United States Patent [19]

Yamada et al.

[11] **3,804,302**

[45] **Apr. 16, 1974**

[54] **AEROSOL CONTAINER CAP DEVICE**

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[22] Filed: **Mar. 27, 1972**

[21] Appl. No.: **238,512**

[30] **Foreign Application Priority Data**

Mar. 31, 1971 Japan ..... 46-23336[U]

[52] **U.S. Cl.** **222/182,** 222/402.14

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

[58] **Field of Search** 222/182, 402.14, 498, 499

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[57] **ABSTRACT**

This invention relates to an aerosol container cap device.

Said device comprises a cap for providing cover to an ejection valve assembly mounted in an aerosol container, a presser member movably mounted in the cap and adapted to be moved downwardly for causing a force to be exerted on said ejection valve assembly to bring said ejection valve assembly to an open position, and means for holding said presser member in its lower position to keep the ejection valve assembly in its open position.

6 Claims, 8 Drawing Figures

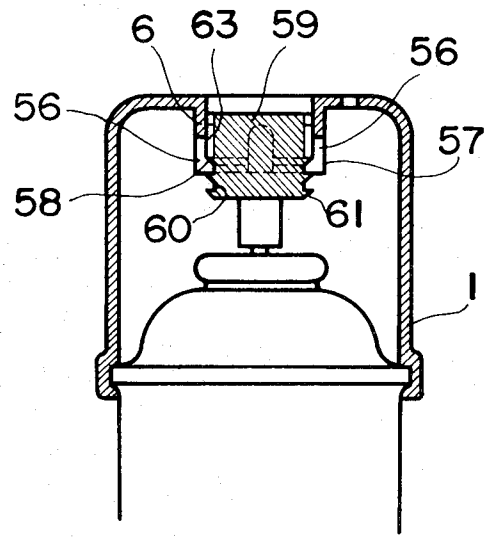


FIG. 1

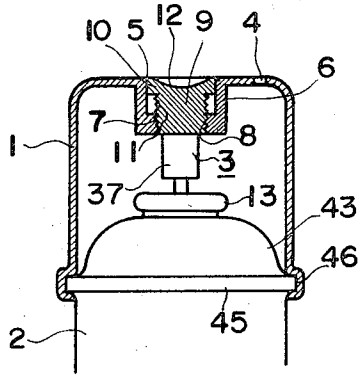


FIG. 2

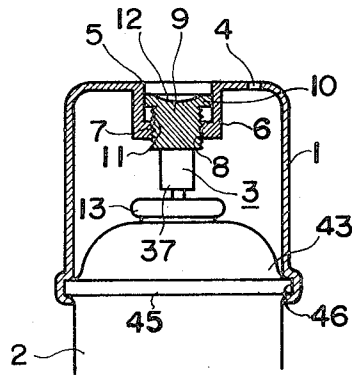


FIG. 3

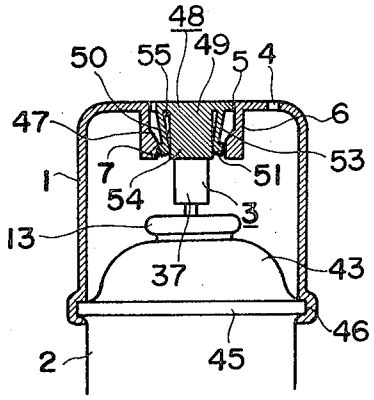


FIG. 4

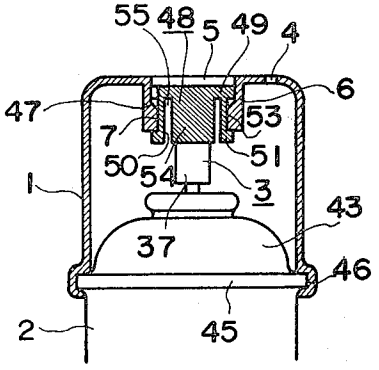


FIG. 5

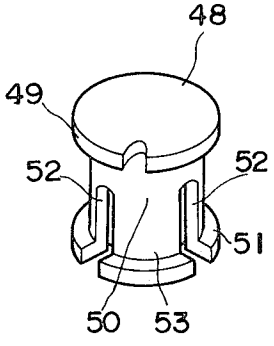


FIG. 6

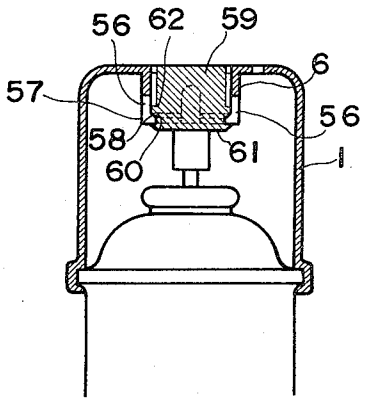


FIG. 7

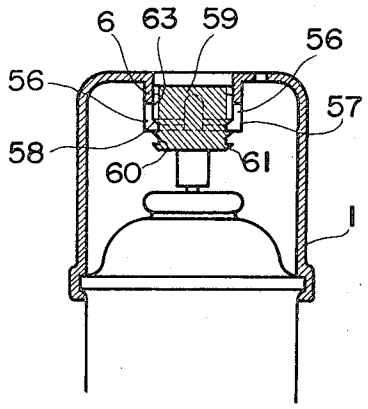
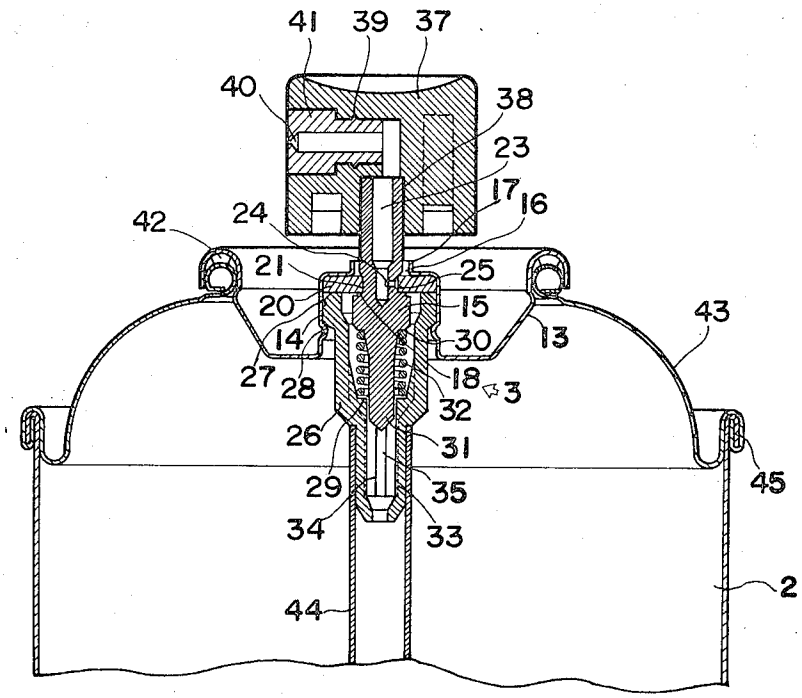


FIG. 8



AEROSOL CONTAINER CAP DEVICE

This invention relates to aerosol container caps, and more particularly it is concerned with a cap device for an aerosol container which is provided with means for ejecting residual gas from the aerosol container when its contents have been exhausted, in order to prevent any accident that might otherwise be caused by the residual gas in the used container.

Generally, some gas or solvent is left in aerosol containers even when all the contents thereof have been exhausted. If such used aerosol containers are discarded without doing anything about the residual gas, there is the danger that it may explode and cause a fire to break out. To avoid such accident, it has hitherto been customary to bore a hole in the used aerosol containers with a gimlet or the like to discharge residual gas to the atmosphere. The operation of boring a hole which has hitherto been performed has had disadvantages in that it is not only troublesome but also liable to cause residual gas to be emitted through the hole when the hole is bored, thereby soiling or damaging clothes or injuring the eyes of the operator.

An object of this invention is to provide a cap device for an aerosol container which comprises a movable presser member normally depressing an ejection valve assembly in the aerosol container to leave an ejection port open at all times, such presser being adapted to be moved by suitable means after the contents of the aerosol container have been exhausted to bring the ejection valve assembly to an open position and maintain the same in such position so as to discharge all the residual gas to the atmosphere from the used aerosol container.

Another object of the invention is to provide an aerosol container cap device which is easy to operate for discharging residual gas from the used aerosol container, such cap device permitting the ejection valve assembly in the container to be maintained in the open position after the contents thereof have been exhausted only if pressure is applied to the presser member.

Additional and other objects as well as features and advantages of the invention will become evident from the description set forth hereinafter when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a sectional view of the cap comprising one embodiment of this invention showing the cap device fitted over an aerosol container;

FIG. 2 is a sectional view of the cap similar to FIG. 1 but showing the cap device in a position in which residual gas is being discharged from the container;

FIG. 3 is a sectional view of the cap device similar to FIG. 1, the cap device shown comprising another embodiment of the invention;

FIG. 4 is a sectional view of the cap device of FIG. 3 but showing the cap device in a position in which residual gas is being discharged from the container;

FIG. 5 is a perspective view of the presser member of the cap device shown in FIGS. 3 and 4;

FIG. 6 is a sectional view of the cap device comprising another embodiment of the invention showing the cap device fitted over an aerosol container;

FIG. 7 is a sectional view of the cap device similar to FIG. 6 but showing the cap device in a position in which residual gas is being discharged from the container; and

FIG. 8 is a sectional view of an ejection valve assembly and the appear portion of the container.

A first embodiment of the invention will now be described with reference to FIG. 1, FIG. 2 and FIG. 8. 1 designates a cap for providing cover to an ejection valve assembly 3 mounted on an upper surface of an aerosol container 2. Cap 1 is formed in its upper wall portion with a gas exhaust port 4 and another port 5 at a middle portion of its upper wall portion. Cap 1 is also formed with a cylindrical body 6 extending perpendicularly downwardly from the edge of port 5, such cylindrical body 6 being formed at a lower end portion of its inner wall surface with a minor diameter portion 7 which is formed thereon with an internal thread 8.

9 designates a presser member formed at its outer or upper end side with a major diameter portion 10 adapted to be movably inserted in opening 5 and at an inner or lower end portion of its outer peripheral surface with an external thread 11 adapted to be threadably received in the internal thread 8 on the minor diameter portion 7 of cap 1. The major diameter portion 10 of presser member 9, which is adapted to stop in its downward movement when it impinges on the minor diameter portion 7 of the cylindrical body 6 extending downwardly from the upper wall portion of cap 1, is formed on its upper surface with an engaging groove 12 adapted to receive therein a coin or the like for rotating the presser member 9.

As shown in FIG. 8, ejection valve assembly 3 is mounted on a mounting cup 13 which is formed at its middle portion with an ejection valve assembly mounting portion 14 of the cylindrical shape projecting upwardly therefrom. Ejection valve assembly mounting portion 14 is formed at the middle of its outer or upper end portion with a bore 16 for permitting a valve stem 15 to move vertically therethrough. A guide 17 is formed in the peripheral edge of bore 16.

Stem 15 is formed substantially at its middle with a minor diameter offset portion 18 which extends through an opening 21 of a stem gasket member 20 fitted in ejection valve assembly mounting portion 14.

Stem 15 is formed therein with a vertical duct 23 which opens at an upper end of stem 15 and communicates near its inner or lower end portion with a transverse orifice 24 formed in the minor diameter offset portion 18 of stem 15 and maintained at its outer opening 25 in engagement with an inner peripheral surface of stem gasket member 20 defining opening 21 for inserting stem 15 therein, so that stem orifice 24 is normally closed.

26 designates a valve housing of the substantially sylindrical shape which is formed at its upper portion with a major diameter portion 27 adapted to be fitted in the ejection valve assembly mounting portion 14 of mounting cup 13, such major diameter portion 27 being adapted to be held in place by stem gasket member 20 and an offset portion 28 formed in ejection valve assembly mounting portion 14.

A coil spring 32 surrounding a guide 31 extending inwardly or downwardly from stem 15 is mounted between an inner bottom portion 29 of valve housing 26 and an offset portion 30 of stem 15. Stem 15 is normally urged by the biasing force of coil spring 32 to move outwardly or upwardly so that orifice 24 may be normally closed by stem basket member 20.

A fluid passage 34 formed in a conduit member 33 formed integrally with valve housing 26 opens at the

inner bottom portion 29 of valve housing 26. A number of axially arranged ribs 35 are formed on an inner wall surface of conduit member 33 defining fluid passage 34 to provide fluid ways between an outer surface of the guide 31 of stem 15 adapted to move through fluid passage 34 and the inner wall surface of conduit member 33 defining fluid passage 34.

37 designates a pushbutton formed at its lower portion with a vertical bore 38 for receiving therein an upper portion of stem 15 which bore is maintained in communication with a nozzle mounting opening 39 which opens at a peripheral surface of pushbutton 37. An insert 41 formed with a discharge orifice 40 is mounted in nozzle mounting opening 39.

As aformentioned, ejection valve assembly 3 comprises stem 15, stem gasket member 20, valve housing 26 and coil spring 32 and is mounted in the ejection valve assembly mounting portion 14 of mounting cup 13.

Mounting cup 13 is connected at its outer perpiheral edge in airtight relationship with an opening of a cover 43 for aerosol container 2 through a mounting gasket 42.

A tube 44 is fitted over and connected to the conduit member 33 of valve housing 26.

An engaging groove 46 is formed, as shown in FIG. 1 and FIG. 2, at an inner peripheral edge of a lower end portion of a vertical wall portion of cap 1 for receiving therein in engaging relation a ledge 45 formed at a base of the cover 43 for aerosol container 2.

The operation of the embodiment constructed as aforementioned will now be described. In applying cap 1 to container 2, presser member 9 is inserted in the port 5 formed in the upper wall portion of cap 1 to bring the external thread 11 of presser member 9 into threadable engagement with the internal thread 8 of cap 1 as shown in FIG. 1. Then, cap 1 is fitted over the upper portion of aerosol container 2 in which ejection valve assembly 3 is mounted. This brings presser member 9 to a position in which its inner or lower end surface is juxtaposed to pushbutton 37 but does not cause a force to be exerted thereon.

When the contents of aerosol container 2 are to be discharged from the container, cap 1 is removed and pushbutton 37 is depressed. This causes stem 15 to move downwardly against the biasing force of coil spring 32 and brings the orifice 24 in stem 15 out of engagement with the inner peripheral surface of stem gasket member 2o defining opening 21, so that stem orifice 24 communicates with the interior of valve housing 26.

If stem orifice 24 is maintained in communication with the interior of valve housing 26 as aforementioned, then the contents are introduced through the fluid passage 34 in conduit member 33 and the ways provided between the inner wall surface of conduit member 33 and the outer wall surface of guide 31 of stem 15 into valve housing 26 by a pressure source which may be any one of the group of materials consisting of liquid gas such as fluorides of hydrocarbon, chlorides of hydrocarbon, and hydrocarbons, and compressed gas such as nitrogen. The contents are led from valve housing 26 through the stem orifice 24 of stem 15, vertical duct 23 to the discharge orifice 40 of insert 41 from which they are ejected in spray, foam, powder, droplet or paste form.

If the force exerted on pushbutton 37 is removed, stem 15 will be caused to move upwardly by the biasing force of coil spring 32 and orifice 24 will be closed by the inner peripheral surface of stem gasket member 20, thereby interrupting the discharge of the contents through insert 41. The contents are thus discharged when pressure is applied to pushbutton 37 and their discharge is interrupted when pressure is released from pushbutton 37.

When residual gas is to be discharged after the contents of aerosol container 2 are exhausted, the engaging groove 46 of cap 1 fitted over aerosol container 2 is brought into engagement with the ledge 45 formed in cover 43. If presser member 9 is turned as by a screw driver engaged in groove 12 to bring the external thread 11 thereof into threadable engagement with the internal thread 8 of cap 1 while engaging groove 46 is maintained in engagement with ledge 45, presser member 9 will move downwardly to push pushbutton 37 downwardly at its inner or lower end surface as shown in FIG. 2. This opens the stem orifice 24 of stem 15, thereby permitting residual gas to be discharged to the atmosphere from the container through the exhaust port 4 of the cap 1.

In this embodiment, exhaust port 4 is formed in cap 1, but it may be formed in an inner edge of the upper wall portion of cap 1 defining port 5 or in a peripheral portion of presser member 9.

A second embodiment will be described with reference to FIG. 3 and FIG. 4. Like reference characters in FIG. 1 to FIG. 4 designate similar parts. An inclined surface portion 47 contiguous with minor diameter portion 7 is formed on the inner wall surface of cylindrical body 6 projecting downwardly from the edge of port 5 formed in the central wall portion of cap 1 made of a synthetic resinous material.

A presser member 48 made of a synthetic resinous material in cylindrical shape comprises a main body 54 formed at its upper end portion with a flange 49 sufficiently large in outer diameter to be fitted in opening 5. Presser member 48 also comprises an outer cylindrical portion 50 which extends downwardly from the underside of flange 49 and which is formed with a flange 51 at a lower end portion of an outer wall surface thereof. A number of axial elongated cutouts 52 disposed equidistantly from one another are formed in outer cylindrical portion 50 to extend from flange 51 to a substantially middle portion of outer cylindrical member 50. By virtue of these elongated cutouts 52, outer cylindrical portion 50 serves as a resilient engaging portion 53. A gap is formed between an outer wall surface of main body 54 and an inner wall surface of outer cylindrical portion 50.

The operation of the second embodiment will be described. When the aerosol container is put to use, presser member 48 is inserted in the opening 5 of cap 1 applied to aerosol container 2. Outer cylindrical portion 50 is guided by the inclined surface portion 47 of the inner wall surface of cylindrical body 6, and resilient engaging portion 53 has its diameter reduced against its resilience. If presser assembly 48 is brought to a position in which the flange 51 of outer cylindrical portion 50 thereof is in pressing engagement with the minor diameter portion 7 of cylindrical body 6, presser member 48 will be held in position in opening 5 with an inner or lower end surface of main body 54 being disposed in spaced apart relationship with pushbutton

37 for ejection valve assembly 3 of aerosol container 2 so that the former may not cause a force to be exerted on the latter.

When the contents of aerosol container 2 are exhausted and the container is to be discarded, presser member 48 is depressed. This results in the inner or lower end surface of main body 54 of presser member 48 moving pushbutton downwardly to bring the flange 51 of outer cylindrical member 50 out of engagement with minor diameter portion 7. This permits resilient engaging portion 53 to expand by its own resilience, so that flange 51 is brought into engagement with a lower end edge of cylindrical body 6 to maintain pushbutton 37 in its lower position to which it has been brought by main body 54 moved downwardly. This permits residual gas to be discharged to atmosphere from the container.

Exhaust port 4 is formed in the cap in this embodiment, however, it may be formed in the flange 49 of presser member 48.

FIG. 6 and FIG. 1 show a third embodiment in which a number of axial elongated cutouts 56 disposed equidistantly from one another are formed in the cylindrical body 6 of cap 1 as shown in FIG. 6 to provide a resilient engaging portion 57 which is formed with a minor diameter portion 58 at a lower end portion of its inner wall surface. A presser member 59 adapted to be movably fitted in opening 5 formed in the upper wall portion of cap 1 and disposed above cylindrical body 6 is formed at a lower end portion of its outer wall surface with annular projections 61 and 62 defining therebetween an engaging groove 60.

When the aerosol container 2 is put to use, the minor diameter portion 58 of resilient engaging portion 57 is engaged in engaging groove 60, so that presser member 59 is held in a position in which it does not cause a force to be exerted on pushbutton 37 when cap 1 is applied to aerosol container 2. When the contents of aerosol container 2 are exhausted and the container is going to be discarded, presser member 59 is moved downwardly to release minor diameter portion 58 from engagement in engaging groove 60 and bring a lower edge of resilient engaging portion 57 into engagement with annular projection 62 so as to hold pushbutton 37 in its lower position to which it has been brought by presser member 59 moved downwardly. This permits residual gas or solvent in aerosol container 2 to be discharged to the atmosphere therefrom through axial grooves 63 formed on an outer wall surface of presser member 59.

It is to be understood that the invention is not limited to the specific construction of the ejection valve assembly shown and described herein and that any other known valve assembly may be used without departing from the spirit of the present invention.

What is claimed is:

1. An aerosol container cap device comprising a cap fixed removably on an aerosol container for covering a pushbutton ejection valve assembly which is formed at its side surface with a discharge orifice maintained in communication with a vertical duct of the ejection valve assembly mounted in said aerosol container for opening and closing said ejection valve, a presser member movably mounted in the cap and adapted to be moved downwardly into contact with said pushbutton and to move said ejection valve assembly to open position, and means for positively holding said presser member in such downward position permanently to keep the ejection valve assembly in its open position, whereby all of the residual gas is discharged in said cap from the aerosol container when said ejection valve assembly is pushed by said presser member wherein the presser member is received movably in a port formed in the cap, said cap having a cylindrical body aligned with the port and extending perpendicularly downwardly from the top of the cap, said cylindrical body being formed with a minor diameter portion at a lower end portion of an inner wall surface thereof, said presser member being provided with a resilient engaging portion, said resilient engaging portion being provided at its lower end portion with a flange adapted to be brought into and out of engagement with said minor diameter portion of the cylindrical body, said flange of said resilient engaging member being brought into engagement with a lower end edge of the cylindrical body when a force is exerted on the presser member to move the same downwardly, whereby the presser member is held in its lower position.

2. An aerosol container cap device as defined in claim 1 further comprising an exhaust port formed in the cap.

3. An aerosol container cap device as defined in claim 1 further comprising axial grooves formed in said presser member for discharging residual gas therethrough.

4. An aerosol container cap device comprising a cap fixed removably on an aerosol container for covering a pushbutton ejection valve assembly which is formed at its side surface with a discharge orifice maintained in communication with a vertical duct of the ejection valve assembly mounted in said aerosol container for opening and closing said ejection valve, a presser member movably mounted in the cap and adapted to be moved downwardly into contact with said pushbutton and to move said ejection valve assembly to open position, and means for positively holding said presser member in such downward position permanently to keep the ejection valve assembly in its open position, whereby all of the residual gas is discharged in said cap from the aerosol container when said ejection valve assembly is pushed by said presser member wherein the presser member is received movably in a port formed in the cap and having a cylindrical body aligned with the port and extending perpendicularly downwardly from the top of the cap, said cylindrical body being formed with a minor diameter portion at a lower end portion of an inner wall surface thereof to provide a resilient engaging portion, said presser member being formed at a lower end portion of an outer wall surface thereof with an engaging groove which is adapted to engage said minor diameter portion.

5. An aerosol container cap device as defined in claim 4 further comprising an exhaust port formed in the cap.

6. An aerosol container cap device as defined in claim 4 further comprising axial grooves formed in said presser member for discharging residual gas therethrough.

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