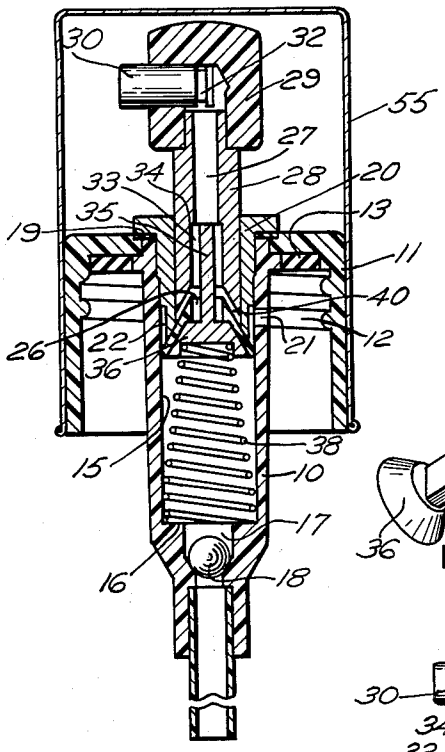
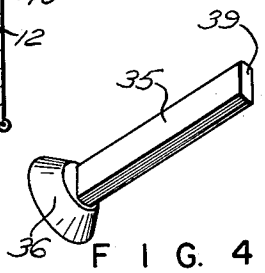
June 28, 1966 R. F. SCHLENKER 3,257,961

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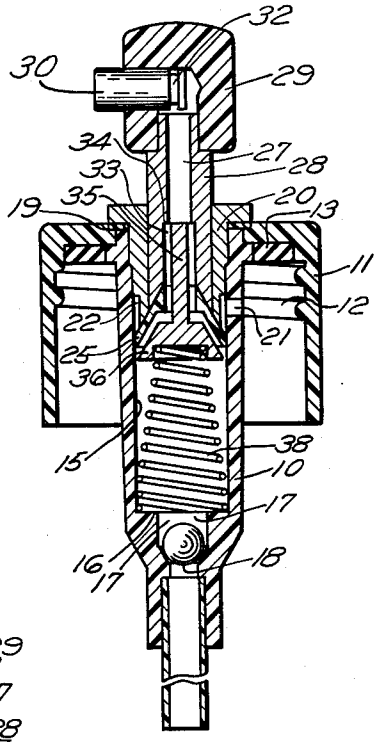
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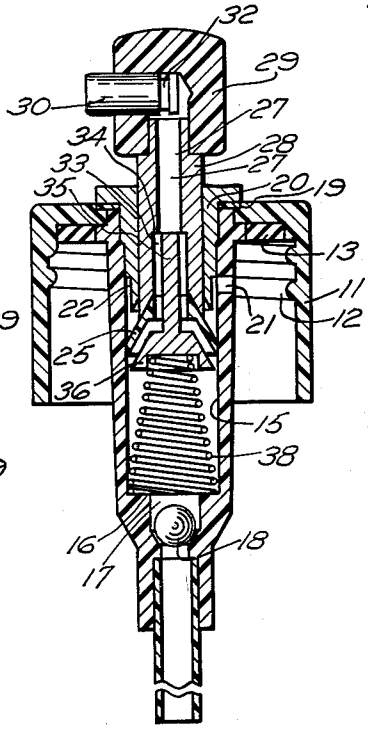
F I G. 1



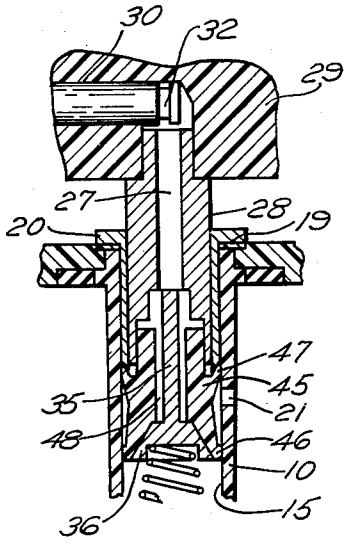
F I G. 4



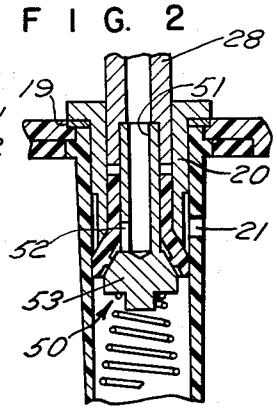
F I G. 2



F I G. 3



F I G. 5



F I G. 6

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This invention relates to an atomizer of the type used upon a bottle of perfume or the like.

One of the objects of the invention is to provide a single unit which may seal an inlet passage and an outlet passage through the mechanism.

Another object of this invention is to provide an operating plunger and a sealing pin which move together so that any length of the stroke may be had independent of other fixed parts of the mechanism.

Another object of this invention is to provide a piston which will present a smaller area to the atmosphere than the area presented to the inner portion of the container from which it is to eject liquid whereby a variation in the atmospheric pressure quickly lessening the pressure outside of the container will operate to increase rather than diminish the seal of the device.

Another object of the invention is to eliminate the need for a top ball valve in the atomizer.

Another object of the invention is to provide a piston with a single lip for the closure of both the inlet and the outlet opening of the atomizer.

Another object of the invention is to provide a seal when the plunger is in the normal upward at rest position.

Another object of the invention is to provide an inexpensive piston which may be made in a straight pull mold with more accurate sizing.

With these and other objects in view, the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

FIG. 1 is a sectional view of the atomizer of this invention in its closed position;

FIG. 2 is a similar view showing the plunger partly depressed;

FIG. 3 is a sectional view showing the plunger further depressed and the piston in a position ready to pump;

FIG. 4 is a perspective view of the sealing pin;

FIG. 5 is a sectional view of a modified form of the atomizer; and

FIG. 6 is a partial sectional view of a modified form of the sealing pin.

In proceeding with this invention, I have provided a cylinder into which liquid to be dispensed may be drawn through a check valve and provided in this cylinder a piston, a plunger for operating the piston, and a sealing pin for effecting a seal of the piston both through the opening axially of the plunger for a discharge of the contents and also for sealing a vent opening in the side wall of the cylinder. Attached to the cylinder there is a suitable ferrule for securing the atomizer on some bottle or other liquid container.

With reference to the drawings, **10** designates the cylinder of the pump or atomizer to which there is attached a ferrule **11** having screw threads **12** for attachment to a bottle or some container from which a liquid is to be dispensed. A washer **13** serves to seal the ferrule to the bottle.

The cylinder has a hollow chamber **15** and bottom wall **16** in which there is an opening **17** for the drawing of liquid into the chamber **15** through a check valve **18**. A bushing **20** sealed by washer **19** at the upper end of the cylinder extends inwardly into the cylinder to a location inwardly of the vent opening **21** in the side wall of the cylinder, and this bushing is recessed so as to

provide a passageway **22** from its lower end to the vent opening **21** which may conveniently be done by recessing or reducing the inner end of the bushing to provide an annular space about the lower end thereof extending to a point slightly above the vent opening **21**.

A flexible piston **25** of plastic or the like is of general frustro conical shape, and has its lower edge substantially the size and shape of the cylindrical wall of the chamber and serves as a closure for the passageway **22** to the vent opening **21** when in its upper position against the lower end of the bushing which serves as a stop limiting the upward or outward movement of the piston. The piston is provided with an opening **26** at its upper end extending axially thereof which registers with the axial bore **27** in the plunger **28**. This plunger is shaped at its lower end to engage the outer conical surface of the piston for forcing the same downwardly. A head **29** is mounted at the upper end of the plunger while a nozzle **30** extends laterally from this head. This nozzle communicates with a recess **32** in the head extending axially of the plunger which in turn communicates with the bore **27** extending therethrough. The bore **27** of the plunger is enlarged as at **33** providing a shoulder **34**. The sealing pin **35** (see also FIG. 4) has a forced fit in the bore **33** with its end against shoulder **34**. The sealing pin is provided with a head **36** (see also FIG. 4) which is of a frustro conical shape on its outer surface so as to engage the inner surface of the flexible piston **25** so as to expand the piston into tight engagement with the inner surface of the cylindrical wall of the hollow cylinder. A spring **38** engages the lower surface of this sealing pin and forces it and the plunger upwardly. The length of this sealing pin **35** is such that when its enlarged head **36** is in engagement with the piston, the end of the plunger **28** will be spaced from the upper surface of the piston as at **40**.

By the above arrangement, when the piston is in its upper position such as shown in FIG. 1, the enlarged portion of the sealing pin will engage the inner surface of the piston and there will be a seal between the cylinder chamber **15** and the axial opening **26** through the piston and bore **27** through the plunger. This piston will also in its upper position close passage **22** to the vent opening. Thus, this single piston serves as a seal for both openings through these parts by means of a single flexible lip of the piston.

For operation, it will be apparent that upon the initial downward movement of the plunger by means of pressure upon the head **29**, the sealing pin **35** will be moved downwardly to the position shown in FIG. 2, at which point the plunger will just come into engagement with the upper outer surface of the piston as shown in this figure, thus opening the passage axially through the plunger to the nozzle **30**. Further downward movement of the plunger will serve then to move the piston downwardly as shown in FIG. 3, thereby forcing the contents of the chamber **15** upwardly through the passage provided between the enlarged head **36** of the sealing pin and the under inner surface of the piston **25**, thence out through the passage **27** in the plunger and out through the nozzle. When pressure is released upon the head, spring **38** will push the sealing pin up into engagement with the piston, thus sealing off the passage through the plunger and preventing any air from being drawn in through the plunger while leaving open the vent to the chamber. By this arrangement, it is also pointed out that there is no top ball valve needed which is usual in many structures of this general character. As the spring further expands to move the piston upwardly, the air which is drawn into the vent opening **21** will move past the flexible piston, and then the piston will close off the passage **22** to the vent opening. Thus, this single piston

closes off at the end of its stroke both passages and provides a seal to prevent the escape of fluid from the atomizer.

In FIG. 5, a somewhat modified construction is shown in which the piston **45** is provided with a lip **46** to engage the inner surface of the cylinder **15** and is also provided with a second lip **47** which will seal the vent opening **21**. The sealing pin is the same as in the other construction, and the plunger **28** is essentially the same as in the above described construction and, likewise, the head **29**, nozzle **30** and passageway **32**. In the construction of FIG. 5 there is a single unit piston which provides a seal for both openings, that is, the opening axially through the plunger and also the opening **48** through the piston. However, two lips instead of one are illustrated in this showing and further the lip **47** must pass the opening **21** in its movement.

One of the advantages of the structure shown in FIGS. 1 to 4 is that the piston at no time passes the vent opening **21**, and thus the piston may have a longer life by reason of there being no edge such as formed by the opening **21** to wear the same, and the opening **21** may be made unlimited in size without any detrimental result to the piston.

Should there by a sudden decrease in atmospheric pressure outside of the location where the atomizer is being used, there will be a tendency for the piston to provide a tighter seal rather than a diminished seal, thus preventing the escape of the contents of the container should such differential pressure occur. This comes about since the gas pressures acting on the sealing pin head **36** are unbalanced in the sealing direction against the end wall of bushing **20** in FIGS. 1 and 6 and against the piston **45** in FIG. 5. Additional pressure in the sealing direction is secured by the spring **38**, thus insuring a seal even if the pressure relationship is reversed by a temperature change.

FIG. 6 shows a modified form of sealing pin **50** having a hollow stem **51** with an opening **52** at its lower end which forms a passage upwardly when its head **53** is displaced from the piston by the plunger **28**.

An over cap **55** may be utilized for preventing the actuation of the head when the device is shipped or carried in a purse.

I claim:

1. In an atomizer pump, a cylinder having a vent hole in its wall, a bushing fixed in the upper end of the cylinder and extending inwardly beyond the vent hole, said bushing being recessed to provide a passage to said vent hole, a flexible piston having an axial opening therethrough in said cylinder limited in its movement in one direction by said bushing, a plunger having a head, said piston plunger and head having communicating axial openings therethrough, a sealing pin extending axially into said piston and plunger, a spring urging said pin and plunger upwardly, a sealing head on said pin to close the axial opening through said piston and plunger and flared to expand said piston to close said passage when moved upwardly by said spring, said plunger engaging said pin for initially moving it to open said axial openings through said piston and plunger, said plunger subsequently engaging said piston to move it to open the passage to said vent and move said piston inwardly of said cylinder for discharging the contents of the cylinder through said axial openings.

2. In an atomizer pump, a cylinder having a vent hole in its wall, a flexible piston having an axial opening therethrough in said cylinder, means to limit the movement of the piston in one direction to prevent its passing said vent hole and providing a passage from said vent hole to the piston, a plunger having an axial opening communicating with the opening of said piston, a sealing pin extending axially into said piston and plunger, a spring urging said pin and plunger upwardly, a sealing head on said pin to close the axial opening through said piston and plunger and flared to expand said piston to close said passage when moved upwardly by said spring, said plunger engaging said pin for initially moving it to open said axial openings through said piston and plunger, said plunger subsequently engaging said piston to move it to open the passage to said vent and move said piston inwardly of said cylinder for discharging the contents of the cylinder through said axial openings.

3. In an atomizer pump, a cylinder having a vent opening in its wall, a plunger in said cylinder having an axially extending opening therethrough to the atmosphere, a flexible piston having an axially extending opening therethrough in said cylinder located at the inner end of said piston, a sealing pin having a head engageable with said piston to seal both of said axial openings and said vent opening, and means to cause said pin and plunger to move together.

4. In an atomizer pump as in claim **3** wherein said pin has a stem extending into the axial opening of said plunger which has a forced fit therein, said stem being of a size less than said axial opening enabling the passage of fluid therealong.

5. In an atomizer pump, a cylinder having a vent opening in its wall, a plunger in said cylinder having an axially extending opening therethrough to the atmosphere, a flexible piston having an axially extending opening therethrough in said cylinder located at the inner end of said piston, a sealing pin having a head engageable with said piston to seal both of said axial openings, a shoulder on said plunger to engage said pin and move it inwardly and a spring engaging said pin to move the pin outwardly whereby said sealing pin moves with said plunger in its movements in opposite directions.

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