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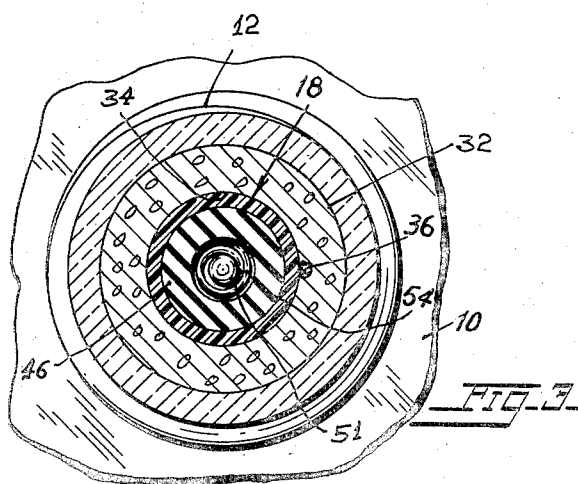
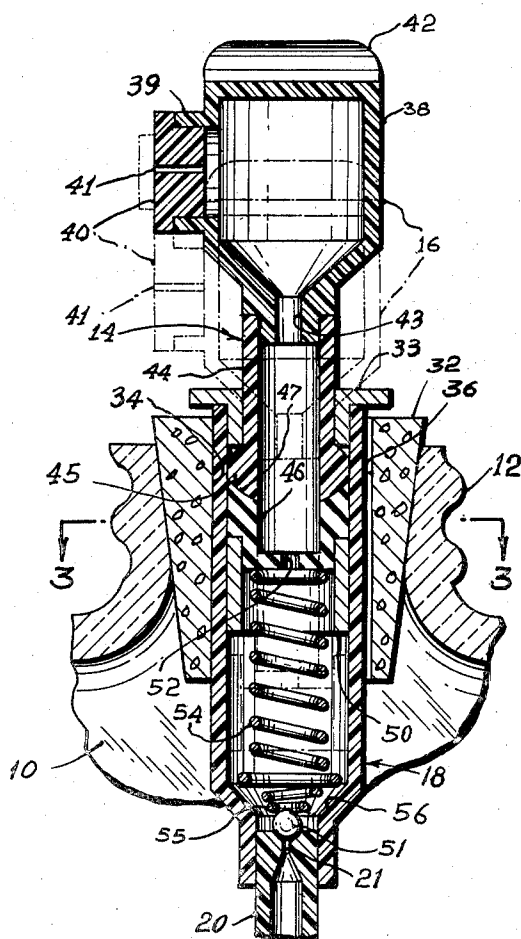
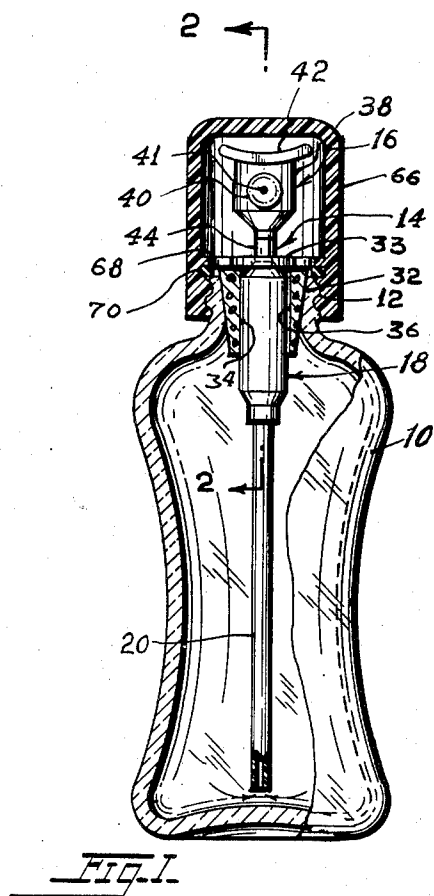
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2,861,839

COMBINATION CONTAINER, CAP AND SPRAYER

Filed Jan. 14, 1957

2 Sheets-Sheet 1



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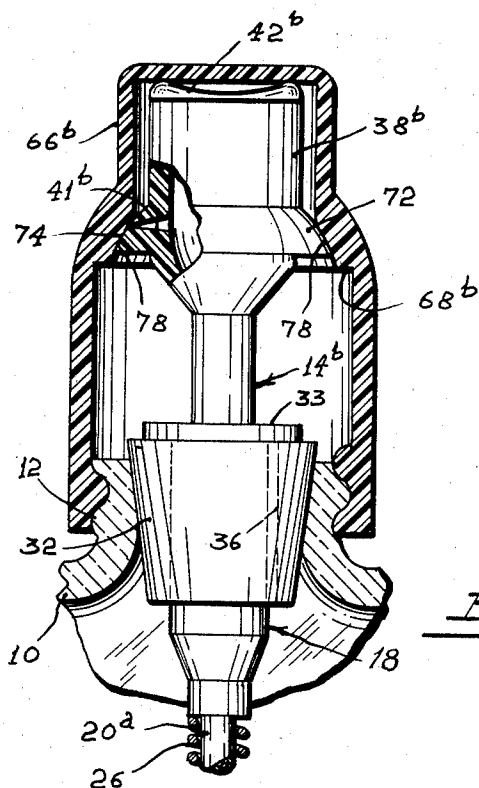
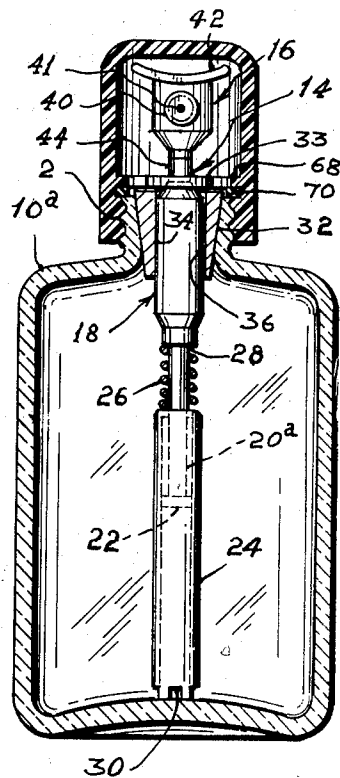
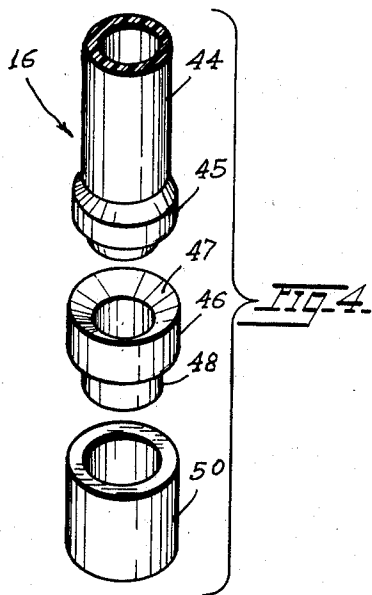
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COMBINATION CONTAINER, CAP AND SPRAYER

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2 Sheets-Sheet 2



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2,861,839

COMBINATION CONTAINER, CAP AND SPRAYER

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Application January 14, 1957, Serial No. 634,027

1 Claim. (Cl. 299—97)

This invention relates to a combination container of the bottle type, a removable closure cap therefor, and a spray device normally enclosed by said closure cap. The present invention represents an improvement over the device shown in U. S. Patent No. 2,586,687, issued to me on February 19, 1952. The main object of the present invention is to provide a generally improved device of the character described, so designed as to be applicable to bottles or similar containers of various sizes, or of various neck diameters.

A more specific object is to provide a combination device as stated which will be characterized by the disposition of the pump unit thereof directly within the stopper of the container, as distinguished from previous devices wherein the pump unit is located in the body portion of the bottle. By reason of the present arrangement, different stoppers may be selected, to be fitted onto a single pump unit, so that the pump unit and stopper assembly can be readily mounted in bottle necks of different diameters. In this way, the combination device constituting the present invention can be kept indefinitely, and positioned in any bottle that is conveniently accessible for the purpose of holding the liquid to be sprayed.

A further object is to provide a generally improved pump unit capable of assembly at low cost, while being fully efficient in the discharge of its intended functions.

Another object of importance is to provide a closure cap for the spray device so designed that the cap will fully seal the bottle against leakage or evaporation of the liquid, while simultaneously retaining the plunger of the spray unit in a depressed, fully inoperative position of adjustment.

A more specific object, in a modified form of the invention, is to include a stem or conduit depending from the pump unit within the container which is adapted under all circumstances to extend axially within the container fully to the bottom thereof, even though the bottle may be of a length greater or less than a bottle in which the unit was previously disposed. It is proposed, in this regard, that the conduit be self-adjusting in length, with its inlet end located in every instance at the bottom of the bottle, to insure the passage of liquid therein even though the bottle may be almost fully exhausted of its contents.

In another modified form of the invention, it is an important object, further, to eliminate the necessity for sealing gaskets or the like on the closure cap, by designing the cap in a manner such that when threaded onto the neck of a conventional bottle, a shoulder within the cap will sealably engage the nozzle of the device, to seal the pump unit against evaporation of liquid there-through, with the cap at the same time depressing and rendering wholly inoperative the operating plunger of the spring unit.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claim in which the various novel

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features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a longitudinal sectional view through the container, closure cap, and spray device in which parts remain in elevation, the closure cap being in its sealing position.

Fig. 2 is an enlarged longitudinal section substantially on line 2—2 of Fig. 1, the plunger and piston unit being shown in dotted and full lines in depressed and extended positions, respectively, the closure cap being removed.

Fig. 3 is a transverse section on the same scale as Fig. 2, substantially on line 3—3 of Fig. 2.

Fig. 4 is an exploded perspective view of a portion of the plunger assembly.

Fig. 5 is a longitudinal sectional view showing the spray device mounted in a bottle of a size different from that shown in Fig. 1, the pump and conduit assembly remaining in elevation, the stem being of a modified construction.

Fig. 6 is an enlarged longitudinal sectional view through the upper portion of another modified construction, in which portions remain in elevation and portions are shown broken away.

Referring to the drawings in detail, in Fig. 1 there has been shown a bottle 10 which may contain various liquids to be sprayed, such as window cleaners, insecticides, etc. The bottle has a neck 12 externally threaded to receive the closure cap of the invention.

The spray device, generally designated 14, includes a plunger or piston generally designated 16 axially shiftable in a hollow cylinder 18 having a reduced lower end receiving and fixedly secured to a tubular stem 20 extending within the bottle. The stem is closed at the top but is provided with a restricted passage 21 communicating with the interior of cylinder 18. The end of the stem is dished around passage 21.

In Fig. 5, the spray unit 14 is identical to the first form of the invention, but the stem construction is modified, and automatically extends or retracts according to the size of the bottle. Thus a bottle 10^a, smaller than bottle 10, is shown. In the modified form, a compression coil spring 26 is circumposed about a stem 20^a. This bears at its lower end against the upper end flange of a tubular extension 24. At its upper end, spring 26 abuts against the lower end 28 of cylinder 18. Extension 24 is thus continuously biased in a direction to extend the same to its maximum extent beyond stem 20^a, into engagement with the bottom of container 10^a. The lower end of extension 24 is formed open, and has inlet ports 30 angularly spaced uniformly about its circumference.

It becomes apparent, therefore, that the device when formed as in Fig. 5 may be inserted in bottles of different lengths and efficiently used in each instance. In a long bottle such as shown in Fig. 1, spring 26 causes extension 24 to project beyond stem 20 a substantial distance, so that the conduit defined by the stem and extension will adjust itself to the overall length of the bottle with the inlet ports still being disposed directly at the bottom of the bottle, to insure the inflow of liquid into the device even though the contents of the bottle have been almost fully exhausted. If the device were mounted in a short container such as shown at 10^a in Fig. 5, the extension 24 would be shifted in the direction of the cylinder 18 against the restraint of spring 26 to telescope the stem 20 within extension 24 to a substantially greater extent, thus reducing the overall length of the conduit extending from the bottom of the bottle to cylinder 18.

The self-adjusting conduit, while being held against the bottom of the bottle despite the fact that the bottle may be shorter or longer than one previously used, has

the desirable feature of remaining at all times in a position extending axially of the bottle, with the ports fully open. This is distinguished from an arrangement, for example, in which a flexible hose might be inserted into the bottle, coiling irregularly therein in an arrangement in which the inlet end of the hose might tend to be forced away from the bottom of the container or might become wholly or partially closed by movement into a position directly against the bottom or side wall of the container.

Referring now to Fig. 2, a stopper 32 of cork or other resilient, sealing material has an axial bore 34 in which the cylinder 18 is snugly but removably engaged. Thus, the stopper can be slipped off the cylinder, to be replaced by a different stopper of a diameter and/or exterior shape different from that shown in the drawing, for the purpose of fitting the device into bottle necks of different diameters.

In any event, the stopper used is tightly fitted upon the cylinder, and has a longitudinal passage 36 extending from end to end of the stopper and open at both its ends, said passage being in communication with bore 34 and defining an air vent when the spray unit is being used, to maintain atmospheric pressure on the surface of the bottle contents, thereby to assure a proper pumping action. Cylinder 18 has a collar 33 rigidly connected to it and sealing the passage at other times, responsive to a slight adjustment of the cylinder downwardly in stopper 32.

The plunger 16 includes a hollow, enlarged head 38 having a laterally opening annulus 39 in which is fixedly engaged a nozzle 40 formed with a restricted outlet 41. Integrally formed on the upper end of the head is an arcuately depressed thumb rest 42, the ends of which project laterally outwardly from the head in opposite directions.

At its lower end, head 38 has a reduced portion or neck 43 fixedly engaged in the outer end of a plunger tube 44 formed at its lower or inner end with an enlargement 45 having a rounded bottom surface seating in and adhesively or otherwise fixedly engaged in a complementary depression 47 of a rubber insert 46 having a leak-proof wiping contact with the wall of cylinder 18. Insert 46 has a reduced axial extension 48 fixedly engaged in a tubular member 50 in cylinder 18. Extension 48 has an end wall formed with an opening 52.

Extending into member 50 and bearing against the perforated end wall of insert 46 is a compression coil spring 54, the other end of which has a large convolution seating on a frusto-conical shoulder 56 provided at the lower end of cylinder 18. The spring is formed with a light convolution 55 below the large convolution, at its extreme end pressing lightly against a ball check valve 51 seated in the dished portion on the upper end surface of the stem 20. The spring normally biases the plunger 16 to its extended, full line position of Fig. 2.

When the container and spring device are not in use during the actual spraying of liquid, a plastic closure cap 66 of inverted cup shape is applied to neck 12. Cap 66 is internally threaded at its lower open end, to receive the threaded neck of the bottle, and within the cap, adjacent the threads thereof, there is formed an inwardly directed, circumferential shoulder 68 to the underside of which is cemented an annular, compressible, sealing gasket 70.

The cap is so proportioned that when applied over the rest 42 in the manner shown in Fig. 1, and threaded onto neck 12, it will fully depress the plunger to its dotted line position of Fig. 2. When the plunger rest is fully depressed to tightly engage the upper end of the head, the sealing gasket 70 will at the same time be fully compressed against the neck 12 to insure positively against any leakage of liquid that might otherwise tend to develop. Evaporation of liquid is also insured against, should such evaporation tend to occur through nozzle 40.

In use of the device, cap 66 is removed. Spring 54 is now free to expand, and raises the plunger to its full line position of Fig. 2, with the user holding the bottle in his hand while maintaining pressure on rest 42 with the thumb of the hand. The cylinder 18 is manually pulled upwardly a short distance through stopper 32 to unseat collar 33.

Then, the liquid is sprayed merely by alternately depressing the rest 42 and then permitting it to move outwardly under the pressure of the spring 54. Each depression of the rest moves the plunger or piston through its pressure stroke to the dotted position shown in Fig. 2, so that the piston reduces the size of the chamber defined between the lower end of insert 46 and the stem.

When pressure on rest 42 is released and spring 54 is permitted to expand, raising the piston, the piston moves through its suction stroke to its full line position of Fig. 2. This develops suction in cylinder 18 lifting ball valve 51 off its seat, causing liquid to be drawn upwardly through the stem 20 into the cylinder 18. On the next pressure stroke of the piston the liquid, seeking an outlet, is forced through the opening 52 and emerges in a spray through nozzle 40.

In the modified construction shown in Fig. 6, the inner construction of the spray or pump unit 14^b is identical to that of the first form, and the stopper 32 is also utilized. Further, stem 20^a, spring 26, and conduit extension 24 of Fig. 5 may be employed. Alternatively, the stem 20 of Fig. 1 may be used.

In this form of the invention, the only differences are in the plunger head, nozzle, thumb rest, and cap construction. The head 38^b is shaped substantially similarly to the first form, except for having a continuously extending, external collar 72, the top surface of which has a transverse convexity 74. Opening through the convex surface is a discharge passage 41^b, so that the shoulder or collar 72 defines a nozzle with a single opening, functioning similarly to nozzle 40.

Thumb rest 42^b in this form of the invention differs from the first form in that it does not project outwardly beyond the sides of the head 38^b. Instead, it is of a diameter equal to that of the head, and is formed with a depression in its top surface to receive one's thumb.

The closure cap 66^b is internally threaded at its lower end to engage neck 12, and intermediate its ends, the cap has an enlargement with an internal shoulder 68^b, said enlargement being formed with a transversely concave, downwardly flaring inner side surface 78 complementing the convexity 74 of collar 72. As a result, when cap 66^b is threaded onto neck 12, it depresses rest 42^b and hence the entire plunger 14^b, similarly to the first form. At the time the rest is fully depressed, the enlargement comes to bear tightly against the collar 72, sealing the discharge passage. This eliminates the need for special gaskets, etc., due to the fact that the previous manual closing of the passage 36 of the stopper 32 prevents leakage between the wall of the stopper and the inner surface of neck 12, while closure cap 66^b prevents evaporation or leakage through the spray device.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claim.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

A combined closure cap, container, and sprayer comprising a container for liquid including a neck, a closure cap removably fitted about said neck, a stopper engageable in the neck, said stopper having an axial bore and a spray device including a hollow cylinder engaged in and adjustable in the axial bore of said stopper, a tubular stem extending from the cylinder into the container, and

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a tubular plunger working in the cylinder, a ball check valve on the stem openable on the suction stroke of the plunger and closable on the pressure stroke thereof to force liquid from the cylinder into the plunger, the plunger further including a discharge nozzle providing an outlet for said liquid and a thumb rest, the cylinder including a collar adapted to bear against one end of the stopper to limit movement of the cylinder axially of the stopper in one direction when the cap is in operative position, the stopper having a longitudinal passage constituting an air vent below the collar for communicating the interior of the container with atmosphere, said collar when engaged against the stopper closing the vent, said closure cap when in operative position on the neck bearing against the thumb rest to shift the plunger through its

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pressure stroke and maintain the same in the position to which it is so shifted, said cylinder upon downward adjustment carrying said collar against the stopper for sealing the air vent.

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