March 22, 1966 C. CLAPP ET AL 3,241,713

THERMAL SAFETY DEVICE FOR AEROSOL CONTAINERS

Filed April 20, 1964

FIG. 1.

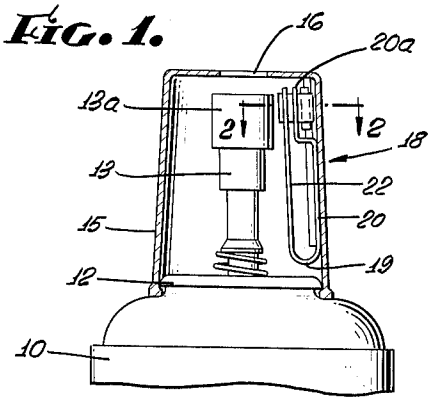


FIG. 5.

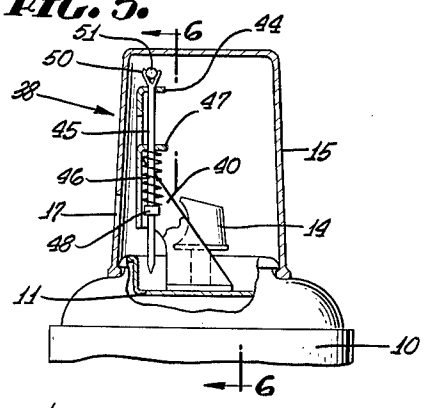


FIG. 2.

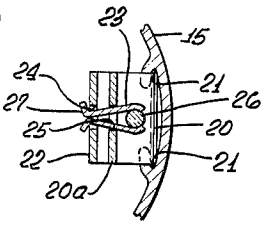


FIG. 6.

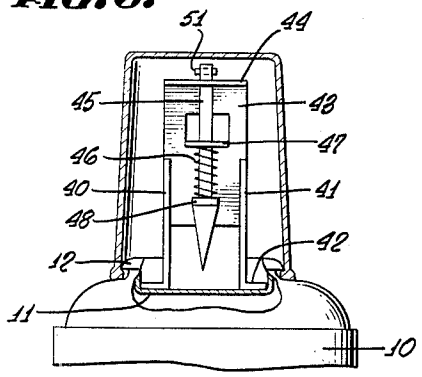


FIG. 3.

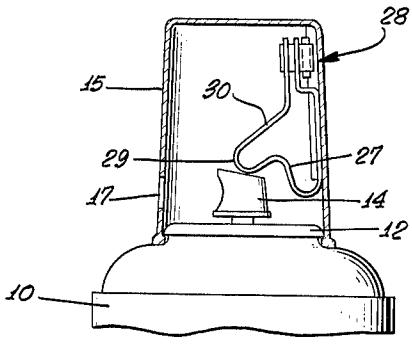


FIG. 7.

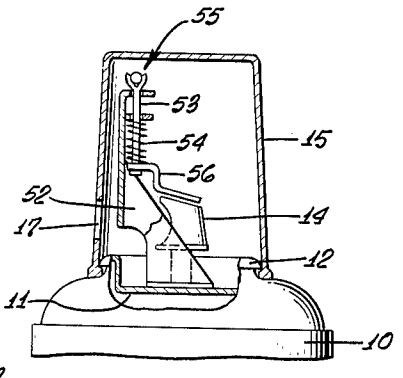


FIG. 4.

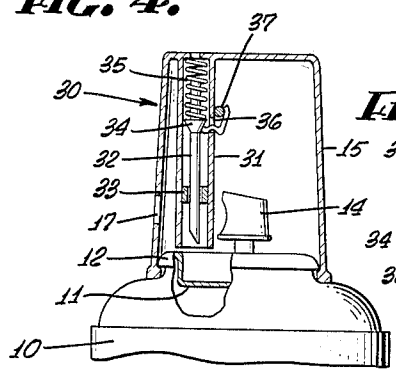
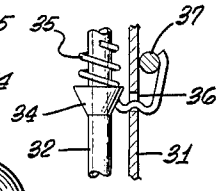


FIG. 4a.



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THERMAL SAFETY DEVICE FOR AEROSOL CONTAINERS

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6 Claims. (Cl. 222—5)

This invention has to do with the prevention of disruption of gas pressurized aerosol containers as a consequence of excessive pressure development occasioned by overheating, and has for its general object to provide simple and economical thermally responsive means operable to depressure the container by gas release.

Commonly such containers have top dispensing valve heads operable to open the valves proper either by lateral tilting or straight down displacement of the heads, to release the container contents. As packaged, such products have removable inverted cup-shaped caps applied to top areas of the containers about the valve heads. Particularly in the case of the more highly pressurized aerosols, their containers are subject to rupture when exposed to abnormally high temperatures because of the consequent gas pressure increase and practical limitations upon the container wall strengths.

Our general object is to provide a simple, low cost and reliable safety device that will automatically act to depressurize the container in response to unsafe temperatures in excess of about 130° F. Particularly contemplated are such devices employing springs releasable from normally retracted to projected conditions or positions to cause gas release either by actuation of the dispensing valve or by penetration of the container itself.

Among our objects of primary importance is to restrain the spring release in its depressurizing action by a low temperature melting or softening material, the normal holding capability of which is overcome by the spring tension when a predetermined temperature is reached. As will appear we utilize preferably for such retaining means a suitable eutectic alloy, e.g. at least partially of lead, tin and bismuth, or of other composition well known, which melts or softens sufficiently to release the spring when heated to a predetermined temperature which as indicated, usually will be above 130° F.

As will appear, the invention contemplates provision of such safety devices within and mounted to the container cap or more directly to the container itself, and in either instance, types of spring urged thermally responsive devices operable to actuate the valve or to puncture the container.

The above as well as various specific features and objects of the invention, as well as a number of illustrative embodiments of the invention will be more fully understood from the following description of the accompanying drawings, in which:

FIG. 1 is a view showing one cap-contained embodiment of the invention, the cap appearing in vertical section;

FIG. 2 is a fragmentary enlarged section taken on line 2—2 of FIG. 1;

FIG. 3 is a view similar to FIG. 1 illustrating a similar variation of the invention;

FIG. 4 is a view similar to FIG. 1 illustrating a cap mounted form of the invention which effects pressure release by puncturing the container;

FIG. 4*a* is a fragmentary enlargement of the FIG. 4 release device;

FIG. 5 illustrates another embodiment of the invention similar to FIG. 4 in which the container puncturing device is mounted independently of the cap;

FIG. 6 is a section on line 6—6 of FIG. 5; and

FIG. 7 is a view similar to FIG. 5 showing a similarly mounted thermal device adapted to actuate the aerosol valve.

In the various views we show a conventional aerosol container **10**, the top configuration of which comprises a cup **11** fitting the container head at the bead seal **12**, the cup mounting a valve **13** of the lateral rocking type shown in FIG. 1, or of the straight push down type **14** appearing in FIGS. 3 to 5. For certain usages, as in sealant pressurizing of automobile tires, the valve may be designed or adapted for attachment to a tire valve stem. In FIG. 1 the valve head assembly is shown to include an adapter **13***a* for such purposes. The valves are designated by their dispensing heads and are of conventional types extending down through the cups **11** into the containers to be actuable to dispense the aerosol by lateral or axial displacement of the valve, as the case may be. The valves are shown to be contained within inverted cup-shaped caps **15** applied to the container about the bead **12** and containing openings as at **16** or **17** to release the aerosol in the event of valve actuation or container puncture by any of the thermally responsive devices now to be described.

Referring now to FIG. 1, the thermally responsive device generally indicated at **18** comprises a leaf spring **19** of bifurcated configuration, one arm **20** of which is suitably mounted to the cap as by retention within recesses **21** molded into the cap, see FIG. 2. Inner arm **22** of the spring extends upwardly adjacent the valve head **13** and opposite an inwardly turned terminal **20***a* of the spring arm **20**. The spring arms are releasably retained in their illustrated positions by a pair of clip pieces **23** extending through openings **24** and **25** in the spring arms, the outer terminals of the clip pieces embracing and being held apart by a body **26** of low melting temperature alloy. In the FIG. 2 configuration the inner clip terminals **27** prevent release of the tensioned spring arm **22** from its normal connection with the spring terminal **20***a*. Upon being heated to predetermined temperature, as by exposure of the aerosol package to temperatures above 130° F., the low temperature alloy **26** melts or softens sufficiently to release the clip retention of the spring arm **22** by collapsing together of the pieces **23**, so that upon release, the arm **22** engages against the valve **13** with sufficient thrust and extent of travel to open the valve and thereby depressurize the container.

The FIG. 3 embodiment is similar except that here the spring **27** mounted to the cap and having its upper terminals releasably retained at **28** as in FIG. 1, has at **29** a double band configuration to overlie the valve head **14** so that upon release of the spring arm **30**, the latter presses down upon and opens the valve.

The FIG. 4 form of the invention also is cap mounted but is designed for pressure release by puncture of the container itself, and specifically the bottom wall of the cup **11**. Here the temperature responsive device **30** comprises a tube **31** molded integrally with the cap and containing a tubular puncture needle **32** given guide support at **33** and carrying a flange **34** against which coil spring **35** bears in the illustrated compressed condition of the spring. Normally the needle is maintained in elevated position by a latch arm extending toward opening **36** in the tube **31**, the inner end of the latch engaging upwardly against the tapered rod flange **34**. Normally the needle is retained in its upper position against the thrust of spring **35** by a piece of low melting alloy **37** inserted at the inside of the outer arm of the latch. Upon melting of the alloy the latch is freed to displace outwardly through the opening **36** sufficiently to disengage the flange **34** and free the needle for thrusting by the spring through the cup **11**, thereby releasing the container gas through the needle.

FIGS. 5 and 6 illustrate a variational form in which the temperature responsive device **38** also is mounted within the cap but independently thereof in being supported directly by the container, and specifically within the cup **11**. Here the device is supported by a pedestal **40** having arms **41** provided with bottom flanges **42** which snap into retained engagement with the cup **11**. The arms **40** are formed integrally with a bridge portion **43**, the upper end of which is turned inwardly at **44**. As illustrated, the arms **40** extend angularly to mount a puncture needle **45** in offset relation to the valve **14**. Normally the needle **45** is maintained in elevated position against the resistance of a coil spring **46** bearing upwardly against abutment **47** and having its lower end bearing against the needle flange **48**, by a thermally responsive release at the top of the needle. The latter is shown to comprise a pair of flexible wings **50** attached to the upper end of the needle above its extension through the turned support **44**, and confining between them the eutectic alloy **51**. Upon fusion of the latter, the thrust of spring **46** forces together the flexible wings **50** so that the latter are pulled down through the support **44** to release the needle for penetration of the cup **11** by the spring thrust.

The final form of the invention shown in FIG. 7 corresponds in all respects to the structure of FIGS. 5 and 6 in that the thermally responsive device is mounted by similar pedestal **52** and comprises an elongated or rod element **53** downwardly displaceable by coil spring **54** when released by the eutectic holding means **55**. Here, instead of being a puncture needle, the rod **53** carries an arm **56** normally overlying the valve **14** and which, upon melting of the eutectic alloy and release of the rod, engages downwardly against the valve to open it for discharge of the aerosol.

We claim:

1. The combination comprising a gas pressurized aerosol container having a top dispensing valve, container depressurizing means carried by the container and including a spring biased means releasable from a retracted spring compressed position to a projected position to effect escape of gas from the container, and means retaining said spring biased means in its retracted position at normal temperatures and fusible at temperatures above about 130° F. to release the spring biased means, said depressurizing means being operable to engage and actuate the valve.

2. The combination comprising a gas pressurized aerosol container having a top displaceable dispensing valve head, a removable inverted cup-shaped cap on the container, depressurizing means including a spring within the cap biasing means releasable from a retracted spring compressed position to a projected position to effect escape of gas from the container, and means retaining said spring biased means in its retracted position at normal temperatures and fusible at temperatures above about 130° F. to release the spring biased means, said spring being mounted to the top wall of the container independently of the cap.

3. The combination comprising a gas pressurized aerosol container having a top displaceable dispensing valve head, a removable inverted cup-shaped cap on the container, depressurizing means including a spring within the cap biasing means releasable from a retracted spring compressed position to a projected position to effect escape of gas from the container, and means retaining said spring biased means in its retracted position at normal temperatures and fusible at temperatures above about 130° F. to release the spring biased means, said depressurizing means upon release of the spring being operable to displace the valve head.

4. The combination comprising a gas pressurized aerosol container having a top displaceable dispensing valve head, a removable inverted cup-shaped cap on the container, depressurizing means including a spring within the cap biasing means releasable from a retracted spring compressed position to a projected position to effect escape of gas from the container, and means retaining said spring biased means in its retracted position at normal temperatures and fusible at temperatures above about 130° F. to release the spring biased means, said spring being of bifurcated form mounted to the cap and being operable to displace the valve head laterally.

5. The combination comprising a gas pressurized aerosol container having a top displaceable dispensing valve head, a removable inverted cup-shaped cap on the container, depressurizing means including a spring within the cap biasing means releasable from a retracted spring compressed position to a projected position to effect escape of gas from the container, and means retaining said spring biased means in its retracted position at normal temperatures and fusible at temperatures above about 130° F. to release the spring biased means, said spring being of bifurcated form mounted to the cap and being operable to displace the valve axially of the container.

6. The combination comprising an aerosol container cap applicable to the top of the container about a displaceable dispensing valve, and container depressurizing means carried by the cap and including a spring biased means releasable from a retracted spring compressed position to a projected position to effect gas escape from the container, and means maintaining the spring biased means in its retracted position at normal temperatures and fusible at temperatures above about 130° F. to release the spring biased means, said depressurizing means being operable to displace said valve by release of the spring.

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