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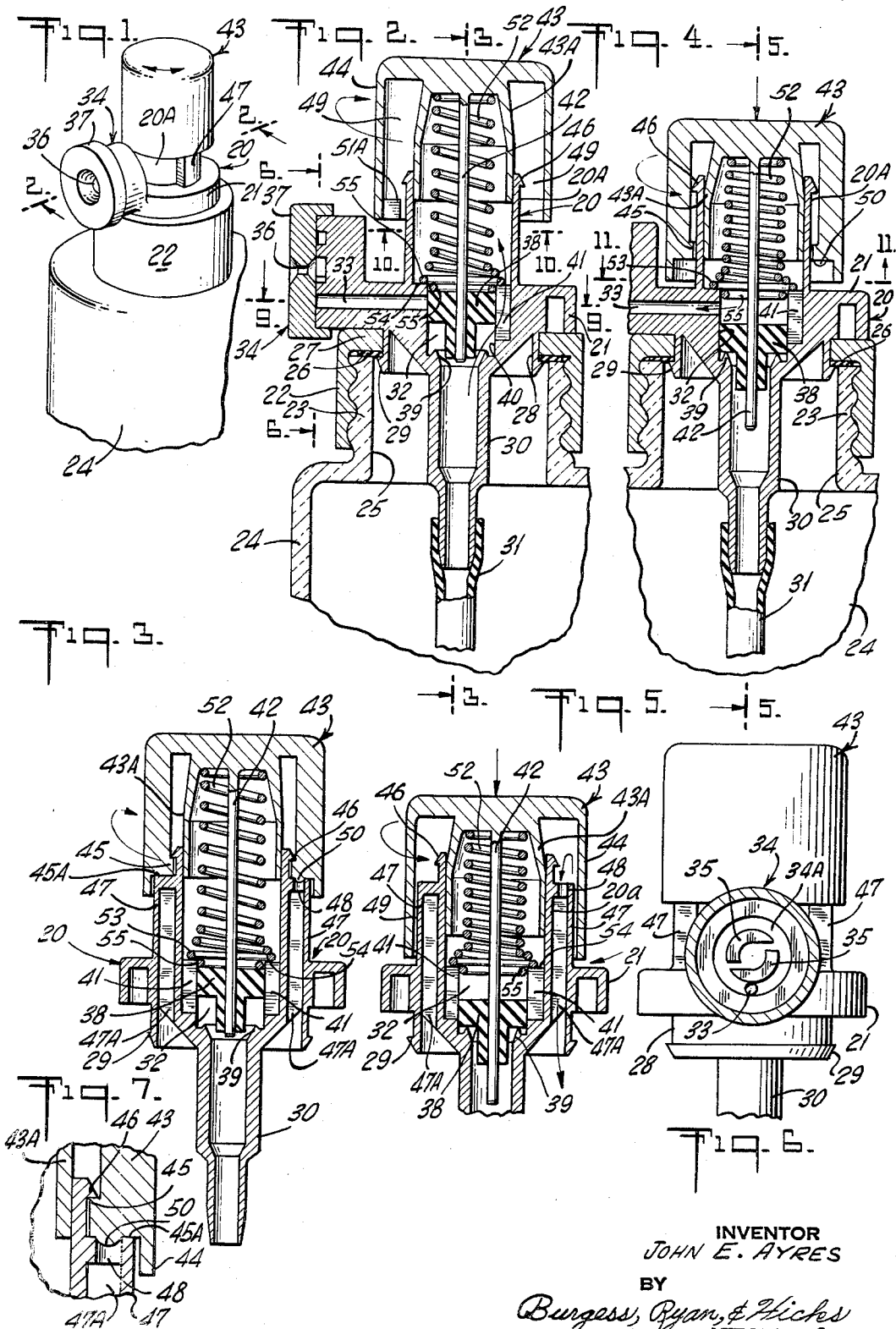
J. E. AYRES

3,489,322

DISPENSER PUMP

Filed Feb. 21, 1968

2 Sheets-Sheet 1



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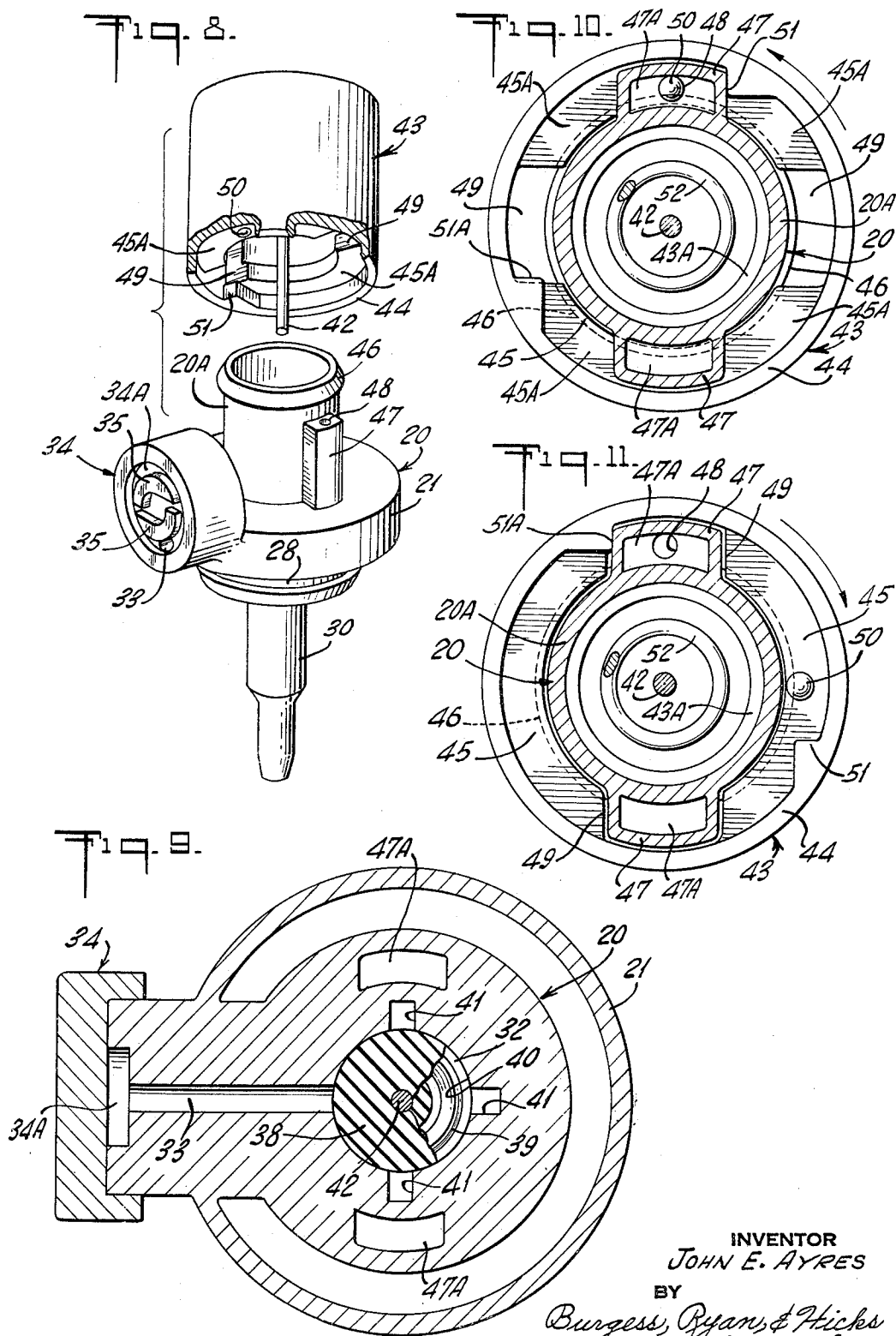
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DISPENSER PUMP

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15 Claims

ABSTRACT OF THE DISCLOSURE

A fluid dispenser pump of the reciprocating type which is manually operable by means of a vertically reciprocable push button. The pump comprising a housing adapted to be seated on a container and having an inlet communicating with the interior of the container. The pump housing includes a pump cylinder on which the push button is mounted for vertical reciprocation relative thereto and incorporates a valve-controlled discharge chamber which communicates at one end with the pump cylinder and at the other end with the housing inlet. A valve member of resilient material is slidably mounted in said chamber and frictionally engages with a valve-actuating rod connected to the push button for movement of the valve member between a discharge position and an intake position in the valve chamber. The pump housing also has one or more vent passageways formed therein which communicate with the interior of a container to which the pump is attached. Said passageways venting the container to atmospheric pressure during operation of the pump and having outlet openings which are closed by rotation of the push button relative to the pump cylinder to a position where the push button is secured against vertical movement relative to the cylinder.

The present invention relates to a reciprocating type of fluid dispenser pump and it relates, more particularly, to a dispenser pump which is to be mounted on a bottle or similar container for the dispensing of fluid material therefrom.

The pump may be used for dispensing fluids in a flowable form such as a liquid or in a more viscous material such as a hand lotion. Where the material to be dispensed is in the form of a liquid such as a cologne or a water-based window cleaning compound, a spray device may be employed so that the material will be discharged in the form of a finely dispersed spray or mist. However, where a more viscous material is to be discharged, such a spray device need not be employed.

An object of the invention is to provide a dispenser pump which has relatively little lost motion in its operation. This permits the pump to operate efficiently on a short stroke and it also permits the pump to be made small and compact in size.

Another object is to provide a vented pump which can readily be made leakproof and in which the operating button can be locked in place if desired.

An important feature of the present invention is that it connects the container to which the pump is attached to atmosphere during operation of the pump and in particular, during the suction stroke thereof.

A further object of the invention is to provide a dispenser pump having relatively few parts which can be produced largely from plastic materials and assembled inexpensively.

These and other advantages of the invention will be better understood and will become apparent from the following description and the accompanying drawings in which:

FIG. 1 is a fragmentary view in perspective illustrating a pump embodying the present invention with the pump being mounted on a container;

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FIG. 2 is a view in vertical section taken along the line 2—2 of FIG. 1, but is drawn to a slightly enlarged scale and with the push button being shown in its raised and locked positions.

FIG. 3 is a view in vertical section taken along the line 3—3 of FIG. 2 with certain parts being omitted for purposes of clarity;

FIG. 4 is a view in vertical section corresponding to FIG. 2, but with the push button and other parts of the pump being shown in their depressed or lowered positions;

FIG. 5 is a view in vertical section taken along the line 5—5 of FIG. 4 with certain parts being omitted for clarity;

FIG. 6 is a view in vertical section taken along the line 6—6 of FIG. 2 with certain parts being omitted for clarity;

FIG. 7 is a fragmentary view in vertical section of a portion of the pump shown in FIG. 3, but is drawn to an enlarged scale;

FIG. 8 is an exploded view in perspective of the pump assembly shown in FIG. 1, with the container being omitted;

FIG. 9 is a section view taken along line 9—9 of FIG. 2 (i.e., through the pump housing and looking upward);

FIG. 10 is a section view taken along line 10—10 of FIG. 2 (i.e., through the pump cylinder and looking upward from beneath the push button);

FIG. 11 is a section view taken along line 11—11 of FIG. 4 (i.e., through the pump cylinder and looking upward from beneath the push button in its depressed position).

Referring now to the accompanying drawings in detail, the pump, as illustrated, comprises a pump housing or body 20 having a pump cylinder 20A extending upwardly from the top thereof. The pump cylinder is open at its upper end and the pump body and cylinder are preferably molded as one piece from a suitable plastic material, such as polypropylene or a linear polyethylene. However, it will be understood that other materials may be used without departing from the invention.

As shown in FIGS. 2 and 4, a central portion 21 of the pump housing extends over and is supported on a retaining member or ring 22 having internal screw threads which threadably engage with threads on an open neck 23 of a container 24. As will be described, the pump housing is sealed to the retainer ring to prevent leakage between these parts and there is also a seal between the ring and the container neck.

The container neck defines an opening 25 to the container and a sealing gasket 26 of resilient sealing material is interposed between an inwardly extending flange 27 at the top of the retaining ring and the upper end of the container neck. As will be described, the gasket also is engaged by a portion of the pump housing to form a seal therewith.

The pump housing is seated on the inwardly extending annular flange of the retainer ring and the pump housing includes a downwardly extending cylindrical sleeve or rim 28 which is dimensioned to make a force fit with the inner dimension of the inwardly extending flange of the retainer ring. The sleeve or rim has an outwardly extending shoulder or lip 29 at its lower end which extends beneath the lower surface of the retainer flange and into engagement with the sealing gasket. This secures the pump housing together with its associated parts to the retainer ring and a seal is formed between the pump housing and the gasket 29. Although the material from which the pump housing is made is of a rigid nature, its resilience permits these parts to be assembled without difficulty.

A centrally located tubular extension 30 also extends downwardly from the pump housing and forms an inlet passageway which communicates with the interior of the container. The extension is open at its lower end and material from the container may enter the pump housing through the extension in operation of the pump. A dip or siphon tube 31 may be attached to the lower end of the tubular extension.

The upper end of the tubular extension leads to what may be termed a combined valve and discharge chamber 32 within the pump housing. As will be described, material is drawn upwardly from the container and enters the pump housing during the suction stroke of the pump. During the discharge stroke of the pump, material is discharged from the pump cylinder and the valve chamber through a discharge passageway 33 which extends through the pump housing at one side thereof to an exterior surface. An inlet to the discharge passageway is located at the upper end of the combined valve and discharge chamber 32 and is open during the discharge stroke of the pump.

In the illustrated embodiment, the outlet of the discharge passageway terminates in a spray forming or atomizing device 34. The spray device comprises a circular channel 34A formed in an outer face of the pump housing and the outlet of the discharge passageway communicates with this channel as shown in FIG. 6. Arcuately shaped ribs 35 which are formed on the face of the housing adjoining the inner edges of the channel, impart a swirling action to the material being discharged and cause the material to be discharged as a fine spray or mist as it emerges under pressure from a nozzle-like orifice 36 in a cap 37. The cap is mounted on the extension of the pump housing and extends over the end of the discharge passageway and the channel. Such an arrangement can be effectively employed with liquid materials. However, more viscous materials such as a hand lotion may be dispensed directly from the end of the discharge passageway which may have a spout-like configuration.

As shown in FIGS. 2-4, a valve member 38 of a resilient material such as rubber or polyethylene is slidably fitted in the combined valve or discharge chamber 32. In operation of the pump, the valve member is moved between an upper position, as shown in FIG. 2, where it blocks the inlet to the discharge passageway and a lower position, as shown in FIG. 4, where it engages with a valve seat 39 which is located at the lower or inlet end of the valve chamber and surrounds the upper end of the tubular extension which communicates with the interior of the container. In its lowered position, the valve member has been moved away from the inlet to the discharge passageway and the sides of the valve member also engage with side walls 40 of the valve chamber at the lower end thereof.

In the raised position of the valve member, vertical intake slots 41 formed in the side walls of the valve member bypass the valve member and provide passageways extending between the lower end of the valve chamber and the pump cylinder through which material drawn upwardly from the container can pass during the intake or suction stroke of the pump. A plurality of these passageways may be employed to insure an adequate amount of the material reaching the pump cylinder.

One end of a valve-actuating rod 42 extends through the valve member and is frictionally engaged by the valve member in moving the valve member between its upper and lower positions. The valve-actuating rod is carried by and extends downwardly from the top of a push button 43 which is mounted on top of the upper pump cylinder and is vertically reciprocable relative thereto. The frictional engagement between the valve member and the valve-actuating rod effects quick and positive movement of the valve member between its upper and lower posi-

tions in the valve chamber in operation of the pump and such movement takes place with a minimum lost motion insofar as the pumping action is concerned.

As will be seen, movement of the valve member to its lower position where the inlet to the discharge passageway is open and the valve member is in engagement with the valve seat takes place upon downward movement of the push button. This requires only a short downward movement of the push button and the remainder of the downward movement discharges material from the pump cylinder. After the valve member is seated on the valve seat, the actuating rod continues to move relative to the valve member until the discharge stroke has been completed.

Upon release of the push button, the valve member is returned immediately to its upper position where it blocks the inlet to the discharge passageway and during completion of the suction stroke, the valve-actuating rod continues to move relative to the valve member with material being drawn into the pump housing and into the pump cylinder from the container.

The push button has an inner sleeve 43A of cylindrical configuration which extends downwardly from the top thereof and into the upper end of the pump cylinder, making a tight sliding fit therewith. On the down or discharge stroke of the pump, the push button acts as a piston in discharging material under pressure from the pump cylinder and through the discharge passageway. On the upward or suction stroke, the upward movement of the push button creates a suction which draws material from the container into the pump.

The push button also has an outer wall 44 which extends around the inner sleeve in spaced relation thereto. The outer wall has an inwardly extending flange 45 at its lower end which extends beneath a shoulder or lip 46 extending outwardly from the pump cylinder adjacent the upper end thereof. Engagement of this flange and the lip on the pump cylinder acts as a stop to limit upward movement of the push button relative to the pump cylinder and also holds the push button in place.

The pump cylinder has oppositely disposed hollow vertical ribs 47 formed in the exterior thereof. As shown in FIGS. 3 and 5, the ribs at their lower ends communicate with passageways 47A which extend through the pump housing on opposite sides of the valve chamber to the interior of the container. One or both of the ribs have an opening 48 formed in the top thereof through which air at atmospheric pressure can enter the container as indicated by the arrows in FIG. 5 when the push button is in an unlocked or vertically movable position relative to the pump cylinder. In this position of the button, the ribs are aligned with slots 49 formed in the inner surface of the outer wall of the push button and thus, the ribs also serve as guides for the push button in its vertical movement.

However, in the upper or fully raised position of the push button, the lower ends of the slots clear the ribs and permit the push button to be rotated relative to the pump cylinder from an operable (or depressible) position to a locked position. In such rotation of the push button, the upper surfaces 45A of recesses at the lower ends of the outer walls of the button slide over the upper ends of the ribs as the button is rotated and the slots in the outer wall are moved out of alignment with the ribs. Such rotation of the push button (about 75° in a clockwise direction as shown in FIGS. 1-3), brings a ball-shaped protuberance or detent 50 on the upper surface of one (or both) of the recesses into sealing engagement with the opening in the top of one (or both) of the ribs as shown best in FIG. 7. In this position, a stop 51 projecting inwardly from the outer wall engages with one of the ribs and prevents further rotation of the button. When the button is rotated in the opposite direction to its unlocked position, a second stop 51a projecting inwardly from the outer wall engages with an opposite

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side of the rib and aligns the slots in the outer wall of the push button with the ribs. In this position of the button, the vent opening in the rib (or ribs) is open.

When the push button has been rotated to close the vent, it is locked in its upper or fully raised position and cannot be depressed accidentally. In addition, closure of the vent opening (or openings) prevents leakage of the container contents and makes the pump leakproof.

Finally, the button is urged toward its raised position and is automatically returned during its operation to this position by means of a compression coil spring 52. One end of the spring engages with the lower surface of the top of the button and an enlarged coil 53 at the other end of the spring rests on a surface 54 surrounding the upper end of the valve chamber. The lowermost coil 55 of the spring engages with the valve member and acts as a stop in its upward movement. In operation of the pump, the button is depressed on the discharge stroke against the force of the spring and is automatically returned on its upward or suction stroke to its raised position by the compression spring.

It will be understood that various modifications and changes may be made in the embodiment of the invention illustrated and described herein without departing from the scope of the invention as defined in the claims.

What is claimed is:

1. In a fluid dispenser pump of the reciprocating type, the combination which comprises:

- (a) a pump housing adapted to be mounted on a container and having an inlet communicating with a supply of flowable fluid material in the container;
- (b) said housing having a valve chamber formed therein;
- (c) a pump cylinder carried by the housing with an end of said cylinder joining an end of the valve chamber;
- (d) said valve chamber having a discharge port in one side thereof adjacent the end thereof joining the pump cylinder and being in communication with the inlet to the housing at its other end;
- (e) a valve member of resilient material mounted in the valve chamber and being movable therein between a first position and a second position;
- (f) said valve member closing the discharge port in the first position thereof and closing the inlet end of the valve chamber in the second position thereof;
- (g) at least one intake passageway extending lengthwise of the valve chamber;
- (h) said intake passageway extending from a point adjacent the inlet end of the valve chamber to the pump cylinder and bypassing the valve member in its first position;
- (i) a push button mounted on the pump cylinder and being reciprocally movable relative thereto;
- (j) said push button having a top extending over an open end of the pump cylinder;
- (k) a sleeve extending downwardly from the top of the push button into the pump cylinder and making a tight sliding fit therewith; and
- (l) a valve-actuating member carried by the top of the push button and extending through the pump cylinder into the valve chamber;
- (m) said valve-actuating member being frictionally engaged by the valve member and moving said valve member between its first and second positions in response to reciprocable movement of the push button relative to the pump cylinder.

2. In a fluid dispenser pump, the combination as defined in claim 1 which includes:

- (a) compressible spring means interposed between the top of the push button and the pump housing;
- (b) said spring means urging the push button toward a raised position relative to the pump cylinder.

3. In a fluid dispenser pump, the combination as defined in claim 2 wherein:

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(a) the spring means comprises a compression coil spring;

(b) said coil spring having coils extending around the valve-actuating member with a lowermost coil extending into the valve chamber and engaging with the valve member in its first position.

4. In a fluid dispenser pump, the combination as defined in claim 1 in which:

(a) the pump housing includes a vent passageway extending therethrough and connecting the interior of the container to atmosphere; and

(b) closure means associated with the pushbutton for selectively opening and closing said vent passageway.

5. In a fluid dispenser pump, the combination as defined in claim 1 in which:

(a) the pump housing includes a vent passageway extending therethrough and connecting the interior of the container to atmosphere; and

(b) closure means associated with the push button for selectively opening and closing said vent passageway;

(c) said means including interengageable members on the push button and housing;

(d) said members being in interengagement with each other and preventing reciprocable movement of the push button relative to the pump cylinder when said vent passageway is closed.

6. In a fluid dispenser pump, the combination as defined in claim 1, which includes:

(a) a plurality of intake passageways extending lengthwise of the valve chamber and bypassing the valve member in its first position.

7. In a fluid dispenser pump, the combination as defined in claim 1, which includes:

(a) a valve seat located at the inlet end of the valve chamber;

(b) said valve seat engaging with the valve member in its second position.

8. In a fluid dispenser pump, the combination as defined in claim 7 which includes:

(a) means for venting the container to atmosphere.

9. In a fluid dispenser pump, the combination as defined in claim 1 wherein:

(a) the push button is rotatable relative to the pump cylinder and is angularly movable between a locked position and an operative position;

(b) a hollow rib extending along one side of the pump cylinder and communicating with a passageway extending through the pump housing;

(c) said rib having an opening therein; and

(d) closure means carried by the push button for selectively opening and closing said opening in angular movement of the push button relative to the pump cylinder;

(e) said closure means including a closure member carried by the push button;

(f) said closure member being shaped to fit into and close the opening in the hollow rib in one angular position of the push button on the pump cylinder.

10. In a siphon type of reciprocating pump for dispensing fluid material from a container, the combination which comprises:

(a) a pump housing adapted to be mounted on a container and having an inlet communicating with a supply of fluid material within the container;

(b) a pump cylinder carried by the housing;

(c) a valve chamber formed in the housing;

(d) said valve chamber having an upper end communicating with the pump cylinder and a lower end communicating with the inlet to the housing;

(e) said valve chamber also having a discharge port in one side thereof adjacent its upper end;

(f) said pump housing having a discharge passageway

- extending between said discharge port and an exterior surface thereof;
- (g) a valve member of resilient material mounted in said valve chamber for movement therein between a raised position and a lowered position;
- (h) said valve member closing the discharge port in its raised position and closing the lower end of the valve chamber in its lowered position;
- (i) said valve chamber having at least one intake passageway extending lengthwise thereof and connecting the pump cylinder to the lower end of the valve chamber when the valve member is in its raised position;
- (j) means for operating the pump;
- (k) said means including a push button mounted on the pump cylinder;
- (l) said push button being vertically reciprocable relative to the pump cylinder;
- (m) a valve actuating member carried by the push button;
- (n) said valve-actuating member extending into the valve chamber and being frictionally engaged by the valve member therein in movement of the valve member between its raised and lowered position.
11. In a siphon type of reciprocating pump as defined in claim 10 wherein:
- (a) the pump housing has a vent passageway extending therethrough;
- (b) said vent passageway connecting the interior of the container with atmosphere;
- (c) means associated with the push button for selectively securing the push button against vertical movement relative to the pump cylinder; and
- (d) closure means carried by the push button for closing the vent passageway when the push button is secured against vertical movement relative to the pump cylinder.
12. In a fluid dispenser pump, the combination which comprises:
- (a) a pump housing adapted to be mounted on a container;
- (b) a valve chamber formed in said housing;
- (c) said chamber having open upper and lower ends and having a discharge port in one side thereof adjacent its upper end;
- (d) a pump cylinder extending upwardly from and communicating with the upper end of the valve chamber;
- (e) a tubular extension communicating with the lower end of the valve chamber and extending downwardly therefrom;
- (f) a valve seat located at the lower end of the valve chamber;
- (g) a valve member of resilient material slidably mounted in the valve chamber for movement between an upper and a lower position therein;
- (h) said valve member closing the discharge port in the valve chamber in its upper position and engaging with the valve seat in its lower position with the discharge port being open;
- (i) the valve chamber having at least one intake passageway extending from the upper end thereof to a point adjacent the valve seat;
- (j) said intake passageway providing communication between the lower end of the valve chamber and the pump cylinder in the upper position of the valve member;

- (k) a push button mounted on and being vertically reciprocable relative to the pump cylinder;
- (l) said push button having a top and including a sleeve extending downwardly therefrom;
- (m) said sleeve extending into the pump cylinder and making a tight sliding fit therewith whereby pressure is exerted on material in the pump cylinder in downward movement of the push button;
- (n) a valve-actuating rod carried by the top of the push button and extending downwardly therefrom;
- (o) said valve-actuating rod having an end extending through the valve member and being frictionally engaged thereby for movement of the valve member between its raised and lowered positions in response to movement of the push button; and
- (p) a compression spring interposed between the pump housing and the top of the push button;
- (q) said spring urging the push button upwardly relative to the pump cylinder.
13. In a fluid dispenser pump, the combination which comprises:
- (a) a pump housing having an inlet thereto and having a valve chamber formed therein communicating with said inlet;
- (b) said valve chamber having open upper and lower ends and having a discharge port adjacent its upper end;
- (c) a valve member of resilient material slidably mounted in said chamber for movement between a first position and second position therein;
- (d) said valve member closing the discharge port in the first position thereof and closing the lower end of the valve chamber with the discharge port being open in the second position thereof; and
- (e) a pump-actuating member mounted on the pump housing for reciprocable movement relative thereto; and
- (f) a valve-actuating rod carried by said pump actuating member;
- (g) said valve-actuating rod being frictionally engaged by the valve member with the valve member being moved thereby between its first and second positions in response to movement of the pump actuating member relative to the pump cylinder.
14. In a fluid dispenser pump, the combination as defined in claim 13 which includes:
- (a) a vent passageway extending through the pump housing.
15. In a fluid dispenser pump, the combination as defined in claim 13 which includes:
- (a) a vent passageway extending through the pump housing; and
- (b) means for selectively opening and closing said vent passageway.

References Cited

UNITED STATES PATENTS

2,824,673	2/1958	Hanlon	222—340	X
3,102,489	9/1963	Corsette et al.	222—383	X
3,185,355	5/1965	Lipman	222—341	
3,337,096	8/1967	Brown	222—383	X
3,379,381	4/1968	Decaux	222—383	X

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222—380, 384