Jan. 11, 1966 W. R. O'DONNELL ETAL 3,228,571

DISCHARGE VALVE CONSTRUCTION FOR DISPENSER PUMP

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Fig. 1

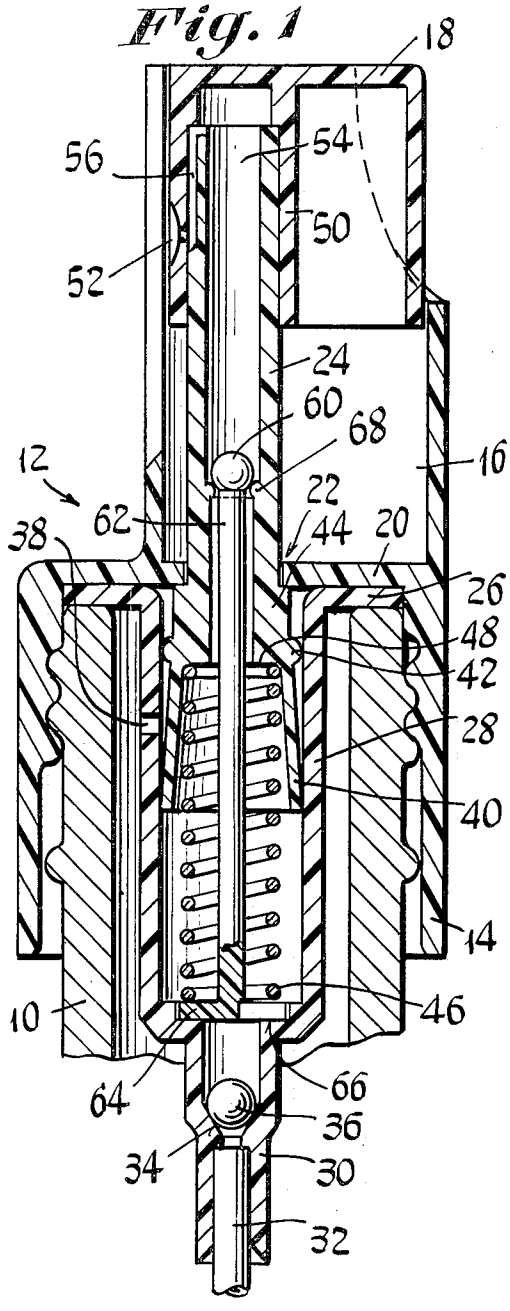
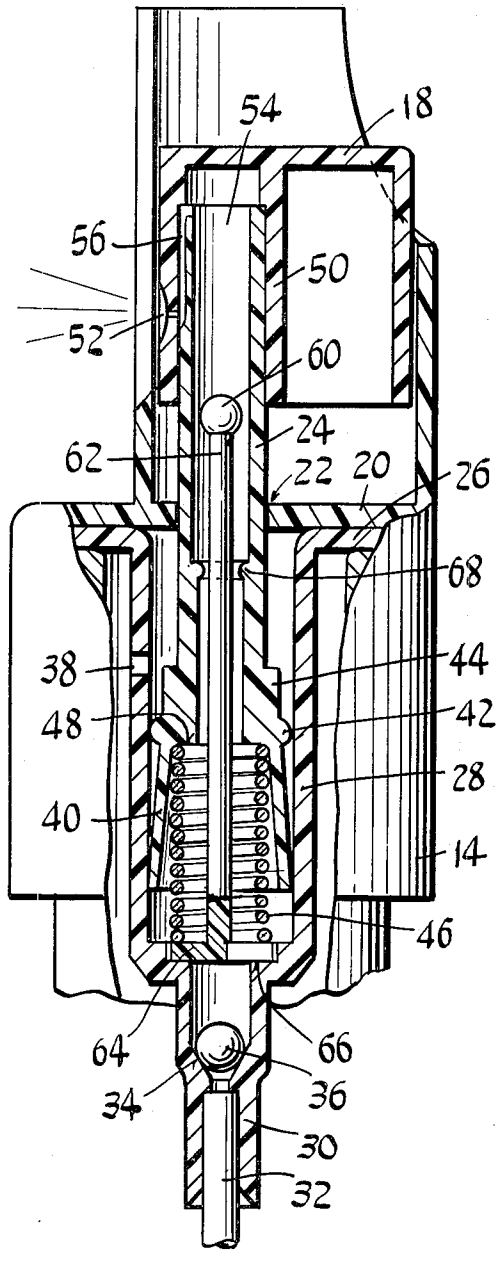


Fig. 3



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Fig. 2

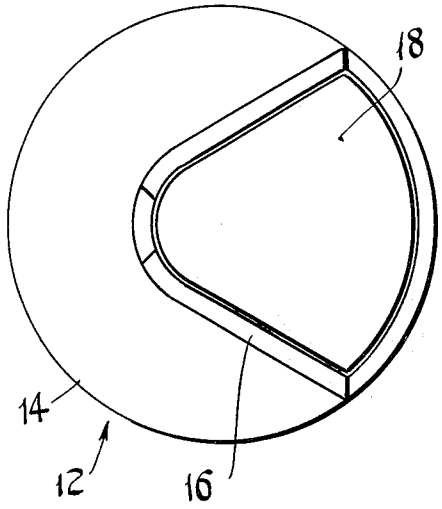
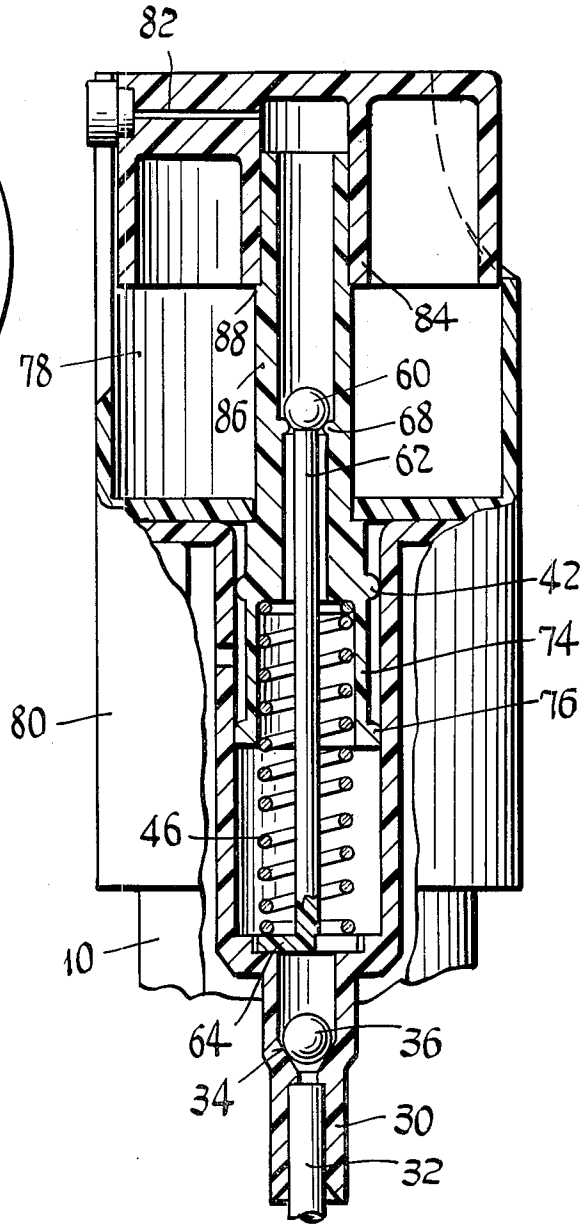


Fig. 4



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DISCHARGE VALVE CONSTRUCTION FOR DISPENSER PUMP

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This invention relates to small hand-held dispensers, and more particularly to pump type dispensers wherein a plunger is finger-actuated to pump out the contents of a container.

An object of the invention is to provide a novel and improved dispenser pump of extreme simplicity which at the same time is reliably leak-proof not only during shipment, but also in storage, or during other periods of non-use.

Another object of the invention is to provide an improved dispenser pump as above set forth, wherein a simplified piston, plunger and discharge valve means are provided, to the end that the number and complexity of the components are reduced.

A feature of the invention resides in the provision of an improved dispenser pump in accordance with the foregoing, wherein the discharge valve means is positive-acting and especially foolproof while at the same time being economical to construct and assemble.

Other features and advantages will hereinafter appear.

In the drawings accompanying this specification, similar characters of reference are used to designate like components throughout the several views, in which:

FIG. 1 is an axial sectional view of an improved dispenser pump as provided by the invention, with the parts shown in the non-pumping or non-dispensing position.

FIG. 2 is a top plan view of the dispenser pump.

FIG. 3 is a view like that of FIG. 1, but showing the pump plunger in the depressed position, effecting a discharge of the contents of the container.

FIG. 4 is an axial sectional view like that of FIG. 1, but showing a modification of the invention.

Referring first to FIGS. 1–3, there is shown the threaded neck portion **10** of a container such as a bottle, said neck portion carrying an internally threaded cap and guide member designated generally by the numeral **12**, such member having a lower chamber **14** accommodating the bottle neck **10** and an upper chamber **16**, in which there is a manually engageable depress or actuator button **18**.

Between the chambers **14** and **16** of the cap-guide member **12** there is disposed a transverse wall **20** having a centralized opening **22** through which a movable plunger shank or piston stem **24** extends. The transverse wall **20** clamps, between it and the top rim of the threaded neck **10**, an annular sealing and mounting flange **26** from which there depends a cylinder **28** having a bottom nipple portion **30** provided with a dip or siphon tube **32**. In the portion **30** there is a valve seat **34** engaged by a gravity influenced back-check ball valve **36**.

A side wall of the cylinder **28** has a vent or air ingress opening **38** which is disposed at one side of a resilient piston skirt **40** carried by the piston stem **24**. The skirt **40**, in accordance with the invention, has a slightly conical configuration and at its upper end connects and functions with an annular bead or shoulder **42** carried or disposed at the lower end of an enlargement **44** engageable with the underside of the transverse wall **20** of the cap and constituting an upper stop or limit for the plunger and piston.

By the present invention, the piston shank or stem **24**, skirt **40**, bead **42** and enlargement **44** are all molded to be integral with each other, of resilient plastic substance. Not only does the skirt **40** engage the inside of the cylinder

28 to constitute a piston therefor, but the bead or shoulder **42** also engages the inside of the cylinder whereby, for the raised position of the plunger and piston as shown in FIG. 1 access to the side vent opening **38** of the cylinder from the cylinder inside is prevented. Thus, the contents of the container cannot leak out through the vent opening **38** when the plunger and piston are in the raised position of FIG. 1. However, when the plunger and piston are depressed as shown in FIG. 3, representing the discharging position of the pump, outside air may enter the container through the side vent opening **38**, such air coming in through the clearance space between the piston stem **24** and the edges of the opening **22** of the transverse wall **20**.

A piston return spring **46** engages an internal shoulder **48** of the piston, said spring being connected to the cylinder **28** so that it normally retains the piston and plunger **40, 24** in the raised, non-discharging position of FIG. 1.

The actuator button **18** has a hollow boss **50** which frictionally receives the upper portion of the piston stem **24**, by which the button **18** is mounted thereon. A discharge orifice **52** of the button **18** connects with the hollow bore **54** of the piston stem **24** by means of a vertical channel **56** in the exterior of the piston stem **24**, thereby to provide for discharge of the contents of the container when said contents are pumped through the hollow stem **24** under the action of the piston **40**.

In accordance with the present invention, an improved and simplified, positive-acting discharge valve means is provided, by which the discharge channel comprising the bore **54** in the stem **24** is closed during the raised positions of the button **18**, stem **24** and piston **40**, and opened during the downward operating movement of the piston button and piston stem. The open condition of the discharge valve is shown in FIG. 3, said valve comprising a valve head or enlargement **60** carried at the upper end of the valve stem **62**, the latter being anchored at the lower portion of the cylinder **28** as by means of a discontinuous flange **64** held under the bottom end of the piston return spring **46** and maintained thereby against a shoulder **66** in the lower, nipple portion **30** of the cylinder.

The valve head **60** is cooperable with an annular internal valve seat **68** which is provided according to the invention in the bore **54** of the piston stem **24**. Above the valve seat **68**, the bore of the piston stem is larger than it is below the valve seat **68**. Thus, for the discharging position of FIG. 3 it will be seen that clearance exists between the valve stem **62**, valve head **60** and the interior configuration of the piston stem **24**, such clearance providing an adequate passage for the upward discharge movement of the container contents which are being ejected from the cylinder **28**.

However, for the raised position of the piston and plunger as shown in FIG. 1, the valve head **60** securely seats against the annular seat **68**, thereby closing effectively the discharge passage through the inside or bore of the piston stem **24**.

In accordance with the invention, the internal annular valve seat **68** is constituted as an integral part of the molding, such valve seat being accordingly resilient and readily formed by suitable die and core configurations in a mold. Further, the valve enlargement **60** is larger in diameter than the diameter of the hole through the valve seat **68** in order to enable the closing of the valve to be effected, but the difference is not so great that, coupled with the resiliency of the molded stem **24** and valve seat **68** the latter cannot in stretching enable the valve head **60** to be forced upward past it during the assembly of the valve to the piston.

It will be understood that the valve stem **62** and the head **60** as well as the mounting flange **64** thereof are molded as a piece separate from the piston-plunger as-

semblage, and that after the molding of these two pieces the valve stem and valve are forced upward into the bore **54** of the piston stem, the valve head **60** being forced past the seat **68** and the latter expanding circumferentially an extent sufficient to enable the head to be shifted past it to the operative position illustrated in FIG. 1.

The integral construction of the piston and valve seat thereof as illustrated, in conjunction with the integral construction of the valve and valve stem as illustrated represents a considerable simplification in the number of parts involving the discharge valve of the dispensing pump. Accordingly, a desirable economy of manufacture is accomplished. At the same time, however, the simplification does not adversely affect the operativeness of the discharge valve assemblage, but instead there is obtained a high degree of reliability in the functioning of the cooperable parts. The action of the discharge valve is positive in its nature, since the depressing movement of the button **18** and plunger assemblage at all times results in a positive opening of the valve. At the same time, the action of the piston-return spring **46** insures a closing of the discharge valve and proper positioning of the piston in the raised, non-operative position when the dispenser is not in use.

The pumping action results from downward movement of the piston which, because of the closed back-check valve **36**, forces the contents of the cylinder **28** upward through the bore **54** past the stem **62** and valve **60** and out through the orifice **52**. Air meanwhile can enter the container through the vent **38**. Upward movement of the piston **40** sucks liquid from the container through the dip tube **32** into the cylinder past the back-check **36**.

Another embodiment of the invention is illustrated in FIG. 4. This embodiment is in many respects similar to that of FIGS. 1–3, except that the actuator button is of larger diameter and area, as well as the upper portion of the cap guide member. Also, a slight difference exists in the shape or configuration of the piston skirt. As shown in FIG. 4, the piston skirt **74** has an annular bead or shoulder **76** engaged with the inner walls of the cylinder, as distinguished from the slightly conical piston skirt **40** of FIGS. 1–3.

The upper guide portion **78** of the cap-guide member is generally cylindrical and constitutes a continuation of the cylindrical lower portion **80** of the cap member. The actuator button **82** is also generally cylindrical and the mounting boss **84** thereof is centrally located in the cap, accommodating the upper portion of the piston stem **86**. A shoulder **88** on the piston stem engages the lower edge of the boss **84**, to position the button properly on the stem.

The operation of the embodiment illustrated in FIG. 4 is in general similar to that already described above in connection with FIGS. 1–3, the main differences existing in the structures involving the larger actuator button and guide portion, and the slightly different piston skirt configuration.

Variations and modifications may be made within the scope of the claims, and portions of the improvement may be used without others.

We claim:

1. A dispensing pump construction comprising, in combination:

(a) a cylinder,

(b) a piston movable in the cylinder, having an operating stem with a through axial bore constituting a discharge channel from the interior of the cylinder, said stem having intermediate its ends an internal annular shoulder constituting a discharge valve seat, and

(c) a discharge valve disposed in said axial bore, said valve being engageable with the valve seat to close the discharge channel and having a stem extending out of the channel,

(d) an actuator button carried on the end of the piston stem,

(e) means anchoring the valve stem to the cylinder, said means thus effecting an anchorage of the discharge valve whereby actuation of the button, the piston stem and the piston to move the latter further into the cylinder effects a separation of the valve from the valve seat,

(f) said piston stem and piston being of integral molded resilient plastic substance,

(g) said valve being slightly larger in diameter than the opening of the valve seat,

(h) said valve seat being circumferentially expansible within limits and capable of sufficient expansion to enable the valve to be forced through it whereby the valve stem extends through the seat, and

(i) said valve stem extending through and out of the piston to the cylinder end which is beyond the piston.

2. A pump construction as defined in claim **1**, wherein:

(a) the internal annular shoulder of the piston stem has a sloping lower surface facing toward the piston,

(b) said valve having a sloping upper surface facing away from the piston,

(c) said sloping surfaces having a cam action to effect said expansion of the valve seat when the valve is forced through the seat in the direction away from the piston.

References Cited by the Examiner

UNITED STATES PATENTS

2,096,227 10/1937 De Weal ---------- 222—321

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