

[54] **VENTING CLOSURE**

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[51] Int. Cl. **B65d 51/16**

[58] Field of Search **215/56, 40, 39, 42**

[56] **References Cited**

UNITED STATES PATENTS

3,310,193	3/1967	MacPherson	215/56
3,480,173	11/1969	Wheaton	215/56

Primary Examiner—George T. Hall
Attorney—David W. Brownlee

[57] **ABSTRACT**

A sheet metal container closure is provided which has a top panel and a depending skirt for affixation to a container and a sealing liner of resilient deformable material underlying the top panel of the closure for sealing against a sealing surface of the container, and further having a score line centrally located in the top panel of the closure, which score line is rupturable by excessive pressure in a container on which the closure is sealed to provide an aperture in the top panel of the closure through which a portion of the sealing liner can be forced to permit gas to escape from the container between the sealing liner and the sealing surface of the container.

10 Claims, 6 Drawing Figures

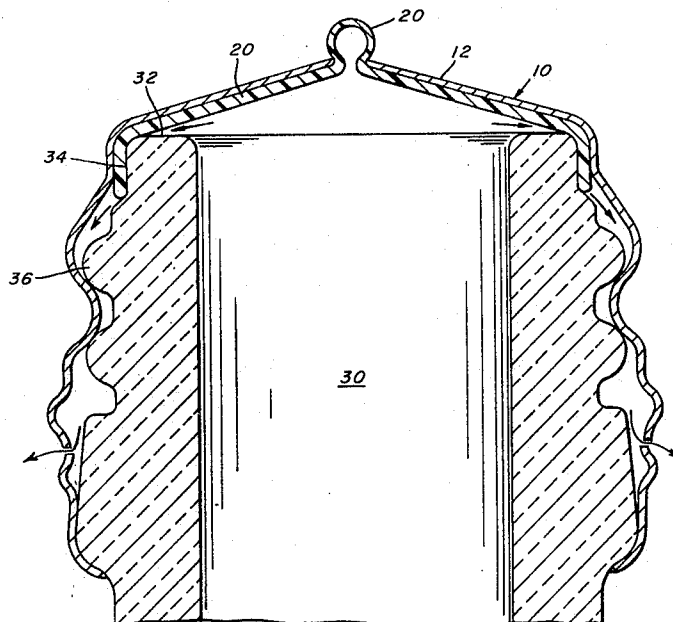


FIG. 1.

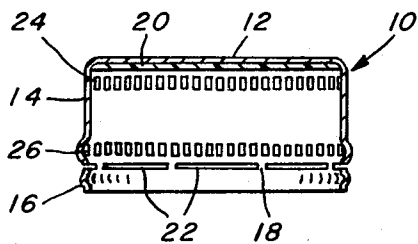


FIG. 2.

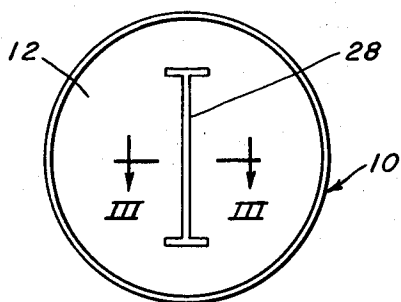


FIG. 3.

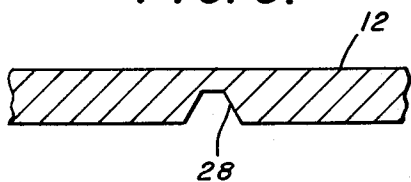


FIG. 4.

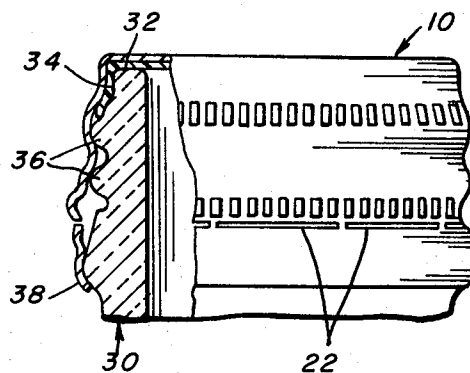


FIG. 5.

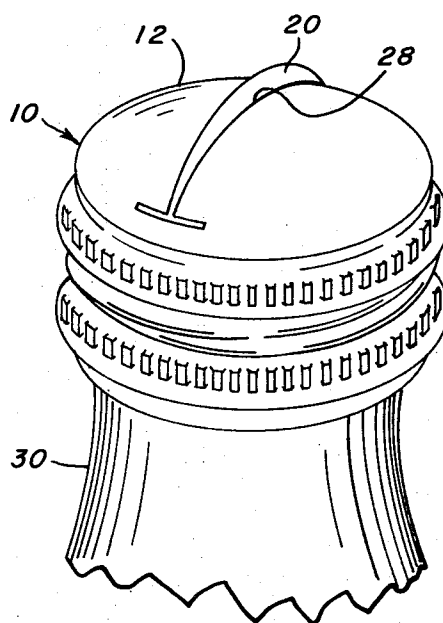
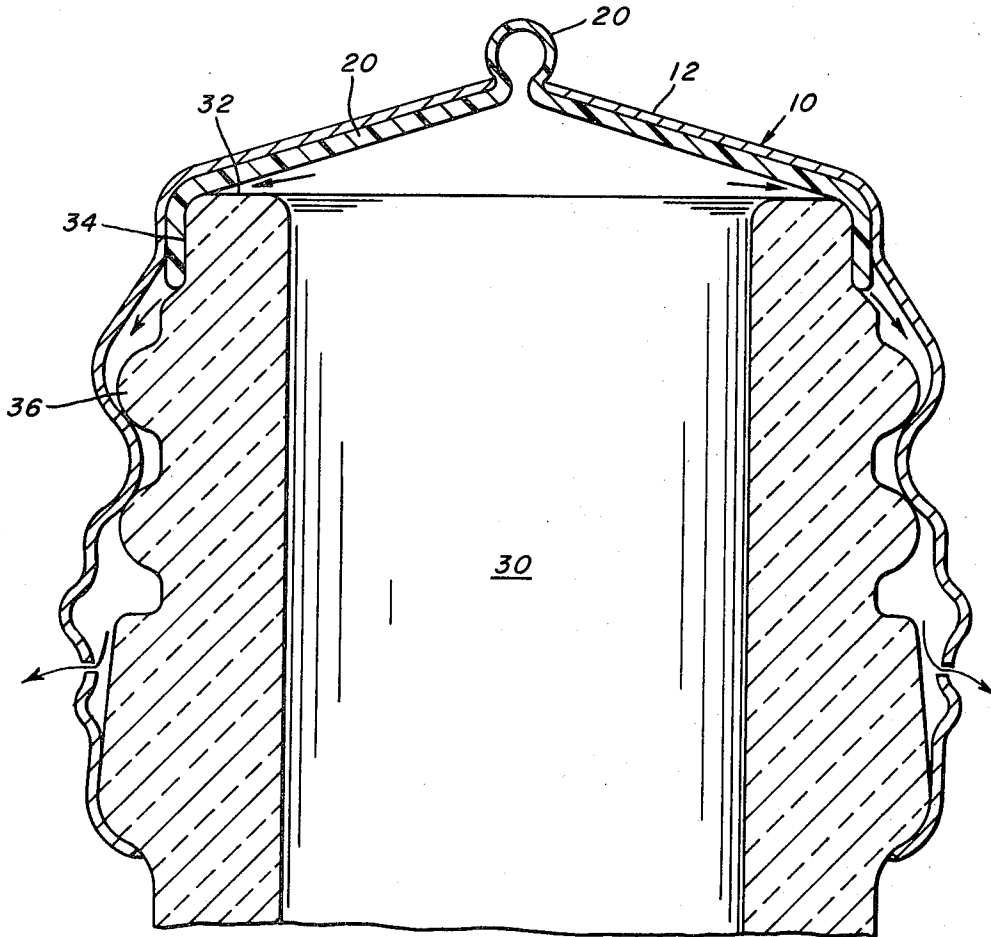


FIG. 6.



VENTING CLOSURE

BACKGROUND OF THE INVENTION

Numerous injuries have been caused by bottles which have exploded due to excessive pressures in the bottles. Excessive pressure may result from agitation and/or warming of bottles which contain carbonated beverages or beverages which may be fermented such as wine, beer or fruit juice. When these pressures become too great, either the closure is blown off the container or the container bursts, throwing particles of glass and other materials which can seriously injure anyone in the area of the explosion.

It is known to provide bottle closures which have means therein for venting excessive pressures from the containers on which the closures are sealed. For example, it is well known as is disclosed in U. S. Pat. Nos. 1,865,764; 2,726,002; and 3,310,193 to provide a bottle cap which has an aperture in its end wall and an inner liner of elastic material which has either a central perforation or weakened area which will permit venting of the container when excessive pressures are developed in the container. It is also well known to provide incisions or slits in the end wall of a closure to provide a vent opening through which gases can escape from a container as is shown in U.S. Pat. Nos. 3,059,799 and 3,387,765. Another closure has included grooves or thin sections in the liner which permit the liner to flex upwardly under pressure for escape of the gas from the container as disclosed in U. S. Pat. Nos. 2,265,862; 2,735,565; 2,739,724; and 2,514,124. When the pressure in these containers is reduced to a safe value, the sections again seal the container. U. S. Pat. Nos. 2,156,585; 2,174,437; 2,423,295; and 2,424,801 disclose metal caps with end walls which can be flexed upwardly by the internal pressures so that the liner can thin by stretching or drawing away from the container sealing surface to permit the escape of gas from the container between the liner and the sealing surface.

Although some of the closures described in the above mentioned patents have provided means for venting some containers, many of them have not been well suited for sealing containers with internal pressures of 100 pounds per square inch and above. Most such closures have also not provided continuous metal seals which prevent moisture and/or oxygen penetration into containers on which they sealed and/or prevent escape of carbon dioxide or other gases from the containers prior to venting. Accordingly, an improved sheet metal venting closure is desired which has a continuous metal top panel and which will seal a container with internal pressures of approximately 110 pounds per square inch, but which will vent pressures in the range of 110 to 160 pounds per square inch.

SUMMARY OF THE INVENTION

A metal closure is provided which has a top panel with a depending skirt for affixation to a container and a sealing liner of resilient deformable material underlying the top panel of the closure for sealing against a sealing surface of a container, the closure further having a scoreline centrally located in its top panel which is rupturable by excessive pressure in a container on which the closure is sealed to provide an aperture in the

top panel of the closure for a portion of the sealing liner to be forced through so that gas can escape from the container between the sealing liner and the sealing surface of the container.

Accordingly, an object of the invention is to provide an improved venting closure which will seal a container having internal pressures of approximately 110 pounds per square inch, but which will vent pressures in the range of 110 to 160 psi.

A further object of the invention is to provide a venting closure with a score line in its top panel which is rupturable by excessive pressures in a container on which the closure is sealed.

A further object of the invention is to provide a venting closure made of metal with a score line centrally located in the top panel of the closure which will be ruptured by excessive pressures in the container so that at least a portion of a sealing liner in the closure can be forced through the aperture in the top panel thereby permit gas from the container to escape between the sealing liner and a top sealing surface of the container.

Another object of the invention is to provide a venting closure which will display obvious evidence of venting.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects and advantages of the invention will be more fully understood and appreciated with reference to the following description and the drawings appended thereto wherein:

FIG. 1 is a vertical sectional view of a closure of the invention;

FIG. 2 is a bottom plan view of the closure of FIG. 1 with the liner removed therefrom;

FIG. 3 is a cross-sectional view taken along line III—III of FIG. 2;

FIG. 4 is a side view of the closure sealed on a container in partial cross section;

FIG. 5 is a perspective view of a closure sealed on a container and showing rupture of the score line and the gasket material projecting from the top of the closure; and

FIG. 6 is a fragmentary cross-sectional view of a closure sealed on a container showing venting of the gases from the inside of the container.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

A preferred embodiment of a closure of the invention is illustrated in the attached drawings and hereinafter described as comprising a roll-on closure with a pilferproof locking band for sealing on a glass or plastic container with a threaded finish on its mouth opening. It will be appreciated, however, that the invention can also be practiced with a great variety of closures such as screw-on closures, crown closures and tear-off closures among others. A preferred embodiment of a closure of the invention is further illustrated and described as including a pre-cut disc liner for sealing against a top sealing surface and a side sealing surface of a container, but the invention is not limited to such a liner. For example, flowed-in liners or pre-cut disc liners which seal against only a top or a side sealing surface of a container can also be used in the practice of the invention.

Referring to FIG. 1, a preferred embodiment of a metal closure of the invention is identified generally by numeral 10, and comprises a top panel 12, a depending skirt 14, a locking band 16 attached to the closure skirt by bridges 18 and a pre-cut disc liner 20 which is preferably made of a synthetic plastic material such as polyvinyl chloride (PVC) or the like. Closure 10 is preferably drawn from a sheet of hard temper aluminum base alloy, and preferably has a thickness of 0.008 to 0.0095 inch, although other materials of other thicknesses can also be used in a closure of the invention. In a preferred embodiment, liner 20 may be cut from a sheet of polyvinyl chloride which is approximately 0.028 inch thick. The cut liner is positioned in the closure against the undersurface of top panel 12, and may or may not be adhered to this undersurface.

In the closure which has been selected for purposes of illustration, a locking band 16 is attached to closure skirt 14 by bridges of metal 18 which are separated by slits or lances 22 in the skirt. Upon application of the closure 10 to a container, the bottom edge of locking band 16 may be tucked under a locking bead on a container to permanently secure the locking band on the container. When closure 10 is unscrewed from a container, bridges 18 are broken and the top portion of the closure is removed from the container leaving locking band 16 on the container. If the closure is replaced on a container, the broken bridges indicate that the container has been previously opened. A closure of the invention may also have vertical weakening lines such as scores, not shown, in its locking band. These vertical scores may rupture upon removal of the closure so that the locking band can be removed from the container with the closure. Closure 10 may also have one or two bands 24 and 26 of knurling in its skirt 14 to facilitate gripping of the closure to unscrew it from a container, and to re-apply it to the container.

FIG. 2 is a bottom plan view of closure 10 absent liner 20. This shows an I-shaped score 28 with the trunk of the I divisive of top panel 12 across approximately the central one-half of the top panel. Score 28 preferably has a cross-section in the shape of a truncated triangle although the invention is not limited thereto. Score 28 extends through at least one-half, and preferably through approximately two-thirds, of the thickness of the material in top panel 12 of closure 10 so that the score can be ruptured by excessive pressures in a container on which the closure is sealed. The score depth will vary from closure to closure depending on the material from which the closure is formed, size of the closure and pressures to be held among other factors. In one embodiment of a closure of the invention which was formed from aluminum approximately 0.0095 inch thick, score 28 was cut approximately 0.0062 inch deep leaving a residual metal thickness of approximately 0.0033 inch.

Turning to FIG. 4, a closure 10 of the invention is illustrated as sealed on a container 30 which has a top sealing surface 32, a side sealing surface 34, threads 36 and a locking bead 38. Closure 10 may be applied to container 30 by means of a pressure block which applies top pressure against top panel 12 of the closure to seal liner 20 against the top sealing surface 32 of container 30 and reforms the marginal portions of the closure and liner from a horizontal plane downward and

inward against side sealing surface 34 as is illustrated and described in U. S. Pat. No. 3,303,955. As described in that patent, one set of rollers may be moved inward against skirt 14 of closure 10 and rotated around the closure to form the skirt against container beads 36, and a second set of rollers may be moved against the bottom edge of locking band 16 and rotated around the closure to tuck such edge under locking bead 38 on the container. This secures closure 10 on container 30 with pressure maintained between liner 20 and top sealing surface 32 and side sealing surface 34 of the container to provide a tight seal therebetween. As sealed, the closure-container combination is capable of containing pressures well above atmospheric pressures, and can seal pressures of up to 110 pounds per square inch (psi) and above.

With prior container-closure combinations, such as that illustrated and described in U. S. Pat. No. 3,303,955, which are capable of sealing high internal pressures, excessive pressures could sometimes burst the container before the integrity of the seal is broken. It is a feature of this invention that the seal between the closure and container will be released before such excessively high internal pressures bursts the container.

The definition of excessively high internal pressures depends upon the design of the container-closure combination and the liquid which it is to contain. With some containers of light construction, pressures of over 30 or 40 psi may be considered excessive, whereas in other containers of substantial construction, pressures may not be considered to be excessive until they reach 110 psi or more. According to the present invention, the depth, length and shape of the score which is cut in the top panel of a closure will depend upon the pressures which are to be vented from the container-closure combination. Closure 10 which has been selected for illustration is designed to vent pressures of over 110 psi, and preferably in the range of 110 psi to 160 psi.

FIGS. 5 and 6 illustrate what happens when a container-closure combination of the invention has been subjected to excessively high internal pressures. The internal pressures in container 30 have caused top panel 12 of closure 10 to dome upwardly rupturing score 28 and forcing a portion of liner 20 through the aperture between the edges of the ruptured score. In this preferred embodiment of a closure of the invention with a substantially elastic PVC liner, the liner has not been ruptured by being forced through the aperture in top panel 12. Instead, gas pressure in container 30 has forced a portion of liner 20 upwardly through the aperture to form a bubble projecting above the surface of the closure. This draws liner material away from top sealing surface 32 and side sealing surface 34 of container 30 and permits gases in the container to escape therefrom between liner 20 and said top and side sealing surfaces. The gases can then pass outwardly between the container threads 36 and the closure threads to the outside of the combination. This relieves the pressure in container 30 to reduce it to a safe pressure which will not burst the container.

It is an advantage of the closure of the invention that once the excessive pressures have been reduced to a safe value, a seal remains between the closure and container which will prevent leakage of the container's contents from the container. Although liner material

has been drawn from the between the closure and sealing surface 32 and 34 to permit venting of excessively high pressures, sufficient liner material remains to seal against lower pressures and against escape of the container's contents.

Another advantage of the invention is that it is apparent from casual observation that a container-closure combination has vented. Liner material continues to project from between the edges of the ruptured score line after the pressure in the container has diminished to a safe range, and this projecting material makes it obvious that the closure has vented. This provides a warning that the contents of the container may have fermented or spoiled and may be unfit for consumption.

It is therefore seen that a closure and a closure-container combination have been illustrated and described which will vent excessive pressures from a container before the container bursts. Although a preferred embodiment of the invention has been illustrated and described, it will be obvious to one skilled in the art that numerous modifications can be made in this embodiment without departing from the invention. For example, it will be appreciated that the score in the top panel can be modified to have other score paths, cross sectional shapes or depths as long as it will rupture when excessive pressures are developed in a container on which the closure is sealed. Changes can also be made in the method of affixation and attachment means, among other details, without departing from the invention.

What is claimed is:

1. In a sheet metal container closure having a top panel and a depending skirt for affixation to a container and having a sealing liner or resilient deformable material underlying the top panel of the closure for sealing against a sealing surface of a container, the improvement comprising a score line centrally located in the top panel of the closure and cut through a portion of the metal thickness, said score line being rupturable by excessive pressure in a container on which the clo-

sure is sealed to provide an aperture in the top panel of the closure for a portion of the sealing liner to be forced through and thereby facilitate venting of pressurized gases from the container.

2. A closure as set forth in claim 1 in which the score line is I-shaped.

3. A closure as set forth in claim 1 in which the sealing liner is cut from a sheet of polyvinyl chloride.

4. A closure as set forth in claim 1 in which the score line is cut through approximately two-thirds of the metal thickness in the top panel of the closure.

5. A closure as set forth in claim 1 in which the score is in the undersurface of the top panel of the closure.

6. In a container-closure combination including a container having a sealing surface and a closure having a top panel and a depending skirt affixed to the mouth of the container and a liner of resilient deformable material underlying the top panel of the closure and sealing against the sealing surface of the container, the improvement comprising a score line centrally located in the top panel of the closure being rupturable by excessive pressure in the container to provide an aperture in the top panel of the closure through which a portion of the sealing liner is forced to facilitate the venting of excessive pressures from the container.

7. A container-closure combination as set forth in claim 6 in which the container has a top sealing surface and a side sealing surface against which the liner is sealed, and between which gases are vented when the score is ruptured in the top panel of the closure.

8. A container-closure combination as set forth in claim 7 in which the marginal edge portion of the top panel of the closure and the liner have been deformed downward and inward against the side sealing surface of the container.

9. A container-closure combination as set forth in claim 6 in which the score in the top panel of the closure is I-shaped.

10. A container-closure combination as set forth in claim 6 in which the liner is formed from polyvinyl chloride.

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