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SPRAYER AND DISPENSER MECHANISM

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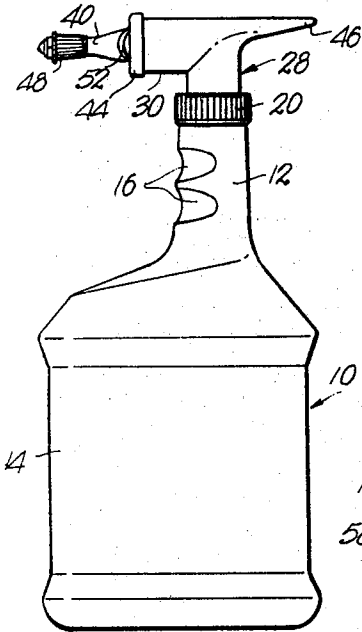


Fig. 1.

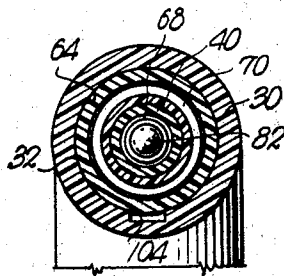


Fig. 4.

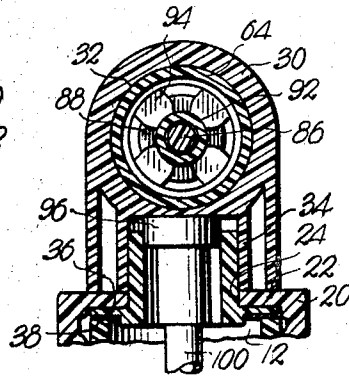


Fig. 5.

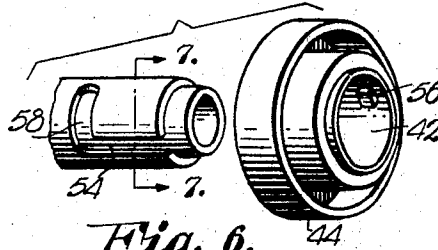


Fig. 6.



Fig. 7.

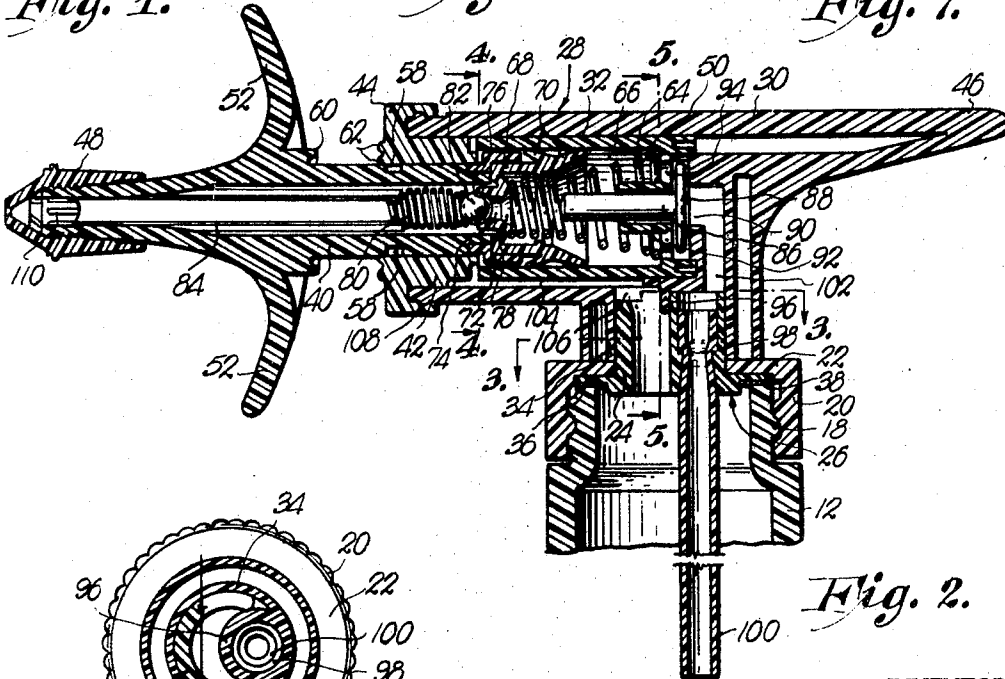


Fig. 2.

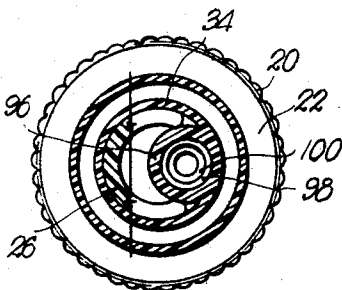


Fig. 3.

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SPRAYER AND DISPENSER MECHANISM

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7 Claims

ABSTRACT OF THE DISCLOSURE

A liquid container has an offset neck with a pump rotatable on the neck upon loosening of the container cap. The neck may be grasped in pistol grip fashion and the pump actuated in a manner similar to pulling a trigger. The pump piston operates in a cylindrical sleeve which not only houses and supports a disc valve but cooperates with a groove in the pump body to present a drain-back passage. The valve is held closed and a port in the piston is plugged by a probe on the valve when the plunger is locked in its depressed position. A retainer for attachment of a lateral tube on the body to the container cap has a dip-tube receiving element that is disposed to place the retainer into intercommunication with the container and the drainback groove.

This is a continuation-in-part of my co-pending application (now abandoned) Ser. No. 570,627, filed Aug. 5, 1966.

An important object of the instant invention is the provision of a hand pump for a container neck wherein the pump and neck are so fashioned as to provide a balanced assembly when used in a manner similar to grasping a pistol and pulling a trigger.

Another important object of my invention is to provide a liquid pump having a sleeve in the body thereof which performs several functions, i.e., (a) presenting a smooth, uniform wiping surface for the pump piston; (b) housing a disc valve (c) supporting a free-floating probe integral with the valve and sealing the fluid port of the piston when the plunger is depressed, locked and sealed; and (d) cooperating with a slot in the body, presenting a flow-back passage to the container for fluid seeping past the piston.

Still another important object of my instant invention is the provision of a novel retainer for rotatably mounting a container cap on a laterally extending tube integral with the pump body, the retainer serving also to place the body into communication with the container not only for liquid pumped into the body but for drain-back liquid seeping past the piston.

In the drawing:

FIGURE 1 is a side elevational view of a container and pump made according to the present invention;

FIG. 2 is an enlarged, vertical cross-sectional view through the sprayer and dispenser mechanism and through a portion of the container neck;

FIGS. 3, 4 and 5 are cross-sectional views taken on lines 3—3, 4—4 and 5—5 respectively of FIG. 2;

FIG. 6 is an exploded perspective view of the collar and a portion of the plunger; and

FIG. 7 is a cross-sectional view taken on line 7—7 of FIG. 6.

As shown in FIG. 1, a liquid container 10 has a neck 12 disposed with its normally vertical axis offset from the upright axis of cylinder 14 of container 10. Finger-receiving depressions 16 are formed in neck 12 below threads 18 thereof which receive a cap 20 having a top

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wall 22. Wall 22 overlies the opening at the upper end of neck 12 and has a central hole 24 which receives a tubular retainer 26 that communicates with neck 12 and rotatably mounts cap 20 on pump 28.

Pump 28 includes a body 30 having a bore 32 and a laterally-extending tube 34 into which the retainer 26 is fitted. Retainer 26 has an external flange 36 therearound disposed beneath wall 22, and a liner 38, surrounding retainer 26, is clamped by cap 20 between flange 36 and the upper end of neck 12.

The pumping mechanism of pump 28 includes a tubular plunger 40 reciprocable in bushing 42 of a collar 44, bushing 42 being inserted into body 30 at the outer end of bore 32. Pumping is effected by hand grasping of the neck 12 in pistol grip fashion with wing 46 of body 30 nesting in the crotch of the hand between the thumb and index finger. Plunger 40 is placed between the index and second fingers adjacent nozzle 48 so that the plunger 40 may be pulled inwardly (FIG. 2) against the action of spring 50 by pressure on opposed finger pieces 52 integral with plunger 40. The third and fourth fingers of the hand engage neck 12 in depressions 16. The direction of discharge of liquid from nozzle 48 is set by loosening cap 20 so that the body 30 may be rotated as retainer 26 in turn rotates relative to cap 20 in hole or opening 24.

During reciprocation of plunger 40, its opposed longitudinal grooves 54 (FIG. 7) clear corresponding nodules in bushing 42, one only being shown in FIG. 6 and designated 56. When not in use, plunger 40 is rotated 90° while retracted as shown in FIG. 1, to lock nodules 56 into circumferential extensions 58 of grooves 54. In such retracted, locked-in position of plunger 40, a seal is established against leakage of fluid from between plunger 40 and bushing 42 by tightly interleaved, annular ribs 60 and 62 on plunger 40 and collar 44 respectively.

A sleeve 64 in bore 32 presents a cylindrical chamber 66 for a hollow piston 68 having spaced, annular, resilient webs 70 which wipe along sleeve 64 in chamber 66 as piston 68 is reciprocated by plunger 40 and spring 50. A retainer 72, surrounding the inner, reduced external diameter of plunger 40, is counterbored to receive piston 68 to connect the latter with plunger 40.

Piston 68 has a port 74 for flow of liquid from chamber 66 to plunger 40, and is also provided with seats 76 and 78 on opposite sides of port 74. A spring 80 and a ball valve 82 are housed in plunger 40, spring 80 being backed by ribs 84 in plunger 40 to yieldably bias ball 82 against seat 76.

When plunger 40 is in the position shown in FIG. 1, a probe 86 on disc valve 88 engages seat 78 to close port 74, and valve 88 is held in engagement with body 30 at the inner end of bore 32 to close liquid inlet 90. Probe 86 is loosely supported by a tubular bushing 92 that is in turn supported on the axis of sleeve 64 by spaced radials 94 integral with bushing 92 and with sleeve 64. Valve 88 is disposed on the compartment of sleeve 64 defined by radials 94 and the inner end of bore 32. Spring 50 surrounds seat 78 and bushing 92, engages radials 94, and is compressed within piston 68 when plunger 40 is in the position shown in FIG. 1 holding piston 68 adjacent radials 94.

A conduit for passage of liquid from container 12 through inlet 90 includes a first section 96 integral with tube 34 therewithin, a second section 98 integral with retainer 26 therewithin and fitted into section 96, a third section 100 in the nature of a dip tube in container 10 and fitted into section 98, and a passage 102 in body 30 between section 96 and inlet 90.

Drain-back means for liquid escaping past piston 68 includes a slot or groove 104 in body 30 communicating with an outlet 106 in body 30 that registers, in turn, with

tube 34 and, therefore, with retainer 26 because of the disposition of section 98 eccentric to the axis of retainer 26. Sleeve 64 bridges across groove 104 and communicates therewith by virtue of being spaced from bushing 42. To this end also, retainer 72 abuts nodules 56 to limit the extent of outward movement of plunger 40, presenting a space between bushing 42 and retainer 72. Still further, retainer 72 is spaced therearound from the sleeve 64.

Any suitable snap fit interlock 108 may be provided to attach collar 44 to body 30. The nature and pattern of the liquid spray emanating from removable nozzle 48 may also be selected by use of an insert 110 extending into plunger 40 and housed within nozzle 48 to create a swirling action in the liquid within nozzle 48 prior to discharge.

OPERATION

Upon release of plunger 40 from the position shown in FIG. 1, spring 50 forces piston 68 to the position shown in FIG. 2, causing liquid to be drawn from tube 100 into sleeve 64 through inlet 90 as valve 88 is opened by the force of the liquid. Air enters container 10 around plunger 40 and via groove 104, outlet 106 and retainer 26. When plunger 40 is depressed, the liquid in sleeve 64 closes valve 88 and opens valve 82 for flow through port 74 to plunger 40. Liquid seeping past piston 68 returns to container 10 via groove 104, outlet 106 and retainer 26.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In combination:
 - a liquid container;
 - a cap on the container; and
 - a pump including:
 - a body having a bore and a laterally extending tube;
 - pumping mechanism having a piston reciprocable in said bore;
 - a tubular retainer, fitted into said tube, communicating with the container, and rotatably mounting said cap on said tube;
 - a conduit in the container, extending through said tube; a passage in said body communicating said conduit with said bore for flow of liquid from the container to said bore,
 - said bore having a drain-back means communicating with said tube for liquid escaping past the piston during pumping;
 - a piston-receiving sleeve in said bore communicating at one end thereof with said passage,
 - said drain-back means including a groove in said body along the sleeve and communicating with the sleeve at the opposite end of the latter.
2. The invention of claim 1,
 - a tubular plunger attached to said piston; and
 - a collar in said bore having a bushing reciprocally receiving said plunger,
 there being an annular passage in the bore, surrounding the bushing between the collar and said opposite end of the sleeve, placing the latter into communication with the groove.
3. The invention of claim 1,
 - and a valve in the sleeve at said one end of the latter, said sleeve having means supporting the valve for movement to and from a position closing the passage.
4. In a liquid pump adapted for mounting on a liquid container having an opening therein;
 - a body having a cylindrical chamber presenting a first end and a second end;
 - mounting means on the body adapted to be secured to the container at the opening;
 - said body having a first passage interconnecting the chamber and said mounting means;
 - a dip tube coupled to the mounting means in communication with said passage and extending into the container;
 - a tubular plunger extending through said second end and reciprocally carried by the body, the plunger

- being provided with a liquid discharge end; and
 - a tubular piston reciprocable within the chamber upon actuation of the plunger and communicating with the latter for flow of liquid from the chamber through said discharge end upon inward movement of the piston toward said second end,
 - said body having a second passage communicating with said chamber adjacent said second end and extending to a position adjacent said dip tube in communication with the opening in the container,
 - whereby liquid seeping past the outer surface of said piston upon said inward movement will flow back into said container through said second passage,
 - said body being provided with a bore having a longitudinal slot communicating therewith, there being a sleeve in the bore presenting said chamber therewithin, said sleeve cooperating with said slot to define said second passage,
 - said mounting means including a first tube extending through said opening and a second tube within the first tube presenting a drain between the first and second tubes, said dip tube being inserted in said second tube and said slot communicating with said drain.
5. In a liquid pump,
 - a body having a bore;
 - a sleeve in the bore, presenting a cylindrical chamber having a valve compartment at one end of the latter, said body having a liquid inlet passage at one end of the bore communicating with said compartment;
 - a valve in said compartment carried by the sleeve for movement to and from a position closing the passage;
 - a tubular plunger extending into the bore at the opposite end thereof and reciprocally carried by the body;
 - a piston in the chamber secured to the plunger for reciprocation thereby toward and away from said compartment said piston having a port for flow of liquid from the chamber to the plunger; and
 - means on the valve for closing the port and the valve when the piston is at one end of its path of travel.
 6. In a liquid pump,
 - a body having a bore;
 - a sleeve in the bore, presenting a cylindrical chamber having a valve compartment at one end of the latter, said body having a liquid inlet passage at one end of the bore communicating with said compartment;
 - a valve in said compartment carried by the sleeve for movement to and from a position closing the passage;
 - a tubular plunger extending into the bore at the opposite end thereof and reciprocally carried by the body;
 - a piston in the chamber secured to the plunger for reciprocation thereby toward and away from said compartment,
 - said piston having a port for flow of liquid from the chamber to the plunger;
 - a closure for the port disposed in said plunger on one side of the port;
 - resilient means in the plunger yieldably biasing the closure against the piston closing said port; and
 - a probe in said chamber, secured to the valve, reciprocally carried by the sleeve, and disposed to close the port at the opposite side of the latter and to close said valve when the piston is shifted in the chamber toward the valve.
 7. In combination:
 - a liquid container having a hollow, cylindrical portion provided with a normally upright axis, and an elongated neck integral with and extending upwardly from said portion and provided with a normally upright, longitudinal axis offset relative to said axis of said portion;
 - a liquid pump having an elongated body normal to said neck and having releasable means below said body

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attaching the body to the normally uppermost end of the neck above the latter remote from said portion; a pumping plunger reciprocable in the body along a path perpendicular to said axes and extending outwardly from one end of the body in spaced, overlying relation to said portion;
 5 opposed finger pieces integral with the plunger exteriorly of the body; and
 an elongated, normally horizontal wing extending from the opposite end of the body above said releasable means, whereby the neck may be hand-grasped above
 10 said portion in pistol grip fashion, the plunger placed between the index and second fingers, the wing nested in the crotch of the hand between the thumb and index finger, and the plunger depressed by force applied to said finger pieces,
 15 said neck being provided with depressions for receiving the third and fourth fingers between said portion and said body,
 said plunger having a discharge nozzle disposed outwardly of said finger pieces,
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said releasable means being a cap,
 said body being rotatable relative to the neck upon loosening of the cap whereby to adjust the direction of discharge of liquid from the nozzle.

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