United States Patent [19]

Ewald

[11] **3,791,561**

[45] **Feb. 12, 1974**

[54] **PRESSURE RELIEF SYSTEM FOR AN AEROSOL DISPENSER**

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[73] Assignee: **Seaquist Valve Company, Division of Pittway Corp.,** Cary, Ill.

[22] Filed: **July 8, 1971**

[21] Appl. No.: **160,645**

[52] **U.S. Cl.** ..... **222/396,** 220/44 R

[51] **Int. Cl.** **F16k 17/02**

[58] **Field of Search** ..... 222/396, 397, 394; 220/44, 220/89 A; 137/516.15, 525, 525.3

[56] **References Cited**

UNITED STATES PATENTS

2,787,400	4/1957	Fritsch	220/44 R X
3,005,577	10/1961	Webster	222/397
3,064,673	11/1962	Rockwell	220/44 R X
3,504,822	4/1970	Haloski	222/397 X
3,283,959	11/1966	Muller	222/396

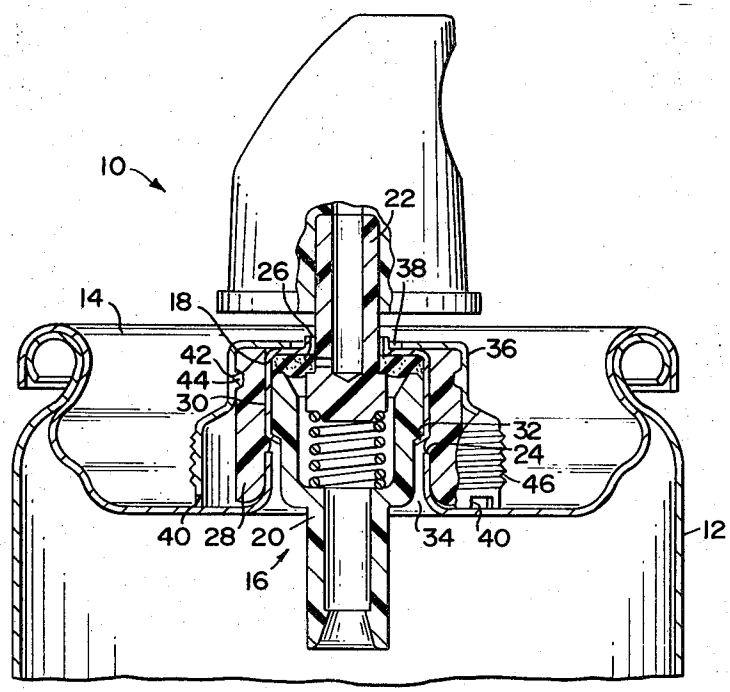
Primary Examiner—Stanley H. Tollberg

Attorney, Agent, or Firm—Stefan M. Stein

[57] **ABSTRACT**

A pressure relief system for an aerosol dispenser utilizing resilient flexing rings or gaskets arranged in sealing relationship relative to vent ports and/or relief passageways so that, at a predetermined pressure, the force of the propellant and product within the aerosol dispenser acts outwardly against these flexing members to break the seal. Uniquely, the same vent ports and/or relief passageways may be used to pressure fill the aerosol dispenser. In one embodiment, a rotatable button overcap is included as a locking means to prevent inadvertent discharge.

19 Claims, 36 Drawing Figures



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SHEET 1 OF 4

FIG. 1

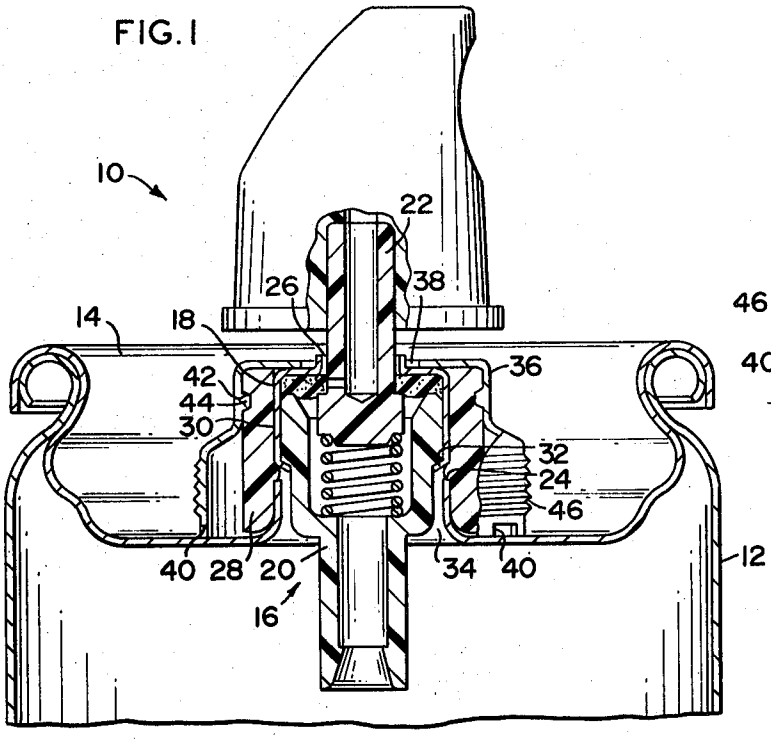
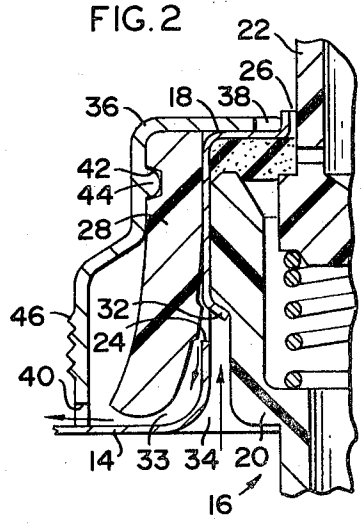


FIG. 2



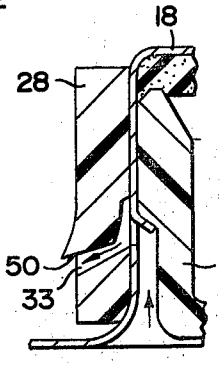
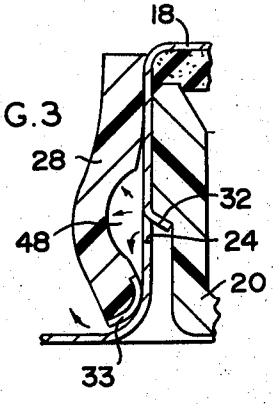


FIG. 4

FIG. 3



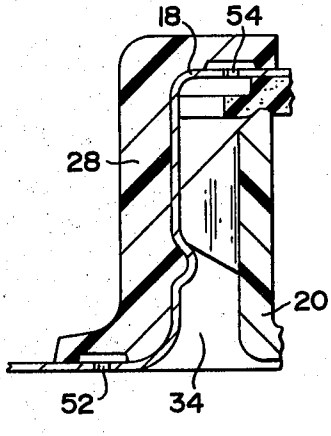


FIG. 5

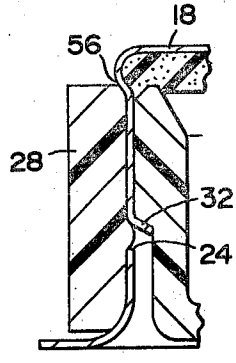


FIG. 7

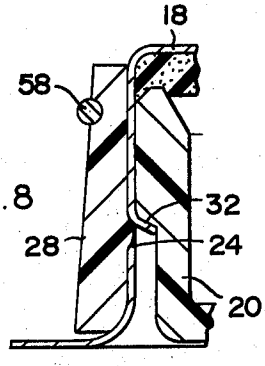


FIG. 8

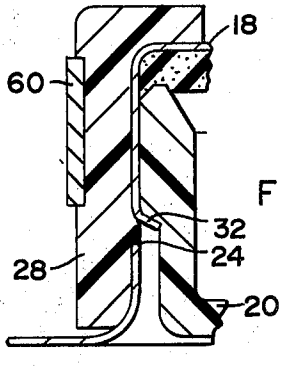


FIG. 9

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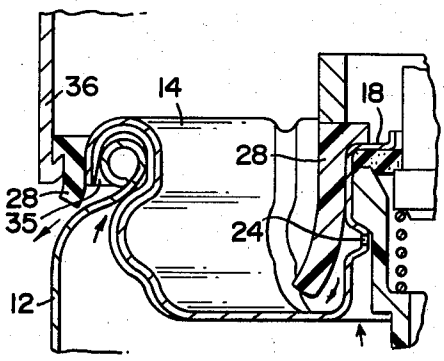


FIG. 6

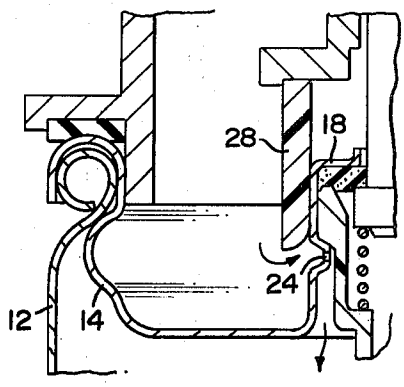


FIG. 10

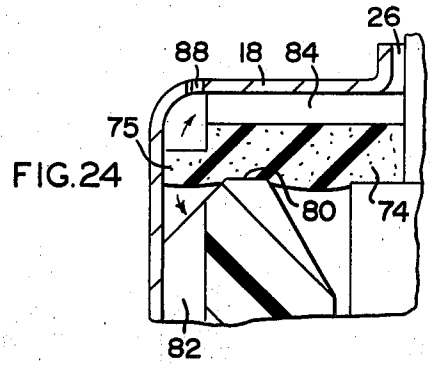


FIG. 24

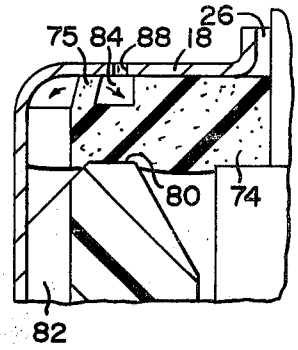


FIG. 25

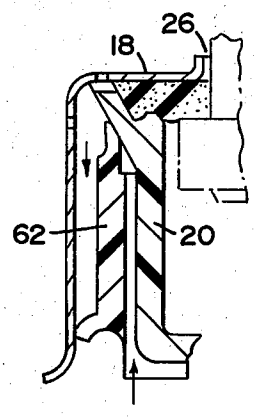


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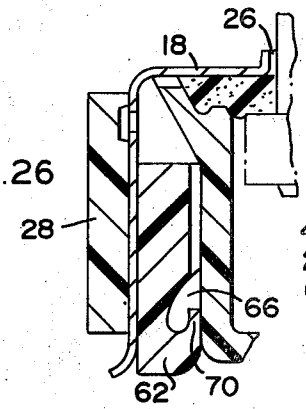


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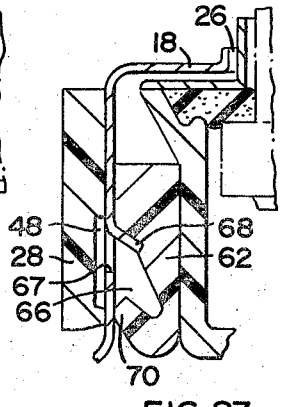


FIG. 27

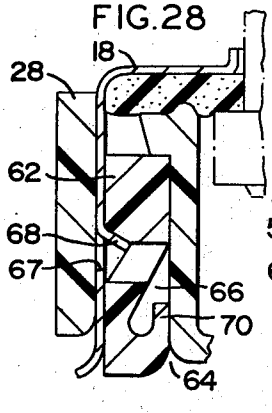


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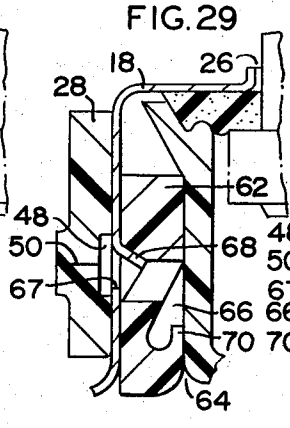


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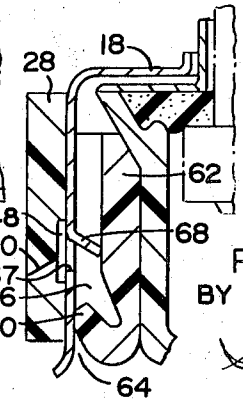


FIG. 30

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FIG. 11

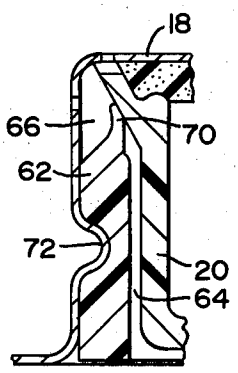


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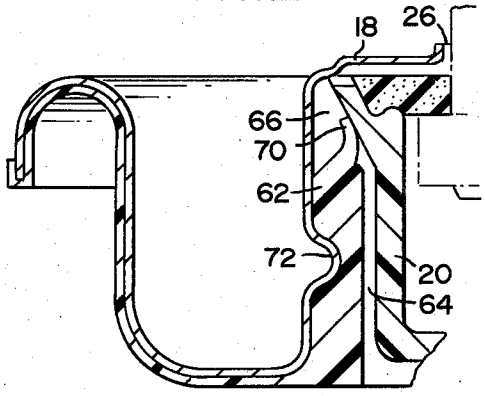


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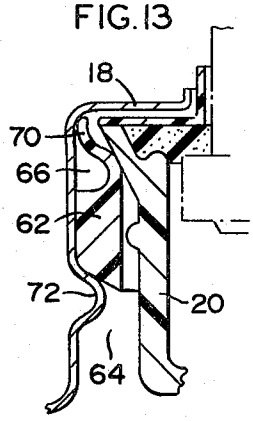


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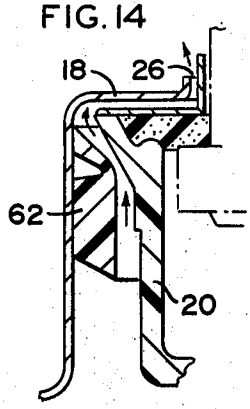


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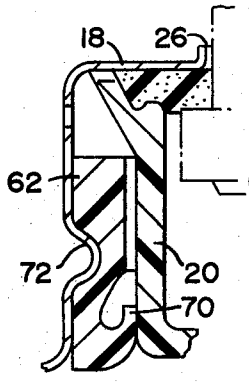


FIG. 16

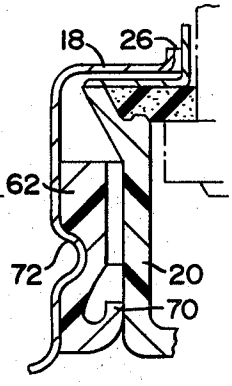
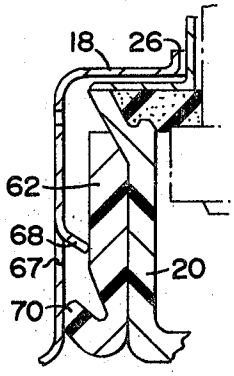
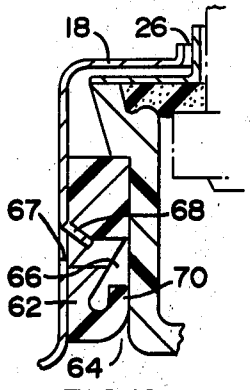
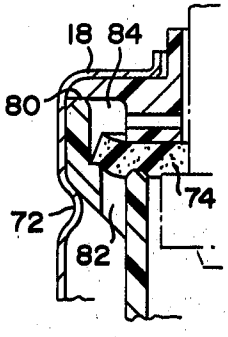
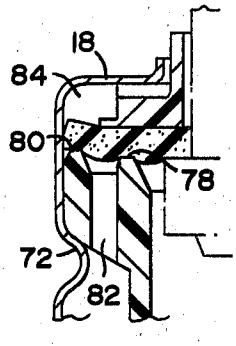


FIG. 17









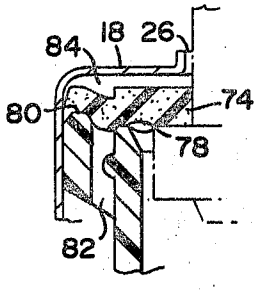


FIG. 18

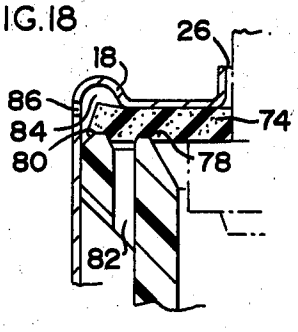


FIG. 20

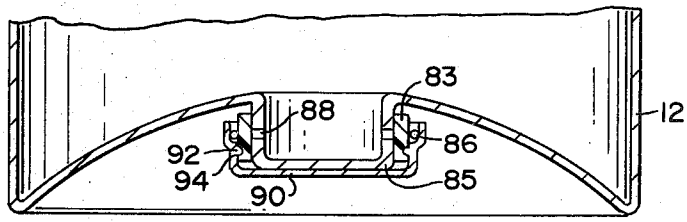
FIG. 21

FIG. 22

FIG. 23

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FIG. 31



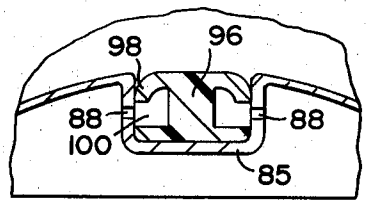


FIG. 32

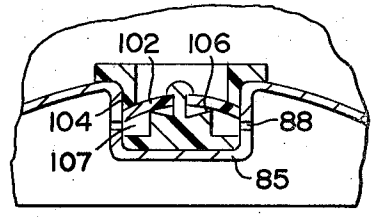


FIG. 33

FIG. 34

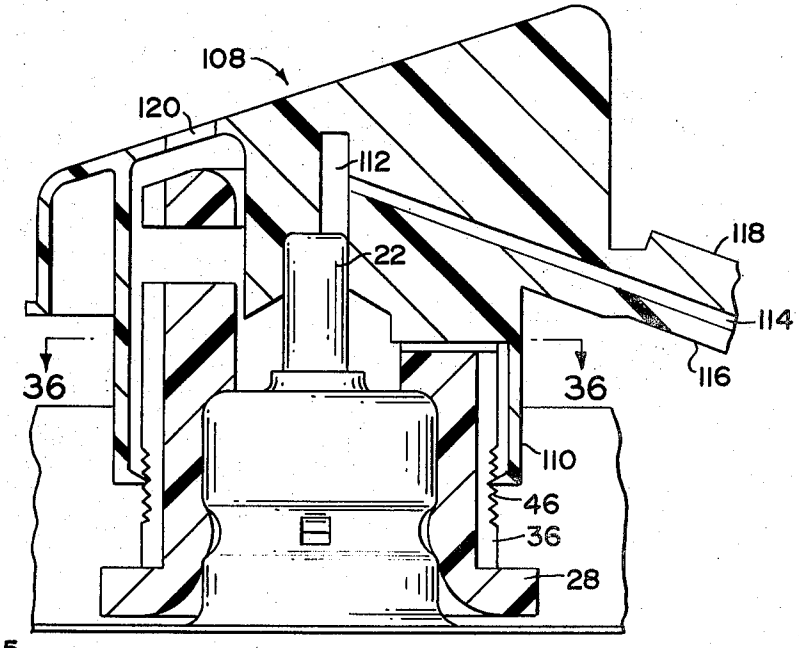
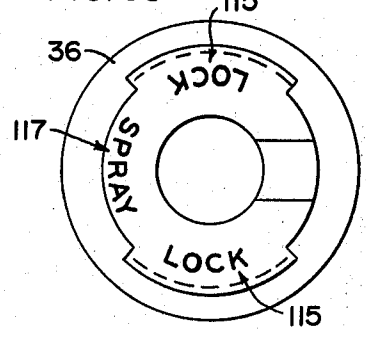


FIG. 35



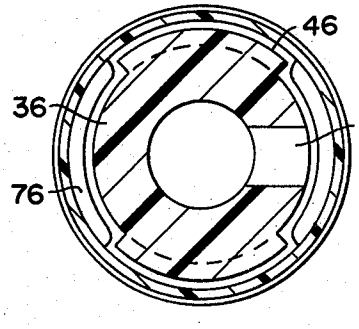


FIG. 36

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PRESSURE RELIEF SYSTEM FOR AN AEROSOL DISPENSER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to means for venting overpressures created in an aerosol dispenser. More specifically, this invention relates to a pressure relief system which utilizes resilient flexing rings or gaskets to form a seal over vent ports and/or relief passageways such that the seal will be broken at a predetermined pressure to relieve any overpressure within the dispenser. These same vent ports and/or relief passageways also provide a means for pressure filling of the aerosol dispenser.

2. Description of the Prior Art

The introduction of many new products into the aerosol dispenser market has greatly increased their use. Since conventional aerosol dispensers contain products and propellants under pressure they are constructed to withstand this internal pressure. However, these dispensers are particularly susceptable to internal overpressure conditions caused by external heat sources such as heaters, radiators, rear window shelves of automobiles and the like which are normally found in the environment in which these containers are used and stored. In view of the potential hazard due to explosion resulting from such overpressures, it is desirable that these dispensers include an adequate pressure relief system.

Many relief systems presently available are not readily adaptable to existing aerosol valves or containers. Thus, substantial design changes must be made to existing valves or containers with attendant increased costs of redesign and manufacture which, in many cases, is prohibitive.

Other systems do not reseal when the dispenser is no longer in an overpressure condition. These "one shot" systems deplete the contents of an aerosol dispenser which is undesirable. A further disadvantage of "one shot" system is that they do not allow effective quality control examination for detection of faulty systems during manufacture and assembly

Another problem common to many systems is the limited variables available for controlling the predetermined overpressure relief point. The margin between ambient conditions and a dangerous overpressure condition is often very slight. Due to these critical tolerances, many systems are not adequate since the dispenser is subject to either premature exhaustion or ineffective pressure relief. Unfortunately, properly designed relief systems are usually complex and costly.

Many existing systems provide for adequate pressure relief but do not incorporate any tamperproof means to prevent dislodging or other malfunction. This is highly undesirable since the reliability of a safety system should be for the life of the container.

Auxiliary to the overpressure relief problem of aerosol dispensers, is that many designs utilize pressure filling of the container after the valve assembly is mounted therein. The product and propellant are forced under pressure through the valve and into the container through the dispensing orifice.

Since proper discharge of the propellant and product govern the size of the orifice, such necessarily limits the flow of the product into the container during the filling process. Thus pressure filling is generally time consuming and otherwise inefficient due to the relatively small size of the dispensing orifice. When an overpressure relief system is incorporated into the valve or even the container, the problems which plague pressure filling becomes even more pronounced. The vent ports or passageways must be considered. Furthermore, disengagement of the dip tube from the valve body during pressure filling process must also be considered. Since such disengagement would render the filled dispenser useless, steps must be taken to avoid such and this, dependent upon the pressure relief system used, must also be considered.

Still another recurring problem associated with aerosol dispensers, in general, much less those having pressure relief systems, is the inadvertent dispensing of product by carelessness, tampering and the like. Although a limited number of dispenser designs exist which feature various locking mechanisms, these designs are often complex and not easily adapted to aerosol dispenser with pressure relief systems.

In summary, most aerosol dispensers are a potential safety hazard if they contain no pressure relief system. The design of such an aerosol dispenser severly inhibits the use of pressure filling.

While various attempts have been made at solving the problem, unfortunately, most are inefficient and unnecessarily costly. Accordingly, a great deal of room for development and improvement remains.

SUMMARY OF THE INVENTION

This invention relates to a tamperproof aerosol dispenser pressure relief system which includes flexing rings or gaskets arranged in sealing relationship relative to vent ports and/or relief passageways specifically designed as a means for relieving overpressures. Uniquely, the vent ports may be used as filling apertures even with the valve within the container and the rate of filling is not restricted by the size of the discharge orifice. Hence, this invention doubles as a pressure relief system as well as a rapid and efficient pressure filling system.

In addition, the pressure relief system of the invention is tamperproof to insure reliability over the life of the container.

More particularly, the present invention comprises a flexible resilient member acting in combination with vent ports and/or relief passages to vent the product and propellant to the atmosphere at a predetermined pressure release point. Three basic embodiments are involved.

The first embodiment comprises an external relief ring made of resilient material; such as rubber or plastic tubing, stretched over the turret of the mounting cup of the valve or over a pressure relief turret located on the bottom of the aerosol dispenser. The location of the vent ports is not restricted to the side of the turret since the relief ring may be extended to the base of the turret as well as the top. When mounted, the ring forms a sealed engagement or bond with the outer surface of the turret. At least one, but preferably a plurality of, vent ports are formed in the turret immediately adjacent to the relief ring and in communication with relief passages formed between the valve body and internal surface of the turret itself. Guide vanes may be formed on the side of the turret and disposed in the relief passages to direct the released porduct and propellant against the relief ring through the vent ports.

The structure of this embodiment provides a number of alternatives for developing the predetermined pressure release point. First, the resilient material that is used may be preselected for a particular pressure release point. Second, the size of the port in the mounting cup turret may be designed to effect a certain amount of surface area on which the pressure is applied. A third alternative is a preselection of the undercut in the relief ring itself to force it to operate in a direction determined by the size and angle of the undercut. In addition, a chamber may be formed in the internal surface of the relief ring immediately adjacent the vent ports so that in combination with the variation in the angle of the undercut, the pressure release point is varied.

It should be evident from the above description that the simplicity of this embodiment when used on a mounting cup turrel allows its use upon exisitng valves by the mere addition of relief ports in the turret.

To insure maximum retention of the external relief ring, one of several retaining means may be employed. A spring wire or plastic snap band may be press fitted about the upper circumference of the external relief ring. Alternatively the mounting cup may be provided with an undercut on its upper portion thereby acting as a wedge against removal when it is in place.

As another retention means combined with a means to tamperproof the entire relief system, a cup shaped tamper-proofing cap may be mounted over the mounting cup and relief ring. Apertures may be formed in the skirt of this cap to diffuse the product and propellant escaping to the atmosphere during overpressure.

As a still further supplemental design a rotatable locking overcap designed to fit over both the tamperproofing cap and the safety release valve assembly of this invention may be utilized. This locking overcap includes locking legs, with feet which engage parallel interrupted locking grooves formed on the outer lower surface of the tamperproofing cap. The grooves and locking feet also provide means for adjusting the locking overcap for the varying size of the actuator assemblies. An indicator is positioned on the top of the tamperproofing cap to show whether the actuator is rotated into its "lock" or its "spray" position. When in the "lock" position, the engagement of the locking feet with the locking grooves prevents vertical movement of the locking overcap. By rotating the overcap 90°, the locking feet and interrupted locking grooves are disaligned thereby permitting vertical movement of the overcap and actuation of the valve.

In addition this embodiment permits the use of the vent ports as fill orifices for pressure filling the container prior to applying the relief ring. Prior to mounting of the relief ring, product and propellant may be forced under pressure through the vent ports. After the container is filled, the pressure relief ring is stretched over the turret.

In use and under normal condition, the container and valve will withstand the internal pressure of the product and propellant. However, when the internal pressure increases over the pressure relief point, the product and/or propellant are forced upward into the relief passage and directed outward through the vent ports against the relief ring by the guide vanes immediately above the vent ports. The resilient relief ring is then forced outward breaking the seal permitting some product and/or propellant to escape into the surrounding atmosphere. If a tamperproofing cap is used, it escapes through the apertures formed in the skirt of the cap.

When the overpressure decreases below the pressure release point, the resilient relief ring will again seal against the turret surface preventing any further escape of product and/or propellant.

When not in use, and if the locking overcap is used, it may be put in the locked position. When locked, the locking post is forced through an indicator window formed in the locking overcap to prevent rotation. To again use, the locking post is depressed and the actuator is rotated 90° to disalign the locking feet and locking grooves thus again permitting the vertical movement of the actuator. In this position "spray" will again appear in the indicator window.

The second embodiment comprises an internal relief ring made of resilient material located inside the turret of the mounting cup and the valve body. The size of the ring is such that it forms a seal with the inner surface of the turret and the valve body and creates a lower chamber in direct communication with the product and propellant and an upper chamber which is in direct communication with at least one, but preferably a plurality of vent ports, formed in the turret. At least one extremity of the relief ring includes a flexing lip designed to flex either in an internal overpressure condition or during pressure filling such that when flexed the seal formed by the ring is broken thus permitting communication between the two chambers.

The pressure release point will be determined by the thickness of the lip and the amount of surface area exposed to pressure.

Unlike the external relief ring, this embodiment requires some valve component changes. The turret diameter may have to be increased to allow room for the inner relief ring. The diameter or even the shape of the valve body may hereto be changed to insure a good seal.

This internal relief ring may also be mounted in a turret in the base of the aerosol container. Here existing valve and container configurations other than the base of the container need not be modified.

In use, as the pressure reaches a predetermined release point, the seal formed between the sealing lip and the upper portion of the valve body is broken permitting product and/or propellant to flow through the upper chamber out the vent ports formed either in the turret or through the space at the base of the valve stem and into the atmosphere.

When the container pressure decreases to the pressure release point, the resilient sealing lip will again seal against the valve body preventing any further escape of propellant and/or product.

To pressure fill, product and propellant are forced, under pressure, through the vent ports and against the internal relief ring. Such causes the sealing lip to open inwardly allowing the product and propellant to flow freely through the chambers and into the body of the container.

The third embodiment comprises an internal flexible gasket spaced from the top of the mounting cup turret to provide room for the gasket to flex upward arranged on two concentric sealing surfaces. The gasket separates the relief passageway into two chambers, a lower chamber in direct communication with the product and propellant and an upper chamber in direct communica-

tion with at least one, but preferably a plurality of vent ports, formed in the turret.

The pressure release point of this embodiment is determined by the gasket thickness, diameter, the diameter of the spacer, and the gasket area exposed to container pressure.

As with the two previous embodiments, the internal flexible gasket may be mounted in the base of the aerosol container.

In operation, when the pressure reaches the pressure relief point, the outer portion of the gasket will be forced upward allowing product and propellant to pass through the lower and upper chambers out the vent ports into the atmosphere.

When the container pressure decreases below the release point, the gasket will reseat.

To pressure fill, product and propellant are forced through the vent ports and against the surface of the internal gasket. This causes the gasket to flex downward allowing product and propellant to flow through the chambers and into the body of the container.

A combination of the external relief ring and internal relief ring embodiments provides a double pressure relief system in which the advantages of both embodiments may be capitalized upon.

With a slight modification, the locking overcap described in the external relief ring embodiment may be adapted to any of the other basic embodiments.

The invention accordingly comprises the features of construction with combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth in the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 shows a cross-sectional side view of an aerosol dispenser with an external relief ring in combination with a tamperproofing cap.

FIG. 2 shows a more detailed but partial cross-sectional side view of the relief ring mechanism of FIG. 1.

FIGS. 3 through 6 show several alternative embodiments of the external relief ring mechanism.

FIGS. 7 to 9 show cross-sectional views of several alternative embodiments of retaining means for the relief ring.

FIG. 10 shows a cross-sectional view of the external relief ring embodiment arranged in position for pressure filling.

FIG. 11 shows a detailed partial cross-sectional view of an internal relief ring embodiment.

FIGS. 12 through 19 show several alternative embodiments of the internal relief ring mechanism.

FIG. 20 shows detailed partial cross-sectional view of an internal flexible gasket embodiment.

FIGS. 21 through 25 shows several alternative embodiments of the internal flexible gasket mechanism.

FIG. 26 shows a partial cross-sectional view of a combination of an internal relief ring and an external relief ring embodiment.

FIGS. 27 through 30 show several alternative embodiments of the combined internal relief ring — external relief ring mechanism.

FIG. 31 shows a cross-sectional view of a bottom mounted external relief ring embodiment.

FIG. 32 shows a cross-sectional view of a bottom mounted internal relief ring embodiment.

FIG. 33 shows a cross-sectional view of a bottom mounted internal gasket relief ring embodiment.

FIG. 34 shows a cross-sectional view of a tamperproof lock overcap mounted on a valve stem assembly.

FIG. 35 shows a top view of the tamperproof cap with "lock" and "spray" indicator.

FIG. 36 shows a cross-sectional top view of the locking overcap taken along line 36—36 of FIG. 34.

DETAILED DESCRIPTION OF THE INVENTION

As seen in FIG. 1, there is illustrated an aerosol dispenser, generally indicated at 10, comprising container 12, mounting cup 14 with turret 18 and valve assembly 16 including valve body 20 and valve stem 22.

A resilient external relief ring 28 is stretched around turret 18 to form a seal between their respective surfaces at 30. At least one, but preferably a plurality of vent ports 24 are formed in turret 18 immediately adjacent to relief ring 28 and in communication with relief passageway 34. Guide vanes 32 are formed on turret 18 and disposed in passageway 34 to direct the flow of overpressurized product and propellant against relief ring 28 through vent ports 24 (see FIG. 2). Relief ring 28 is secured in place by tamper-proof cap 36 through the cooperative engagement of annular slot 42 formed in the upper circumference of the ring 28 and annular ridge 44 formed in cap 36. A plurality of diffuser vents 40 are formed in the skirt of overcap 36 act as a diffuser for the relief system.

FIG. 3 shows a chamber 48 formed in the inner surface of ring 28 immediately adjacent to vent port 24 to control the pressure release point. The size and shape of chamber 48 may be varied to change the release point. In addition, as seen in FIG. 4, an undercut 50 in ring 28 may be included to control the pressure release point. The release point varies with the size and angle of undercut 50.

FIG. 5 shows an alternative embodiment where relief ring 28 is extended to seal vent ports 52 and 54 arranged at the base and/or the top of turret 18.

FIG. 6 shows an alternative embodiment where the external relief ring 28 retained by tamperproof cap 36 seals passage 35 formed between the crimped edges of mounting cup 14 and container 12. This may be in addition to or in place of ring 28 mounted on turret 18 as shown in the basic embodiment.

FIGS. 7, 8, and 9 show alternative means of securing or retaining relief ring 28 to turret 18. FIG. 7 shows an undercut 56 formed in the upper portion of the mounting cup 18 thereby acting as a wedge against removal when the ring 28 is in place. FIGS. 8 and 9 show a spring wire 58 and snap band 60 respectively arranged circumferentially about the pressure relief ring 28 to secure pressure relief ring 28 to turret 18.

Normally the internal pressure within the container 12 is sufficient to break the seal between ring 28 and turret 18. However, when the internal pressure increases over the pressure release point, the product and/or propellant are forced upward into relief passage 34 and directed outward through vent ports 24 against relief ring 28 by guide vanes 32. As best seen in FIG. 2, when the pressure reaches the pressure release point, the lower portion of ring 28 flexes outward breaking

the seal between the turret **18** and the ring **28** allowing product and/or propellant to escape through space **33** and diffuser vents **40** into the atmosphere. When the pressure decreases to the pressure release point, ring **28** will again seal against turret **18** blocking any further escape of propellant and/or product through vent ports **24.**

A similar flexing action of ring **28** is experienced in alternative embodiment of FIG. **4** except escape of product and/or propellant is through space **33** formed by the undercut **50.**

In FIG. **5** the extremities of ring **28** flex upward in an overpressure condition to allow escape through ports **52** and **54.**

In FIG. **6** the product and/or propellant flows through space **35** out against ring **28** and directly into the atmosphere in an overpressure condition.

As previously described, the vent ports **24** may be used to pressure fill the container **12** prior to applying the relief ring **28.** With reference to FIG. **10,** it can be seen that product and/or propellant may be forced into ports **24** prior to attaching ring **28.**

FIGS. **11** through **19** show the second embodiment comprising an internal relief ring **62** located in the relief passageway **34** formed between the valve body **20** and turret **18.** The size of ring **62** is such that it seals against the inner surface of turret **18** and the valve body **20.** The internal relief ring **62** divides the relief passageway **34** into a lower chamber **64** in direct communication with the product and propellant and an upper chamber **66** which is in direct communication with at least one but preferably a plurality of vent ports **67** formed on the side of turret **18.** Alternatively the space formed by aperture **26** about the upper portion of valve stem may function as a vent port.

At least one extremity of relief ring **62** includes a flexing lip **70** designed to flex either in an internal overpressure condition or during pressure filling such that when flexed the seal is broken thus permitting communication between chambers **64** and **66.**

The side wall of turret **18** may contain a crimp **72** to secure ring **62** in place.

During normal conditions the internal relief ring **62** seals against the turret and valve body to prevent the escape of product and/or propellant. However, when the pressure reaches the pressure release point product and/or propellant passes upward through the lower chamber **64** and against the flexible lip **70** breaking the seal thereby allowing product/or propellant to flow through upper chamber **66** and into the atmosphere via aperture **28** or vent ports **67.** As seen in FIGS. **17** and **18** guide vanes **68** may be formed in turret **18** immediately adjacent to ports **67** to direct the overflow to the atmosphere.

To pressure fill, the product and/or propellant is forced under pressure, through vent ports **67** or aperture **28** into chamber **66.** There the pressure flexes lip **70** inward to allow the product and/or propellant to flow through chamber **64** and into the body of container **12.** Upon completing the filling process lip **70** automatically returns to its normal position sealing against turret **18** and valve body **20.**

FIGS. **20** through **23** shows the third embodiment comprising an internal flexible gasket **74** held from the top turret **18** to form a space **84** which provides room for the gasket **74** to flex upward. The valve body **20** has a smaller diameter sealing surface **78** which is forced into the gasket **74** to give proper gasket compression and a larger outer sealing surface **80** slightly higher than the smaller surface **78** which flexes the gasket **74** slightly upward and against the turret **18** to form a seal between the gasket **74** and the turret.

The relief passageway comprises two chambers separated by the gasket **74** wherein the lower chamber **82** is in communication with the product and propellant and the upper chamber **84** is in communication with at least one, but preferably a plurality of, vent ports formed in the side or top of turret **18.** Alternatively, aperture **26** may be used as a vent port either with or in place of side vents **86** and top vents **88.**

FIGS. **24** and **25** show alternative embodiments where lip **75** of gasket **74** has been cut to form sealing engagement with the side or top of the turret **18** respectively.

The position of sealing surface **78** relative to sealing surface **80,** the thickness of gasket **74** and the material of gasket **74** all control the pressure release point.

Normally the outer surface of gasket **74** prevents the flow of product and/or propellant from lower chamber **82** to upper chamber **84.** However, when the pressure reaches the pressure release point, gasket **74** flexes upward allowing product and/or propellant to flow from chamber **82** into and through chamber **84** and through port **86** or aperture **26** into the atmosphere. As the pressure decreases below the pressure release point, gasket **74** again reseals against sealing surface **80.**

In the alternative embodiment of FIGS. **24** and **25,** lip **75** flexes upward or sideways at the pressure release point to allow flow from chamber **82** through chamber **84** and ports **88** or aperture **26** into the atmosphere. Lip **75** will reseal against turret **18** when the pressure decreases to below the pressure release point.

To pressure fill, pressurized product and/or propellant are fed into ports **86** and **88** or through aperture **26** against gasket **74** or lip **75** flexing them inward and downward to permit flow through chambers **84** and **82** into container **12.**

A fourth embodiment, shown in FIGS. **26** through **30,** comprises a combination of the external relief ring **28** and internal relief ring **62** whereby the basic features of each relief ring are included.

The operation of this fourth embodiment is fully illustrated in FIG. **29.** In an overpressure condition product and/or propellant passes upward through chamber **64** forcing lip **70** of internal relief ring **62** upward breaking the seal between the lip **70** and valve stem **20** allowing the fluid to flow into chamber **66.** From there guide vane **68** directs the flow through vent **67** into chamber **48** and against external relief ring **28.** This causes the upper and lower portions of ring **28** to separate at undercut **50** to permit flow outward into the atmosphere. As the internal pressure devreases below the pressure release point, undercut **50** again reseals, a further decrease permits lip **70** to reseal.

As can be seen, this combination provides a maximum of variables to determine and control the pressure release point.

The use of this embodiment as a pressure filling system is similar to that of the internal relief ring system. Before the external relief ring **28** is applied, product and propellant are forced under pressure into ports **67** through chamber **66** and against lip **70.** As lip **70.** As lip **70** flexes under this pressure the fluid passes freely into the container **12.** After the proper amount of fluid

is fed into the container 12 external pressure filling is discontinued to allow lip 70 to return to sealing engagement with valve body 20 to prevent escape of product or propellant. External relief ring 28 is then stretched over turret 18.

As shown in FIGS. 31, 32, and 33, each of the three basic embodiments may be adapted for use with a turret 84 on the bottom of the aerosol dispenser 12. FIG. 31 shows external relief ring 83 secured to bottom turret 85 by means of spring wire 86. As in the top mounted ring 28, a snap band or undercut may be used in place of spring wire 86 as shown in FIGS. 7 and 9 respectively. In contrast to the top mounted ring 28, there is no relief passage. The product communicates directly with ring 83 through vent ports 88 found in the side of turret 85.

A tamperproof cap 90 may be secured to the ring and turret assembly by annular ridge 92 engaging annular slot 94 formed on the outer surface of ring 83.

In operation as the pressure inside the container 12 increases to the pressure release point the product and/or propellant force outward through ports 88 against ring 83 breaking the seal between ring 83 and turret 85 allowing the product and/or propellant to escape into the atmosphere around the base of cap 90. As the pressure decreases to the pressure release point the ring 83 again engages turret 85 to form a seal to prevent further escape or product and/or propellant.

As with the top mounted external relief ring, product and propellant may be pressure filled through vent ports 88 before applying ring 83.

FIG. 32 shows internal relief ring 96 arranged to form a seal with the inside of bottom turret 85. Flexible sealing lips 98 seal off relief passage 100 and vent ports 88 from the container contents.

FIG. 33 shows internal gasket 102 in sealing engagement with the interior wall of turret 85. Gasket 102 is flexed downward by cooperative engagement of members 104 and 106. Relief passage 107 which communicates with relief ports 88 is sealed from the product.

In either the internal relief ring embodiment of FIG. 32 or internal gasket embodiment of FIG. 33 when the pressure inside the container increases to the pressure release point lips 98 and 104 flex downward allowing product and/or propellant to flow through chambers 100 and 107 respectively and into the atmosphere through ports 88. When the pressure decreases to the pressure release point lips 98 and 104 return to the inward position to form sealing bonds to prevent any further escape of product and/or propellant.

Forcing pressurized product and/or propellant into ports 88, will cause lips 98 and 104 to flex upward thus allowing pressure filling of the container 12.

FIG. 34 shows a locking overcap indicated generally at 108 mounted on cap 36 and valve stem 22. Locking overcap 108 is secured to cap 36 by means of locking feet 110 formed on the lower portion of the overcap 108 cooperatively engaging interrupted locking grooves 46. Overcap 108 may be adjusted vertically in grooves 46 to accommodate valve stems of various heights.

Overcap 108 includes recess 112 and discharge passage 114 formed in nozzle 116. Nozzle 116 is provided with tab 118 to facilitate rotation of rotating overcap 108 from the "lock" to the "spray" position.

As shown in FIG. 35, indicators "lock" 115 and "spray" 117 are formed on the top of tamperproof cap 36. The "lock" indicator is raised to form a post 115 which in cooperation with aperture 120 formed in overcap 108 lock the overcap 108 in place.

As seen in FIG. 36, channel 122 is formed in cap 36 to permit vertical movement of overcap 108 without interference with nozzle 116.

When in the "lock" position locking feet 110 engage locking grooves 46 to prevent vertical movement of the overcap 108. In this position the indicator "lock" will be wedged in aperture 120 to prevent rotation of the overcap 108. To place in "spray" position, the operator depresses post 115 and rotates overcap 108 90° using tab 118 as a lever. In the "spray" position indicator 117 will appear in aperture 120. Nozzle 116 will align directly over channel 122. The operator may then depress the overcap 108 to actuate the valve assembly.

To return to the "lock" position the operator rotates the overcap 108 by tab 118 90° where "lock" wedge 115 will pop into aperture 120 to lock in place.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description as illustrative and not in a limiting sense.

Now that the invention has been described, what is claimed is:

1. A pressure relief system for an aerosol dispenser including at least one turret formed thereon, said pressure relief system including flexible sealing means comprising an annular ring having a pressure control means formed thereon, said pressure control means configured to control the pressure release point, said sealing means mounted directly on said turret and in sealing engagement with said turret to seal at least one vent port formed in said dispenser, said pressure control means arranged relative to said vent port such that the interior pressure of said dispenser acts directly against said sealing means immediately adjacent said vent port to break said sealing engagement of said sealing means with said turret at the predetermined pressure release point.

2. The system of claim 1 wherein said dispenser includes a valve mounting cup having said turret formed thereon.

3. The system of claim 1 wherein said vent port is formed in a turret on the base of said dispenser.

4. The system of claim 1 wherein said dispenser includes a container and valve mounting cup attached thereto, said vent port comprising an open space cooperatively formed between said container and said valve mounting cup.

5. The system of claim 1 wherein said vent port is formed between the mounting cup of said dispenser and its valve stem.

6. The system of claim 1 wherein said external relief ring further includes retaining means to fix the position of said relief ring relative to said turret.

7. The system of claim 6 wherein said retaining means comprises a substantially cylindrical member of such size relative to said ring and said turret to firmly hold said ring to said turret.

8. The system of claim 6 wherein said retaining means comprises an undercut formed in the upper portion of said turret to press fit said ring into sealing engagement with said turret.

9. The system of claim 1 further including a tamper-proof means comprises a substantially cup-shaped cap mounted over said turret.

10. The system of claim 9 wherein said cap includes an annular ridge formed on its inner surface which engages a corresponding annular slot formed in turret to lock said cap in place relative to said turret.

11. The system of claim 9 wherein said cap includes apertures formed in the lower portion of said cap to act as diffusers for product and propellant escaping through said pressure relief system.

12. The system in claim 9 wherein said tamper-proof means includes a locking means arranged on said tamper-proof means to prevent inadvertant dispensing of product and propellant.

13. The system of claim 12 wherein said locking means comprises a locking overcap mounted on said tamperproof means by locking feet formed on the lower portion of said locking overcap adapted to cooperatively engage a plurality of interrupted locking grooves formed on the surface of such means such that the vertical position of said locking means relative to the valve assembly is fixed and whereby by rotating said locking overcap said locking feet are disaligned from said locking grooves thereby permitting the vertical movement of said locking overcap to activate said dispenser.

14. The system of claim 13 including an indicator means to indicate a "spray" and a "lock" position.

15. The system of claim 14 wherein said indicator means includes a post on said tamperproof cap indicating "lock," and adapted to wedge in an aperture formed in said locking overcap to prevent rotation of said locking overcap relative to said tamperproof cap when in the locked position.

16. The system of claim 1 wherein said vent port is formed in a turret formed on said dispenser and said annular ring comprises an external relief ring stretched over said turret in sealing engagement with said vent port formed thereon.

17. The system of claim 1 wherein said control means comprises a chamber formed in the inner surface of said annular ring immediately adjacent of said vent port to control the pressure release point.

18. The system of claim 1 wherein said control means comprises an undercut formed in said annular ring from its outer surface to its inner surface immediately adjacent to said vent port to control the pressure release point.

19. The system of claim 1 including a guide means formed on the inner wall of said turret immediately adjacent said vent port to direct fluid against said annular ring immediately adjacent said vent port.

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