June 7, 1966 A. WAKEMAN 3,254,677

SEQUENTIALLY OPERATED OUTLET VALVES FOR A PRESSURIZED CONTAINER

Filed Nov. 15, 1962 2 Sheets-Sheet 1

Fig. 1.

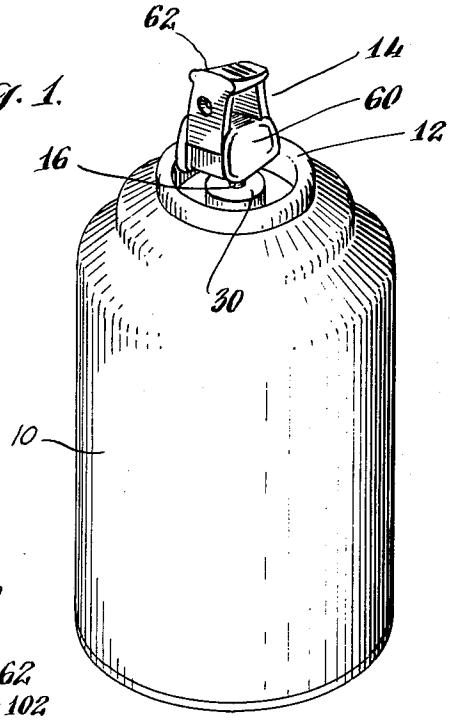
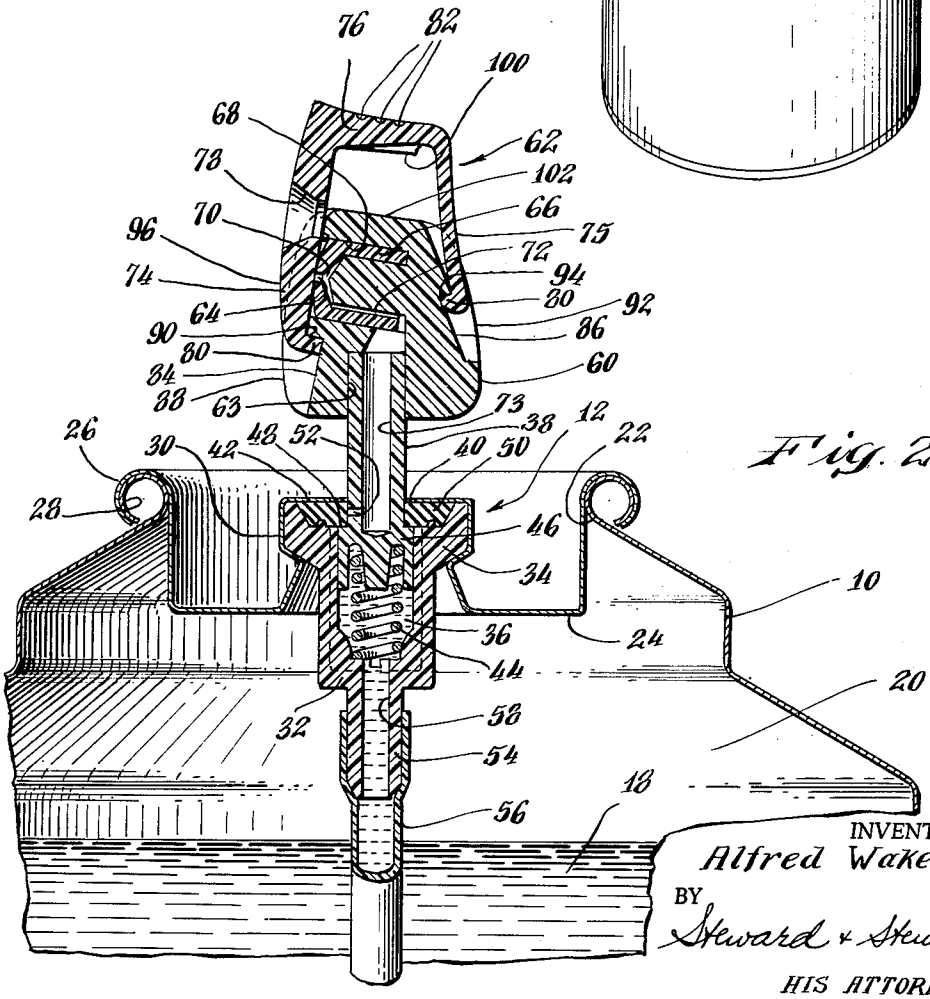


Fig. 2.



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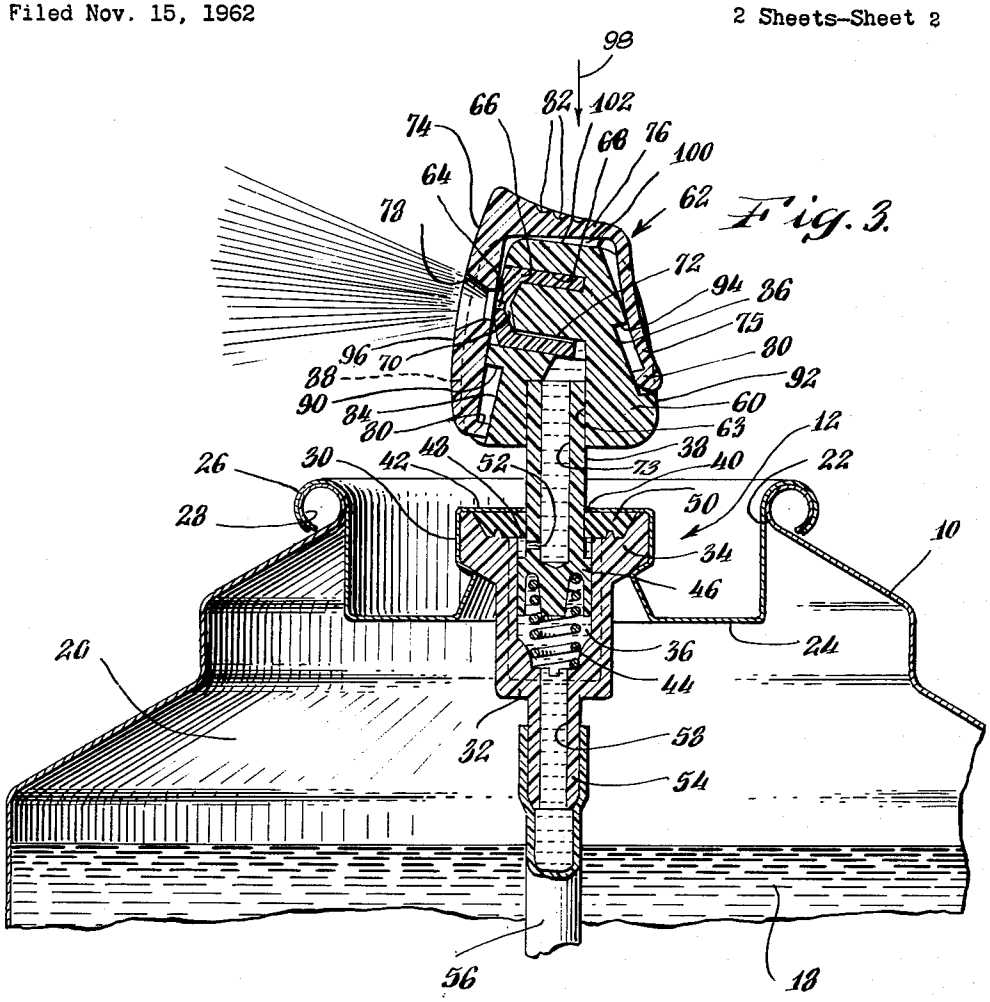


Fig. 3.

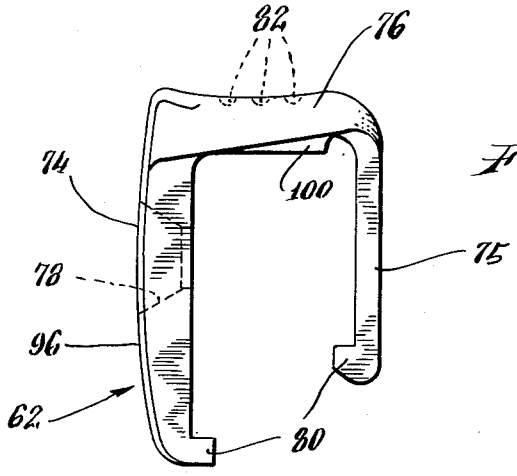


Fig. 4.

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SEQUENTIALLY OPERATED OUTLET VALVES FOR A PRESSURIZED CONTAINER

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6 Claims. (Cl. 137—630.22)

This invention relates to valve actuators used on pressurized packages in which a product is dispensed from a container under the pressure of a gaseous propellant, control of the product's discharge being had by means of a manually operable valve secured to the container. Specifically, the invention relates to an improved valve actuator for such pressurized packages that is adapted to be self-sealing, that is, having provision for automatically closing off from the atmosphere the discharge orifice in the actuator except during those periods when the package is in use.

A large number of products are now sold in pressurized packages wherein the product, usually in liquid form, is discharged from its container under the superatomspheric pressure of the gaseous propellant within the container. Discharge of the product is effected by the manual actuation of a valve ordinarily mounted in the mouth of the container of the package. Actuation of the valve is had by the user applying pressure to a valve actuator that serves as a convenient device for operating the valve and which normally contains the discharge orifice through which the product is dispensed.

Despite the continually increasing number of products being marketed in pressurized packages, there have been, heretofore, certain types of products which could not be marketed in this manner. These products include those, which for one reason or another, would either clog the discharge orifice and passageways in the actuator as a result of being exposed to the atmosphere, or which are of such a nature that prolonged exposure to the atmosphere would adversely affect their quality.

The difficulty arises from the fact that in the usual pressurized package there is a substantial distance between the cut-off point in the valve and the discharge orifice in the actuator. As a result, the passageways connecting these points are exposed to the atmosphere for long periods between successive usages of the package. Inasmuch as there is always some residue of product left within these passageways after each actuation of the valve, any product containing a nonvolatile ingredient that will dry out in the presence of air will clog these passageways and prevent any subsequent dispensing of the product. If the product is one that is adversely affected by prolonged exposure to the air, the residue of product left in the passageways will become contaminated due to its exposure to the atmosphere and will be dispensed upon the next subsequent use of the package.

The present invention, accordingly, has for its object the development of a self-sealing actuator for aerosol valves that will seal off the discharge orifice and passageways in the actuator from the atmosphere without in any way interfering with the normal actuation of the valve or use of the package. Another object of the invention is to accomplish the sealing off of the orifice and passageways in an automatic manner so as not to require specific action for this purpose on the part of the user.

Briefly, and in general, the invention comprises a novel two part actuator construction in which there are a main body portion and a movable closure therefor. The main body portion is adapted to be mounted on the package in any suitable manner and, inasmuch as the overwhelming practice in the art is to mount the valve actuator at the

upper end of a hollow stem for the valve, it is preferred to provide the main body portion with a recess to receive the valve stem. A discharge orifice is also provided in the main body portion and is communicated with the valve in any suitable way so as to provide for the dispensing of the product through the orifice whenever the valve is opened. Again, because of present practices in the art, it is preferred to accomplish this by connecting the discharge orifice with the upper end of the hollow valve stem since it is customary to pass the product through the passageway formed by the hollow valve stem.

The main body portion is, upon actuation by the user of the package, operative to open the valve in the container. Accordingly, the main body portion of the actuator is movable in a direction which serves to open the valve. If the valve is of the "toggle" or tilt action type the main body is laterally movable to open the valve by tilting of the valve stem. If the valve is a vertically actuated type, the main body portion is movable in a direction generally parallel to the longitudinal axis of the valve stem so that the stem may be vertically depressed to open the valve.

The closure for the main body portion is an open-ended device that is formed from a resilient material, such as a suitable plastic. In general shape the device is in the form of the letter U and an aperture is provided in one of the arms of the U. The open end of the U-shaped closure fits over the main body portion and engages two diverging surfaces thereon. As a result of the spacing of the diverging surfaces the ends of the arms are spread somewhat so as to slightly distend the closure. In this normal, slightly distended position the closure serves to seal off the discharge orifice in the main body portion from the atmosphere.

Opening of the closure is effected by applying a force to the closure in the same direction required to move the main body portion to its valve opening position. If a laterally directed force is required to actuate the main body portion, a laterally directed force is applied to the closure. If a vertically directed force is required to actuate the main body portion, a vertically directed force is applied to the closure.

The force applied to the closure results in the closure being moved to an orifice-opening position in which the aperture in the arm of the closure is in register with the discharge orifice in the main body portion. The diverging surfaces on the main portion are so disposed that the ends of the closure during the movement of the closure to the orifice-opening position are continuously spread so as to further distend the device. When the opening in the closure is in register with the orifice in the main body portion, continued application of the actuating force results in the main body portion being moved to its valve opening position and in a dispensing of the product through the discharge orifice.

Upon the release of the actuating force the main body portion is moved to a valve-closing position. At the same time the closure, because of its resilient character, is moved to its normal orifice-closing position in which the open end contacts to a less distended condition to relieve the stresses imposed on the closure by the spreading of the open end. Return of the closure to its normal orifice-closing position is thereby achieved automatically without requiring any special action on the part of the user of the package.

For the purpose of illustrating how the invention may be made and used, a presently preferred embodiment of the invention is shown in the accompanying drawings and will be described in detail hereinafter. This embodiment shows how the invention may be adapted for use in a pressurized package employing a vertically actuated

type of valve but it will be apparent to those skilled in the art that the invention is not limited to this type of valve and may be used wih other types of valves and may take specific forms different from the embodiment shown and described herein. The accompanying drawings, and the description to follow, are, accordingly, by way of example only and are not intended to define or restrict the scope of the invention. The claims appended hereto, together with their lawful equivalents, are relied upon for that purpose.

Of the drawings:

FIG. 1 is a perspective view of a pressurized package employing a valve actuator constructed in accordance with the teachings of the invention;

FIG. 2 is a partial, sectional view in side elevation through the pressurized package of FIG. 1 showing the parts in the nonactuated positions;

FIG. 3 is a sectional view similar to FIG. 2 showing the parts in actuated positions; and

FIG. 4 is a side elevational view of the closure for the actuator before its mounting on the main body portion.

A pressurized package equipped with a valve actuator made in accordance with the teachings of the invention is shown in FIG. 1. The package comprises a container **10**, a valve assembly **12** secured in the mouth of the container and a valve actuator **14** mounted on the valve stem **16** of the valve assembly **12**.

The container **10**, which may be made from metal as shown, or from glass, plastic or any other suitable material, is partly filled with the product **18** to be dispensed. In most cases the product **18** is in liquid form as is shown but the product may also take other forms as well, such as powder or paste. A gaseous propellant fills the head space **20** in the container above the liquid level of the product **18**.

An opening or mouth **22** is provided at the upper end of the container **10** and this opening is closed off by the valve assembly **12** that serves to control the dispensing of the product from the container. The valve assembly **12** comprises a metal cup **24** with a turned over edge **26** that is crimped over the rolled edge **28** of the container **10** around the opening **22** to form a gas-tight seal therewith. At the center of the depression of the cup **24** there is a raised boss **30** which serves as a housing for the control valve for the package.

The control valve comprises a valve body **32** that is provided with a thick flange **34** at its upper end and the boss **30** on the cup **24** fit over and is turned inwardly under the flange **34** to securely mount the valve body **32** in the cup **24**. An internal chamber **36** is formed in the valve body **32** and a reciprocable valve stem **38** extends inwardly into the chamber **36** through an opening **40** formed in the top surface **42** of the boss **30** on the cup **24**. A spring **44** is positioned in the chamber **36** and the upper end of the spring presses against the underside of the flange **46** on the valve stem **38** to normally dispose the valve stem in its outermost, nonactuating position. In this position the upper surface **48** of the flange **46** bears against a sealing gasket **50** that serves to seal off an outlet port **52** formed in the side wall of the hollow upper end of the stem **38**.

The valve body **32** is formed with a narrower tail piece **54** at its lower end and a hollow dip tube **56** is frictionally mounted on the tail piece in the usual manner. The lower end of the dip tube **56** is disposed adjacent the bottom of the container **10** and an inlet passageway **58** in the tail piece communicates the dip tube **56** with the internal chamber **36**. Inasmuch as the internal chamber **36** is in continuous communication with the body of liquid product **18** in the container **10** dispensing of the product from the container under the super-atmospheric pressure of the gaseous propellant will occur whenever the valve is opened to the atmosphere. Opening of the valve occurs whenever the valve stem **38** is vertically depressed sufficiently to bring the outlet port **52** formed therein below the sealing gasket **50** into the internal chamber **36** and the valve actuator **14** is provided on the valve stem **38** to facilitate vertical actuation of the stem.

In accordance with the teachings of the invention the actuator **14** comprises a main body portion **60** and a resilient closure device **62** therefor. The main body portion **60** has a recess **63** that is adapted to fit over the upper end of the hollow valve stem **38** and a discharge orifice is also provided in the actuator body. In this instance the discharge orifice comprises a central opening **64** formed in a cylindrical insert **66** that fits within a correspondingly shaped recess **68** in the actuator body **60**. The central opening **64** communicates with a narrow chamber **70** in the main body portion **60** immediately behind the insert **66**. The chamber **70**, in turn, is communicated with the recess **63** for the valve stem **38** by a lateral passageway **72**. Thus, in this manner, a continuous passage is formed in the body **60** of the actuator **14** which, in conjunction with the internal passageway **73** formed by the hollow valve stem **38**, opens the valve to the atmosphere whenever the outlet port **52** is moved downwardly below the sealing gasket **50**.

However, the discharge orifice **64** is normally closed off from the atmosphere by the closure **62** which is mounted on the bain body portion **60** of the actuator. The closure **62** comprises a member that is formed from a suitably resilient material, such as plastic. The closure **62** is formed with a pair of arms **74, 75** that in the unstressed condition of the member are substantially parallel and a crosspiece **76** at the top of the device joins the arms **74, 75** together. By reason of this construction the configuration of the closure **62** resembles the letter U inverted. One arm **74** is longer than the other **75** and an aperture **78** is formed in this arm. Both arms **74, 75** are provided with inturned lips **80, 80** at their ends for a purpose to be described hereinafter, and grooves **82, 82** are formed in the crosspiece to engage the finger of the user of the package during use.

The main body portion **60** and the closure **62** are adapted for the mounting of the closure on the body. To this end the body portion **60** has a pair of grooves **84, 86** formed in opposite sides thereof. One groove **84** is formed in the face **88** of the actuator body **60** in a plane generally perpendicular to the axis of the discharge orifice **64**. This particular orientation is not essential but the orifice **64** must be located in the groove **84**. A lip or shoulder **90** is formed at the bottom of the groove **84** just below the recess **68** for the insert **66**. Similarly the other groove **86** is formed at the back **92** of the body portion **60**. This latter groove **86**, as well as the groove **84**, are formed at an angle with respect to the longitudinal axis of the valve stem **38** so that the bottoms of the grooves **84, 86** form surfaces which diverge outwardly toward the bottom of the main body portion **60**. As in the case of the groove **84**, a lip or shoulder **94** is also formed in the groove **86** in the back face **92** of the body **60**.

In mounting, the arms **74, 75** of the closure **62** are spread apart so that the ends of the arms will fit into the grooves **84, 86** below the lips or shoulders **90, 94** therein and the inturned lips **80, 80** on the arms **74, 75** engage the shoulders **90, 94** in the grooves **84, 86** and lock the closure onto the main body portion. This is the normal position of the closure **62** relative to the body **60** and in this position the outer portion **96** of the front arm **84** seals off the discharge orifice **64** from the atmosphere.

Opening of the orifice **64** to the atmosphere is effected by pressing downwardly on the crosspiece **76**, that is, pressing in a direction generally parallel to the longitudinal axis of the valve stem, as indicated by the arrow **98** in FIG. 3. This downward force on the closure results in the diverging surface **84, 86** on the body **60** spreading the arms **74, 75** and further distending the closure. At the same time the aperture **78** in the arm **74** is brought into register with the discharge orifice **64** in the main

body portion **60**. When this occurs, the bottom edge of the rib **100** at the underside of the crosspiece **76** for the closure comes into engagement with the top surface **102** of the main body portion. Further downward movement of the closure **62** then serves to move the main body portion **60** downwardly as well. This downward movement of the actuator body **60** moves the valve stem **38** downwardly until the outlet port **52** is below the sealing gasket **50**. Dispensing of the product then occurs through the discharge orifice **64** and the aperture **78** in the front arm **74** of the closure **62**.

When the desired amount of product has been dispensed the user of the package shuts off the package simply by withdrawing his finger from the closure **62** and removing the actuating force thereon. The spring **44** thereupon moves the valve stem **38** outwardly until the upper surface **48** of the flange **46** butts against the sealing gasket **50** and cuts off the flow of fluid product through outlet port **52**. At the same time the closure **62** springs upwardly relative to the main body portion **60** due to the resiliency of the material from which the closure is made. By moving upwardly the arms **74, 75** are able to contract to less distended positions to thereby relieve some of the stress imposed on the closure on the downward stroke. Upward movement of the arms **74, 75** is limited, however, by the shoulder **90, 94** in the grooves **84, 86** which are engaged by the inturned ends **80, 80**. In moving to this uppermost position the opening **78** is moved out of register with the discharge orifice **64** and the portion **96** again seals off the orifice from the atmosphere.

What is claimed is:

1. A self-sealing valve actuator for use in pressurized packages wherein a product is confined within a container under the pressure of a gaseous propellant and discharge of the product from the container is controlled by a valve mounted thereon, said valve actuator comprising:

(A) a main body portion for mounting on the valve stem of the valve and movable relative to said package to open the valve, said main body portion having

(1) a discharge orifice in communication with the valve to permit the dispensing of the product therethrough when the valve is opened and

(2) two diverging surfaces, and

(B) an apertured, open-ended, resilient closure mounted on the main body portion with said open end engaging the diverging surfaces thereon, said closure

(1) being normally disposed to seal off the discharge orifice in the main body portion from the atmosphere and

(2) movable upon the application of a force to the closure in the same direction required to move the main body portion to its valve-opening position, to bring the aperture in the closure into register with the discharge orifice,

(3) said movement causing the diverging surfaces on the main body portion to spread the open end of the closure outwardly so that upon the withdrawal of the actuating force the resiliency of the closure will serve to move the closure in an opposite, orifice-closing direction to a position in which said open end may contract to a less distended condition.

2. A self-sealing valve actuator as set forth in claim **1** wherein said main body portion has a recess to receive the valve stem and is movable in a direction generally parallel to the longitudinal axis of the valve stem.

3. A self-sealing valve actuator as set forth in claim **2** wherein said diverging surfaces are positioned on opposite sides of said main body portion.

4. A self-sealing valve actuator as set forth in claim **3** wherein said closure comprises a substantially U-shaped member having an aperture in one of the side arms of said member.

5. A self-sealing valve actuator as set forth in claim **4** wherein said diverging surfaces are formed at the bottom of grooves in the main body portion.

6. A self-sealing valve actuator as set forth in claim **5** wherein said surfaces and the arms of the closure are provided with cooperating means to limit the movement of the closure in the orifice closing direction.

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