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Loeffler

[11] **3,861,564**

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[54] **PRODUCT PRESSURIZING DISPENSER INCLUDING PRODUCT FLOW CUTOFF**

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[52] **U.S. Cl.** **222/80,** 222/193

[51] **Int. Cl.** **B65d 83/14**

[58] **Field of Search** 222/193, 135, 145, 383, 222/384, 80; 239/349

[56] **References Cited**

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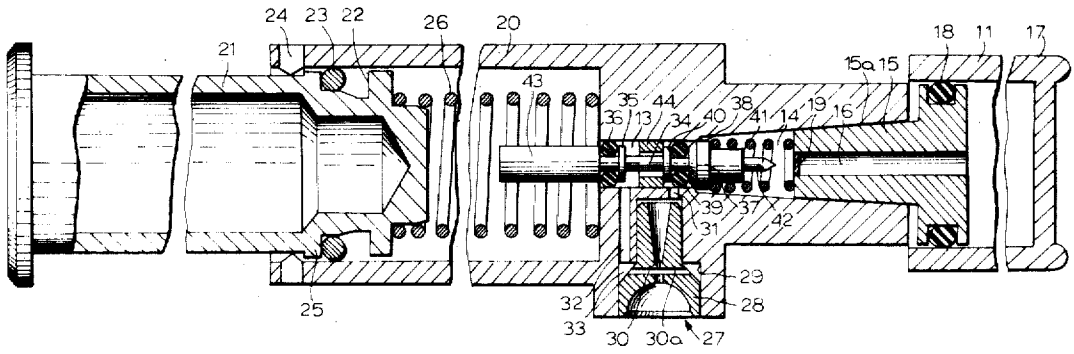
Primary Examiner—Stanley H. Tollberg

Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

A device for dispensing liquid product in fine droplet form has a dispenser body having a bore therethrough. A product pressurizing piston cylinder means is provided on one end of the dispenser body for pressurizing liquid product in the product pressurizing means. An air compressing piston cylinder means is provided on the other end of the dispenser body having a member movable through a compression stroke for compressing air within the air compressing piston cylinder means and supplying it to the bore of the dispenser body. A dispensing nozzle means is provided on the dispenser body having a compressed air passage and a liquid passage therethrough for co-mingling the compressed air and liquid and dispensing the liquid product in fine droplet form in the compressed air. The dispenser body has a liquid passage opening out of one end of the bore and extending to the dispensing nozzle means and a compressed air passage opening out of the other end of the bore and extending to the dispensing nozzle means. When pressure is exerted from opposite ends of the device, gas valve means in the bore are movable to open the compressed air passage, and liquid valve means in the bore are movable to open the liquid passage by the movement of the movable member of the air compressing piston cylinder means near the end of the compression stroke only when said air compressing piston cylinder means has compressed air to a predetermined pressure.

9 Claims, 6 Drawing Figures



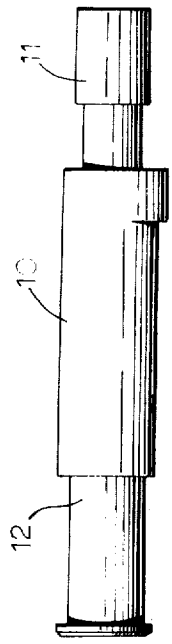

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FIG.1

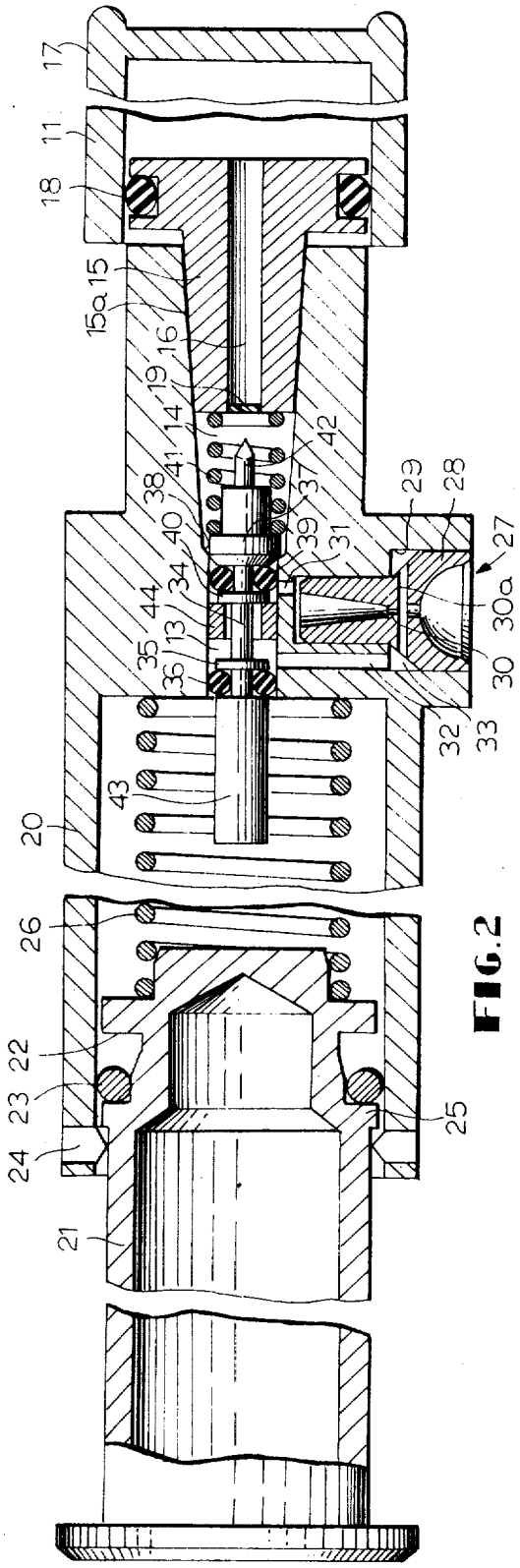
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FIG.2

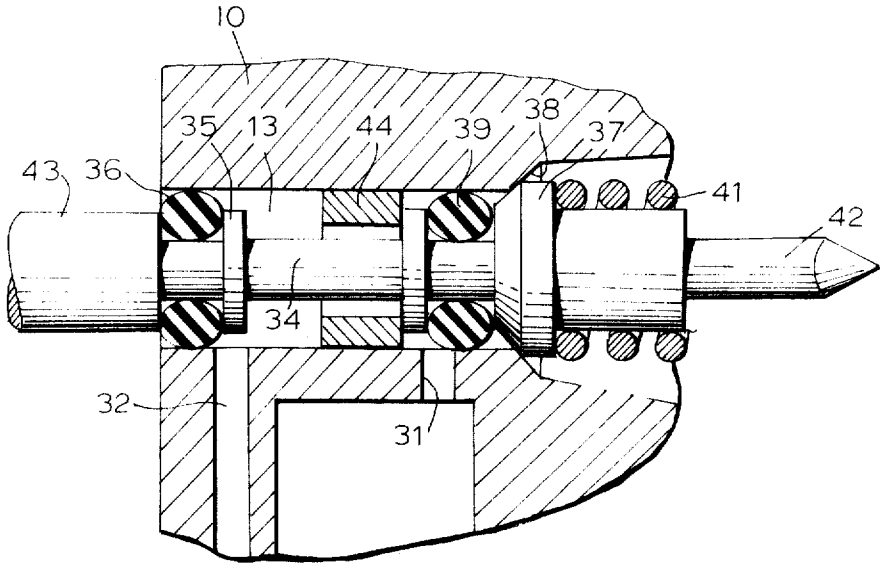
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FIG. 3

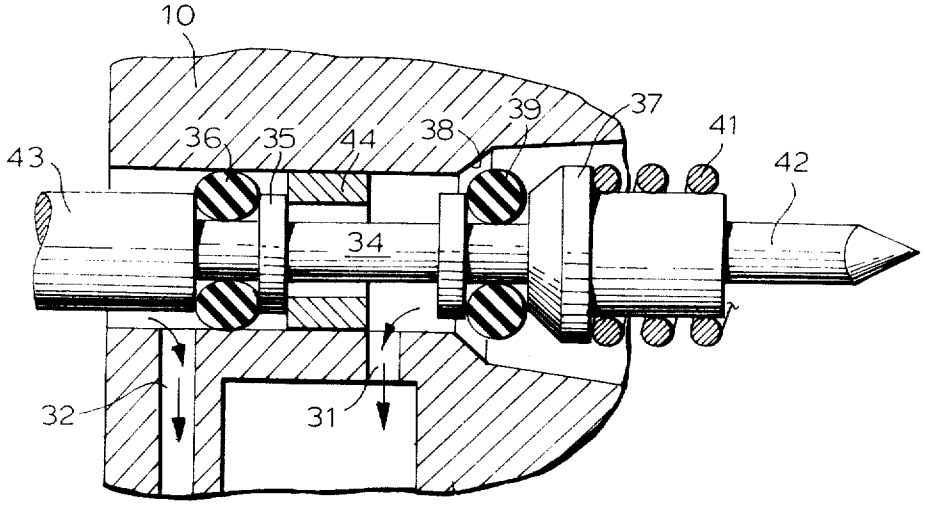
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FIG. 4

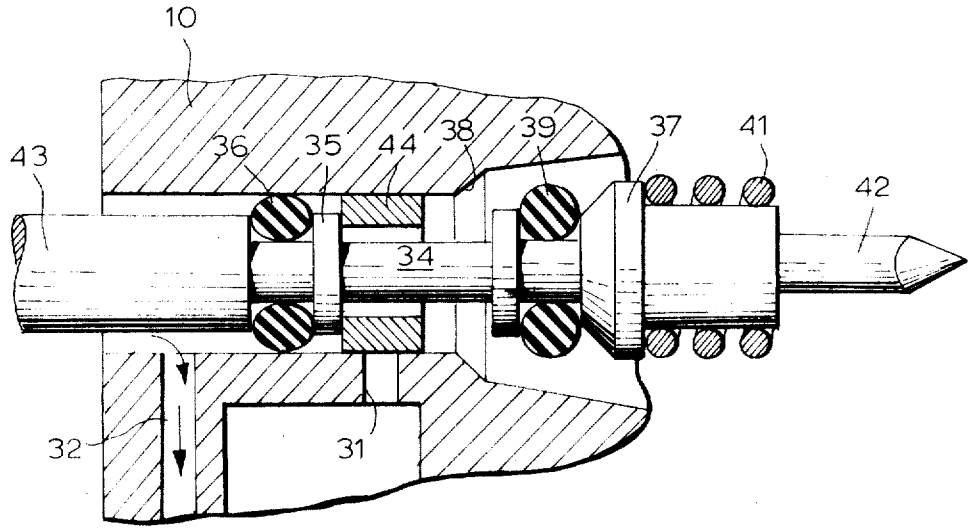
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FIG. 5

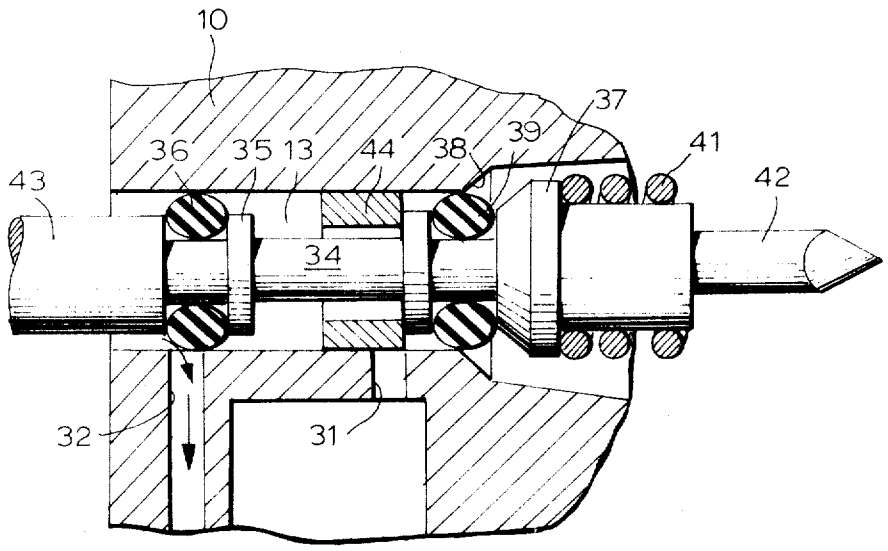
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FIG. 6

PRODUCT PRESSURIZING DISPENSER INCLUDING PRODUCT FLOW CUTOFF

This invention relates to a device for dispensing liquid product in fine droplet form in compressed air, and more particularly to a dispenser of this type in which pressure is exerted on the dispenser to compress the air and to pressurize the liquid product at the same time during actuating of the dispenser for dispensing.

BACKGROUND AND PRIOR ART

There has recently been developed an improvement of the type of aerosol dispensers in which a charge of air is compressed each time the dispenser is actuated and is used to aspirate a product from a product container to dispense it as a spray. In such a dispenser, air pressure is built up in a piston cylinder means until it reaches a predetermined pressure, and at that point, and actuating pin, usually mounted on the movable member of the piston cylinder means, such as the piston, positively opens a valve to release the compressed air suddenly. Examples of this type of dispenser are found in U.S. Pat. Nos. 3,672,545 and 3,733,010.

In the recently developed improvement, means has been devised to exert a pressure on the liquid product to be dispensed simultaneously with the opening of the air valve, this means being a further piston cylinder means incorporated in the liquid product flow path from a liquid product container to the nozzle means of the dispenser.

However, the structures for accomplishing this result are relatively complex as aerosol valves are concerned, and since cost is a vital factor in producing and using such valves commercially, it would be desirable to simplify the structure for pressurizing the liquid product so that the dispensers could be made at a cost which is attractive to sellers of products dispensed therein. Moreover, it would be desirable to have such a dispenser which does not drip liquid product after an actuating cycle.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide a dispenser device for dispensing liquid product in fine droplet form in compressed air in which the product is pressurized at the time of dispensing by a simple and relatively inexpensive structure.

It is a further object of the invention to provide such a dispenser in which the flow of the compressed air and the liquid product are controlled in such a manner that the product is purged from the dispenser and dripping of product from the nozzle means after the end of the compressed air flow is avoided.

BRIEF DESCRIPTION OF THE INVENTION

These objects are achieved by a device for dispensing liquid product in fine droplet form in compressed air which has a dispenser body with a bore therethrough, and on one end of the body is a product pressurizing piston cylinder means which is adapted to contain liquid product which is pressurized by movement of the movable member thereof. On the other end of the dispenser body is an air compressing piston cylinder means which compresses air by the movement of the movable member relative to the fixed member thereof and delivers it to the bore in the dispenser body. Nozzle means is provided on the dispenser body which has a compressed air passage and a pressurized liquid passage leading thereto from the bore of the dispenser body, and valve means is provided in the bore for both the compressed air and the pressurized liquid. When pressure, such as finger pressure of the user of the device, is exerted on opposite ends of the device, valve means is moved by an actuating pin when the movable member of the air compressing piston cylinder means nears the end of its compression stroke to pass compressed air and pressurized liquid to the nozzle means. A lost motion valve means is provided the movement of which is timed during the movement of the valve means to cut off the flow of liquid to the liquid passage before the end of the flow of compressed air.

BRIEF DESCRIPTION OF THE FIGURES

The invention will now be described in connection with the accompanying drawings, in which:

FIG. **1** is an elevation view of the dispenser according to the invention;

FIG. **2** is a longitudinal sectional view, on an enlarged scale, of the dispenser of FIG. **1**, with the parts in the rest positions;

FIG. **3** is a longitudinal sectional view, on an enlarged scale, of part of the device of FIG. **2**, also with the parts in the rest positions;

FIG. **4** is a view similar to FIG. **3** showing the parts in the positions during dispensing of liquid and compressed air;

FIG. **5** is a view similar to FIG. **3** showing the parts in the positions after flow of liquid has been cut off and compressed air is still flowing; and

FIG. **6** is a view similar to FIG. **3** showing the parts in the position after the start of the return movement of the valve moving stem.

DETAILED DESCRIPTION OF THE FIGURES

Referring to the figures, which show a preferred embodiment of the device, the device is comprised generally of a dispenser body **10** having a product pressurizing piston cylinder means **11** on one end thereof and an air compressing piston cylinder means **12** on the other end thereof. The dispenser body **10** has a bore **13** therethrough the end toward the product pressurizing piston cylinder means **11** being tapered outwardly as shown at **14.**

The product pressurizing piston cylinder means **11** is comprised of a piston member **15** which in this embodiment has a tapered stem **15***a* thereon which is tightly but removably fitted into the tapered portion **14** of the bore **13,** and which has a product passageway **16** therethrough. Since the piston **15** is on the stem **15***a*, it is fixed to the dispenser body and thus is the fixed member of the product pressurizing piston cylinder means **11.** A movable member of the means **11** is constituted by a cylinder **17** which is fitted over the piston **15,** a ring gasket **18** being mounted in a groove around the piston **15** to seal the space between the piston **15** and the cylinder **17.** When the space within the cylinder **17** is filled with liquid, a force exerted on the end of the cylinder **17** toward the dispenser body **10** will place pressure on the liquid.

It will of course be understood that the cylinder and piston can be reversed, i.e., the cylinder can have the stem **15***a* mounted on the closed end thereof, and thus become the fixed member, and the piston can move within the cylinder so as to be the movable member. A

diaphragm **19** is provided over the end of the product passageway **16** which seals the product pressurizing piston cylinder means **11** until the first actuation of the device, at which time the diaphragm **19** is pierced by a piercing member to be described later. Thus, sealed replacement product pressurizing piston cylinder units can be provided to replace units from which all the product has been exhausted simply by pulling the unit out of the tapered portion **14** of the bore **13**. The diaphragm prevents loss of product until the unit is properly placed on the dispenser body **10** and the device is actuated.

On the other end of the dispenser body **10** is an air compressing piston cylinder means, which in this embodiment is comprised of a cylinder **20** integrally formed with the dispenser body **10** so as to constitute the fixed member of the air compressing piston cylinder means. Slidably mounted in the cylinder **20** is a piston **21** which constitutes the movable member of the air compressing piston cylinder means, and in a double depth groove **22** around the piston **21** is positioned a ring gasket **23** which seals the space between the piston **21** and the cylinder **20**. The deeper part of the groove **22** is toward the closed end of the cylinder so that when the piston **21** is being moved toward the dispenser body **10** in a compression stroke, the ring gasket **23** is forced into the shallow end of the groove so as to seal the space between the piston **21** and cylinder **20** tightly. When the piston **21** is moving away from the dispenser body **10**, however, the ring gasket is moved into the deep end of the groove **22** so that the space is no longer sealed and air can enter to relieve the vacuum. A flange **25** is provided around the piston **21** outwardly of the ring gasket **23** which cooperates with stops **24** projecting inwardly from the cylinder **20** to prevent the piston from being completely withdrawn from the cylinder. A piston return spring **26** is positioned between the inner end of the piston **21** and the bottom of the cylinder **20** to return the piston **21** after its compression stroke.

Dispensing nozzle means generally indicated at **27** is provided on said dispenser body **10**, and is constituted by a nozzle insert **28** which fits into a recess **29** in the dispenser body **10** so as to leave a space therearound at **33**. The nozzle insert **28** has a venturi passage **30** therethrough and lateral supply passages **30*a*** opening into the venturi passage from the space **33**. A liquid product passage **31** opens out of one end of the bore **13** and extends into the recess **29** so as to communicate with the venturi passage **30**, and a compressed air passage **32** opens out of the other end of the bore **13** toward the air compressing piston cylinder means, and extends to the space **33**, the space **33** thus serving as a supply chamber for supplying compressed air to the lateral supply passages **30*a***. Although the arrangement shown supplies air laterally into the liquid stream, the reverse arrangement can of course be used.

Gas valve means is provided in the bore **13**. A valve moving stem **34** is positioned in the bore **13** so as to be reciprocally movable therein, and at the end thereof toward the air compressing piston cylinder means **12** has a gas valve retaining flange **35** against which is positioned a ring gasket **36** which seals the bore **13** between the air compressing piston cylinder means **12** and the compressed air passage **32**, and thus constitutes gas valve means.

Liquid valve means is also provided in the bore **13** and is constituted by a valve member **37** on said stem **34** at a position between the opening of said liquid passage **31** into the bore **13** and the product pressurizing piston cylinder means **11**, and a valve seat **38** formed in the inner surface of the bore **13**. The liquid valve means further has a ring gasket **39** between said valve member **37** and the end of said liquid passage **31** which is held in place against the valve member **37** by a retaining flange **40**. A valve moving stem return spring **41** is positioned between said valve member **37** and the end of the stem **15** and urges the valve member **37** toward the seat **38** and the valve moving stem toward the air compressing piston cylinder means **12**. A pointed piercing member **42** in the form of a pointed pin is mounted on the valve member **37** and is aligned with the diaphragm **19**.

An actuating pin means in the form of a pin **43** is mounted on the end of the valve moving stem **34** and extends into the cylinder **20** to be engaged by the piston **21** near the end of the compression stroke of the piston **21**. Although the actuating pin **43** is here shown as being on the valve moving stem, it will be clear that it could equally well be mounted on the inner end of the piston **21** and function in exactly the same way. The advantage of the arrangement as shown is that the end of the actuating pin **43** at the valve moving stem **34** acts as retaining means for holding the gas valve ring gasket **36** against the retaining flange **35**. Thus, all that is really necessary for the actuating pin **43** is that it be operatively associated with the movable member of the air compressing piston cylinder means, here the piston **21**, and the valve moving stem **34** for positively moving the stem near the end of the compression stroke of the movable member.

A lost motion valve means is provided in said bore in the form of a sliding sleeve **44** which is positioned between the gas valve ring gasket retaining flange **35** and the retaining flange **40** for holding the ring gasket **39** against the valve member **37**. The sleeve **44** is shorter than the distance between the two retaining flanges **35** and **40** and is thus free to slide along the bore **13** relative to the valve moving stem **34** to a limited extent. It is in substantially liquid tight sliding engagement with bore **13**. In the rest position of the parts, as shown in FIG. **2**, the sleeve is against the flange **40** and does not obturate either the compressed air passage **32** or the liquid passage **31**. At the extreme limit of its movement toward the product pressurizing piston cylinder means **11**, as shown in FIG. **5**, it obturates the liquid passage **31**.

In operation and starting with the cylinder **17** of the piston cylinder means **11** filled with liquid and the parts in the rest positions as shown in FIG. **2**, pressure is exerted on the cylinder **17** toward the dispenser body **1** and pressure is exerted on the piston **21** of the air pressurizing piston cylinder means **12** toward the dispenser body **10**. These pressures can be exerted by holding the device between the thumb and foreginger of the hand of the user. When the piston **21** nears the end of the compression stroke, it strikes the actuating pin **43**, moving the valve moving stem **34** along the bore **13**. In the first part of this movement, the parts will reach the positions shown in FIG. **4**, at which point the piercing member **42** has pierced the diaphragm **19** if it has not already been pierced in a previous actuation of the device. The ring gasket **36** of the gas valve has moved past the opening of the compressed air passage **32** to admit compressed air from the cylinder **20** to the passage **32**

and thence to the supply chamber **33** and the nozzle insert **28.** Also the valve member **37** has been unseated from the valve seat **38** and the ring gasket **39** has moved past the valve seat **38,** thereby opening the liquid passage **31** to the flow of liquid from the pressurized liquid product in the cylinder **17** through the product passageway **16** and the tapered part **14** of the bore **13.** Liquid product in fine droplet form in compressed air is thereby dispensed through the nozzle insert **28.** The sleeve **44** has been engaged by retaining flange **35** and moved only slightly. Further movement of the piston **21,** actuating pin **43** and valve moving stem **34** causes the parts to move to the positions shown in FIG. **5,** in which the compressed air passage **32** is still open to the flow of compressed air and the valve member **37** is still unseated from valve seat **38,** but in which the sliding sleeve **44** has covered the opening of the liquid passage **31.** Thus compressed air continues to flow through the nozzle insert, but liquid flow is cut off by the sleeve **44.** Liquid product is thus purged from the nozzle insert.

During the first part of the return movement of the valve moving stem **34,** the ring gasket **39** of the liquid valve means first comes in contact with the valve seat **38** and the wall of the bore **13** to seal the flow path for the liquid, and the parts reach the positions of FIG. **6** in which the retaining flange **40** has just reached the sliding sleeve **44.** Thereafter, further movement of the valve moving stem causes the sleeve **44** to move back toward its initial position, uncovering the liquid passage **31.** Only the small amount of liquid trapped between the ring gasket **39** and sleeve **44** will flow into passage **31,** however, since the flow path is blocked by the sealing ring gasket **39.** Movement of the parts continues until they reach the positions of FIGS. **2** and **3,** at which point the dispenser is ready for another cycle.

It will be seen that by the lost motion action of the sleeve **44,** the liquid flow is blocked off near the end of the movement of the valve moving stem in the valve opening direction while compressed air is still flowing, so that the nozzle means is purged of product. Then the sleeve remains in place during the initial return movement, and is not moved until the liquid valve means on the stem acts to seal the bore, at which time it is then moved to its original position.

There has thus been provided a dispenser which meets the objects of the invention, i.e., in which the product is pressurized by a simple and relatively inexpensive structure, a simple piston cylinder means. There are only a few major parts to the device, namely the dispenser body with which the fixed member of the air compressing piston cylinder means can be integrally formed, a two part product pressurizing piston cylinder means which is removably mounted on the dispenser body by a simple stem in a tapered recess, the nozzle insert, and the valve moving stem. All of the other parts, the ring gaskets, springs and the like are readily available parts and are very inexpensive.

Moreover, the simple sliding sleeve **44** acts to control the flow of the liquid so that product is purged from the nozzle means and thus no product will drip from the device at the end of the operating cycle because the product has been cut off well ahead of that time.

All of the parts, with the exception of the springs, and the possible exception of the ring gaskets, can be molded from plastic to produce a simple and inexpensive dispenser which is also very reliable in operation.

It is thought that the invention and its advantages will be understood from the foregoing description and it is apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing its material advantages, the form hereinbefore described and illustrated in the drawings being merely a preferred embodiment thereof.

What is claimed is:

1. A device for dispensing liquid product in fine droplet form in compressed air, comprising:

a dispenser body having a bore therethrough;

a product pressurizing piston cylinder means on one end of said dispenser body and having a fixed member and a movable member movable relative to the fixed member for pressurizing liquid product in said product pressurizing means, and having a product passageway therethrough opening into said bore;

air compressing piston cylinder means on the other end of said dispenser body having a fixed member and a movable member movable relative to said fixed member through a compression stroke for compressing air within said air compressing piston cylinder means and supplying it to said bore, said movable member of said air compressing piston cylinder means being movable in opposition to the movable member of said product pressurizing piston cylinder means;

a dispensing nozzle means on said dispenser body having a compressed air passage and a liquid passage therethrough for co-mingling the compressed air and liquid and dispensing the liquid product in fine droplet form in the compressed air, said dispenser body having a liquid passage opening out of one end of said bore and extending to said dispensing nozzle means and said dispenser body having a compressed air passage opening out of the other end of said bore and extending to said dispensing nozzle means;

gas valve means in said bore normally obturating said compressed air passage and movable to open said compressed air passage, and liquid valve means in said bore normally obturating said liquid passage and movable to open said liquid passage, and a valve moving stem reciprocably movable in said bore engaging both said valve means; and

actuating pin means operatively associated with said movable member of said air compressing piston cylinder means and said valve moving stem for positively actuating said stem and hence said valve means near the end of the compression stroke only when said air compressing piston cylinder means has compressed air to a predetermined pressure;

whereby when liquid is present in said product pressurizing piston cylinder means and pressure is exerted on said product pressurizing piston cylinder means and said air compressing piston cylinder means to force the movable members thereof toward each other, pressure exerted on the liquid and the air pressurizes the liquid and compresses the air until the actuating pin means moves said valve moving stem to open said compressed air passage and said liquid passage, whereupon said compressed air and liquid under pressure are delivered to said nozzle means and the liquid is dispensed in fine droplet form in the compressed air.

2. A device for dispensing liquid product as claimed in claim 1 in which said fixed member of said product pressurizing piston cylinder means is a piston mounted on said dispenser body and having a product passageway therethrough for conducting product to said bore, and said movable member thereof is a cylinder slidable around said piston.

3. A device for dispensing liquid product as claimed in claim 2 in which said piston of said product pressurizing piston cylinder means and said dispenser body have spigot and recess means therebetween with said spigot being removably positioned in said recess means and having said product passageway therethrough.

4. A device for dispensing liquid product as claimed in claim 3 in which said spigot is on said piston and said recess is around the end of said bore in said dispenser body.

5. A device for dispensing liquid product as claimed in claim 1 in which said fixed member of air compressing piston cylinder means is a cylinder mounted on said dispenser body and said movable member thereof is a piston movable in said cylinder through said compression stroke.

6. A device for dispensing liquid product as claimed in claim 1 in which said gas valve means comprises a ring gasket around said valve stem and fixed relative thereto and sealing said bore and movable during the movement of said valve moving stem from a position between the opening of said compressed air passage into said bore and said air compressing piston cylinder means and a position on the other side of the opening of said compressed air passage from said air compressing position cylinder means.

7. A device for dispensing liquid as claimed in claim 6 in which said actuating pin means is an actuating pin mounted on the end of said valve moving stem toward said air compressing piston cylinder means and extending into said cylinder thereof, and said valve moving stem has an air valve retaining flange thereon, said ring gasket being held between said actuating pin and said air valve retaining flange.

8. A device for dispensing liquid as claimed in claim 1 in which said liquid valve means comprises a valve member on said valve moving stem between said opening of said liquid passage into said bore and said product pressurizing piston cylinder means, a valve seat in said bore, said valve member cooperating with said valve seat and being moved off said valve seat when said valve actuating stem is moved by said actuating pin means.

9. A device for dispensing liquid as claimed in claim 1 in which said gas valve means is positioned in said dispenser body bore and is movable from a position between the opening of said compressed air passage into said bore and said air compressing piston cylinder means and a position on the other side of the opening of said compressed air passage from said air compressing piston cylinder means, and said liquid valve means is positioned between said opening of said liquid passage into said bore and said product pressurizing piston cylinder means, and said device further comprises a lost motion valve means in said bore and engageable by said valve moving stem to be moved from a position in which it is clear of said liquid passage of the start of movement of said stem by said actuating pin means, to a position at which it obturates said liquid passage at the end of the movement of said stem, and engageable by said valve moving stem for being moved to the initial position thereof during the return movement of said valve moving stem.

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