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SPRAYER HEAD HAVING IMPROVED SEALING AND DISCHARGING MEANS

Filed Aug. 24, 1959

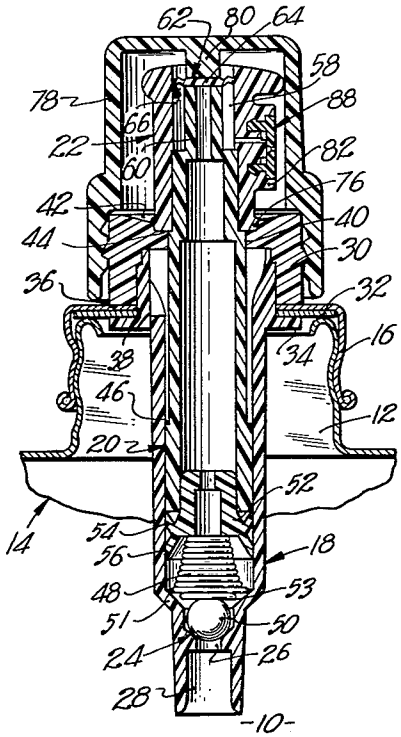


Fig. 1.

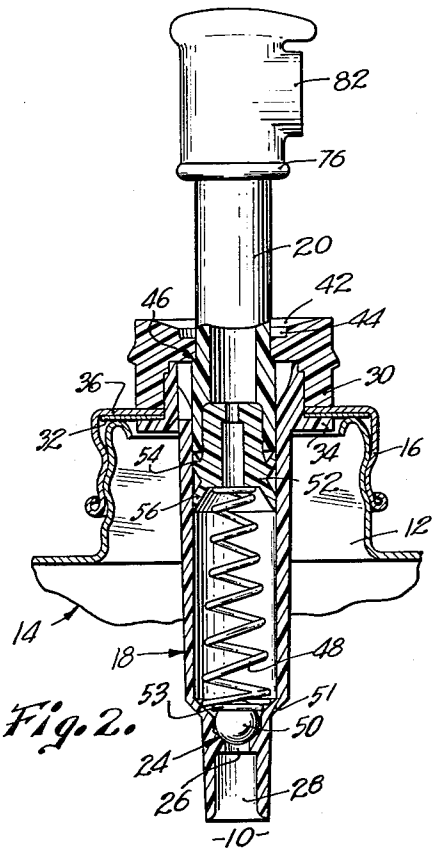


Fig. 2.

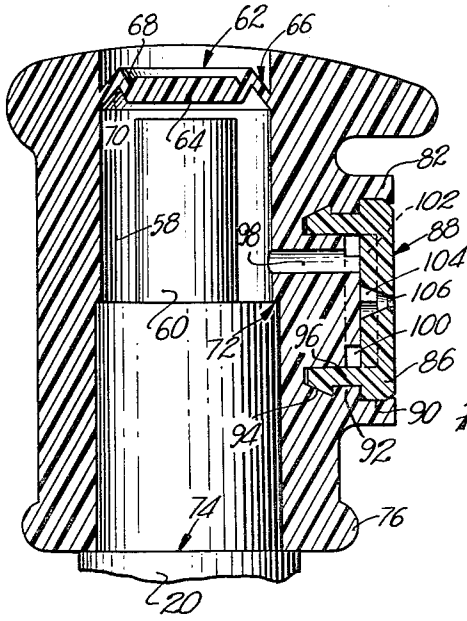


Fig. 3.

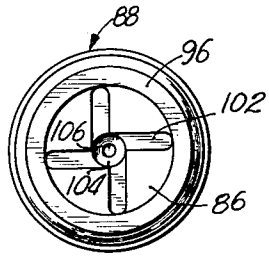


Fig. 4.

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SPRAYER HEAD HAVING IMPROVED SEALING AND DISCHARGING MEANS

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8 Claims. (Cl. 222—321)

Ths invention relates to improvements in pumps or sprayers and particularly to that class of spraying attachments for containers commonly employed for example, in the dispensing of insecticides and other fluids, the primary object being to eliminate leakage problems when the pump or sprayer is not in use. Hand pumps of the kind used in small containers and utilizing a spring-loaded reciprocable plunger are prone to leak while in storage, and although the discharge head of the sprayer may be held depressed and enclosed within a cap, such improvement of itself does not prevent leakage into the cap.

It is the most important object of the present invention, therefore, to provide a valve that blocks the normal flow of the fluid to the outlet orifice of the discharge head whenever the plunger is held depressed at the inner end of its path of travel.

Another important object of the present invention is to provide a diaphragm valve in the nature of a flexible membrane that may be held closed while the pump plunger is depressed through use of a hold-down member that of itself, need not either house the discharge head or operate as a sealing means.

Another important object of the present invention is to eliminate leakage from between the plunger and the barrel of the pump within which the plunger is reciprocably mounted through the medium of a seal between the discharge head and the barrel that is likewise held in a sealing condition by the hold-down member aforementioned.

Another object of the present invention is to provide in the aforementioned diaphragm valve, a special construction permitting flexing without stretching of the material from which the membrane is made.

Another object of the present invention is to provide a control nozzle for the discharge head of the pump that has novel interlocking means with the head, as well as a unique arrangement for utilizing the fluid pressure itself as the means for sealing the nozzle with respect to the head, eliminating the necessity of using adhesive to hold the nozzle in place.

In the drawing:

FIG. 1 is a vertical, cross-sectional view of a pump provided with a sprayer head having improved sealing and discharging means made pursuant to my present invention, the container within which the pump is mounted being illustrated fragmentarily.

FIG. 2 is a view similar to FIG. 1 but with the hold-down member removed and the plunger disposed at the outer end of its path of travel.

FIG. 3 is an enlarged, fragmentary view showing the head in section and the outer end of the plunger in elevation; and

FIG. 4 is an inside view of the nozzle prior to mounting the same on the head.

A pump, broadly designated by the numeral 10, is shown in FIGS. 1 and 2 attached to neck 12 of a fluid container 14. The connection is releasable by virtue of the fact that pump 10 is attached to a cap 16 which is in turn screw-threaded onto the neck 12.

Pump 10 includes a barrel 18, a spring-loaded plunger 20 reciprocable in barrel 18, and a discharge head 22 on the outer end of the plunger 20. Barrel 18 progressively

decreases in diameter as a valve seat 24 is approached, seat 24 being within the barrel 18 near the inner end of the latter and being juxtaposed to a restricted opening 26 in barrel 18. A tube (not shown) leading to the bottom of the container 14 is fitted into recess 28 at the inner end of barrel 18, and such tube, therefore communicates with the opening 26.

A retention member 30 forming a part of the barrel 18, clamps a gasket 32 against the upper end of neck 12 and against an outwardly extending flange 34 integral with the barrel 18 therearound. It also clamps top face 36 of cap 16 against flange 34.

Barrel 18 extends through an opening 38 in the top 36 of cap 16 and through the washer-type gasket 32. The member 30 is press-fitted or otherwise tightly affixed to the barrel 18 to become a part thereof, and is provided with a central opening 40 within which the plunger 20 reciprocates. The outer face of the member 30 has a dish-shaped recess 42 terminating in a socket 44, both of which surround the plunger, socket 44 having an annular, transversely sloping side wall as seen in FIG. 2.

Plunger 20 provides a tubular passage for fluid and is provided with an outwardly-facing shoulder 46 that engages member 30 as shown in FIG. 2, to limit the extent of outward movement of plunger 20 under influence of spring 48 that is housed within barrel 18 between plunger 20 and a spherical check valve 50 engageable with seat 24. Spring 48 rests on wall 51 of barrel 18, not on valve 50, the inner convolution 53 of spring 48 limiting the extent of movement of floating valve 50 away from seat 24. A tubular plug 52 attached to plunger 20 and extending into the inner end of the latter, receives the proximal end of the spring 48 and is provided with oppositely flaring, flexible wings 54 and 56 therearound that are in wiping engagement with the inner face of barrel 18.

Head 22, that is finger-actuated during use of the pump 10 to reciprocate the plunger 20, is telescoped over the outer end of the plunger 20 and provided with a bore 58 therethrough that is appreciably larger in diameter than the outside diameter of a tubular reduced end portion 60 of the plunger 20 whereby the bore 58, adjacent the portion 60, is adapted to receive fluid from the plunger 20 when diaphragm 62 is unseated, as illustrated in FIG. 3.

The diaphragm 62 is in the nature of a thin membrane that partitions or closes off the upper end of the bore 58 and is preferably made as an integral part of the head 22. Diaphragm valve 62 has a central disc-like portion 64 that is adapted to engage the outer end of the portion 60 of plunger 20 to block flow of fluid from plunger 20 to bore 58 as illustrated in FIG. 1.

To the end that the diaphragm 62 may be flexed toward and away from the proximal end of plunger 20 without stretching the material from which diaphragm 62 is made, there is provided an annulus 66 that is transversely undulated. Annulus 66, which integrally interconnects the inner wall of head 22 that defines bore 58 with the portion 64 therearound, normally has substantially the shape of an inverted V, although if desired, the transverse shape of the annulus 66 might well be that of an upright V.

To this end, an outwardly-facing, annular, transversely V-shaped groove 68, and a similarly shaped, inwardly-facing groove 70 are formed in the diaphragm 62.

The distance between the outer end of plunger 20 and the diaphragm portion 64 when the latter is in its normal position as shown in FIG. 3, is determined by interengaging shoulders 72 between the head 22 and the plunger 20 and by the inner end of head 22 engaging shoulder 74 on plunger 20. The said inner end of head 22 also seats against the bottom wall of socket 44 when the plunger 20 is depressed, as shown in FIG. 1. Further sealing at this point is provided by a bead 76 integral with head 22 at its innermost end in surrounding relationship thereto. The

bead 76 which is substantially semi-circular transversely thereof, also fits within the socket 44 rather tightly, deforming the flexible material from which the member 30 and the head 22 are made (see FIG. 1). The action is similar in nature therefore, to that provided by an O-ring seal.

Releasable means in the nature of a hold-down member 78 is attached to barrel 18 and particularly to the portion 30 thereof in any suitable manner such as by intermeshing screw threads as illustrated. While the member 78 chosen for illustration, is cup-shaped so as to enclose the head 22, such enclosure is not necessary and, therefore, the hold-down member 78 may take any desired form. However, it is necessary that the member 78 not only maintain the plunger 20 depressed, but that it maintain the parts 44—76 tightly sealed. Still further, the member 78 serves to deflect the diaphragm valve 62 and press the portion 64 thereof against the proximal end of plunger portion 60 by virtue of a pressure ear 80 integral with the top wall of member 78 and depending therefrom. Note in FIG. 1 that the ear 80 enters the bore 58 and engages the diaphragm portion 64 when the member 78 is attached to the portion 30 of barrel 18.

A laterally extending boss 82 on the head 22 is provided with a shallow, outwardly-facing cavity receiving a plate portion 86 of a discharge nozzle 88. The side wall of boss 82 defining the cavity therein is provided with an annular groove 90 surrounding the plate portion 86 and into which the latter is snap-fitted.

An inturned, annular rib 92 within the boss 82 separates the groove 90 from a dovetail-type of annular groove 94 within boss 82. An inwardly-extending band 96 integral with plate 86 complementally receives the rib 92 and is received by the groove 94 again by a snap-fit because of the resilient nature of the material from which head 22 and nozzle 88 are made.

Head 22 has an outlet port 98 placing the cavity of boss 82 into communication with bore 58, and particularly with an annular chamber 100 in boss 82 that is surrounded by the band 96 and covered by plate 86. The chamber 100 registers directly with a plurality of passages 102 in the inner face of plate 86 that are tangential to the band 96 and to a frusto-conical outlet aperture 104 in the plate 86 that terminates in a cylindrical hole 106.

When the pump 10 is to be placed in use, the hold-down member 78 is removed, whereupon an operator may reciprocate the plunger 20 in cooperation with spring 48 to force fluid such as a liquid insecticide, from the container 14, through the aperture 104. It is obvious that the valve 50 rises from seal 24 to admit the liquid into the plunger 20 when the latter is depressed, and bears against seat 24 to prevent passage of liquid back into container 14 when spring 48 forces plunger 20 to the position shown in FIG. 2, causing the liquid to flow into bore 58.

The fluid passes from the bore 58 and thence to the port 98 where it is equalized within the chamber 100 and flows to all of the passages 102 for discharge in an atomized uniform spray from the terminal end 106 of aperture 104. The pressure of the fluid within the chamber 100 acts radially outwardly on the band 96 of nozzle means 88 to press the band 96 tightly against the rib 92. Any fluid that tends to move inwardly in chamber 100, away from plate 86 along the band 96, also tends to hold the latter tightly within the groove 94. This action seals the member 88 and prevents leakage.

When the pump 10 is not in use, the member 78 is placed on the part 30 of barrel 18 and in so doing, there is a sealing action not only between the valve 62 and the portion 60 of plunger 20, but a sealing action between the bead 76 and the member 30 in socket 44.

Accordingly, the fluid cannot leak to the outside of the container 14 either from the outer end of plunger 20 or from between barrel portion 30 and plunger 20 at the opening 40. Furthermore, the member 78 prevents accidental reciprocation of plunger 20 and, therefore, discharge of the fluid during storage, shipment or other nonuse of the pump 10.

This is a continuation-in-part of our copending application Serial No. 789,902, filed January 29, 1959, now abandoned.

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

1. In a fluid handling assembly, the combination of:
(*a*) a hollow pump barrel;
(*b*) member on the barrel;
(*c*) a plunger having conduit means therethrough, reciprocable in the barrel and extending through the member;
(*d*) a head mounted on the plunger above said member provided with a bore communicating with the conduit means of said plunger;
(*e*) a shiftable, biased, flexible diaphragm secured to the head and closing the normally uppermost end of the bore, the upper end of said plunger being open, being disposed within the bore, and being spaced below the diaphragm when the latter is in the normal position thereof permitting free flow of fluid into the bore through said open end of the plunger, said head having a fluid outlet port communicating with said bore;
(*f*) means on the plunger within the barrel for pumping fluid into the barrel, through the plunger, into said bore, and thense through said port upon reciprocation of the plunger;
(*g*) a hold-down elememt releasably attached to the member and having a top overylying the head when the element is attached to the member; and
(*h*) an ear depending from said top and against the diaphragm, holding the latter in a shifted position opposed to the bias and against said upper end of the plunger in complete fluid closing relationship therewith only when the element is attached to the member.

2. In a fluid handling assembly, the combination of:
(*a*) a hollow pump barrel;
(*b*) a member on the barrel;
(*c*) a plunger having conduit means therethrough, reciprocable in the barrel and extending through the member;
(*d*) a head above said member and provided with a bore;
(*e*) a shiftable, biased, flexible diphragm secured to the head and closing the normally uppermost end of the bore, said plunger extending into the opposite end of the bore and having a terminal portion within the bore of reduced outside diameter, presenting a space in the bore surrounding said portion, the upper end of said terminal portion being open and spaced below the diaprhagm when the latter is in the normal postion therof permitting free flow of fluid into the bore through said open end of the plunger, said head having a fluid outlet port communicating with said space;
(*f*) means on the plunger within the barrel for pumping fluid into the barrel, through the plunger, into said space, and thence through said port upon reciprocation of the plunger;
(*g*) a hold-down element releasably attached to the member and having a top wall overlying the head when the element is attached to the member; and
(*h*) an ear depending from said wall and against the diaphragm, holding the latter in a shifted position against said upper end of said terminal portion of the plunger in complete fluid closing relationship therewith only when the element is attached to the member.

3. In fluid handling assembly, the combination of:
(*a*) a hollow pump barrel;
(*b*) a member on the barrel;

(c) a plunger having conduit means therethrough, reciprocable in the barrel and extending through the member;

(d) a head above said member and provided with a bore;

(e) a shiftable, biased, flexible, generally flat diaphragm secured to the head and closing the normally uppermost end of the bore, said plunger being tightly fitted into the opposite end of the bore coaxially therewith and having a terminal portion within the bore of reduced outside diameter, presenting a space in the bore surrounding said portion, the upper end of said terminal portion being open and spaced below the diaphragm when the latter is in the normal position thereof permitting free flow of fluid into the bore through said open end of the plunger, said head having a fluid outlet port communicating with said space;

(f) means on the plunger within the barrel for pumping fluid into the barrel, through the plunger, into said space, and thence through said port upon reciprocation of the plunger:

(g) a hold-down element releasably attached to the member and having a top wall overlying the head with the element is attached to the member; and

(h) an ear intgral with said wall and depending therefrom, said ear extending into the bore and against the diaphragm, holding the latter in a shifted position against said upper end of said terminal portion of the plunger in complete fluid closing relationship therewith only when the element is attached to the member.

4. In a fluid handling assembly, the combination of:

(a) a hollow pump barrel;

(b) a member on the barrel;

(c) a spring loaded plunger having conduit means therethrough, reciprocable in the barrel and extending through the member;

(d) a head above said member and provided with a bore;

(e) a shiftable, biased, flexible, generally flat diaphragm integral with the head and closing the normally uppermost end of the bore, said plunger being tightly fitted into the opposite end of the bore coaxially therewith and having a terminal portion within the bore of reduced outside diameter, presenting a space in the bore surrounding said portion, the upper end of said terminal portion being open and spaced below the diaphragm when the latter is in the normal position thereof permitting free flow of fluid into the bore through said open end of the plunger, said head having a laterally-extending, fluid outlet port communicating with said space;

(f) means on the plunger within the barrel for pumping fluid into the barrel, through the plunger, into said space, and thence through said port upon reciprocation of the plunger;

(g) a hollow, hold-down cover releasably attached to the member in surrounding relationship to the latter and in housing relationship to the head, said cover having a top wall overlying the head when the cover is on the member; and

(h) an ear integral with said wall within the cover and depending therefrom, said ear extending into the bore and against the diaphragm, holding the latter in a shifted position against said upper end of said terminal portion of the plunger in complete fluid closing relationship therewith only when the cover is on the member.

5. In a fluid handling assembly, the combination of:

(a) a hollow pump barrel;

(b) a member on the barrel;

(c) a spring-loaded plunger having conduit means therethrough, reciprocable in the barrel and extending through the member, said member having a normally uppermost face provided with a socket surrounding the plunger;

(d) a head above said face and provided with a bore;

(e) a shiftable, biased, flexible, generally flat diaphragm integral with the head and closing the normally uppermost end of the bore, said plunger being tightly fitted into the opposite end of the bore coaxially therewith and having a terminal portion within the bore of reduced outside diameter, presenting a space in the bore surrounding said portion, the upper end of said terminal portion being open and spaced below the diaphragm when the latter is in the normal position thereof permitting free flow of fluid into the bore through said open end of the plunger, said head having a laterally-extending, fluid outlet port communicating with said space;

(f) means on the plunger within the barrel for pumping fluid into the barrel, through the plunger, into said space, and thence through said port upon reciprocation of the plunger;

(g) a hollow, hold-down cover releasably attached to the member in surrounding relationship to the latter and in housing relationship to the head, said cover having a top wall overlying the head when the cover is on the member;

(h) an ear integral with said wall within the cover and depending therefrom, said ear extending into the bore and against the diaphragm, holding the latter in a shifted position against said upper end of said terminal portion of the plunger in fluid closing relationship therewith only when the cover is on the member; and

(i) a bead integral with the head in surrounding relationship thereto adjacent the lower end of the head, said cover operating through the ear in holding the plunger depressed and the bead seated in said socket to provide a seal against flow of fluid into the cover between the plunger and the member.

6. In a fluid handling assembly, the combination of:

(a) a hollow pump barrel;

(b) a member on the barrel;

(c) a spring-loaded plunger reciprocable in the barrel and extending through the member, said member having a normally uppermost face provided with a socket surrounding the plunger;

(d) a head above said face and provided with a bore;

(e) a shiftable, biased, flexible diaphragm secured to the head within the bore closing the normally uppermost end of the latter, said diaphragm having a central, disc portion and an annulus surrounding the disc portion and integrally joining the same with the head, said annulus being V-shaped in cross section, presenting continuous grooves in the outer and inner faces, respectively, of the diaphragm, said plunger being tightly fitted into the opposite end of the bore coaxially therewith and having a terminal portion within the bore of reduced outside diameter, presenting a space in the bore surrounding said portion, the upper end of said terminal portion being open and spaced below the diaphragm when the latter is in the normal position thereof permitting free flow of fluid into the bore through said open end of the plunger, said head having a laterally-extending, fluid outlet port communicating with said space;

(f) means on the plunger within the barrel for pumping fluid into the barrel, through the plunger, into said space, and thence through said port upon reciprocation of the plunger;

(g) a hollow, hold-down cover releasably attached to the member in surrounding relationship to the latter and in housing relationship to the head, said cover having a top wall overlying the head when the cover is on the member;

(*h*) an ear integral with said wall within the cover and depending therefrom, said ear extending into the bore and against the disc portion of the diaphragm, holding the latter in a shifted position against said upper end of said terminal portion of the plunger in fluid closing relationship therewith only when the cover is on the member; and

(*i*) a bead integral with the head in surrounding relationship thereto adjacent the lower end of the head, said cover operating through the ear in holding the plunger depressed and the bead seated in said socket to provide a seal against flow of fluid into the cover between the plunger and the member.

7. In a fluid handling assembly, the combination of:

(*a*) a container cap provided with an opening;

(*b*) a hollow pump barrel extending through said opening;

(*c*) a retention member on the barrel, said barrel having means within the cap cooperating with said member to hold the cap attached to the barrel;

(*d*) a spring-loaded plunger having conduit means therethrough, reciprocable in the barrel and extending through the member, said member having a normally uppermost face provided with a socket surrounding the plunger;

(*e*) a head above said face and provided with a bore;

(*f*) a shiftable, biased, flexible diaphragm secured to the head within the bore closing the normally uppermost end of the latter, said diaphragm having a central, disc portion and an annulus surrounding the disc portion and integrally joining the same with the head, said annulus being V-shaped in cross section, presenting continuous grooves in the outer and inner faces, respectively, of the diaphragm, said plunger being tightly fitted into the opposite end of the bore coaxially therewith and having a terminal portion within the bore of reduced outside diameter, presenting a space in the bore surrounding said portion, the upper end of said terminal portion being open and spaced below the diphragm when the latter is in the normal position thereof permitting free flow of fluid into the bore through said open end of the plunger, said head having a laterally-extending, fluid outlet port communicating with said space;

(*g*) means on the plunger within the barrel for pumping fluid into the barrel, through the plunger, into said space, and thence through said port upon reciprocation of the plunger;

(*h*) a hollow, hold-down cover releasably attached to the member in surrounding relationship to the latter and in housing relationship to the head, said cover having a top wall overlying the head when the cover is on the member;

(*i*) an ear integral with said wall within the cover and depending therefrom, said ear extending into the bore and against the disc portion of the diaphragm, holding the latter in a shifted position against said upper end of said terminal portion of the plunger in fluid closing relationship therewith only when the cover is on the member; and

(*j*) a bead integral with the head in surrounding relationship thereto adjacent the lower end of the head, said cover operating through the ear in holding the plunger depressed and the bead seated in said socket to provide a seal against flow of fluid into the cover between the plunger and the member.

8. In a fluid handling assembly, the combination of:

(*a*) a fluid container having a neck;

(*b*) a cap mounted on said neck and provided with an opening;

(*c*) a hollow pump barrel in the container, coaxial with said neck and extending through said opening;

(*d*) a retention member on the barrel exteriorly of the container, said barrel having means within the cap cooperating with said member to hold the cap attached to the barrel;

(*e*) a spring-loaded plunger having conduit means therethrough, reciprocable in the barrel and extending through the member, said member having a normally uppermost face provided with a socket surrounding the plunger;

(*f*) a head above said face and provided with a bore;

(*g*) a shiftable, biased, flexible diaphragm secured to the head within the bore closing the normally uppermost end of the latter, said diaphragm having a central, disc portion and an annulus surrounding the disc portion and integrally joining the same with the head, said annulus being V-shaped in cross section, presenting continuous grooves in the outer and inner faces, respectively, of the diaphragm, said plunger being tightly fitted into the opposite end of the bore coaxially therewith and having a terminal portion within the bore of reduced outside diameter, presenting a space in the bore surrounding said portion, the upper end of said terminal portion being open and spaced below the diaphragm when the latter is in the normal position thereof permitting free flow of fluid into the bore through said open end of the plunger, said head having a laterally-extending, fluid outlet port communicating with said space;

(*h*) means on the plunger within the barrel for pumping fluid from the container, into the barrel, through the plunger, into said space, and thence through said port upon reciprocation of the plunger;

(*i*) a hollow, hold-down cover releasably attached to the member in surrounding relationship to the latter and in housing relationship to the head, said cover having a top wall overlying the head when the cover is on the member;

(*j*) an ear integral with said wall within the cover and depending therefrom, said ear extending into the bore and against the disc portion of the diaphragm, holding the latter in a shifted position against said upper end of said terminal portion of the plunger in fluid closing relationship therewith only when the cover is on the member; and

(*k*) a bead integral with the head in surrounding relationship thereto adjacent the lower end of the head, said cover operating through the ear in holding the plunger depressed and the bead seated in said socket to provide a seal against flow of fluid from the container into the cover between the plunger and the member.

References Cited in the file of this patent

UNITED STATES PATENTS

232,380	Truesdell	Sept. 21, 1880
868,426	Goodchild	Oct. 15, 1907
1,688,195	McGregor	Oct. 16, 1928
1,970,138	Hawley	Aug. 14, 1934
1,973,709	Hibbert et al.	Sept. 18, 1934
2,069,156	Bernhardt	Jan. 26, 1937
2,088,790	Huthsing	Aug. 3, 1937
2,117,296	Cahoon	May 17, 1938
2,299,472	Edmundson	Oct. 20, 1942
2,392,085	Ferrel	Jan. 1, 1946
2,681,622	Titus	June 22, 1954
2,835,534	Galeazzi	May 20, 1958
2,956,509	Cooprider et al.	Oct. 18, 1960