United States Patent [19]

Hardt

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[54] **PRESSURIZED FLUID DISPENSING DEVICES**

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

[58] **Field of Search** 222/54, 396, 397, 222/402; 220/44, 89

[56] **References Cited**

UNITED STATES PATENTS

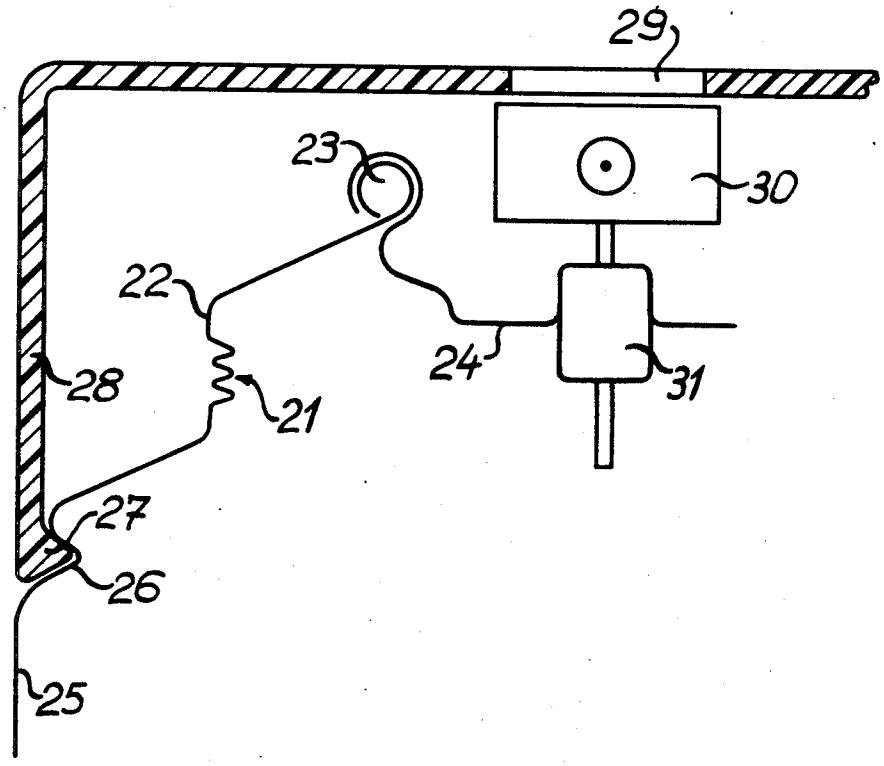
3,659,755 5/1972 Prussiv 222/397

Primary Examiner—Robert B. Reeves
Assistant Examiner—Larry Martin
Attorney—Robert E. Burns et al.

[57] **ABSTRACT**

An aerosol dispenser comprises a can closed by a cup-like cap member, a valve body supported on the cap member, and a manually operable push button adapted when depressed to dispense the aerosol. Outward movement of the push button is limited by means such as a cover, and one of the can and cap member include a part which when subjected to an internal pressure above a safe value deforms and moves outwards together with the valve body, thereby depressing the push button to dispense the aerosol as for normal operation.

4 Claims, 7 Drawing Figures



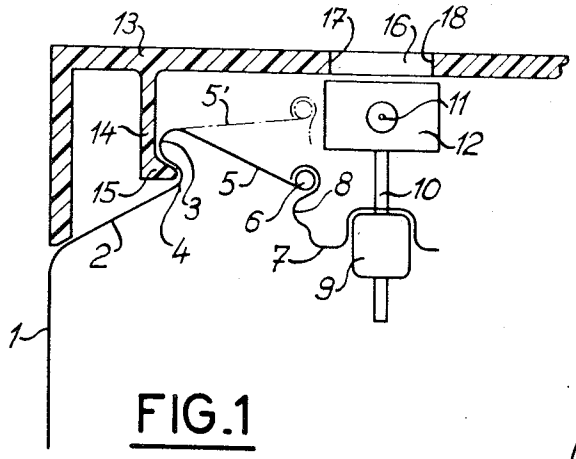


FIG.1

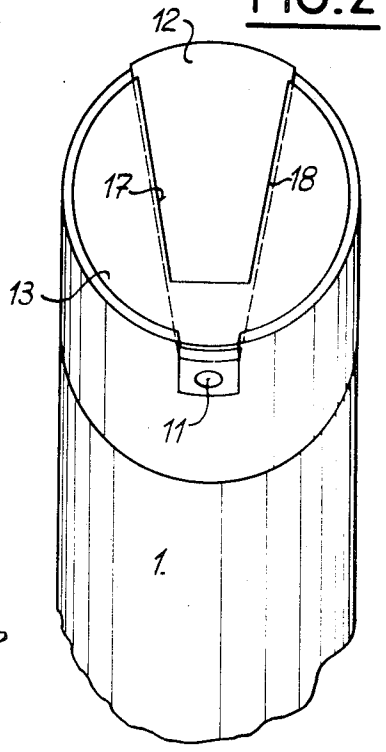


FIG.2

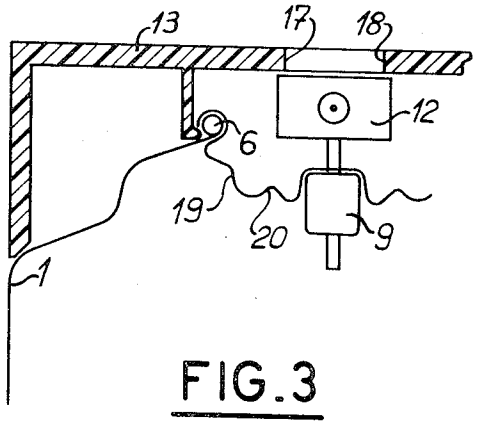


FIG.3

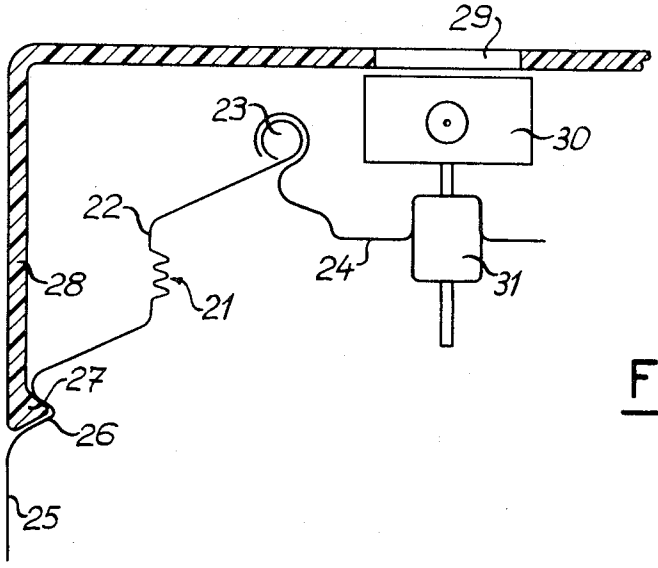
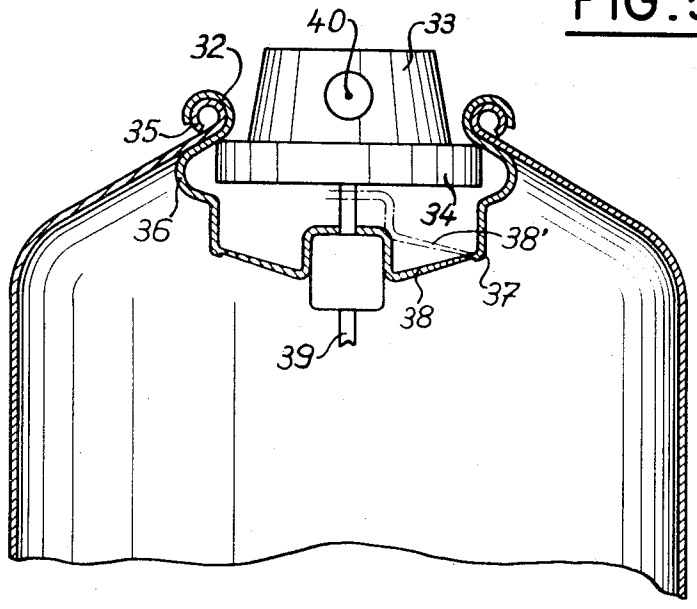


FIG.4

FIG.5



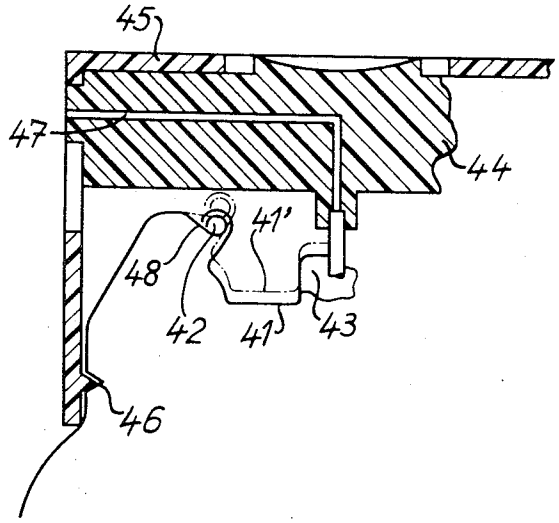


FIG. 6

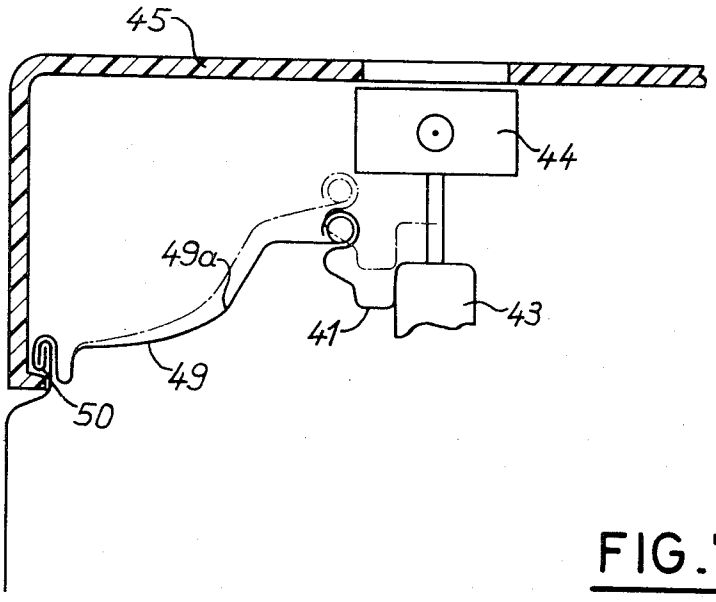


FIG. 7

PRESSURIZED FLUID DISPENSING DEVICES

The invention relates to high-pressure fluid dispensing devices, for example aerosol cans.

Aerosol and similar cans adapted to contain a fluid under pressure may be submitted to relatively high inner pressures. At a temperature of 20°C the inner pressure varies between about 2.5 and 6.6 kg/cm². This pressure rises rapidly with temperature and at 50°C reaches values between about 6 and 12 kg/cm².

Such an increase in pressure is accompanied by a danger of bursting or explosion of the can. To avoid an explosion, it is possible to provide the can with a zone of low resistance which rips when the pressure exceeds a given value. This ripping must not, however, take place abruptly and provide a large opening since this may lead to a dangerous propulsion of the can at high speed.

According to the present day international regulations in force, the pressure that such cans must be able to support without visible deformation should be equal to at least 10 kg/cm², or 50 percent greater than the pressure in the can at a temperature of 50°C, i.e. up to a maximum of 18 kg/cm². The explosion pressure should be 20 percent greater than this value. It is observed that these regulations only concern the can and do not mention the cup-like cap member which closes the can and supports the valve. The majority of safety measures proposed to date are therefore directed to the can itself and do not take into account the existence of the cup member and, most important, of the valve. However, it has proven delicate to provide cans with zones of low resistance which support the maximum authorized pressure without deformation, deform above this pressure, and tear gently at the explosion pressure in such a manner that the aerosol or other pressurized fluid escapes relatively smoothly without causing a propulsion effect.

The dispensing devices already include a member for controlling the outlet of the pressurized fluid or aerosol, namely the valve. The above mentioned difficulties may therefore be avoided by arranging for the valve to act as a safety vent when the internal pressure exceeds a given value.

U.S. Pat. No. 2,757,964 has already disclosed a high pressure fluid dispensing device in which, in case the stored fluid exceeds a certain pressure, a valve is caused to open as a result of deformation of part of a cup-like cap member supporting the valve. However, this device employs a special type of valve incorporating a deformable diaphragm and, when it acts as a safety vent, the valve opens in a special manner by distension and unseating of the diaphragm, whereas in normal operation the valve is opened by depressing a push button.

An aim of the invention is to provide a fluid dispensing device in which a valve can act as a safety member, and in which the valve operates in the same manner both when used as a safety member and in normal use, by depression of a push button relative to a valve body.

According to the invention there is provided a fluid dispensing device comprising a can, a cup-like cap member closing the can, a fluid dispensing valve including a valve body supported on the cap member and a manually operable push button or actuator accessible from exteriorly of the can, which valve may be actuated to dispense a pressurized fluid in the can by a generally axial inward movement of the push button towards the valve body, one of the can and cup member including a part which when subjected to an inner pressure above a certain value deforms and moves together with the valve body generally axially outwards from a main portion of the can, and means for limiting axial outward movement of the push button relative to the main portion of the can for actuating the valve when said part and the valve body move outwards.

Several embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is partial cross-section of a first embodiment;

FIG. 2 is a partial perspective view of the first embodiment;

FIG. 3 is a partial cross-section of a variation of the first embodiment;

FIGS. 4, 5 and 6 are partial cross-sections of second, third and fourth embodiments; and

FIG. 7 shows a variation of the fourth embodiment.

The aerosol can shown in FIGS. 1 and 2 has a cylindrical wall 1 extended at its upper end by a frusto-conical part 2 which tapers inwardly to an annular groove 4 forming a neck and an outwardly directed bulge 3 forming a collar, itself extended by an inwardly protruding part 5 terminating with a rolled edge 6 forming an opening in the can. A cup-like cap member 7 is fixed onto edge 6 by means of a bulge 8 engaging under edge 6, this cap member carries a valve body 9 at its centre.

The valve body 9 engages a tubular conduit 10 leading to a dispensing nozzle 11 integral with a push button 12. A cover 13 of synthetic material having a cylindrical skirt 13 terminated by one or several inwardly-directed protuberances 15 is secured to the can by clipping of the protuberance(s) 15 into the groove 4. Cover 13 has a central opening 16 for the button 12 which is accessible from the exterior and can be manually depressed, opening has side edges 17 and 18 located above the button or valve actuator 12 so as to limit upper axial movement thereof.

Part 5 of the can is approximately trunco-conical and has a certain elasticity so that it behaves substantially like a bent metal blade fixed at its two ends, i.e. it has two stable states on either side of a plane through the upper edge of bulge 3. Thus, when the pressure inside the can reaches a certain value, the part 5 is lifted and as soon as it moves past said plane it tips into its second stable state, indicated by 5'. During the lifting up thereof, the part 5 also lifts the cap member 7 and valve body 9. Since button 12 is prevented from moving upwardly by abutment against edges 17 and 18 of cap 13, the valve opens and the nozzle 11 delivers the pressurized fluid in the can, this operation being the same as that obtained during normal use of the can, i.e. by manually depressing button 12. Since state 5' is a stable state, the can remains in this configuration after venting of the pressurized fluid to remove the overpressure, so that it is possible to observe when there has been an overpressure.

In a variation, not shown, the upper part of the can, instead of being formed in one piece, could have a substantially dome-like piece fixed onto a cylindrical can body. In this case, the dome would carry the cup-like cap member and would include the substantially trunco-conical deformable part 5, the cover 13 being se-

cured onto the can by clipping over a rib joining the can body and the dome.

In the modification shown in FIG. 3, the cover 13 is secured to the rolled edge 6 at the joint of wall 1 and a cap member 19. The deformable part is formed by an annular undulation 20 in the "bottom" of cap member 19 which allows the central part of cap member 19, together with valve body 9, to be raised in the case of an internal overpressure.

In the embodiment shown in FIG. 4, the can has a deformable part in the form of an annular accordion-like fold 21 on a cylindrical portion 22 of the can between a rolled edge 23 to which cap member 24 is fixed and a cylindrical wall 25 of the can. An inwardly protruding edge 27 of a cover 28, analogous to cover 13 of FIG. 1, is adapted to clip into an annular groove 26 in wall 25. Cover 28 has a central opening 29 to enable manual depression of push button 30 the upward axial movement of which is limited by the edges of opening 29. If the pressure inside the can exceeds a given value, the fold 21 deforms by "expansion", lifting up the cap member 24 so that button 30, which comes to abut against the cover 28, is pressed towards the valve body 31. If it is desired to enable observation of an overpressure even after the overpressure has disappeared, i.e. after the aerosol can is emptied of its contents, the fold 21 is made so that the valve does not outlet until fold 21 has deformed by an amount exceeding the elastic limit of its material, in such a manner that a permanent deformation is provided.

In the embodiment of FIG. 5, the can does not have a cover fixed to the can body, but a rolled edge 32 of the cap member forms an abutment for control button 33 which, for this purpose, has an outwardly protruding flange 34 of slightly greater diameter than the inner diameter of the opening in the cap member in such a manner that the button 33 may be introduced by forcing it through the opening of the cap member, and may only be removed by exerting a pressure far greater than the normal pressure involved in depressing the button 33 to actuate the valve.

The cup-like cap member is fixed in a known manner to a rolled edge 35 of the can neck by means of an annular bulge 36 formed by an expansion process known as "dudgeonning" or "clinching", said bulge 36 forming a re-entrant groove in the cap member in which flange 34 is free to move downwardly. Part 37 of the cap member is deformable by an inner pressure above a given value to cause raising of the bottom 38 of the cap member, as indicated at 38', the bottom 38 raising valve body 39 and pressing it towards push button 33, which is retained by its flange 34 against the edge 32 of the cap member, so as to open the valve which outlets by the nozzle 40. Part 38 behaves in the same manner as part 5 of FIG. 1.

FIG. 6 shows a fourth embodiment in which a cap member 41 is secured by "dudgeonning" or "clinching" to a rolled edge 42 of the can. The wall of the can includes a bent-over deformable part 48 adjacent to edge 42, this part being deformed in the case of an internal overpressure to lift the cap member to the position indicated by 41', lifting valve body 43 with it. Since control button 44 is retained by a cover 45 engaged in a peripheral groove 46 of the can, the valve is actuated by the button 44 and outlets by a conduit 47 passing through the button 44.

FIG. 7 shows a variation of the preceding embodiment in which cap member 41 is fixed onto a dome-like piece 49 secured to the edge of a cylindrical wall of the can at 50. Dome 49 includes a curved section 49a which is able to deform and, as indicated in broken lines, axially lift up cap member 41 and valve body 43 in the case of an internal overpressure.

What is claimed is:

1. An aerosol dispenser comprising, a can, a valve on said can having a manually operable actuator accessible from exteriorly of said can to dispense a pressurized pressure fluid in the can, a cap member mounting said valve on said can, pressure-responsive deformable means on said can and deformable in a direction outwardly of the can and for moving said valve relative to said can and actuating it when a predetermined pressure in said can is exceeded, a can cover secured on said can having means engaged by said actuator when said deformable means moves said valve to actuate said valve to dispense said pressure fluid, and said deformable means comprising a part of said can intermediate a region where said cover is secured to said can and said cap member is secured to said can.

2. An aerosol dispenser according to claim 1, in which said deformable means is generally tubular and comprises at least one flexible peripheral fold.

3. An aerosol dispenser according to claim 1, in which said cover comprises a removable cover removably secured to said can.

4. An aerosol dispenser comprising, a can, a valve on said can having a manually depressable actuator accessible from exteriorly of said can to dispense a pressurized fluid in the can, a cap member mounting said valve on said can, said can having a neck and an opening in said neck, said cap member having a protruding circumferential bulge defining a re-entrant groove and holding said cap member in said neck fluidtightly, said cap member having a pressure-responsive, deformable part deformable in a direction outwardly of the can for moving said valve relative to said can and actuating it when a predetermined pressure in said can is exceeded, said actuator comprising a flange disposed in said re-entrant groove limiting travel of said valve and actuating said depressable actuator when said deformable part moves said valve and said actuator flange engages a boundary of said re-entrant groove thereby dispensing said pressure fluid.

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