

[54] **EASY OPEN METAL CLOSURE**  
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 [51] **Int. Cl.** ..... **B65d 41/32**  
 [58] **Field of Search** ..... 215/253, 254, 255, 324,  
 215/327; 220/54, 27

[56] **References Cited**  
**UNITED STATES PATENTS**  
 3,480,171 11/1969 Rohde ..... 215/254 X  
 3,545,638 12/1970 Brown ..... 215/255  
 3,743,129 7/1973 Willis et al. .... 215/255

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[57] **ABSTRACT**  
 The disclosure relates to an improvement in a convenience type (easy-open) closure for a bottle or the like. The closure includes an outer cap of severable material, such as aluminum, crimped around the rim of the bottle finish. The cap has an integral tear strip formed by score line weakening of the material. The score line has two spaced legs that join at their innermost end at the top of the cap and extend into the skirt, the one leg that extends to the free edge of the rolled or curled skirt wire is interrupted and discontinuous for a short length occurring about mid-way of the rolled section of the skirt wire. This increased the "hoop strength" of the closure. The other leg is terminated well within the skirt. Pressure retention of the closure is enhanced appreciably.

**5 Claims, 7 Drawing Figures**

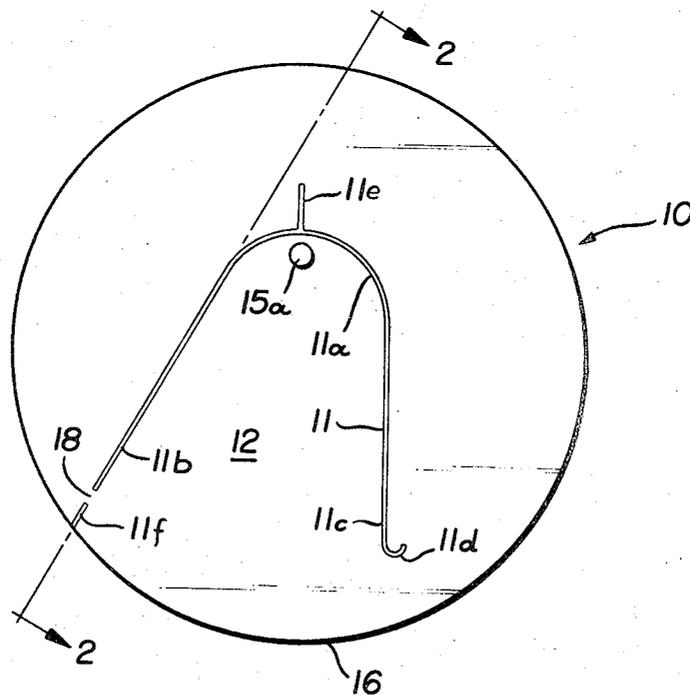


FIG. 1

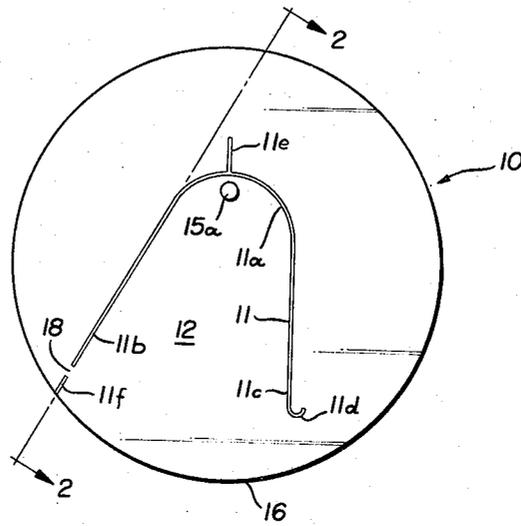


FIG. 2

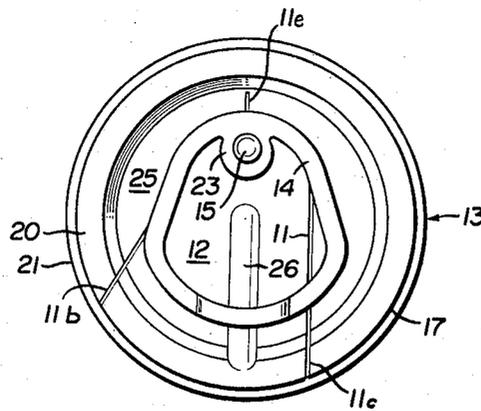


FIG. 3

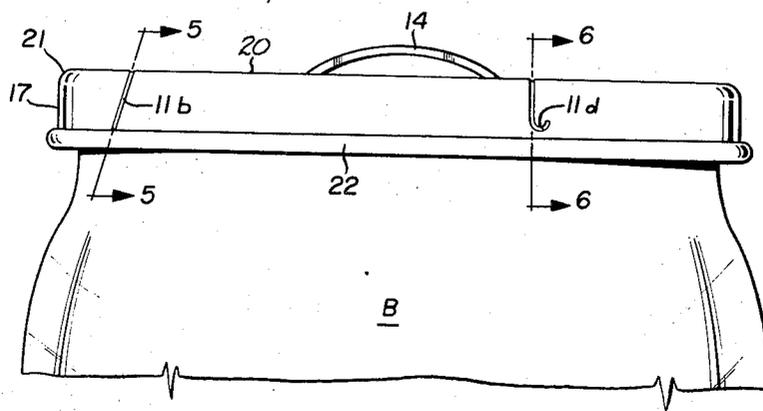


FIG. 4

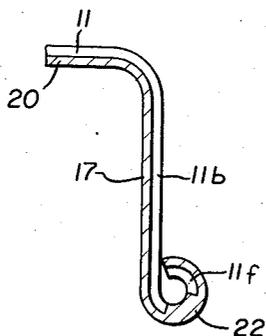


FIG. 5

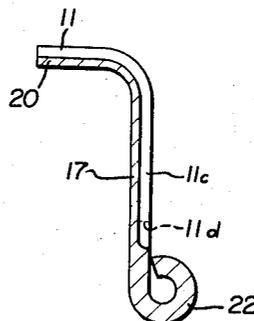


FIG. 6

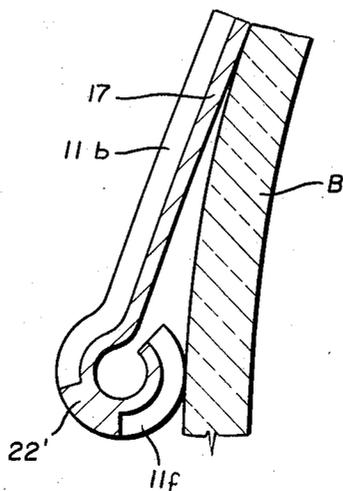


FIG. 7

## EASY OPEN METAL CLOSURE

## BACKGROUND OF THE INVENTION

The present invention relates to convenience opening closures for bottles or like containers, such as the closure disclosed in U.S. Pat. No. 3,561,631. The closure of this type is placed over and about the bead at the mouth rim of the bottle and compressed or crimped thereon by a capper. In the top panel of the closure is a pull ring or tab riveted onto an innermost end portion of an integral, scored tear strip formed in the metal of the cap. This pull ring, when it is lifted and pulled, severs the metal at the one end of the tear strip from the top of the cap and subsequently severs the strip from the balance of the cap through the skirt edge or wire bead thereby loosening it and freeing it for removal from about the finish or bead of the bottle as a single piece. In the prior art closures of this type, the formed tear strip has included the score line in a continuous fashion defining a substantially V-shaped section of the cap wherein the apex of the V or bight of the scored tear strip occurs in the top panel portion thereof. The diverging legs of the tear strip extend toward the skirt and lower rim or wire of the cap. One of the legs extends to the outer free edge of the rolled periphery of the skirt and the other leg most often terminates well within the skirt wall portion. The score line weakening of the metal in defining the tear strip weakens the encircling wire or curled edge of the skirt of the cap in what is generally referred to as the "hoop strength" thereof.

## SUMMARY OF THE INVENTION

It is therefore the principal object of the present invention to increase hoop strength of a closure of this type. In so doing, the pressure retention property of the closure is enhanced.

Another important object of the invention is to provide novel structure in the cap skirt and tear strip by the provision of an interrupted score line extending along the skirt and into the curled or rolled wire portion at the peripheral edge thereof. The interruption in the score line occurs in the outer bend region of the curl or wire and thereby strengthens this section of the closure skirt, i.e., increasing hoop strength of the unit.

The invention is especially adapted to closures for pressure containers, such as beer or carbonated beverage products under a range of pressure of 2.5 to 7 volumes. Fracture of the wire of the closure after it is applied on a pressurized container invariably means a leakage or break of seal on the packaged product and spoilage of the product of leakage from the container may result. In such a package, pressure retention is of utmost importance.

Besides enhancing the hoop strength of the closure skirt, the present invention also provides a means by which material saving may be achieved in the closure manufacture. For a given thickness of metal or material in the closure, the hoop strength by utilization of the present invention is increased. Accordingly, if a comparable hoop strength in the closure skirt is to be achieved, as compared to the prior art style of closure, the metal or material thickness may be reduced; and thus, a material saving made in the resultant closure by the present invention.

Various other objects of the invention will occur to those skilled in the art from the following disclosure and detailed description of the appended drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a circular metal cap blank wherein the scored tear strip of the invention is formed;

FIG. 2 is a sectional elevational view taken along line 2—2 on FIG. 1;

FIG. 3 is a plan view of the completed closure of the invention;

FIG. 4 is a side elevational view of the closure of the present invention as applied to a bottle;

FIG. 5 is a sectional elevational view taken along line 5—5 on FIG. 4;

FIG. 6 is a sectional-elevational view of the cap as taken along line 6—6 on FIG. 4; and

FIG. 7 is a sectional elevational view, similar to FIG. 5, illustrating a second embodiment of the curled wire portion of the present invention.

## DESCRIPTION OF THE INVENTION

Referring to the drawings, FIG. 1 illustrates a closure blank 10 which comprises a stamped, circular flat section of sheet metal. The preferred embodiment has the blank 10 of aluminum which includes a weakening means reducing shear strength of the metal along a line 11. In the preferred form, this weakening means is accomplished by die forming a score line defining the desired outline of a tear strip. The die forming is done on the circular flat blank. The tear strip will appear in the formed closure, to be presently described, in a functional form. The scoring is done by blanking dies which have the tear strip 12 configuration therein bounded by the score line 11. In forming score line 11, blanking dies of conventional type (not shown) reduce the thickness of the metal to form a weakened segment of the metal. When this segment of the metal is subjected to shearing force, the metal will sever along the score line path; however, prior to the application of such shearing force, the metal of the blank 10, when in cap form as described hereinafter, will hold the product in pressure internally of the bottle and retain the cap as an integral metal closure on the container.

The score line 11, in preferred form, is outlined to form the tear strip 12 located well beyond the axial center of the cap and extending across and toward the other edge of the cap 13.

The curved nose section 11a of the tear strip 12 is formed to center on and abut the inner edge of the straight side segments 11b and 11c of the score line. The nose section 11a accommodates the location of a pull ring device 14 and the rivet 15 formed integral from metal within the nose section 11a of the tear strip (see FIG. 3). The one leg or side segment of the score line 11b extends to a location near the periphery of the cap blank, whereat the score line is interrupted for a short space, as shown at 18. This leg of the score line then continues after the interruption in the segment 11f extending to the outer peripheral edge of the blank. The interruption segment 18 is spaced about 0.050 inches inwardly, i.e. the score segment 11f is 0.050 inches in length. In the preferred form, the span of the interruption segment 18 is about 0.035 inches in length defining the space between the inner end of the segment 11f and the outward terminal end of the segment 11b of the one score leg. The score leg 11b then ex-

tends continuously from adjacent the space 18 into the arcuate apex segment 11a and then along the second leg 11c which terminates at a reverse arcuate segment 11d. Thus, the tear strip 12 is formed of the two leg segments 11f-11b, 11a and 11c-11d having different relationships with the free outer edge 16 of the blank 10. The tear section 12 has the two spaced edges that join together only in the top portion and each leg of said tear section extends into the skirt. The skirt is rolled at the edge to form a bead or wire at the lower perimeter of skirt 17 of the metal cap formed from the blank 10.

Blank 10 is formed in a progressive die set. In addition to forming the score line, as just described, the integral rivet in its initial raised form 15a is embossed within the tear strip area 12 (FIG. 1).

As shown on FIGS. 3 and 4, blank 10 is processed through dies to form the metal cap, indicated generally as 13. The cap 13 includes a top central panel 25 and raised therefrom in a radial direction is annular portion 20 providing a packing groove to be disposed over the bottle finish rim. The periphery of the portion 20 has a corner radius 21 (FIG. 4) connecting with the circumferential skirt 17, its free lower end or free edge being rolled upon itself as a peripheral wire 22 of the cap 13.

In the first form of the invention, as shown on FIG. 5, the rolled wire 22 has the peripheral edge portion of the cap turned outwardly, upwardly and then rolled back inwardly, hereinafter mentioned as the "outside" rolled wire form of cap. As shown on FIG. 5, the section taken along the leg of the score line 11b indicates the score defining the edge of the tear strip 12 extends over the packing groove 20 around the corner radius 21 and down the skirt wall 17. At or near the bottom curvature of the rolled wire 22, the interruption 18 of the score leg 11 occurs. On the upward side of the curl of the bead 22, the score line 11f continuance is shown extending through the peripheral edge of the metal.

FIG. 6 is a section through the other score leg 11c defining the opposite spaced edge of the tear strip 12. The score line 11c extends through the raised portion of the top panel, around the corner radius 21 and well into the skirt wall 17. The reversed curvature portion 11d of the score line occurs just above the rolled wire 22 and terminates in the skirt wall. Thus, the other leg of the score line terminates well up in the skirt wall spaced from the peripheral edge of the metal of the rolled wire 22. This differential in score leg length, as between portions 11b and 11c, effects a one-piece removal of the cap 13 upon operation of the tear strip through the pull ring 14. The ring pull or pull tab device 14 (FIG. 3) comprises a ring or tab portion and a yoke portion 23 by which the pull ring device 14 is fastened to the tear strip and cap top panel.

The ring pull device 14 is secured to the tear strip 12 adjacent the curved nose portion 11a of the score line by means of the integral rivet 15a inserted through an aperture in the tongue 23 of the ring pull device and the rivet is flattened, as at 15 (FIG. 3). Ring pull device 14 is fastened to the nose section of the tear strip to function as a lever and a pull handle, in that order. The tongue 23 extends from rivet 15 to join with the ring pull device 14 at about the inner reaches of score line 11a, and the ring device extends outside the score line 11 to bear against the top panel portion 25 of the cap. If the ring pull 14 is lifted by inserting the finger under its free end remote from the rivet, the opposite forward

end of the ring pull engages panel 25 outside score line 11a and functions as the fulcrum point for the lever action. The connection of tongue 23, integral with pull ring 14, and rivet 15 lifts tear strip 12 causing it to fracture in the underlying area of score line 11a. Continued pulling of the ring pull 14 tears the strip 12 along score 11b and 11c. When the shearing of the weakened metal along line 11b reaches the interrupted segment 18, fracture of material stops in the rolled wire area. However, a new fracture begins in the segment 11f of the score line. In opening the closure, the severing is accomplished by a straight pull and the wire severance at the rolled area 22 is enhanced by a slight twist on the pull ring. The rolled wire breaks completely at the interrupted segment 18 and with less force than if score 11b had extended continuously to the outer peripheral edge of the metal.

On the other hand, in capping the closure 13 about the rim of a bottle B, the circumference of wire 22 is slightly larger than the circumference of the rim or finish of the bottle to readily nest the cap over the bottle mouth. Once the cap 13 is located about the bottle finish rim, a capping device (not shown) compresses the annular skirt wall 17 and wire 22 inwardly and against the bottle wall. The present invention increases the strength of the skirt of the cap by the provision of interrupted segment 18 along the score line 11b-11f. Of course, the other score line 11c-11d is maintained above the rolled edge 22 of the skirt. This score interruption 18 increases the "hoop strength" of the closure skirt and wire once cap 13 is applied onto a bottle B. As a result, the pressure retention of the closure is increased markedly. On the other hand, cap removal function is enhanced because in shear severing of the metal, the operation of pull ring 14 causes a greater percent of function of one-piece removal of the cap compared with the prior art tear strip configurations. That is to say, the tear strip fractures the wire 22 only at the score line 11b-11f plane and the metal between score 11d and the wire 22 will not sever. This unsevered portion connects the tear strip 12 and the remainder of the closure as a handle strap for pulling the cap off the bottle in one piece once circumferential wire 22 is broken.

The bottle B is constructed of glass and includes a mouth opening defined by a circular rim on which there is preferably formed on annular bead. This rim and bead about the mouth of bottle B forms a bottle finish over which the closure 13 is applied and fastened by capping (crimping) the skirt 17 and wire 22 around it.

Longitudinally of the scored tear strip 12 is an embossed strengthening rib 26. This aids in the longitudinal reinforcement of the tear strip against bending. The wire 22 of the skirt is broken upon radial and outward pull on the tear strip to release the encircling crimp of the cap 13 on the underlying bead of the bottle B. In the form shown, a form of gasket, such as a full liner snap cap underlies the cap 13 and covers the mouth of bottle B.

#### EXAMPLE

A cap 13 formed in accordance with the invention is applied over a 42 mm. bottle mouth finish and crimped and capped onto the bottle B, (FIG. 3). The closure was tested for pressure retention utilizing this closure as against a closure wherein the score, such as 11b, ex-

tended all the way through the edge of the wire 22. The cap constructed in accordance with the invention had approximately a 20 p.s.i. pressure retention increase capability when both types were tested to failure by increasing internal pressure in the bottle.

In the operation of opening the closure of the invention, the pull required to break the wire 22 was on the order of 3 pounds of pull (pull gauge measurement) accompanied by a twist as the score line 11b was severed to the interrupted segment 18. This pull force is a decrease over that required by the other style of closure score of conventional type.

A second embodiment of the invention is shown on FIG. 7. In this embodiment, the score line 11b extends into an "inwardly" rolled wire 22' and the score appears on the outside surface of the wire 22' interrupted by the portion 18, indicated by the arrow. Thereafter portion 11f of the score continues to the edge of the metal of the rolled wire. This inwardly rolled wire is sometimes preferred in cap constructions over the other form, as shown in FIG. 5. The invention is readily adaptable to either type, i.e., the outwardly rolled wire or inwardly rolled wire form of cap skirt formation.

Having shown and described preferred embodiments of the invention, changes, modifications and substitutions, other than as may be mentioned herein, may be made by those ordinarily skilled in the art without departing from the spirit and scope of the invention as defined by the appended claims; wherein we claim:

1. A closure of the tear-open type for use in closing an opening of a container comprising a severable tear strip integral in said closure, said closure having a top panel portion, annular depending skirt portion adapted to encircle said opening of the container, and an annularly extending corner radius portion joining said top and skirt portions, said tear strip being defined by a score line weakening means, said tear strip including two spaced apart legs of the score line that join together only in the top portion, one leg extending from the top portion into the skirt portion and to the free edge at the periphery thereof and is interrupted and discontinuous near said free edge of said skirt, the free edge of the skirt being rolled and said interrupted por-

tion of the one score leg being disposed in said rolled edge portion of the skirt, a pull member for severing the tear strip, and means connecting the pull member to said tear strip near the junction of said two score line legs in the top portion for effecting the severing of the integral tear strip of said closure for removal of the latter from a container.

2. A closure for a container having a finish rim defining a mouth opening at one end of the container, said closure comprising a top portion adapted to be disposed over said mouth opening and a depending peripheral skirt portion adapted to be disposed around said container encircling the rim thereof to secure the closure to said container, the skirt of said closure being reversedly rolled at the peripheral edge thereof, said closure having a tear section integral therewith and provided with two spaced edges that join together only in the top portion to define thereat one end of the tear section, one edge of the tear section extending from the top portion into the skirt portion and the other edge extending to a terminal end in the skirt and spaced from the peripheral edge of said skirt, said two edges of the tear strip being defined by score line weakening of the closure material, said score line weakening of said one edge being interrupted and discontinuous intermediate the rolled extent of the outer peripheral edge of said skirt, said score line extending to the outer peripheral edge of said rolled skirt.

3. The closure of claim 2, wherein the peripheral edge of said skirt is reversedly rolled outwardly on the closure skirt wall.

4. The closure of claim 2, wherein the peripheral edge of said skirt is reversedly rolled inwardly on the closure skirt wall.

5. The closure of claim 2, wherein the score line interruption of said one edge of the tear strip is approximately 0.035 inch in radial length and is disposed radially approximately 0.05 inch from the free peripheral edge of the closure skirt, said interruption of said score line occurring within the reversedly rolled portion of the skirt.

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