July 14, 1959 H. ZERLIN 2,894,665

MECHANISM FOR DISPENSING LIQUID

Filed April 4, 1957

Fig. 1

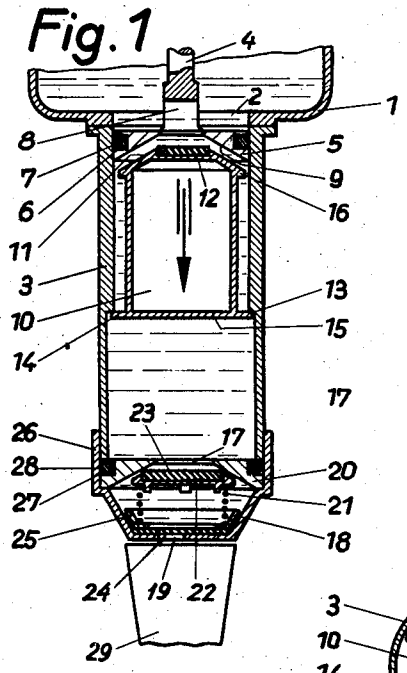


Fig. 2

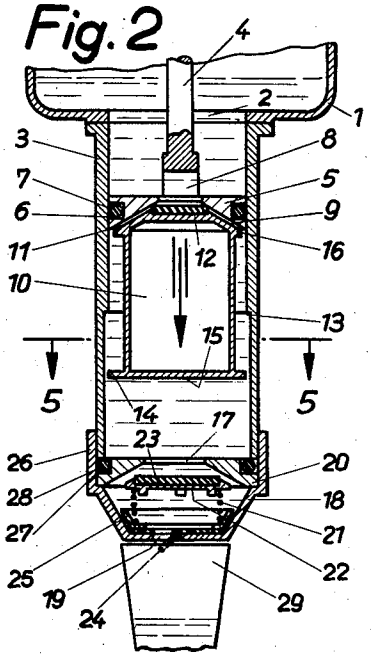


Fig. 5

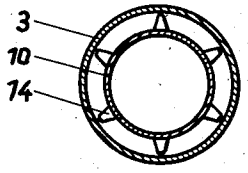


Fig. 3

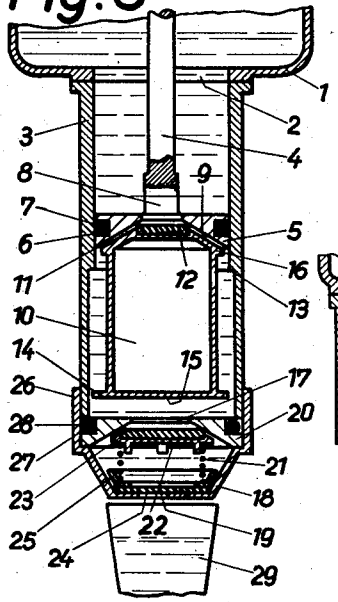


Fig. 6

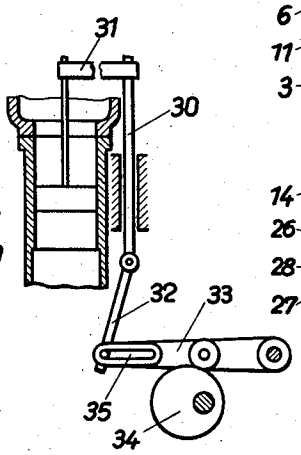
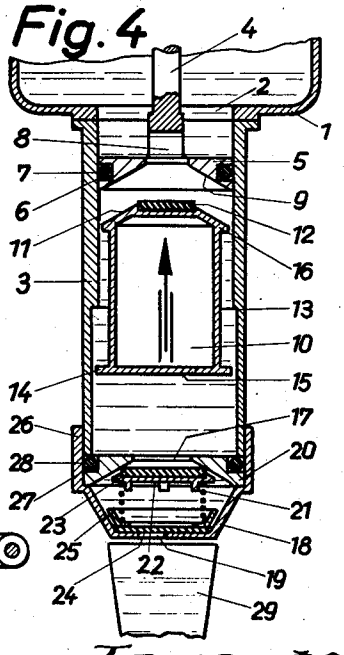


Fig. 4



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MECHANISM FOR DISPENSING LIQUID

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Application April 4, 1957, Serial No. 650,717
Claims priority, application Germany May 18, 1956
6 Claims. (Cl. 222—378)

The present invention relates broadly to the art of dispensing.

More particularly, this invention relates to mechanism for dispensing liquids such as milk or the like. The invention is specifically relating to a liquid dispensing mechanism which delivers or racks liquid such as milk into containers and which utilizes a piston means that is reciprocable in a calibrated cylinder, associated with a container for the liquid, for delivering milk or like liquid to cartons or the like.

In dispensing mechanisms of this character the calibrated container or chamber is provided with inlet and outlet ports. The piston reciprocates in the chamber and the stroke thereof determines the amount of liquid that is delivered or dispensed. The mechanism includes inlet port means providing communication between a storage tank and the calibrated chamber and outlet means providing communication between the chamber and the container to be filled. The operation of the mechanism is such that the interior of the calibrated chamber is placed in alternate communication with the storage tank and the outlet port by valve means controllable in accordance with the sequence of movement of the piston.

The present invention is related to dispensing mechanisms of the character described in an application filed in the name of Jurgen Farber on March 19, 1957, bearing Serial No. 647,087 and entitled "Mechanism for Filling Containers With Liquid."

This invention is directed to improvements in dispensing mechanisms of the type disclosed in the above referred to application which while utilizing certain of the features of that application is particularly related to the construction and operation of the inlet valve means controlling communication between the storage tank and the calibrated chamber.

Dispensing devices or mechanisms of the character referred to are generally so constructed as to include inlet valve means associated within the piston structure for cooperation with outlet valve means mounted at the lower end of the calibrated measuring chamber or cylinder. The valve means operate in alternation as the piston reciprocates.

A particular problem in connection with dispensing mechanisms of this character deals with the exhaustion of air in the measuring cylinder either at the beginning of a filling operation or after interrupting a filling operation, caused, for example, when the supply tank becomes empty. In other words, it is of the greatest importance to avoid entrapment of air in the measuring cylinder, so as to prevent faulty dispensing and undue foam formation when dispensing milk.

It has been demonstrated in practice in connection with conventional type inlet valves controlled in accordance with the working stroke of the piston or spring controlled, that any air in the measuring cylinder or calibrated chamber has no chance of escaping upwardly at the beginning of the downstroke of the piston, because the inlet valve either due to the influence of mechanical control elements or spring force is closed when the piston starts its downward dispensing stroke. This results that air as well as liquid are forced out of the outlet valve re-

sulting in a faulty dispensing stroke. This is in turn repeated and aggravated in subsequent dispensing strokes since part of the volume in the chamber is taken up by air, and there is a tendency for any liquid in the discharge funnel or sleeve at the lower end of the calibrated chamber to be pressed out by this air. It is, therefore, an object of the present invention to provide an arrangement which ensures that at the commencement of a dispensing stroke and also upon the resumption of a dispensing stroke the calibrated chamber or measuring cylinder and the nozzle body or dispensing sleeve mounted on the lower end of the chamber are filled with liquid such as milk.

It is a particular object of the invention to provide an improved inlet valve means controlling communication between the storage tank and the calibrated chamber that is constructed as a float. In utilizing a float valve, air in the calibrated chamber or cylinder can escape therefrom because the float can close the inlet port either when raised into engagement with this port by the rise in the liquid level in the chamber or when engaged by the piston. Specifically, it is an object of the invention to provide a simplified valve arrangement constructed and arranged to permit ready servicing of the dispensing mechanism for cleaning purposes and the like and one which does not include any positive connection between the piston and the float valve arrangement. Further, the float valve body is guided for free movement longitudinally of the measuring or dispensing chamber and disposed to be positively engaged by the piston during its downstroke and to move upwards during retraction of the piston solely by its inherent buoyancy.

The invention further provides the structural arrangement in which the float valve is limited by stop means in its upward movement while the piston is still moving to its upper terminal position. This arrangement provides a space between the upper end of the float and the piston when the latter is in its uppermost position so as to assure ecape of any air from the measuring cylinder or chamber and the complete filling of the cylinder or chamber with liquid.

It is a specific object of the invention to provide a float valve in the form of a hollow body having lateral projection means for cooperation with an internal shoulder formed on the wall of the measuring cylinder or chamber. The engagement between the projection means and shoulder limiting the upward movement of the float.

It is a further object of the invention to provide a float valve structure controlling communication between a storage tank and a measuring cylinder or chamber in which the float body has its upper surface shaped as a truncated cone, the upper end of which carries an elastic sealing disk for cooperation with an opening in the dispensing piston. The spherical shape of the upper face of the float body is especially adapted for cooperation with a similarly shaped recess formed in the under surface of the piston so that the space between the under surface of the piston and the outer upper face of the float body present a passageway which facilitates the passage of air in one direction and the inflow of liquid in the other with minimum resistance. In other words, the facing surfaces of valve body and piston are designed and constructed to present minimum resistance to flow.

Further and more specific objects will be apparent from the following description when taken in connection with the accompanying drawings in which:

Figures 1 to 4 are respective longitudinal sectional views through a dispensing mechanism incorporating the teachings of this invention and illustrating the parts in different positions during a dispensing from and refilling of the measuring cylinder or chamber.

Figure 5 is a cross sectional view taken on line 5—5 of Figure 2.

Figure 6 shows diagrammatically the driving means for the piston.

In the drawings, the dispensing mechanism of the invention includes a calibrated cylinder or measuring chamber 3 which communicates at its upper end via an opening 2 with a storage reservoir or tank 1. The cylinder or chamber 3 can either be attached to the bottom of the tank or constitute a depending tubular extension thereof. Within the cylinder or chamber is slidably disposed a piston 5. The piston rod 4 is reciprocated vertically as for example by a cam drive mechanism including a connecting rod coupled to a holder, in turn connected to the upper end of piston rod 4. The piston body 5 is provided with a peripheral groove 6 accommodating a O-ring 7 of elastic material such as rubber for providing an effective seal between the piston and the cylinder. The lower end of the piston rod is bifurcated or otherwise apertured to provide an inlet opening 8 through which liquid can flow from the tank through the piston to the cylinder. The lower face of the piston body is shaped to provide a conical valve seat denoted at 9. To control the valve opening through the piston during reciprocation thereof the invention includes a float body 10. This float body is a thin-walled hollow body having an upper face 11 which in conformation with the valve seat 9 has the general shape of a truncated cone. The top of the upper face of the float body 10 accommodates a circular sealing disk 12 of elastic material such as rubber. The transverse dimensions of the sealing disk exceed that of the opening at the inner end of the valve seat on the piston so that the marginal or peripheral portion of the sealing disk 12 abuts against the valve seat 9 to close communication between the tank and chamber when the piston is moved into engagement with the float body and the proper guidance of float body 10 within the measuring cylinder 3 assuring easy adaptation of the sealing disk 12 relative to the valve seat 9 and thus an effective closing of the opening 8. Size and construction of float body 10 are such that, due to the weight of the float body 10, a buoyancy is obtained, resulting in a contact pressure against valve seat 9 of about 300 grs.

The float body is freely movable within and guided within the measuring cylinder 3. When the piston body 5 moves downwardly it engages the upper surface of the float body to displace the float body downwards. When the piston 5 moves upwardly the opening 8 is exposed due to the influence of buoyancy of the float body. In other words, the piston moves upwards in accordance with its drive connections while the float body starts to move upwards when the liquid flowing into the cylinder exerts a lifting effect thereon. The upward movement of the float body 10 is limited by a stop 13 constituting an internal shoulder formed on the interior wall structure of the cylinder or chamber 3. To engage against this stop the lower end of the float body has lateral projection means 14 which as shown in Figure 1 extend beyond the periphery of the bottom of the float and hold the float at an upper terminal position while the piston 5 moves upwardly to its upper terminal position. The projecting means 14 cooperates with the interior wall of the lower part of the chamber 3 in guiding the float. The lower part of the chamber 3 has greater diameter than that part above the shoulder 13. Similar projecting means 16 are provided at the upper end of the piston at the margin of the upper conical face 11. The projections 16 being smaller than the projections 14 due to the difference in diameter between the upper and lower portions of the chamber 3.

The lower end of the measuring cylinder or chamber accommodates an outlet port body 17 held in place by dispensing sleeve or nozzle body 18. The nozzle body 18 is supplied with an outlet opening 19. The outlet valve means is constituted by the annular valve seat 20 formed on the under surface of the port body 17 and a cooperating valve plate 22 accommodating a sealing disk 23 of elastic material. Spring means 21 normally urges the sealing disk 23 into engagement with the port body 17. The outlet opening 19 in the nozzle body is closed by a rubber flap valve means 24 held against the upper surface of the nozzle body bottom by a pressure ring 25 accommodating one end of spring means 21. The nozzle body includes a cylindrical extension 26 connected to the lower end of the measuring cylinder 3 by a readily releasable connection such as a bayonet joint, clamp means or threaded connection not shown. The port body 17 is provided with an annular groove 27 accommodating an O-ring 28 which seals the connection between the nozzle body and the measuring chamber.

The flap valve 24 is provided with a slit which allows a flap portion of the rubber body 24 to open downwardly under the influence of pressure. The above referred to prior filed application descrbes and claims the outlet structure just referred to.

In addition to the previously mentioned functional advantages, the structure of this invention due to its simplicity in construction can readily be taken apart for cleaning the various components. A dispensing mechanism of this character for use in a dairy must frequently be cleaned. To effect cleaning of the components the piston can be extracted upwardly out of the measuring cylinder or chamber, the nozzle body can be removed from the lower end of the measuring cylinder due to the releasable connection between these parts and the float body 10 can be withdrawn from the lower end of the measuring chamber.

The operation of the structural components of this invention is indicated in the drawings. Figure 1 illustrates the position of the parts when the measuring cylinder 3 has been filled with liquid following a preceding upward stroke of the piston with the valve opening 8 permitting the liquid to flow from tank 1 in the chamber 3. When the piston starts to move downwardly the valve seat 9 thereof first abuts sealing disk 12 and in continued movement moves float 10 downwardly with the valve opening 8 closed. Due to liquid pressure generated by the downward movement of the piston in the interior of the cylinder 3 and as shown in Figure 2 the outlet valve 23 is opened the pressure of liquid overcoming the force of spring 21 and the liquid flows through the nozzle body 18 and out the discharge opening 19 after forcing open the flap of rubber flap valve body 24 so that a container 29 is filled. At the conclusion of the simultaneous downward movement of piston 5 and float 10, Figure 3, due to the diminishing of liquid pressure the outlet in port body 17 is closed because the spring 21 raises the sealing disk 23 into closed position. The piston starts its upward movement and in so doing exposes the inlet opening 8 because the float lacks buoyancy due to the lack of liquid. With the piston moving upwards the inflowing liquid causes the float to raise to follow the movement of the piston. During the upward movement of the float the inlet opening 8 remains open in that the piston moves faster than the float. The float body 10 moves upward until the projections 14 abut the internal shoulder 13, and the measuring cylinder is refilled with liquid with the piston returned to its upward position as shown in Figure 1. With the parts again in the position of Figure 1 a new filling operation can be effected.

As clearly shown in the drawings, the stroke of the piston is confined between the upper end of measuring cylinder 3 and the edge of the shoulder 13. The volume of the liquid which remains in a lower portion of the measuring chamber at the conclusion of the downstroke of the piston is insufficient to effect rapid upward movement of the float body 10 when the piston retracts, and it is the incoming liquid which elevates the piston, any

air that may be present having the opportunity to escape upwardly through the incoming liquid because the valve opening 8 is exposed on the upstroke.

As illustrated in Fig. 6 the up and down movement of piston 5 is effected by guide bar 30 holding the piston rod 4 by means of carrier arm 31. The bottom end of the guide bar 30 is connected with the free end of pivoting lever 33 by rod 32. The movement of pivoting lever 33 is actuated by cam 34. The free end of lever 33 is provided with a slot 35, allowing an adjustment of connecting rod 32 thus determining the stroke of the piston 5 and thereby the filling volume.

What is claimed is:

1. In a liquid dispensing mechanism of the type including a measuring chamber means and a piston reciprocable therein to dispense liquid therefrom, outlet valve means for the chamber operable to open in response to pressure exerted on the liquid when the piston moves in one direction and, to close when the piston moves in the opposite direction, means for reciprocating the piston to effect dispensing of liquid, said piston having an inlet opening therein through which liquid can flow to enter said chamber, a float valve body independent of the piston and movable in the chamber for controlling said inlet opening during movement of the piston, said float valve body being entrained by the piston when it is moving in said one direction and when the piston moves in the opposite direction said float valve body following the piston in normal spaced relation thereto, and said chamber and float valve body having facing cooperative surfaces constituting means for guiding the float valve body to freely move longitudinally of the chamber.

2. A liquid dispensing mechanism as claimed in claim 1 in which the float valve body includes a surface cooperable with the inlet opening to close the same when the piston moves in said one direction.

3. In a liquid dispensing mechanism of the type including a measuring chamber means and a piston reciprocable therein to dispense liquid therefrom, outlet valve means for the chamber operable to open in response to pressure exerted on the liquid when the piston moves in one direction and to close when the piston moves in the opposite direction, means for reciprocating the piston to effect dispensing of liquid, said piston having an inlet opening therein through which liquid can flow to enter said chamber, a float valve body independent of the piston and movable in the chamber for controlling said inlet opening during movement of the piston, said float valve body being entrained by the piston when it is moving in said one direction and when the piston moves in the opposite direction said float valve body following the piston in normal spaced relation thereto, said chamber and float valve body having facing cooperative surfaces constituting means for guiding the float valve body to freely move longitudinally of the chamber, said float valve body including a surface cooperable with the inlet opening in the piston adapted to close said opening when the piston moves in said one direction, and stop means limiting the movement of the float valve body in the opposite direction while the piston moves to upper dead center position to maintain a space between said inlet opening and said surface on the float valve body.

4. In a liquid dispensing mechanism of the type including a measuring chamber means and a piston reciprocable therein to dispense liquid therefrom, outlet valve means for the chamber operable to open in response to pressure exerted on the liquid when the piston moves in one direction and to close when the piston moves in the opposite direction, means for reciprocating the piston to effect dispensing of liquid, said piston having an inlet opening therein through which liquid can flow to enter said chamber, a float valve body independent of the piston and movable in the chamber for controlling said inlet opening during movement of the piston, said float valve body being entrained by the piston when it is moving in said one direction and when the piston moves in the opposite direction said float valve body following the piston in normal spaced relation thereto, said chamber and float valve body having facing cooperative surfaces constituting means for guiding the float valve body to freely move longitudinally of the chamber, said float valve body including a surface cooperable with the inlet opening in the piston adapted to close said opening when the piston moves in said one direction, stop means limiting the movement of the float valve body in the opposite direction while the piston moves to upper dead-center position to maintain a space between said inlet opening and said surface on the float valve body, said stop means comprising an internal shoulder means on the chamber means and lateral projections on the float valve body for engagement with said shoulder means.

5. A liquid dispensing mechanism including a reservoir for liquid, a measuring cylinder depending from the reservoir and in communication therewith, said cylinder including a lower end, a ported piston reciprocable within the cylinder, valve means operably associated with the lower end of the cylinder and adapted to open in response to pressure exerted on the liquid in the cylinder when the piston moves down and to close upon cessation of pressure so that the cylinder can be refilled, a float body disposed within the cylinder intermediate the piston and the lower end of the cylinder, and cooperable with the piston for closing the port therein when the piston moves down and to move upwardly slower than the piston so as to expose the port in the piston when the piston moves upwardly, whereby the cylinder can be refilled from the reservoir, the cylinder including upper and lower portions, said upper portion being of less transverse dimensions then the lower portion, an internal shoulder delimiting the longitudinal extent of the respective portions approximately intermediate the length of the cylinder, said float body having transverse dimensions slightly less than that of the upper portion to provide an annular space between the periphery of the float body in the interior of the upper portion of the cylinder, said float body having a longitudinal extent less than that of the upper portion, lateral projections extending beyond the periphery of the float body at the bottom thereof and adjacent its top for guiding the float body longitudinally of the cylinder, and the lateral projections at the bottom of the cylinder engaging said shoulder when the float body moves upwardly during refilling of the cylinder so as to limit the upward movement of the float body to a position where the top of the float body is spaced from the under surface of the piston when the latter occupies its top dead center position.

6. A liquid dispensing mechanism as claimed in claim 5 in which said float body has its upper portion shaped in the form of a truncated cone and terminates in a top, an elastic sealing member carried by the top, said ported piston having a recess extending upwardly from the bottom of the piston in the shape of a truncated cone and the port in the piston being at the top of the recess, the port of the piston having less transverse dimensions than that of the sealing member, the arrangement being such that the float body is guided relative to the piston in response to downward movement of the piston to apply the sealing member to the recess in the piston to adequately seal the port therein during the downstroke of the piston.

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