

United States Patent

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[54] **AEROSOL CAN WITH OVERPRESSURE VENTING
AND ENTRAPPING MEANS**
3 Claims, 8 Drawing Figs.

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220/89

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

[50] Field of Search 222/394,
396, 397, 402.12, 402.13, 402.16, 406, 408;
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[56]

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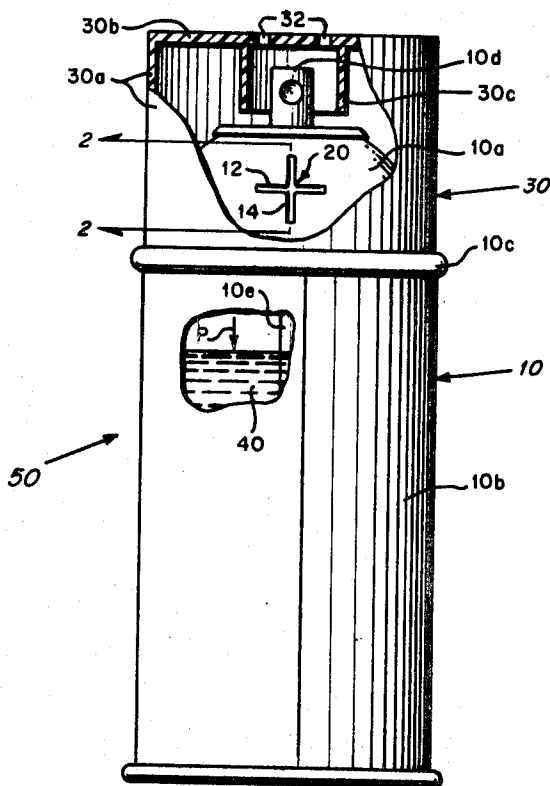
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ABSTRACT: The present invention relates to an improvement in pressurized aerosol-dispensing containers, wherein a pressure-responsive overpressure relief means is strategically located as a structural part of the pressurized envelope and is combined with entrapping means thereon for restraining the violent escape of the dispensed product in the event that overpressure occurs.



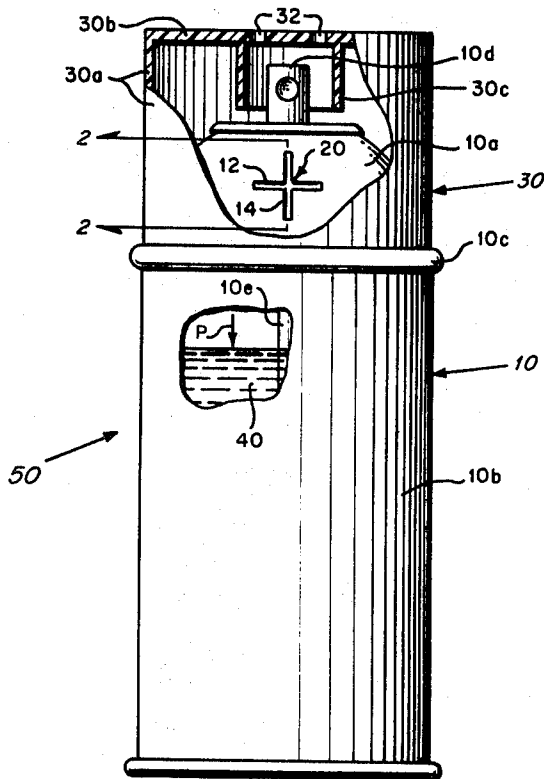


Fig. 1

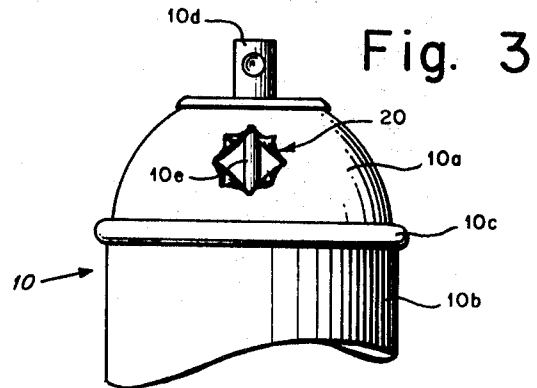


Fig. 3

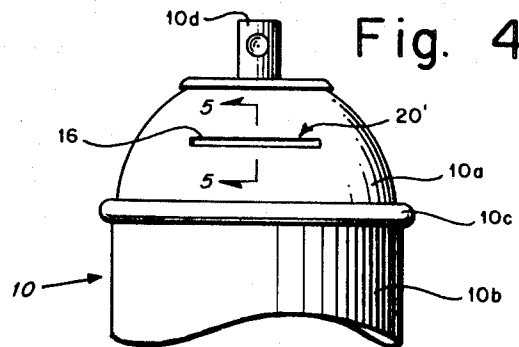


Fig. 4

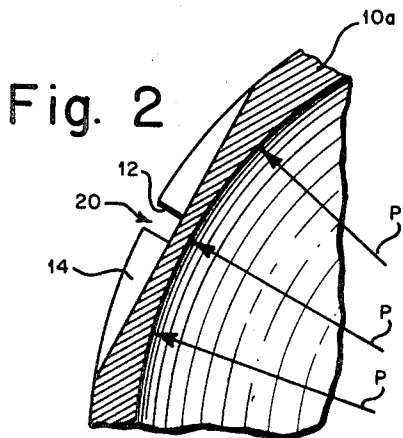


Fig. 2

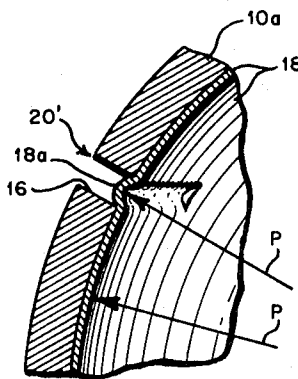


Fig. 5

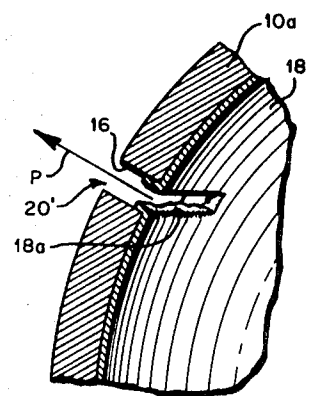


Fig. 5a

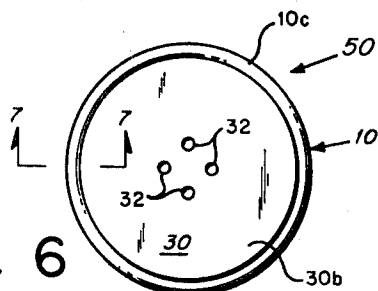


Fig. 6

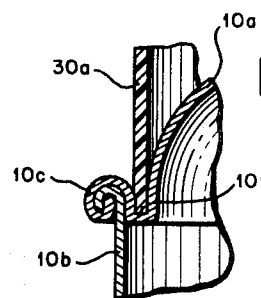


Fig. 7

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AEROSOL CAN WITH OVERPRESSURE VENTING AND ENTRAPPING MEANS

BACKGROUND OF THE INVENTION

Within the past two decades, aerosol-dispensing containers, particularly of the relatively thin-walled type, have become increasingly more popular for the dispensing of a variety of products, such as liquids, pastes and powders.

During this period of steadily increased consumer demand and usage, a special "Hazard Warning" was attached to each aerosol container, due to the inherent explosive nature of pressurized containers, particularly when exposed to heat.

In many cases of record, either through inadvertence, ignorance or apathy on the part of the consumer, a steadily growing number of accidental explosions (many of them fatal) has occurred as a result of pressurized containers being incinerated, stored near hot-water pipes or radiators, or otherwise exposed to excessive heat.

It has been found that overpressure in aerosol containers (either during or after the filling cycle) without timely relief, will cause an uncontrolled fragmentation of the container walls, thereby scattering the enclosed product and jagged bits of metal over a wide area with explosive force.

Furthermore, it has become apparent that bulk storage of aerosols has presented an additional hazard if the storage area itself is involved in a fire situation. For example, while fighting supermarket fires, firemen are often hampered in their efforts to combat the flames, as exploding aerosols scatter metal fragments and flammable ingredients into an already degraded environment.

In addition to the filling, storage and use hazards mentioned above, disposal of depleted aerosol containers has also been of particular concern to governmental agencies, or the like, charged with this function.

For example, the Federal Government now requires of its installations, a separate collection of all depleted aerosol containers for future underground burial, rather than other less costly methods, as a safety precaution.

Inasmuch as potentially explosive overpressure in aerosols is more often an ancillary result of exposure to excessive heat, most prior art (with the possible exception of the manual can-puncturing type) has dealt with temperature responsive venting means, such as plastic or solder-type meltable seals.

This method, to be totally effective, would require that a maximum portion of the applied heat be directed toward the temperature-responsive venting area, before dangerous overpressure buildup is relieved. However, this alignment is not always factual, and violent explosions may yet conceivably occur. It was with this factor in mind that design of the instant invention was primarily directed toward a pressure-responsive venting means.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a safe and inexpensive means for automatically relieving overpressure in aerosol packages, and more specifically, to provide for controlled, nonfragmenting overpressure relief on the aerosol envelope in conjunction with a splash-resistant protective cap about the relief area, to provide a tortuous, velocity-reducing path to the exiting pressurized material.

Another object is to provide a means for overpressure relief which may be formed simultaneous to the stamping operation which determines the ultimate shape of the pressurized can, thereby effectively eliminating additional manufacturing steps.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the drawings, wherein:

FIG. 1 is a side elevation, with parts broken away, of a typical safety aerosol container package showing one embodiment of the inventive device.

FIG. 2 is an enlarged sectionalized portion taken along line 2-2 of FIG. 1.

FIG. 3 is a view (with cap 30 removed) of the overpressure relief device of FIG. 1 after rupture.

FIG. 4 shows a second embodiment of an overpressure relief device (with cap 30 removed).

FIGS. 5 and 5a are enlarged sections taken along line 5-5 of FIG. 4, showing that embodiment before and after rupture, respectively.

FIG. 6 is a plan view (reduced in size) of the device of FIG. 1.

FIG. 7 is an enlarged fragmental view in section taken along lines 7-7 of FIG. 6.

DETAILED DESCRIPTION OF DRAWINGS

Referring again to the drawings, wherein like reference numerals designate like or corresponding parts throughout the several views; there is shown in FIG. 1 a preferred embodiment of the inventive device.

Safety aerosol package 50 is comprised of, first, an internally pressurized product-dispensing can 10, having an integrally formed overpressure relief area 20; and secondly, a splash-resistant cap member 30, which is firmly seated on can 10 while surrounding relief area 20.

Dispensing can 10 is composed, generally, of upper portion 10a and lower portion 10b, which are mutually joined by a leak-proof seal 10c, or the like, as is well known in the art.

A product 40, such as paint or other matter, is maintained under pressure within can 10 by an inert propellant gas, indicated as pressure P, and is dispensed, as desired, by valve 10d after rising through dip tube 10e, as is also well known in the aerosol dispensing art.

The inventive overpressure relief area 20, shown in FIGS. 1 and 2, is an integral part of portion 10a and is composed of, first, a horizontal elongated weakening line 12 and an intersecting vertical elongated weakening line 14. Lines 12 and 14, as shown in FIG. 2, present their weakest points of stress at the point of mutual intersection, while maintaining their respective lengths as the progressively stronger stress points.

In this manner, in the event that the internal pressure P exceeds a predetermined tolerable stress limit, fragmentation is avoided, since rupture first occurs at the intersection of lines 12 and 14 (the weakest stress point), and continues along each of said line until pressure P is fully expended, as is shown in FIG. 3.

Of course, many variations of lines 12 and 14 may be utilized to effect a variety of rupture patterns. For example, only one, or, a plurality of either lines 12 or 14 may be desired in some cases, whereas in others, a simple disc shaped weakening area will suffice.

In any event, the general structure of portion 10a will remain intact, without fragmentation, should overpressure occur, due to the design of lines 12 and 14, wherein the strongest points of stress occur at their respective ends.

In instances wherein the composition of portion 10a is such that either milling, stamping or otherwise normally forming lines 12 or 14 is not practical, from a tolerance standpoint, an alternative method of overpressure relief is shown in FIGS. 4, 5, and 5a.

In this alternative modification, overpressure relief area 20' is composed of an elongated through-slot 16, with an internal backing of frangible material 18, such as metal, plastic, rubber, or the like. Material 18 may be in the form of a fragmentary covering of slot 16 alone, or may also be made into full internal envelope size, to enclose the product 40 under pressure P.

FIG. 5 shows the effect of pressure P buildup at point 18a, before rupture; and FIG. 5a shows the rupture of material 18 at point 18a, after overpressure and the resultant escape of pressure P through slot 16.

As was true of lines 12 and 14, the number and orientation of slots 16 will depend on the desired rupture patterns to be sought.

The immediately foregoing paragraphs have dealt with two preferred forms of controlled overpressure relief in aerosol cans. Regardless of the venting method being employed to achieve this function, some consideration should be given to the sudden outrush of gas pressure P and product 40, in the event of controlled overpressure relief.

Splash-resistant cap 30 is herewith offered as an inventive adjunct to a controlled depressurization of the aerosol container.

Referring again to FIG. 1, and also to FIGS. 6 and 7, it is shown that the lower portion of circular wall 30a of cap 30 is firmly seated in well 10f of can 10, and combines at its upper portion with flat surface 30b to form a chamber about overpressure relief area 20. Baffle 30c extends downwardly into the formed chamber from surface 30b to a point slightly above can 10. A plurality of vent apertures 32 through surface 30b permit atmospheric contact with the formed chamber.

In the event of a sudden depressurization of can 10, through relief area 20, 20', or the like, the propellant gas (under the, by now, increased pressure P) would first enter the formed chamber within cap 30. It would then follow a tortuous path caused by baffle 30c, and exit through vent apertures 32, which are sized to create an opposing back pressure to resist further movement through relief area 20.

After a considerable (back pressure caused) reduction in velocity, the gas will exit through apertures 32 until completely dissipated.

Should any of product 40 be drawn through ruptured area 20, or the like, near the end of the propellant venting cycle, it would also be subjected to the same tortuous path and back pressure, however, due to its normally heavier consistency (as compared to the propellant), and an ever-reducing pressure P, it would remain substantially entrapped within the formed chamber of cap 30.

The chamber size, baffle 30c arrangement, number of venting apertures 32, and seating of wall 30a may be modified on cap 30 to accommodate a variety of operating pressures and other requirements.

Cap 30 (which may also be utilized with the configuration shown in FIG. 4) may be made of heat-resistant plastic or

metal.

What is claimed is:

1. In an aerosol-dispensing container formed for receiving a valve for dispensing pressurized matter including a product and propellant gas from within said container under action of internal gas, the improvement comprising:

- a. controlled automatic pressure-responsive relief means having a normally closed vent formed on a pressure subjected wall portion of said aerosol dispensing container for opening and venting said container of said pressurized matter through said normally closed vent in response to the direct application of an internal pressure on said wall portion exceeding a discrete tolerance level;
- b. chamber means forming an encompassing cavity about said pressure-responsive relief means for receiving said pressurized matter vented by said pressure-responsive relief means when said normally closed vent opens;
- c. said chamber means having a normally open vent formed thereon for providing a communication between said cavity and the exterior of said chamber means;
- d. said normally closed vent, after its said opening, being proportionately greater than said normally open vent, to create a rapid increase in total storage volume for said pressurized matter as said matter begins to dissipate slowly through said normally open vent.

2. In an aerosol-dispensing container formed for receiving a valve for dispensing a product from within the wall of said container under action of internal gas pressure, the improvement comprising:

- a. at least one discrete area in said wall of reduced thickness for unrestrained initial rupture when said pressure exceeds a predetermined tolerance level;
- b. at least another discrete area of reduced thickness but thicker than said one discrete area radiating therefrom for restrained secondary rupture following said initial rupture.

3. The device of claim 2, further comprising

- a. said other discrete area having a thickness progressively increasing from said one discrete area to said wall thickness.

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