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Clawson et al.

[11] **3,918,378**

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[54] **CONTAINER CLOSURE WITH VENT OPENING MEANS AND METHOD OF FORMING THE SAME**

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[21] Appl. No.: **489,257**

Related U.S. Application Data

[62] Division of Ser. No. 281,715, Aug. 18, 1972, Pat. No. 3,851,782.

[52] **U.S. Cl.** ..... **113/121 C;** 113/15 A

[51] **Int. Cl.²** **B21D 51/26**

[58] **Field of Search** ..... 113/15 R, 15 A, 121 C, 113/116, 116 QA; 83/2, 7; 215/301, 268, 253, 258, 307; 222/541

[56] **References Cited**

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1,296,341	3/1919	Towle	222/541
2,187,433	1/1940	Punte	113/15 A
2,789,524	4/1957	Crawford et al.	113/116
3,786,967	1/1974	Giocomo et al.	222/541
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FOREIGN PATENTS OR APPLICATIONS

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[57] **ABSTRACT**

A container wall or end closure is provided which has a hollow upwardly convex embossment formed in it, and at least one radially extending score line in an outer portion of the embossment which will be ruptured to form a vent opening in the closure when force is applied against the center of the embossment. The container wall may further include an inclined wall formed therein around the periphery of the embossment and a thinned zone or band of material in such wall to facilitate rupture of the score in the embossment. A method of forming such a container closure is also provided.

3 Claims, 6 Drawing Figures

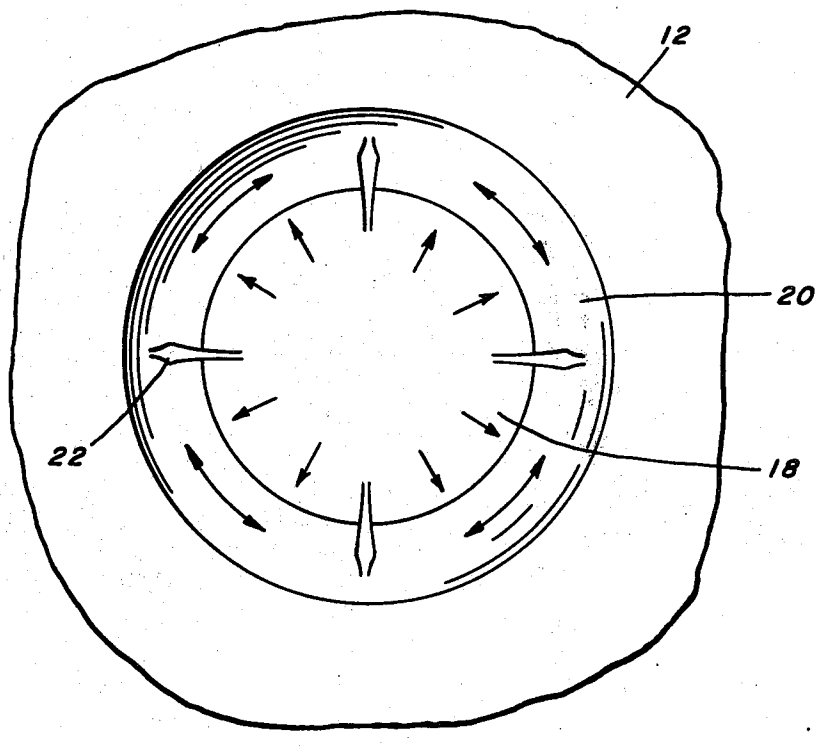


FIG. 1.

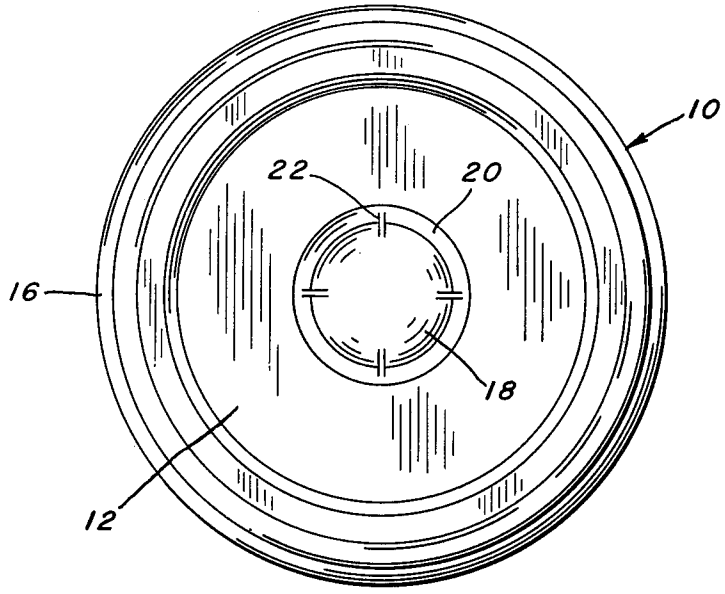


FIG. 2.

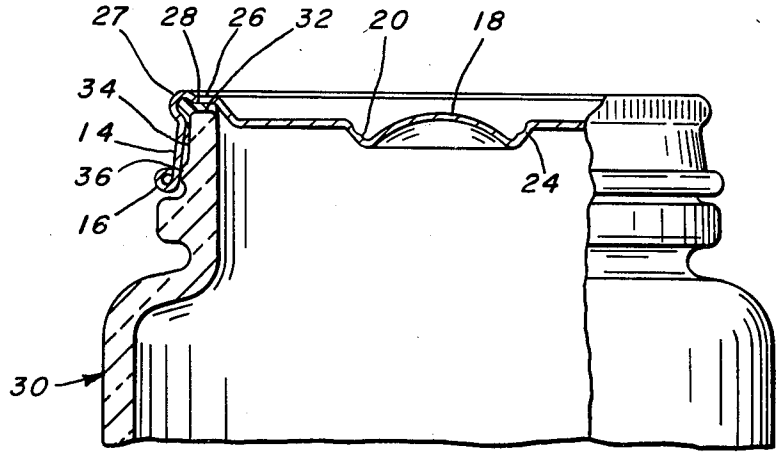


FIG. 3.

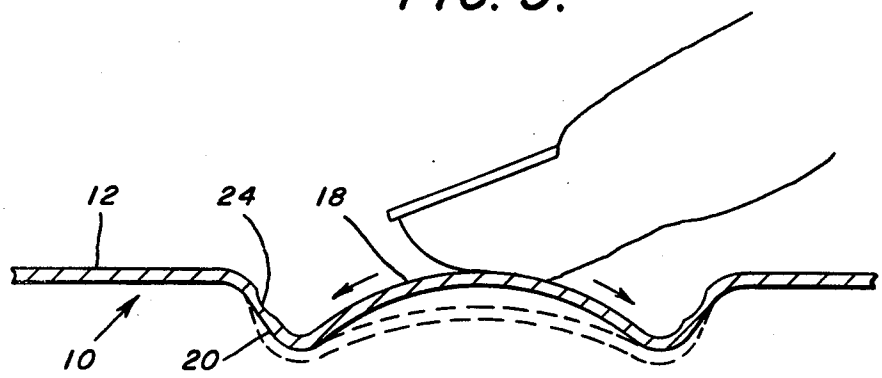


FIG. 4.

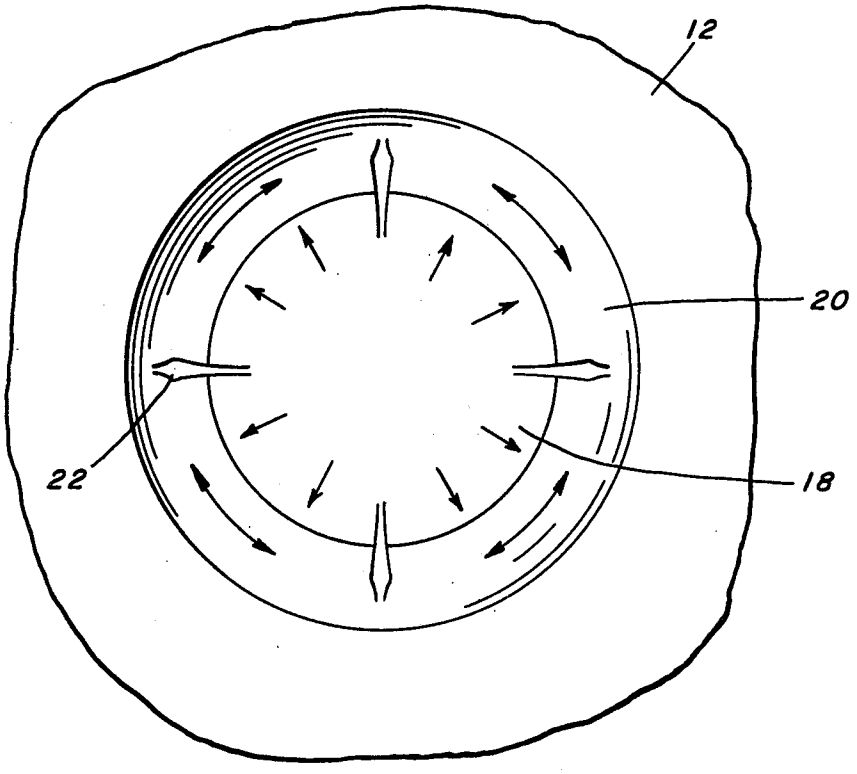


FIG. 5.

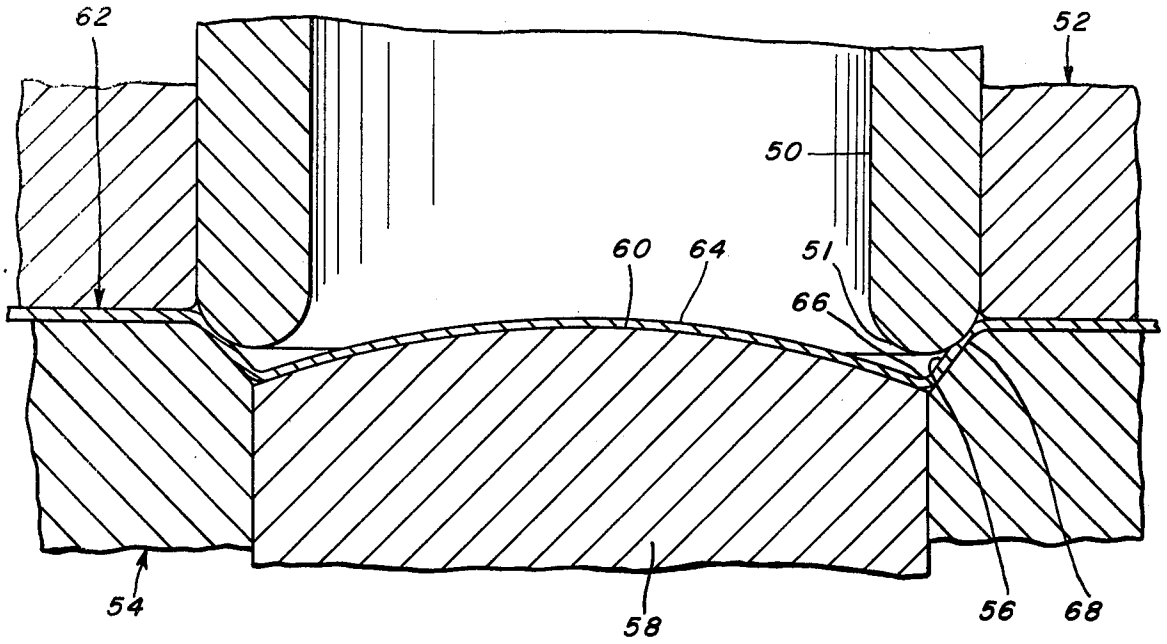
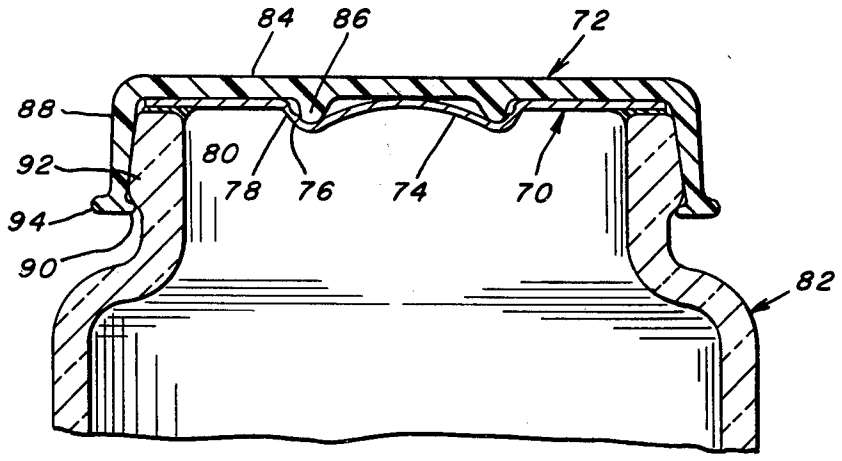


FIG. 6.



CONTAINER CLOSURE WITH VENT OPENING MEANS AND METHOD OF FORMING THE SAME

This is a division of application Ser. No. 281,715, filed Aug. 18, 1972 now Pat. No. 3,851,782.

BACKGROUND OF THE INVENTION

It is known to provide means in a container closure for releasing a vacuum or pressure in a container on which the closure is secured in order to facilitate removal of the closure from the container as is disclosed in U.S. Pat. Nos. 1,718,459 and 3,446,383. According to those patents, a tool such as a fork may be inserted in an opening in the closure to break a seal between a gasket in the closure and the bottle finish to permit venting of the bottle.

It is also known, as is disclosed in U.S. Pat. No. 1,743,283, to provide a rosette or other similar figure in the material of a can top to weaken the top and assist the consumer in forming a vent opening in the can top. It is further known, as is disclosed in U.S. Pat. No. 1,296,341, to provide a container wall with a boss in it and a groove around the boss having a weakened line in its bottom to be ruptured to form a vent opening in the container wall. There are also several patents including U.S. Pat. Nos. 3,246,791, 3,362,569 and 3,410,436, among others, which disclose container closures with embossed buttons formed therein and score lines around the buttons which may be ruptured by depressing the buttons with ones fingers or other pressure applying means. See also U.S. Pat. No. 3,262,611.

It is desirable to provide a container wall such as a closure or can end which includes means for forming a vent opening with a minimum of effort and without the need for a tool such as a fork or the like.

SUMMARY OF THE INVENTION

This invention provides a container closure with a hollow embossment formed in it which slopes outwardly from its center of its base, and further has at least one radially extending weakening line cut part way through the material of the container closure in the outer portion of the embossment. An inclined wall which includes a zone of reduced material thickness may connect the base of the embossment with the sheet material of the closure therearound for facilitating rupture of the score or scores in the embossment. This invention also provides a method of forming such a vent opening means in a container wall.

Accordingly, an object of the invention is to provide a container closure having means therein for forming a vent opening.

Another object of the invention is to provide a container closure having an embossment formed therein and at least one radially extending weakening line in the embossment which can be ruptured by depressing the embossment.

A further object of the invention is to provide a vent opening means in a closure which leaves visible evidence when the closure has been opened or tampered.

Another object of the invention is to provide a method of forming a vent opening means in a container closure.

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 hereto wherein:

FIG. 1 is a top plan view of a container closure of the invention,

FIG. 2 is a partial cross-sectional view of the container closure of FIG. 1 secured on a container,

FIG. 3 is an enlarged partial cross-sectional view illustrating manipulation of the vent opening means in the closure of FIGS. 1 and 2 to rupture the scores in the closure,

FIG. 4 is an enlarged top plan view of the vent opening means of FIG. 3 showing the forces in the closure during opening,

FIG. 5 is a cross-sectional view of tools which may be used to form an embossment in a container closure in accordance with the invention, and

FIG. 6 is a partial cross-sectional view of an alternative embodiment of a closure of the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS AND A METHOD OF FORMING THE SAME

Referring to FIGS. 1 and 2, a preferred embodiment of the invention is illustrated as comprising a metal closure **10**, preferably made of aluminum or an alloy thereof, having a top end wall or panel **12** and a depending peripheral skirt **14** with a bead **16** on its bottom edge, and further including a vent opening means formed in the top end wall. Closure **10** is adapted to be held in a sealed condition on a container mouth by a vacuum in the container, so the closure includes no threads, lugs or other mechanical means for securing it on a container. Such a vacuum sealed container closure assembly can be opened by venting air into the container to relieve the vacuum therein which releases the closure from the container.

According to this invention, a vent opening means in such closure may comprise an upwardly domed embossment **18**, an inclined wall **20** extending upwardly and outwardly from the base of the embossment **18** to the end wall **12** therearound, and four radially extending score lines **22** in the outer portion of the embossment. Although the length of score lines **22** is not considered to be critical, they preferably extend at least into wall **20**. Such scores may be cut either in the inside or outside surface of closure **10**. Embossment **18** and inclined wall **20** combine to form an upwardly open groove in top end wall **12** of closure **10**. Wall **20** may have a thinned portion **24** formed therein to weaken it and thereby facilitate rupture of scores **22** as will be explained.

In the embodiment selected for illustration, which is particularly adapted to have an opening formed therein to vent a container on which the closure is applied, embossment **18** is symmetrical about a vertical line through the center of the embossment and has an upwardly domed, arcuate cross-sectional configuration. It will be apparent to those skilled in the art that for other closure applications, such an embossment may be formed to have other shapes. For example, in a self-venting safety closure in which a score line will automatically rupture when excessive pressure exists in the container, the embossment may be downwardly domed in the closure so that the excessive pressure will deflect the embossment upwardly to rupture the score. An embossment in an end closure of the invention may also have an elliptical, oval or conical shape, although a substantially hemispherical-shaped embossment is preferred. Further, a closure of the invention is not limited

to four scores as in closure **10** which is illustrated in FIGS. **1** and **2.**

As seen in FIG. **2,** top end wall **12** of closure **10** includes a recessed central portion with a raised channel therearound comprising an inclined wall portion **25,** a horizontal wall portion **26** and a beaded corner **27.** Gasket material **28** such as foamed polyvinyl chloride may be disposed against the undersurface of the raised channel for sealing closure **10** against a container mouth. Although it is not critical to the invention, it is desirable for the top of embossment **18** to lie in approximately the same plane or below the recessed central portion of closure **10** to protect the embossment from being accidentally depressed when containers are stacked on top of one another or when a price stamp is applied to such a closure. If embossment **18** were accidentally depressed, one or more of score lines **22** could be ruptured to vent a container on which closure **10** is sealed, and such venting of the container could result in spoilage of the contents of the container and/or separation of the closure from the container.

FIG. **2** further illustrates an exemplary container **30** on which closure **10** may be sealed. Container **30** has a mouth configuration which includes an upwardly facing top sealing surface **32** and a side surface **34** with a plurality of outwardly projecting beads **36** thereon extending around the bottle mouth. In one embodiment of such container **30,** four such outwardly projecting circumferentially spaced heads **36** may be provided on side surface **34** and each such bead may include an arc length of 5° to 60° around the circumference of the bottle mouth. The number and arc length of these beads may vary with the diameter of the closure and container. Such beads **36** preferably have a frictional interference with closure skirt **14** to provide a limited amount of resistance against removal of closure **10** from the container **30** after the vacuum in the container has been relieved. Such frictional interference makes closure **10** more suitable for use as a reclosure after initial opening of container **30.** A plurality of spaced beads **36** are preferably provided on the container finish, rather than one continuous bead, because the spaced beads permit a closure to be deformed slightly by going out-of-round over and between such beads to facilitate application of a closure on the container, and to accommodate glass tolerances. If a container had one continuous bead around its mouth, it might be difficult or impossible to position a closure on the container when the interference between the beads and the closure skirt **14** is on the high side due to variations in the tolerances permitted in forming such container and closure. Such a continuous bead would not permit the closure to deform to fit thereover.

FIGS. **3** and **4** illustrate opening a venting means in a container closure **10** of the invention. This may be done by applying pressure against the top of embossment **18** by means of the thumb, finger or the like to depress the embossment to approximately the shape and position shown by the ghost lines in FIG. **3.** Depressing embossment **18** tends to flatten the embossment which spreads the peripheral portion or base of the embossment as indicated by the arrows in FIGS. **3** and **4.** This increases the circumference of the embossment and stretches the metal in the base of the embossment, or produces tensional stresses therein, and ruptures scores **22** in such periphery as is illustrated in FIG. **4.** The shape of ruptured scores **22** is exaggerated slightly in this figure for purposes of illustration. In an actual closure, the change in the appearance of the scores due to rupturing may be almost imperceptible to the naked eye. For purposes of the invention, the size of the opening which is produced by the ruptured scores is not considered to be critical because even a small opening will effectively vent air into a container to permit relatively easy removal of the closure from the container.

In some embodiments of this invention, embossment **18** may be formed to have a downwardly convex configuration when it is depressed to rupture score lines **22** therein. Such reversal of embossment **18** is readily apparent to a consumer and therefore provides visual evidence that a package with closure **10** thereon has been opened or tampered.

In opening a vent means of the invention, it is believed that inclined wall **20** and thinned zone **24** in such wall facilitate rupture of scores **22** because the wall and thinned zone reduce the restraint against flattening of the embossment. If no such inclined wall were provided, the metal in closure **10** around embossment **18** would provide more resistance against depressing and flattening the embossment because such metal could not accommodate an increased diameter of the embossment except through buckling or wrinkling of the metal which would require substantial force. When embossment **18** is depressed in a closure which includes an inclined wall **18,** the wall can easily pivot or hinge outwardly, especially when it has a thinned zone **24** therein which weakens the wall to permit bending along the zone. Preferably, thinned zone **24** is located relatively high in wall **20,** or close to the material in closure **10** adjacent the wall, to further facilitate outwardly pivoting of the lower portion of the wall.

Once a closure of the invention has been vented by depressing embossment **18** to rupture scores **22,** the closure can be easily removed from container **30** by simply lifting it off the container. As explained above, a frictional interference fit of a few thousandths of an inch may be provided between the skirt of the closure on container beads **36** so the closure will not be accidentally dislodged from a container, but can be removed from a container with ease. After initial venting of closure **10** for removal of the closure from a container, the closure can be used to reclose the container for temporary storage. Such vented closure is not intended for use in hermetically resealing a container since the closure has the vent opening in its top end wall.

FIG. **5** illustrates exemplary tools which may be used to form an embossment in a sheet of material such as a metal container closure in accordance with this invention. Preferably, the top panel will have been scored prior to having the embossment formed therein. The closure can be formed before or after the opening device has been formed. The exemplary tools include an upper forming ring **50** with a rounded working end or nose **51,** an upper holddown member **52** around the ring, a lower annular forming member **54** with an upwardly and inwardly facing angular forming surface **56** on its top inner corner, and a center punch **58** with an upwardly arcuate working surface **60** over which an embossment can be formed.

In the operation of such tools, a sheet of material such as a metal container closure **62,** which is preferably made from aluminum alloy sheet material, is placed between annular member **54** and holddown member **52** which is clamped against the closure, and ring **50** is moved downward against the closure to draw metal

from the closure into the groove formed by the two lower dies. Rounded nose **51** on ring **50** then coins the metal in closure **62** against angular surface **56** on annular member **54,** which extrudes metal inwardly and downwardly into the groove between the punch **58** and annular member **54.** This further forms the metal from closure **62** over punch **58** to produce an upwardly convex embossment **64** with a groove **66** around the embossment. As formed, the outer wall of groove **66** has a narrow band or zone **68** in which the metal of the closure is thinner than is the original thickness of the metal. As explained above, such thinner band or zone of material **68** in the wall of the groove increases the flexibility of the wall to facilitate rupture of scores in the sheet.

FIG. **6** illustrates an alternative embodiment of the invention which comprises a metal sealing disc **70** having a vent opening means in its center, and a plastic cover cap **72** over the disc. Disc **70** is adapted to be held in a sealed condition on container **82** by a vacuum in the container and therefore does not include mechanical means for securing it on the container. A vacuum sealed package with disc **70** thereon can be opened by venting air into the package to relieve the vacuum and release the disc from the container. In accordance with this invention, a vent opening means in disc **70** may include an upwardly convex embossment **74** in the disc, at least one radially extending score line (not shown) in the periphery of the embossment, and an annular wall **76** inclined upwardly and outwardly from the base of the embossment to the sheet metal therearound. Annular wall **76** may have a thinned annular zone **78** in it to facilitate rupture of the scores in the disc as was explained with respect to the embossment illustrated in FIGS. **1–4.** Disc **70** may also have a ring **80** of gasket material on its undersurface for seating against the top of container mouth **82.**

Plastic cover cap **72** includes a top end wall **84** with an annular rib **86** on its undersurface for disposition in the groove in disc **70** formed by embossment **74** and annular wall **76,** and a depending peripheral skirt **88.** Such skirt may have an inwardly projecting circumferential edge flange **90** thereon for engagement under container bead **92** to retain the cap on the container, and an outwardly projecting circumferential edge flange **94** for facilitating removal of the cover cap from container mouth **82** with ones thumb or fingers. Annular rib **86** on cover cap **72** is provided to help prevent accidental rupture of the scores in disc **70.** With a cover cap **72** having such rib **86,** force applied against the top of the cover cap will be supported by substantially the entire surface of disc **70** so that embossment **74** will not be thereby depressed within the disc to rupture the scores in the embossment. In order to depress embossment **74** with disc **70** and thereby rupture the scores in the embossment, cover cap **72** must first be removed. Rupture of the scores in disc **70,** vents ambient air into container **82** so that the disc is no longer held against such container and can be easily removed. After opening, cover cap **72** is available for use to reclose container **82.**

From the above description and the drawings appended hereto, it is seen that this invention provides a container wall such as a closure or can end having a venting means therein which may be opened by pressing with the thumb or finger, and a method of forming such a venting means. Although a preferred embodiment of such a closure and a preferred method of forming the same have been illustrated and described, it will be apparent to those skilled in the art that numerous variations can be made in the closure and a method without departing from the scope of the appended claims. For example, a closure of the invention may have threads rolled in its skirt to secure it on a threaded container, and may have a pilferproof locking band on the bottom edge of the skirt. The venting means of the invention may also be formed in a can end for venting a can on which the end is sealed to facilitate opening of the end without spraying of the contents of the container on the user. As explained above, the venting means of the invention may also be formed in a safety closure in which the score lines in the venting means will automatically rupture when excessive pressures are present in a container on which the closure is sealed. Further, the score lines or weakening lines in a closure of the invention may be formed by any of a variety of known methods.

What is claimed is:

1. A method of forming a vent opening in sheet metal wall for a container comprising the steps of:

cutting at least one score line part way through the sheet metal of the wall;

supporting the metal wall against a die having a generally hemispherically shaped support convex toward the wall with an annular groove therearound open toward the wall, and with the wall positioned with the score line extending in the wall radially overlying the outer portion of the support; and

drawing the metal wall against the support and into the groove therearound to form a generally hemispherically shaped embossment in the wall with an annular wall portion around the embossment forming a groove with the outer portion of the embossment, and with the score line extending radially in the outer portion of the embossment.

2. A method as set forth in claim **1** which includes coining the metal in the annular wall portion around the embossment to thin the wall portion and extrude metal inwardly into the groove around the embossment.

3. A method as set forth in claim **1** which includes cutting a plurality of score lines part way through the sheet metal in the wall radiating from a predetermined location in the wall and spaced to overlie the die around the periphery of the support therein.

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