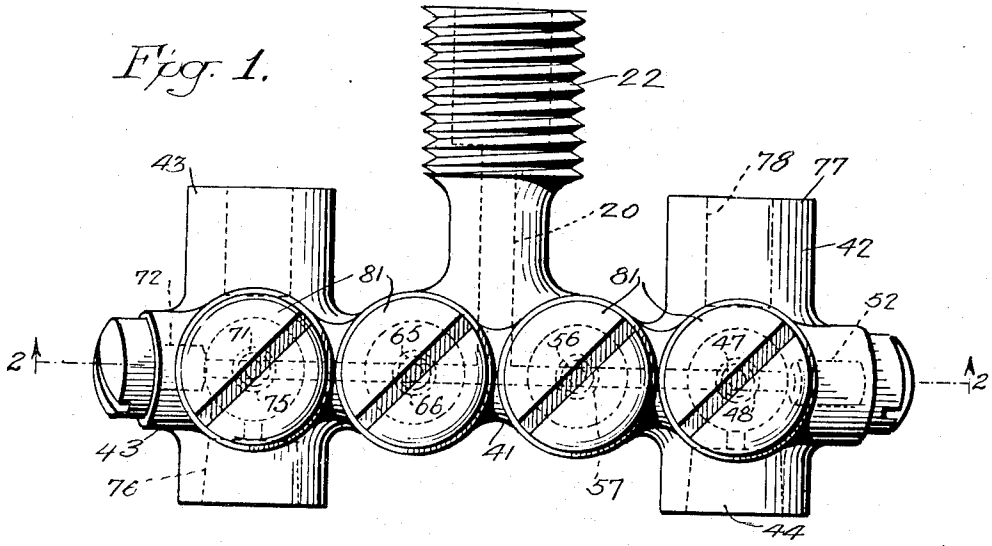
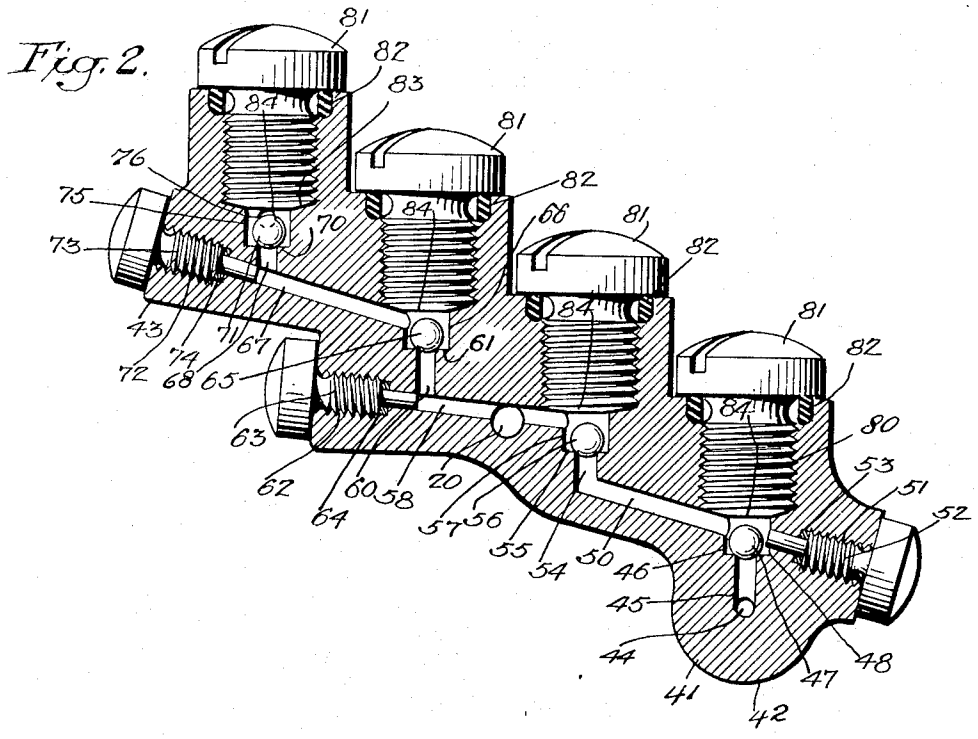


Fig. 2.



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VALVE SYSTEM

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1 Claim. (Cl. 137—533.11)

The present invention relates to a valve system, particularly suited for proportioning pumps.

The present application is a division of my co-pending application Serial No. 181,208, filed August 24, 1950, for Proportioning Pump and Valve Assembly.

A purpose of the invention is to render the valve construction more compact, by providing a common passageway between the last of the inlet valves and the first of the outlet valves which branches into the pump cylinder.

A further purpose is to provide access to the inlet and outlet valve passageways through removable plugs in the valve housing for inspection and cleaning.

A further purpose is to close the valve chambers by downwardly crowned plugs which limit the motion of the ball check valves.

A further purpose is to mount the valves on a unitary housing which contains the pump cylinder and which extends transversely in both directions from the pump cylinders, desirably being of T shape.

A further purpose is to connect each check valve with the next by a diagonal upwardly extending passage to which access is had at one end, connecting to a vertical passage to which access is had at the top.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which my invention may appear, selecting the form shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a top plan view of the valve assembly of the invention.

Figure 2 is a section on the line 2—2 of Figure 1.

Describing in illustration but not in limitation and referring to the drawings:

The present invention is designed to provide a valve assembly of great simplicity and economy of manufacture which is suited particularly for use on metering pumps.

In accordance with the invention, the cylinder of the pump is formed as the base of a T, the inlet valve passages being in one branch of the T and the outlet valve passages being in the other branch of the T. The inlet and outlet valve passages are made up of combinations of vertical passages which enlarge in shoulders to form the valve seats and extend above the valve chamber to form screw plug access openings, and diagonal upwardly extending passages which join the vertical passages at the upper end and which extend to the outside at one end and receive clean-out plugs. Both the vertical and diagonal passages are straight so as to permit introduction of a clean-out tool as desired.

The plugs closing the vertical passage openings above the valves have annular tapered lower edge portions which conform with tapered seats in the plug openings around a portion of the circumference, and conform with the tops of the diagonal upwardly extending passages at another

portion of the circumference, while the centers of the plugs limit the upward motions of the valves.

A pump cylinder 20 has a thread 22 which may desirably form part of a stuffing box.

The unitary cylinder casting 41 is generally of T formation, the cylinder 20 being formed in the base of the T and opposite branches 42 and 43 extending to the sides and respectively housing the inlet valves and the outlet valves. The inlet branch 42 is disposed generally below and the outlet branch 43 is mounted generally above the pump cylinder so that the liquid will flow progressively upward and avoid air entrapment. The passages through the pump also gradually and progressively ascend to avoid the possibility of entrapping air and thus causing inaccuracy in pumping.

Inlet connection 44 connects with upwardly extending passage 45, in which the first upwardly directed inlet valve seat 46 is positioned to support ball check valve 47. The ball check valve 47 is held in a valve chamber 48, which communicates at one side with a diagonally upwardly extending inlet passage 50, which is in line with end access opening 51 threaded to receive clean-out screw plug 52 gasketed at 53. At the upper end of the passage 50 a vertical inlet passage 54 is provided which connects with second upwardly directed valve seat 55, holding second ball check valve 56 in valve chamber 57. At one side, chamber 57 connects with diagonally upwardly extending passage 58 having, intermediate its ends, connection with one end of the pump cylinder 20, and at the upper end connecting with upwardly extending outlet valve passage 60, which leads to upwardly extending outlet valve seat 61.

It will be understood that passage 58 serves in part as an inlet passage and in part as an outlet passage, since it connects with the pump cylinder between its ends.

At the upper end of passage 58, threaded access opening 62 in prolongation of the passage receives screw cleanout plug 63, gasketed at 64.

Outlet ball check valve 65 on check valve seat 61 moves in outlet valve chamber 66. At one side, valve chamber 66 connects with diagonally upwardly extending passage 67 which at the upper end communicates with vertically extending passage 68, leading to upwardly directed ball check valve seat 70, which receives outlet ball check valve 71.

In prolongation of valve passage 67 and at the top, threaded cleanout opening 72 receives screw clean-out plug 73, gasketed at 74.

Ball check valve 71 operates in valve chamber 75, which connects with outlet connection 76. On the back of the valve casing 41, lugs 77 are provided toward the base of the T, which has screw sockets 78 and receive screws not shown, which mount the valve casting on the housing.

Immediately above and concentric with each ball check valve is provided a screw clean-out opening 80 in line with the vertical passage below the valve seat, which receives a screw clean-out plug 81 gasketed at 82. Each one of the access openings 80 has a tapered bottom surface which receives a tapered or conical bottom edge surface 83 on the plug which conforms with the top of the valve passage immediately above the corresponding valve in the case of the three lower valves, to guide the liquid.

As the piston moves back and forth on the suction stroke, liquid is drawn in through inlet connection 44 and flows upwardly through vertical passageway 45, unseating the first inlet check valve 47 from its seat 46. The liquid then flows through the valve chamber 48 and diagonally upward through passageway 50, and then vertically upward through passageway 54 to unseat the second inlet check valve 56. The inlet liquid then passes through the valve chamber 57 and the lower portion of

diagonal upward passage **58** to the pump cylinder **20**. It will be noted that the motion of the liquid has been continuously upwardly without encountering any pockets. The upper surfaces encountered have been the bottom flat and tapered surfaces of the plugs **81** which conform with the diagonal passages, and then the diagonal passages themselves.

On the pumping stroke the liquid leaves the valve cylinder, and flows through the upper portion of diagonal upward passages **58** and then through vertical passage **60**, unseating the outlet check valve **65**. The liquid enters valve chamber **66** and then flows upward through diagonal passage **67** and vertical passage **68** to unseat check valve **71**, flow through valve passage **75** and then leave by outlet connection **76**.

All of the passages encountered by the liquid are straight and all are readily cleaned by removing the respective plugs and inserting a cleaning tool such as a clean-out brush.

The ball diameter may in normal practice be as small as $\frac{3}{32}$ inch or as large as ¼ inch.

The extremely small size of the passages increases the need for clean outs, and the ready access to the passages for cleaning makes it practical to pump commercial chemical solutions in the extremely small equipment described herein.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claim.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

In a valve system, a casing, walls forming a valve chamber in the casing, a valve seat at the bottom of the valve chamber, walls forming a passage extending downwardly through the valve seat, a ball check valve in the valve chamber, an enlarged internally threaded opening above the valve chamber having a downwardly tapered annular surface around its edges, walls forming a diagonally upwardly extending passage from the valve chamber which at its upper edge conforms to the taper of the bottom of the threaded opening and extends into the threaded opening and a threaded plug in the threaded opening having a tapered portion at the outer edge of the bottom, the tapered portion of the plug seating in the tapered portion of the threaded opening and extending in prolongation of the top of the diagonal passage to conform with the diagonal passage and produce a uniform liquid flow as the liquid leaves the valve chamber.

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