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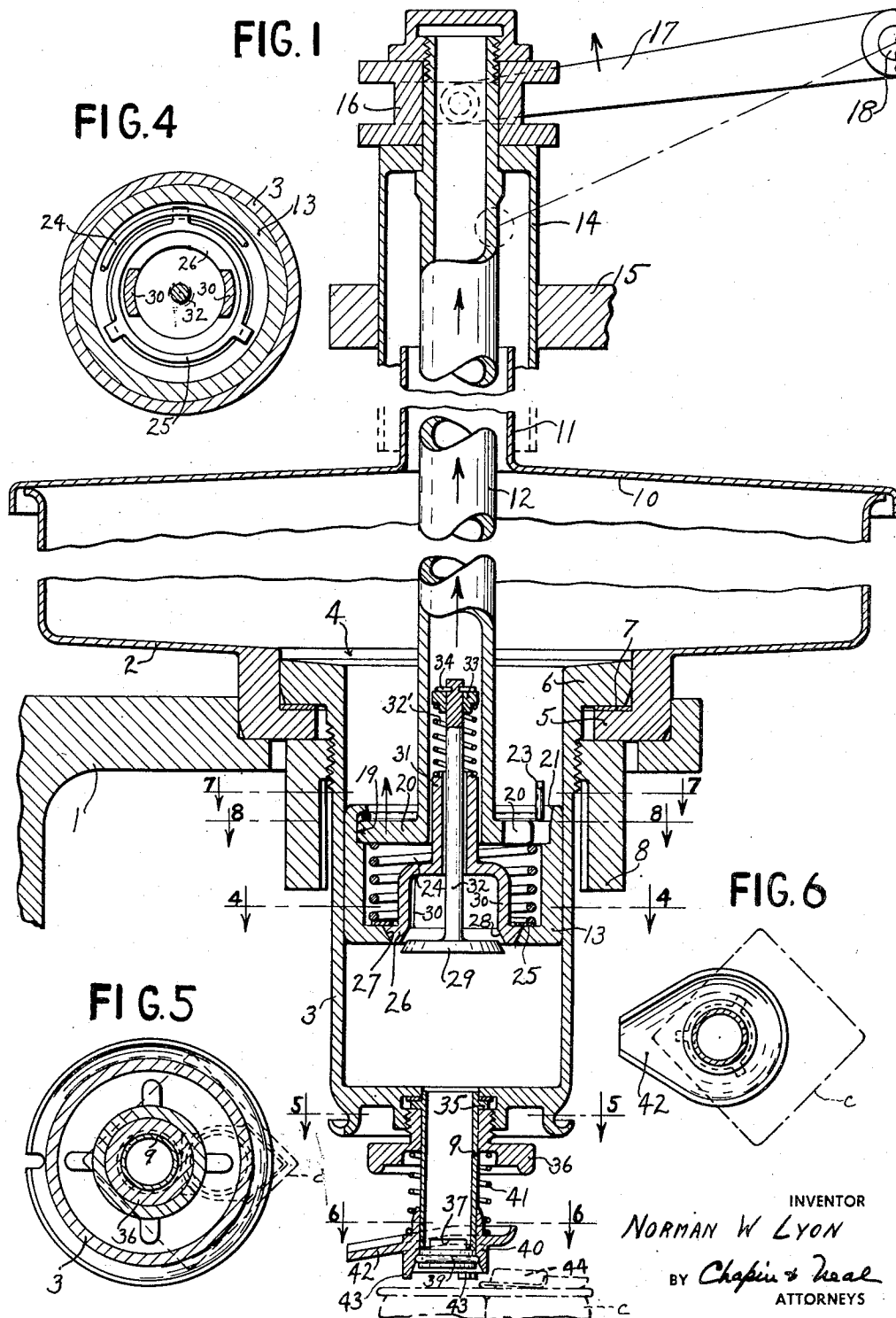
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2,776,785

VALVE MECHANISM FOR CONTAINER FILLING APPARATUS

Filed April 29, 1954

2 Sheets-Sheet 1



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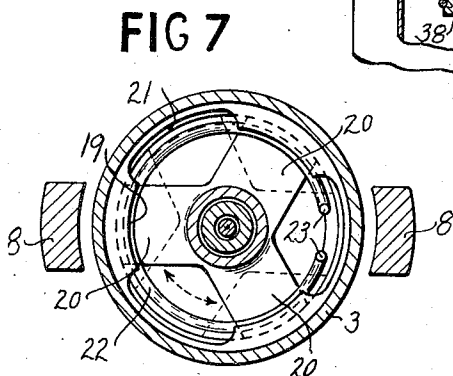
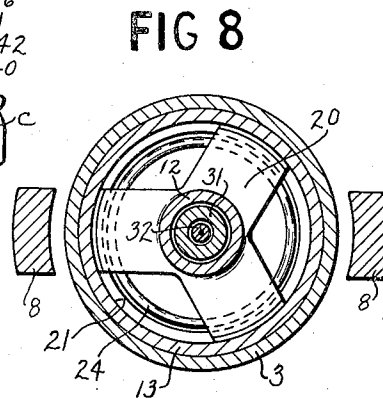
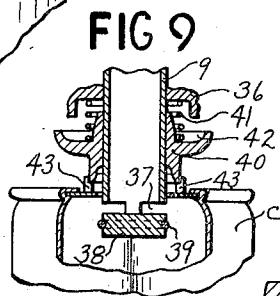
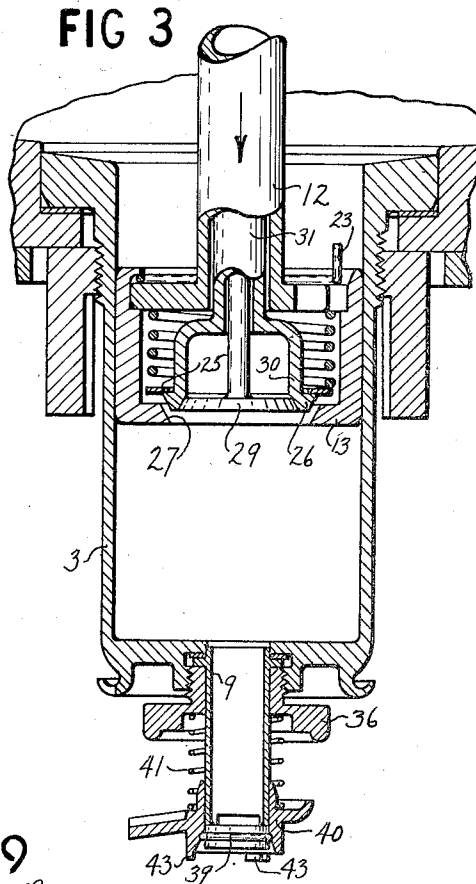
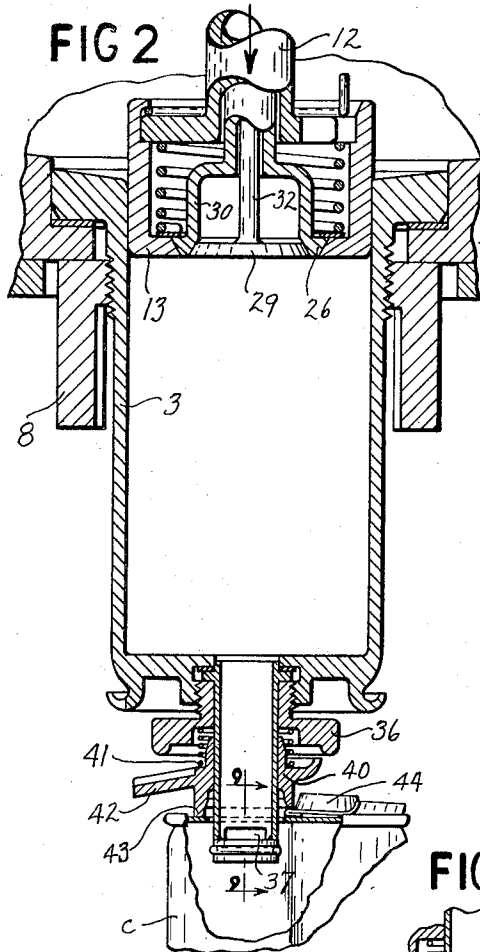
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VALVE MECHANISM FOR CONTAINER FILLING APPARATUS

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7 Claims. (Cl. 222—318)

This invention relates to valve apparatus for container filling machines in which the valve operates to admit and discharge a metered quantity of material such as liquid milk and the like from a measuring chamber.

An object of the invention is to provide an automatically operable reversing valve assembly mounted for reciprocation in a measuring cylinder having a valved discharge spout at one end thereof, said reversing valve during a filling stroke outwardly of the cylinder admitting liquid into an empty chamber contingent upon the closing of the discharge spout valve, and during its discharge stroke inwardly of the cylinder causing a discharge of the metered quantity of liquid contingent upon the opening of the discharge spout valve. In the event of a failure of the discharge valve to close during the outward filling stroke of the reversing valve, the latter prevents the entry of liquid into the measuring chamber of the cylinder. In the event of a failure of the discharge valve to open during the inward discharge stroke of the reversing valve, the latter bypasses the metered liquid back through to the supply side of the reversing valve.

The composite valve structure of the invention is in the form of a reciprocating piston cup member having upwardly opening and downwardly opening spring loaded valve members. The many advantages of the particular construction, as shown in the embodiment of the invention of the accompanying drawings, will be apparent from the following description.

In the drawings,

Fig. 1 is a vertical section of an apparatus showing an embodiment of the invention as used for filling milk cartons, the piston valve mechanism thereof being shown on its outward or upstroke so as to fill the measuring chamber with milk;

Fig. 2 is a similar view with portions cut away and showing the piston valve mechanism on the inward or downstroke thereof for discharging the metered quantity of liquid into a milk carton;

Fig. 3 is a view similar to Fig. 2 with the piston valve mechanism shown during a downstroke thereof with the discharge spout valve closed, said piston valve bypassing fluid in the chamber to the supply side of the same;

Fig. 4 is a sectional view on line 4—4 of Fig. 1 showing detail of the piston valve mechanism;

Fig. 5 is a section on line 5—5 of Fig. 1 showing detail of the discharge spout;

Fig. 6 is a section on line 6—6 of Fig. 1 showing detail of the discharge valve;

Fig. 7 is a section on line 7—7 of Fig. 1 showing details of the connection between the piston valve assembly and actuating plunger;

Fig. 8 is a section on line 8—8 of Fig. 1; and

Fig. 9 is a section on line 9—9 of Fig. 2 showing further details of the discharge spout valve.

Referring to Fig. 1 in the assembly shown a suitable mounting bracket 1 is shown supporting a supply tank 2 to the underside of which is connected a measuring

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cylinder 3 at the bottom opening 4 of the tank. Mating flanges 5 and 6 of the tank and cylinder are sealed by a gasket 7 and a threaded nut member 8 clamps the cylinder to the tank. At the bottom of the cylinder 3 is a discharge nozzle or spout at 9.

The tank 2 is provided with a cover 10 having a central upstanding sleeve portion 11 in vertical alignment with the cylinder axis. Projecting downwardly through this sleeve and tank and into the chamber of the cylinder is a hollow plunger 12, on the lower end of which is carried a piston cup member 13 in slidable relation against the cylinder walls. At the shouldered upper end of the plunger is mounted a guide sleeve 14, the skirt of which overlaps the sleeve portion 11 of the cover. Sleeve 14 rides in the opening of a mounting bracket member 15 and above the sleeve 14 is fixed a peripherally grooved collar 16 receiving in opposite sides of the groove thereof the free ends of a yoked driving arm 17 pivoted as at 18 for the reciprocable drive of the plunger.

The piston valve assembly in the cylinder includes the cup member 13 having a sliding fit against the cylinder wall. At the top of the cup member 13 the inner wall surface is recessed to form an annular groove 19 into which the outer ends of prong members 20 (see Fig. 8) of a spider formed at the lower end of plunger 12 are turned through a bayonet slot connection with entrance recesses at 21 (see Fig. 7). Also, as best shown by Fig. 7 the spider may be assembled with the cup by a spring wire clip ring 22, the ring being snapped in place over the spider ends and into the top of recess 19 by pinching the upstanding prong ends shown at 23.

Against the underside of the spider is seated a compression spring 24. The other end of the spring is seated on an annular spider plate 25 which lies on the bottom wall of the cup member adjacent the side wall portions thereof and at the edge of an upwardly opening outer ring valve member 26. The annular ring valve 26 is adapted to seat in the bottom wall opening of the cup against the upwardly flared edge thereof at 27. The inner edge of the outer ring valve 26 forms a downwardly flared valve seat at 28 for the disc of an inner valve 29. The ring valve 26 is provided with upwardly directed bail members 30 (see Fig. 4) and is connected to a sleeve portion 31 surrounding a vertical stem 32 of the inner valve 29. The sleeve 31 is received in the lower end of the hollow plunger 12 and carries at its top within the plunger a spring 32' urging the stem 32 and inner valve disc 29 upwardly thereof by reason of its abutment against a plate 33 held at the top by a ring clip 34. Spring 32' as will be later explained is calibrated to exert a thrust equal to the force exerted by the weight of the inner valve member itself, plus the column of milk to be supported at the top supply side of said inner valve disc 29.

The discharge passage or spout 9 at the bottom of the cylinder 3 comprises a pipe having at the top thereof a flange at 35 for a sealed connection at the opening of the cylinder, being fixed thereto by the threaded nozzle nut 36 (Figs. 1 and 5). At the bottom of the pipe 9 discharge openings 37 (see Fig. 9) are formed in the side wall by the end disc 38 fitted with an O-ring at 39. A discharge spout valve 40 slidably embraces the lower end of pipe 9 with the valve normally seated against the O-ring 39 by reason of a spring 41 compressed between the valve and nut 36. Valve 40 is formed at 42 with a flanged portion for draining off spillage (see Fig. 6).

At its lower edge the valve is provided also with peripherally spaced depending foot members 43 engageable against the top surface of a milk carton *c* and permitting the extension of the hinged edge of the closure plug

member 44 under the adjacent edge of the valve 40 when the nozzle pipe is projected through the container opening in a filling operation (see Fig. 2).

Assuming a normal cycle of operation when the piston cup assembly is at the bottom of the measuring cylinder 3, the nozzle valve 40, as in Fig. 1, is in a closed position, covering the discharge openings in the side walls of the discharge nozzle. The upward movement of the piston valve assembly at a time when the entrance of atmospheric pressure is excluded from the discharge pipe 9, and consequently to the measuring cylinder 3, tends to create a partial vacuum below the inner valve disc 29 which causes the disc 29 to overcome the resistance of spring 32' and be lowered from its downwardly flared seat 28 in the piston assembly. The inner valve thus opens due to the drop in pressure below it, the spring 32' as previously mentioned being carefully calibrated to exert a thrust equal to the oppositely directed force of the inner valve and stem assembly as well as the column of milk supported above the inner valve disc. Thus milk will flow from the supply tank 2, down through the spaced spider arms 20 around the bails 30 and through the inner valve opening into the measuring cylinder 3 and pipe 9. At the top of the upstroke of the piston valve the cylinder and discharge pipe will contain a measured quantity of milk, as a quart.

When the chamber of the cylinder 3 is full the absence of a vacuum condition below the inner valve 29 causes the valve to again seat itself under the force of the spring 32'. Also when the piston assembly reaches a top upstroke position, a container as the carton c is presented to the nozzle valve 40 by any suitable conveyor means and the container raised to cause the nozzle valve to move upwardly, open, and permit the milk in the cylinder to flow out into the container. As valve 40 opens, the plunger 12 reverses its stroke and the piston assembly moves inwardly of the cylinder on the downstroke thereof to fill the container.

The position of the valve parts during the downstroke is shown by Fig. 2. Both the inner valve and outer valve are closed and the mechanism follows the top level of liquid discharging through the pipe 9 until the piston member reaches the lower end of the cylinder 3 and the container is filled. On the completion of the filling operation the container c is lowered from contact with the discharge valve 40, the valve 40 closes and the valve mechanism commences its upstroke to fill the cylinder underneath it as described in connection with Fig. 1. In the event the valve 40 for any reason fails to close the openings 37 of the discharge pipe atmospheric pressure is admitted to the underside of the inner valve disc 29 which in the absence of a vacuum condition will fail to be lowered from its seat and the upstroke of the piston cup 13 will simply lift the column of milk above it to the top of the cylinder chamber and the chamber will remain unfilled.

It will, of course, be appreciated that where the cylinder is being refilled for the filling of another container, a succeeding carton may be fed under the discharge spout so as to be lifted against the valve 40 at the top of the piston upstroke and filled on the next downstroke of the plunger. Thus at each cycle of plunger operation a carton is presented at the discharge spout, filled, and followed by another carton.

In the event a succeeding carton fails to open the discharge spout valve 40 or the valve fails to be opened for any other reason the outer upwardly opening valve 26, under the pressure exerted against the liquid trapped below the piston, will overcome the spring 24 and the trapped liquid will escape back to the supply column above the piston. This condition of the parts is shown by Fig. 3. On the return upstroke of the piston valve mechanism the measuring chamber will be refilled in the manner described in Fig. 1 and the bypassing and refilling

cycle will continue until the valve 40 is again opened to fill a container.

It will be appreciated that the size of the chamber of cylinder 3 determines the top delivery capacity during one complete stroke of the plunger and piston. The plunger may, of course, be suitably adjusted for a shorter stroke, if desired, and thus lesser quantities of metered material may be discharged into suitable containers.

What is claimed is:

1. In a container filling machine having a material measuring cylinder provided at its lower end with a discharge valve, a piston reciprocally mounted in said cylinder to discharge material from the cylinder upon downward movement of the piston when the discharge valve is open, a downwardly opening valve in said piston opening in response to the vacuum created below the piston upon upward movement of the latter when the first-named valve is closed and an upwardly opening valve in said piston, opening upon downward movement of the piston when said first-named valve is closed.

2. In a container filling machine having a supply tank, a combination measuring and discharge chamber opening from the bottom thereof and provided with a discharge spout terminating in a container actuated discharge valve, a material discharging plunger carried piston reciprocally mounted in said chamber, said piston comprising an upwardly opening cup member connected at its upper end to said plunger and formed with a valve opening in the bottom thereof, a valve member seating in said opening and forming therewith an upwardly opening valve and a spring biasing said valve member towards its seat, a second valve seat in the bottom of said cup and a second valve member having a spring normally maintaining the latter on the said second valve seat and comprising a downwardly opening valve, said last-named spring being calibrated to balance the weight of said second valve member and of the column of material superposed thereon, and to yield to a vacuum in the chamber below the piston and allow the chamber to be filled from the tank upon the upward stroke of the piston when said container actuated discharge valve is closed, said first-named spring yielding to open said upwardly opening valve to bypass material upwardly past said piston upon the downward stroke of the latter when said discharge valve remains closed.

3. In a container filling machine having a supply tank a combination measuring and discharge cylinder opening from the bottom thereof and provided with a discharge spout terminating in a container actuated discharge valve, a material discharging plunger carried piston reciprocally mounted in said cylinder, said piston comprising an upwardly opening cup member connected at its open end to said plunger and formed with a valve opening in the bottom thereof, an annular valve member seating in said opening, said valve opening and valve member forming an upwardly opening valve, a second valve seat formed on the inner periphery of said annular valve member, a second valve member seating in said second valve seat, said second valve seat and second valve member forming a downwardly opening valve, a spring normally maintaining said first valve closed, a second spring normally maintaining said second valve closed, said last-named spring being calibrated to balance the weight of its valve and the column of material superposed thereon, and to yield to a vacuum formed in the cylinder below the piston to permit the cylinder to fill upon the upward stroke of the piston, said first spring yielding to open the first valve to bypass the material in the cylinder upon the downward stroke of the piston in the event that said discharge valve remains closed.

4. In a container filling machine as set forth in claim 3 in which the plunger for actuating said piston is hollow and a hollow stem portion of said first-named upwardly opening valve is telescopically received in the lower end of the plunger and a stem of the second-named down-

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wardly opening valve is telescopically received in the hollow stem of said first-named valve.

5. In a container filling machine having a supply tank a combination measuring and discharge cylinder opening from the bottom thereof and provided with a discharge spout terminating in a container actuated discharge valve, a hollow plunger and a material discharging plunger carried piston reciprocably mounted in said cylinder, said piston comprising an upwardly opening cup member connected at its open upper end to said plunger, said hollow plunger being concentrically disposed in upwardly spaced relation to the bottom of said cup with the bottom of said cup being formed with a concentric valve opening therein and an annular valve member seating in said opening and comprising therewith an upwardly opening valve, said annular valve member having an upwardly spaced and centrally disposed hollow stem portion forming a sleeve extending into the lower end of said plunger and a spring normally maintaining said annular valve on its seat, a second valve seat formed on the inner periphery of said annular valve member concentric with the bottom of the cup member and a second valve member seating in said second seat and comprising therewith a downwardly opening valve, said second valve member having a central upwardly disposed rod extending through the sleeved stem portion of said first valve member, a spring seated between said sleeved stem and the top of said rod and normally maintaining said second valve on its seat, said last-named spring being calibrated to balance the weight of said second valve and the column of material superposed thereon and to yield to a vacuum formed in the cylinder below the

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piston to permit the cylinder to fill upon the upward stroke of the piston, said first spring yielding to open the first valve to bypass material in the cylinder upon the down stroke of the piston when the said discharge spout valve remains closed.

6. In a container filling machine having a material measuring cylinder provided at its lower end with a discharge valve, a piston reciprocably mounted in said cylinder to discharge material from the cylinder upon downward movement of the piston when the discharge valve is open, a downwardly opening valve in said piston positioned in concentric relation therewith and opening in response to the vacuum created below the piston upon upward movement of the latter when the first-named valve is closed and an upwardly opening valve in said piston, opening on downward movement of the piston when said first-named valve is closed, said downwardly opening valve forming a part of said upwardly opening valve and positioned concentrically with the same and with said piston.

7. The device of claim 6 in which said valves are each spring biased to closed position and the spring of said downwardly opening valve is calibrated to balance the weight of the valve itself and of a column of material superposed thereon.

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