

[54] **HAND OPERATED SPRAYER**

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[58] Field of Search 239/355, 375, 361, 526,
239/359, 372, 333, 321, 329; 222/383, 384,
385, 546

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[57] **ABSTRACT**

A hand operated sprayer of the trigger type is disclosed having a body with a vertical spring urged plunger therein from which a dip tube extends into the liquid receptacle and which carries a piston and an inlet check valve in communication with the dip tube, the plunger being positioned by a trigger having a cam surface engaging an actuating surface on the plunger, the plunger controlling the venting of the receptacle. A spray piston is mounted in the body and can be positioned by a nut for delivery of spray or for shut-off of flow.

The trigger can also be locked in a shut-off position to retain fluid in the receptacle by the positioning of the plunger.

18 Claims, 6 Drawing Figures

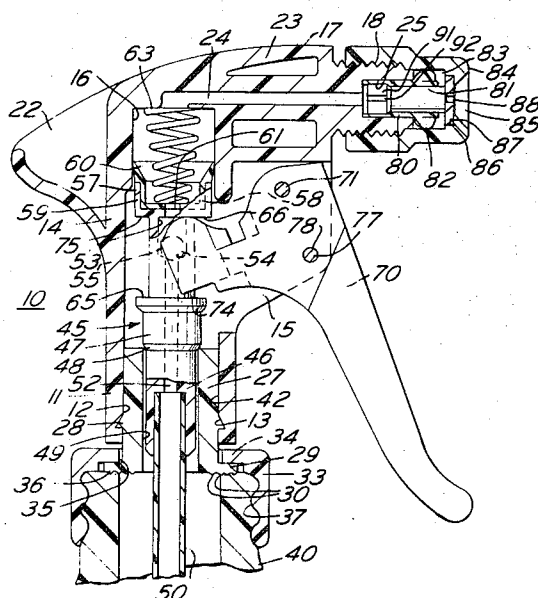


FIG. 1

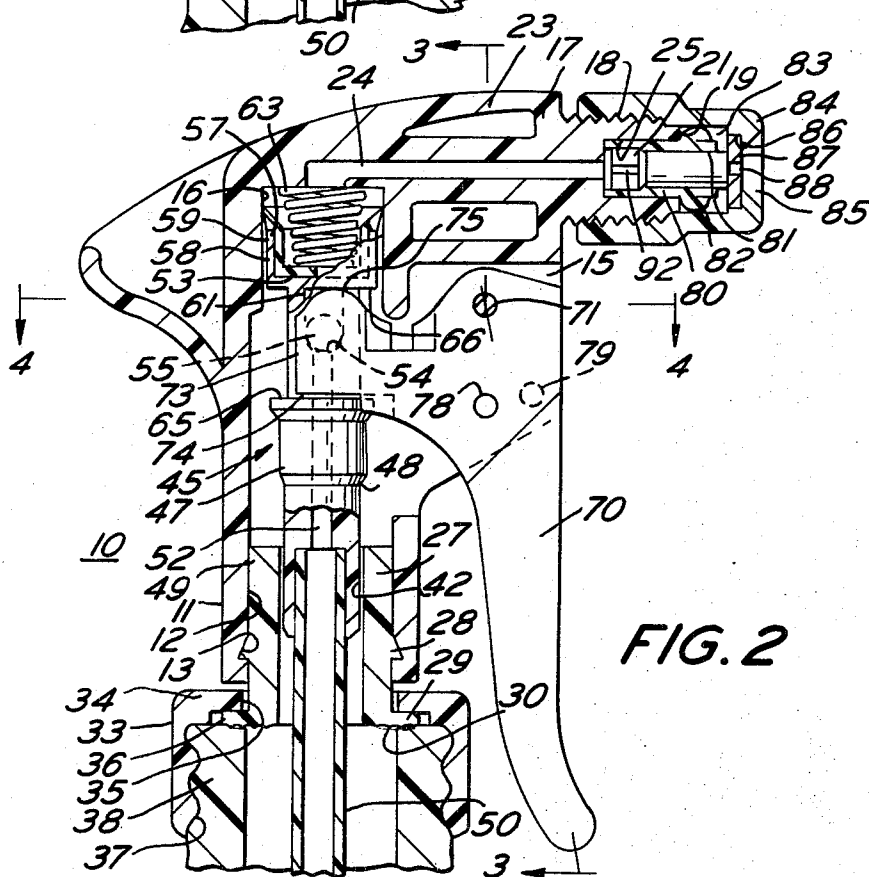
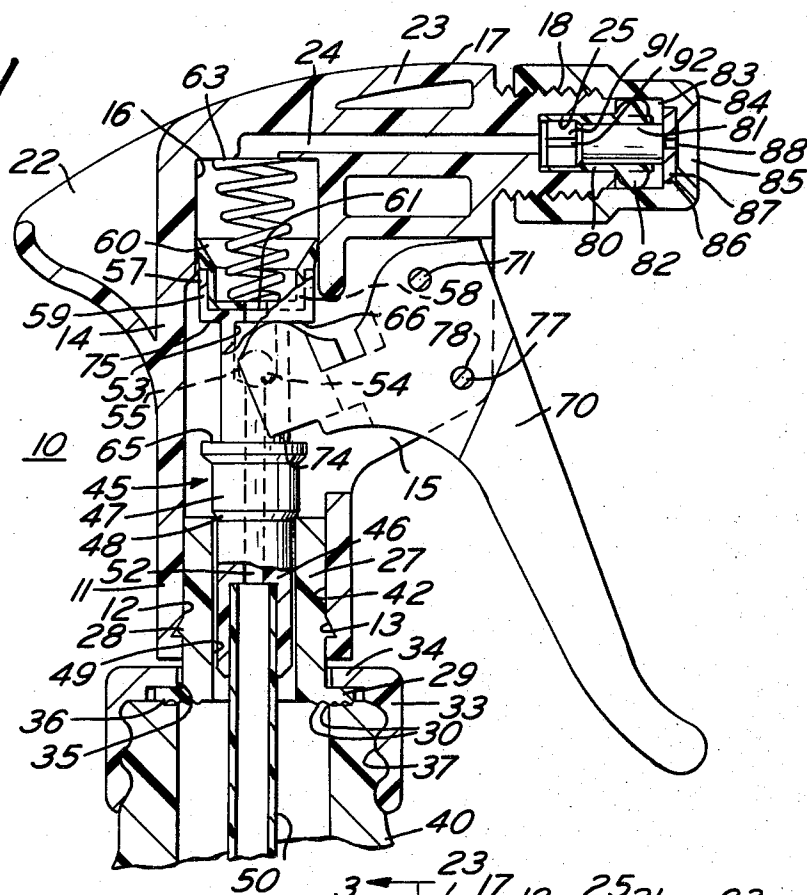


FIG. 2

FIG. 3

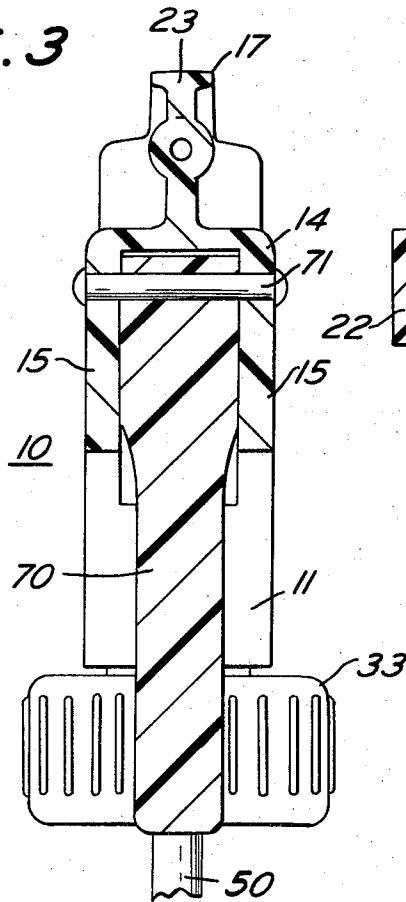


FIG. 4

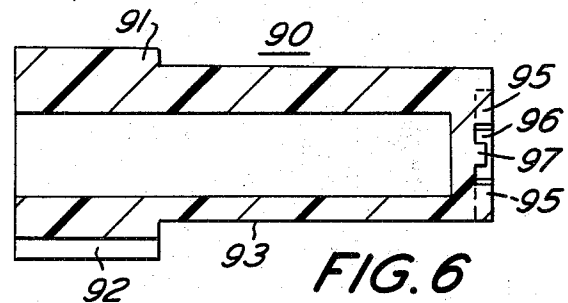
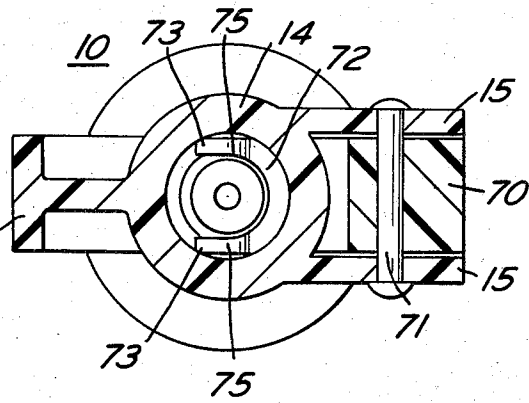


FIG. 6

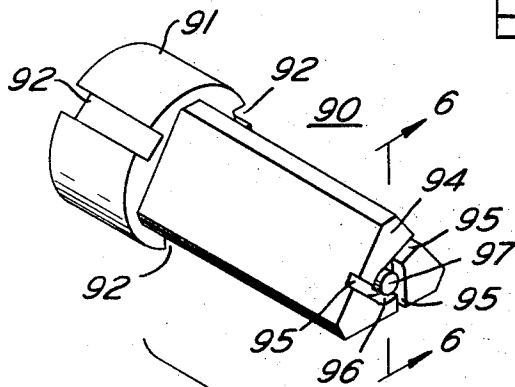
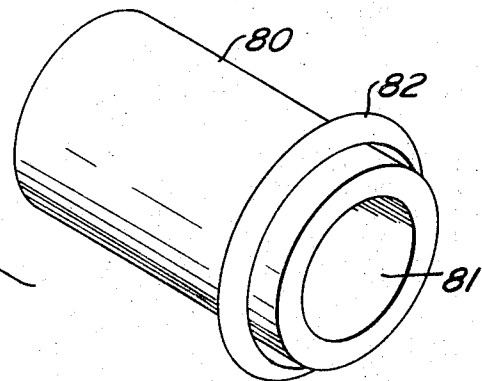


FIG. 5



HAND OPERATED SPRAYER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to hand operated sprayers of the trigger type for dispensing liquids in spray form from bottles or other liquid receptacles.

2. Description of the Prior Art

It has heretofore been proposed to provide detachable sprayers for spraying liquids from bottles and which are operated by a trigger like handle. In certain of the sprayers heretofore proposed the pumping chamber was inclined with respect to the axis of the neck of the receptacle while in others the axis of the pumping chamber was perpendicular to the axis of the neck of the bottle. Such structures were cumbersome and complicated and subject to breakdown after a short period of time.

Certain of the prior trigger type sprayers were limited to use with receptacles having long necks to avoid contact of the trigger with the receptacle.

In the trigger type sprayers heretofore available difficulties have been encountered in preventing leakage during shipping and after the same have been placed in operation while providing adequate venting for pumping.

The sprayer of the present invention obviates many of the difficulties heretofore encountered.

SUMMARY OF THE INVENTION

In accordance with the invention a hand operated sprayer of the trigger type is provided, the major components of which are of molded synthetic plastic materials, in which a body detachably connected to a receptacle has a piston therein in longitudinal axial alignment with the axis of the neck of the receptacle, the piston being controlled by a cammed pivotally mounted trigger, the spray nozzle structure being carried in the body perpendicular to the piston axis and being adjustable for delivery and for shut-off of flow.

It is the principal object of the invention to provide a hand operated sprayer of the trigger type which is simple in construction, held in closed position for shipping, and is reliable in operation and free from undesired leakage.

It is a further object of the invention to provide a hand operated sprayer which is readily assembled from molded components.

It is a further object of the invention to provide a hand operated sprayer having a wide range of usefulness.

Other objects and advantageous features of the invention will be apparent from the description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The nature and characteristic features of the invention will be more readily understood from the following description taken in connection with the accompanying drawings forming part hereof, in which:

FIG. 1 is a vertical central sectional view of a sprayer in accordance with the invention with the trigger in one limit position for initiating pumping and for storage and shipping;

FIG. 2 is a view similar to FIG. 1 showing the trigger in its other limit position and upon the completion of a delivery stroke;

FIG. 3 is a vertical sectional view taken approximately on the line 3—3 of FIG. 2;

FIG. 4 is a horizontal sectional view taken approximately on the line 4—4 of FIG. 2;

FIG. 5 is an enlarged exploded perspective view of a portion of the spray controlling structure; and

FIG. 6 is a longitudinal sectional view, further enlarged, taken approximately on the line 6—6 of FIG. 5.

It should, of course, be understood that the description and drawings herein are illustrative merely and that various modifications and changes can be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawings, a body 10 is provided, of molded synthetic plastic of relatively high density, so as to be relatively rigid. Suitable plastics include polyethylene.

The body 10, of one piece construction, has a lower tubular portion 11 with a central interior opening 12 an interior annular frustoconical recess 13 being provided spaced upwardly from the lower extremity thereof. Above the tubular portion 11 an upper portion 14 is provided having spaced vertical wall portions 15 extending therefrom. The upper body portion 15 has a central hollow cylinder 16 with a forwardly extending portion 17 whose horizontal central axis is perpendicular to the vertical longitudinal axis of the body portions 11 and 14.

The forwardly extending portion 17 has an externally threaded extension 18 in axial alignment therewith with a terminal shoulder 19.

Reinforcing and strengthening ribs 22 and 23 can be provided.

The upper portion 15 has a central passageway 24 communicating with the cylinder 16 and with a bore 25 terminating at the shoulder 19.

The tubular portion 11 has a sealing collar 27 inserted therein and retained and sealed at this location by an annular rim 28 engaged in the recess 13. The collar 27 is preferably of a low density synthetic plastic material so that the rim 28 is resilient for insertion within the central opening 12 of the body 10 and engagement in the recess 13. The collar 27 has an outwardly extending end disc 29 with circular sealing ribs 30 on the lower face thereof.

A closure cap 33 is provided having an inwardly extending rim 34 with a central opening 35 and with a lower shouldered recess 36 for engagement with the end disc 29. The closure cap 33 is preferably internally threaded as at 37 for engagement with the threaded neck 38 of a bottle or other receptacle 40, of glass, synthetic plastic material, or of metal.

The closure cap 33 can be tightened to force the end disc 29 and its ribs 30 into sealed engagement on the upper margin of the neck 38.

The sealing collar 27 has a central passageway 42, with a valve seat at the upper end thereof.

A plunger 45 is provided having a lower tubular end portion 46 for movement within the central passageway 42 and with a clearance therebetween for venting, as hereinafter explained. The plunger 45 is preferably molded in one piece of high density synthetic plastic, such as that employed for the body 10, and so as to be relatively rigid.

The plunger 45 has an enlargement 47 above the end portion 46 with a seating portion 48 for engagement with the sealing collar 27 at the top of the passageway 42.

The end portion 46 has a bore 49 therein for the reception of the upper end of a dip tube 50 which extends downwardly into receptacle 40 for liquid delivery therefrom, as hereinafter explained.

The plunger 45 has a bore 52 extending upwardly to an enlarged bore 53, the lower end of which has a seat 54 for a valve ball 55.

The plunger 45 has a cylindrical piston enlargement 57 with a lower interior end wall 58 and an interior side wall 59 for the reception of a flared cup packing 60 carried in the enlargement 57 and in sealing engagement with the cylinder 16 and for vertical movement therein. The packing 60 has a passageway 61 in communication with the bore 52. The packing 60 is preferably of low density synthetic plastic so as to be flexible and resilient.

A spring 63, seated in the cup packing 60 and engaged with the upper end of the cylinder 16 normally urges the plunger 45 downwardly.

The plunger 45 above the enlargement 47 has an upwardly facing annular transverse actuating face 65, and, spaced upwardly therefrom, and forming the bottom exterior of the piston 57, a downwardly facing annular transverse face 66.

An actuating lever or trigger 70 is provided for manual actuation and is pivotally mounted between the walls 15 on a pivot pin 71 carried by the walls 15. The trigger 70 has a bifurcated portion 72 with legs 73 disposed on opposite sides of the plunger 45.

Each of the legs 73 may have a lower cam surface 74 for engagement with the lower actuating face 65 upon movement of the trigger 70 counterclockwise from the position shown in FIG. 2 to urge the plunger 45 downwardly and has an upper cam surface 75 for engagement with the upper actuating face 66 upon movement of the trigger 70 clockwise from the position shown in FIG. 1 to the position shown in FIG. 2.

A locking pin 77 can be provided, engageable in a hole 78 in the trigger 70 and in aligned openings 79 in the walls 15 when the trigger 70 is in the position shown in FIG. 1.

The bore 25 has mounted therein and extending therebeyond a spray piston guide 81 with an annular compressible packing shoulder 82 therearound for contact with the terminal shoulder 19 and the interior surface 83 of a spray nozzle nut 84 which is in threaded engagement with the extension 18 for adjustable positioning thereon. The guide 81 is preferably of low density synthetic plastic material so that the shoulder 82 is in resilient engagement with the surface 83 to prevent fluid leakage.

The nut 84 has an end opening 85 for fluid delivery and interiorly thereof has a shoulder 86 for the reception of an orifice plate 87 with a central orifice 88 therein.

The spray piston guide 80 has a spray piston 90 loosely mounted therein for limited longitudinal movement. The spray piston 90 has a head 91 with spaced ports 92 therealong, the ports 92 being closed when the piston 90 is positioned so that the head 91 engages the inner end of the bore 25. The piston 90 is movable away from the inner end of the bore 25, if the nut 84 is turned to move it to the right as seen in FIGS. 1 and 2.

The spray piston 90 has triangularly disposed faces 93 for delivery of fluid therealong from the ports 92 and has an end face 94. The end face 94 has inwardly directed passageways 95 extending tangentially to a central vortex chamber 96 with a central inset baffle 97 aligned with but spaced from the orifice 88.

The length of the spray piston 90 is such that upon engagement therewith of the orifice plate 87 and turning of the nut 84 the spray piston 90 can be moved to the left as seen in FIGS. 1 and 2 to a position with the head 91 engaged at the end of the bore 25 to shut off fluid delivery through the ports 92.

Upon turning of the nut 84 in the opposite direction, release of the spray piston 90 is effected when pressure is applied thereagainst to open the ports 92.

The mode of operation will now be pointed out.

The normal position for storage and shipping is shown in FIG. 1 in which the locking pin 77 holds the trigger 70 against movement, the plunger 45 being positioned with the seating portion 48 on its seat on the sealing collar 27. The nut 84 is also normally positioned for storage and shipping to hold the spray piston 90 in its shut-off position.

When it is desired to use the sprayer the nut 84 is turned to permit movement of the spray piston 90 to open the ports 92. The locking pin 77 is removed.

Pressure is applied by the fingers on the trigger 70 to move it clockwise, as seen in FIG. 1 to move the plunger 45 upwardly against the force of the spring 63, by engagement of the cam surfaces 75 on the upper actuating face 66, and with downward movement of the plunger 45 effected by the spring 63. Several strokes may initially be required for priming, i.e. so that liquid in the dip tube 50 is advanced above the check valve 55 into the cylinder 16 and above the cup packing 60.

Upward movement of the plunger 45 then causes delivery of liquid through the central passageway 24, the ports 92, along the faces 93, inwardly through the passageways 95 to the vortex chamber 96 and therefrom in a rotary conical spray through the orifice 88 and end opening 85.

The upward movement of the plunger 45, by moving the seating portion 48 from its seat at the upper end of the passageway 42, permits air to enter the receptacle 40 and prevent fluid lock.

Actuation of the trigger 70 can be repeated as desired.

It will be noted that the structure can be easily assembled.

The spray nozzle assembly will be effected by inserting the spray piston 90 into the spray piston guide 80, and inserting the guide 80 into the bore 25. The spray nozzle nut 84 with the orifice plate 87 mounted thereon is then threaded onto the threaded extension 18 and positioned as desired either for fluid shut-off or for use.

The plunger 45, with the valve ball 55 in place has the cup packing 60 mounted therein and the spring 63 added.

The closure cap 33 is mounted on the sealing collar 27 and, with the plunger 45 introduced through the bottom of the passageway 42 the sealing collar 27 is advanced upwardly along plunger 45 and moved into its locked position with the rim 28 engaged in the recess 13.

The trigger 70 can then be positioned with the legs 73 on opposite sides of the plunger 45 and between the surfaces 74 and 75 and the pivot pin 71 inserted. The locking pin 77 can then be inserted.

It will be noted that the location of the trigger 70 is such that there is no obstruction of trigger operation by the receptacle 40 even if it has a very short neck 38.

It will thus be seen that a sprayer has been provided with which the objects of the invention are attained.

I claim:

1. A sprayer comprising

a body having a lower tubular portion and an upper portion with an upright cylinder,

said body having a forward portion with a delivery passageway therein extending from said cylinder,

a plunger having an upper piston portion disposed in said cylinder for movement therein and a lower tubular end with a dip tube for insertion into a receptacle extending therefrom and movable therewith,

said plunger between said piston portion and said lower tubular end having an actuating face thereon,

a trigger pivotally carried on said body and having a cam portion engaging said actuating face for moving said plunger in a predetermined direction upon movement of said trigger,

said forward portion having spray means at its forward end with which said delivery passageway is in communication.

2. A sprayer as defined in claim 1 in which said body has

a sealing collar at the lower end thereof with a central opening therethrough through which said plunger is movable, and

a closure cap in engagement with said sealing collar for securing said body to a liquid receptacle.

3. A sprayer as defined in claim 2 in which said lower tubular portion is in spaced diametrical relation to said central opening of said sealing collar for venting therealong, and

said plunger has a valve seating portion for engagement with said sealing collar to cut off fluid access in one position and to vent along said tubular portion in another position.

4. A sprayer as defined in claim 1 in which said spray means includes a movable member for shutting off flow through said discharge passageway in one position thereof.

5. A sprayer as defined in claim 2 in which said sealing collar is insertable into said body for assembly, and

said sealing collar and said body have portions in locked engagement in the assembled position of said sealing collar.

6. A sprayer as defined in claim 3 in which

holding means is provided in engagement with said trigger and said body for holding said valve seating portion in engagement with said sealing collar.

7. A sprayer as defined in claim 1 in which a resilient member is provided urging said plunger in opposition to said trigger.

8. A sprayer as defined in claim 7 in which said resilient member is disposed in said cylinder in engagement with said piston.

9. A sprayer as defined in claim 1 in which a non-return valve is provided in the fluid passageway in said plunger for retaining fluid in said cylinder against return flow.

10. In a sprayer for attachment to a container comprising a body member having a cylinder therein with nozzle means at one end and a sealing collar and closure cap means at the other end, a piston in the cylinder operable in a first direction for filling said cylinder with material to be dispensed and operable in a second direction for dispensing the material from said cylinder through said nozzle means, the improvement comprising

a dip tube carrying extension extending downwardly from said piston and into said sealing collar and movable with said piston,

said extension having a portion engaged in sealing relation with said sealing collar in one position of said extension and said extension permitting venting through said collar in another position of said extension.

11. A sprayer as defined in claim 10 in which said portion of said extension is an enlargement which engages said sealing collar at its upper end.

12. A sprayer as defined in claim 10 in which a handle is provided pivoted on said body for moving said piston.

13. A sprayer as defined in claim 12 in which means is provided for locking said handle with respect to said body with said enlargement in sealing relation to said collar.

14. A sprayer as defined in claim 12 in which said piston has a rim portion with an annular transverse face thereon for actuating engagement by a portion of said handle.

15. A sprayer as defined in claim 14 in which said piston has an additional rim portion with an annular transverse face thereon spaced from said first mentioned annular face for actuating engagement by another portion of said handle.

16. A sprayer as defined in claim 15 in which said handle has an upper cam face for operating engagement with one of said annular transverse faces and a lower cam face for engagement with the other of said annular transverse faces.

17. In a device for dispensing material from a container having a mouth, said device having a cap for releasable attachment to the container mouth, the improvement which comprises: means providing a cylinder beyond said cap away from the container mouth, a discharge nozzle extending from said cylinder away from said cap; a hollow piston slidably reciprocable in said cylinder, a tube extending from said piston through said cap for reception in the container inward from the container mouth, said tube having a longitudinal passage therethrough which opens at one end into the hollow interior of the piston and opens at the opposite end

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into the interior of the container, said piston being slid-
able in said cylinder toward said cap to fill the cylinder
through said tube with material from the container and
slidable away from the cap to dispense material from
the cylinder through said discharge nozzle; and means 5
for venting the container mouth to the atmosphere
when said piston is moved away from the cap to dis-
pense material from the cylinder.

18. A dispensing device according to claim 17,
wherein said last-mentioned means comprises: means 10
attaching said cylinder to said cap and providing a pas-

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sage that opens at one end into the interior of said cap
for fluid communication with the mouth of the con-
tainer and is open to the atmosphere at its opposite end
away from the cap; and a guide member slidable in said
passage and coupled to said piston to substantially
close said passage when the piston is moved toward
said cap and to open said passage so as to vent the con-
tainer to the atmosphere when the piston is moved
away from the cap.

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