

[54] **EASY OPEN END CLOSURE**

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[51] Int. Cl. **B65d 17/20**

[58] Field of Search 220/54, 53, 48, 27;
222/541

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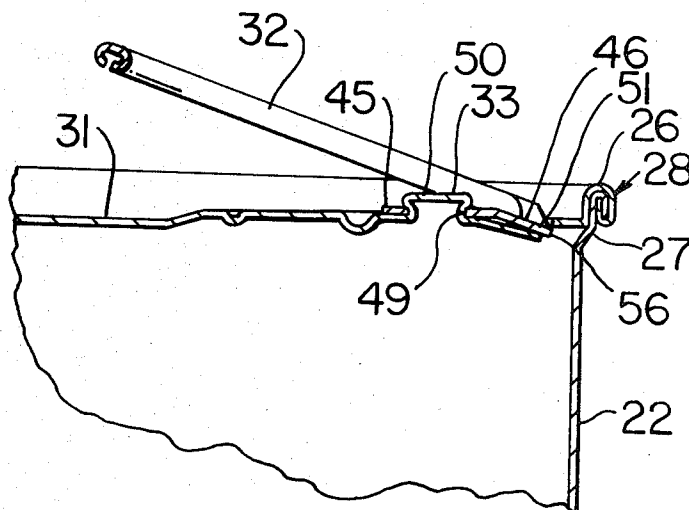
Primary Examiner—George T. Hall

[57]

ABSTRACT

An easy open end closure is provided with a roughly circular full-size tear-out panel which is easily severed by initially severing a chordal portion having a comparatively large area and which extends over an arcuate length of at least 45° whereupon the remainder of the panel is severed with ease.

15 Claims, 10 Drawing Figures



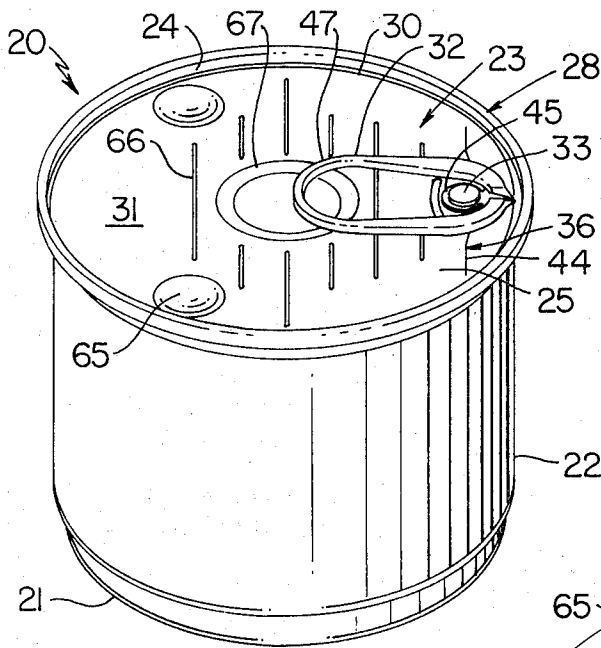


FIG. 1

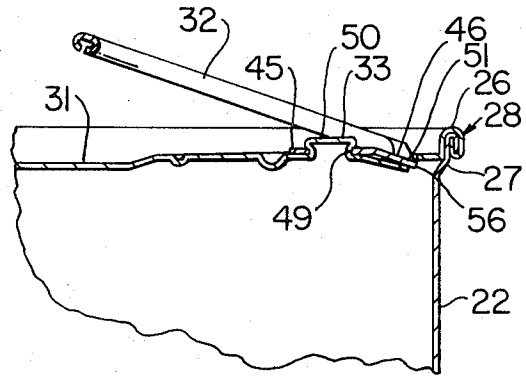


FIG. 2

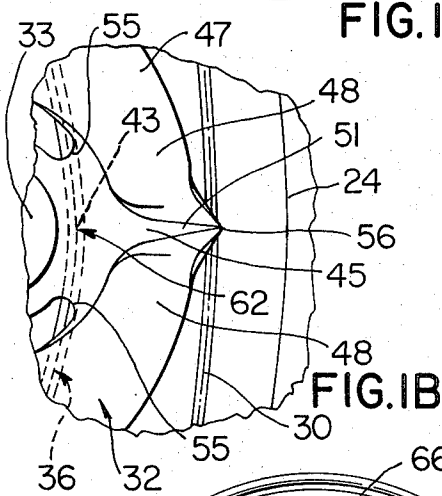


FIG. 1B

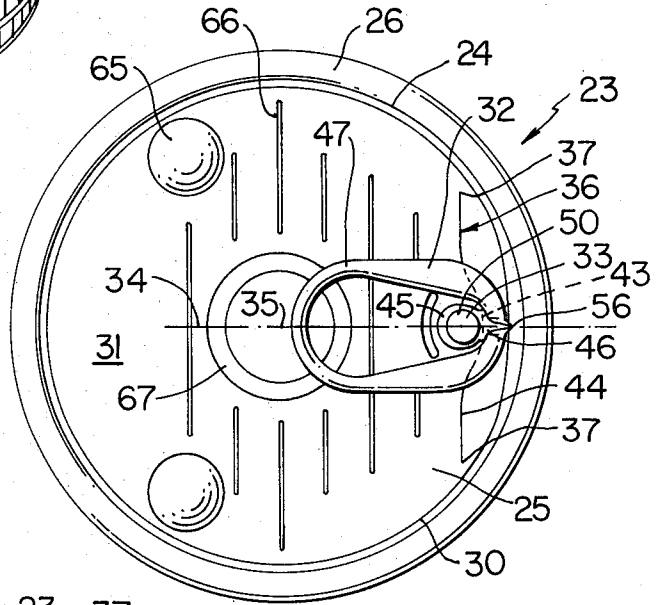


FIG. 1A

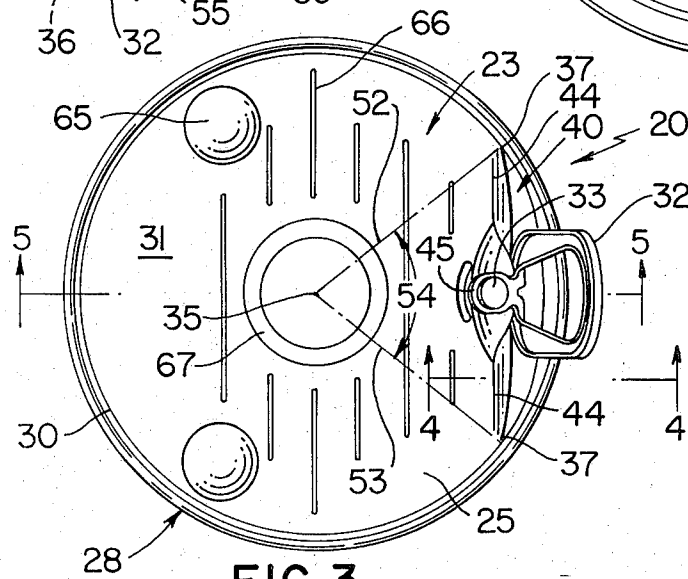


FIG. 3

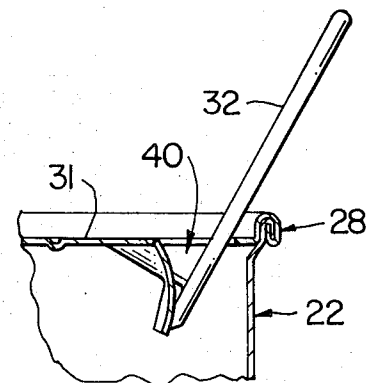


FIG. 4

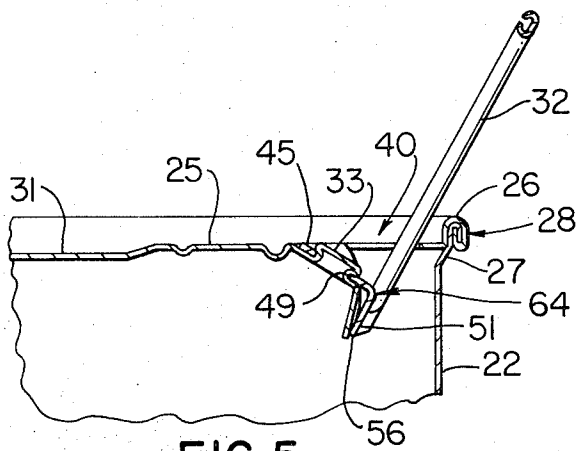


FIG. 5

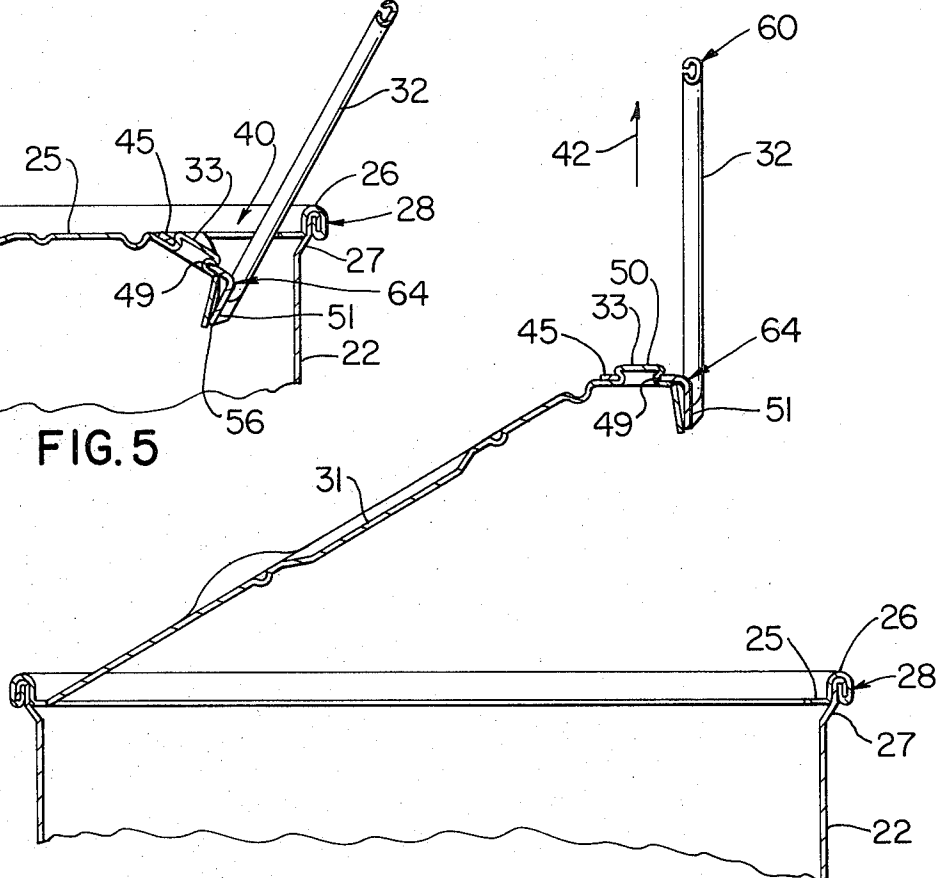


FIG. 6

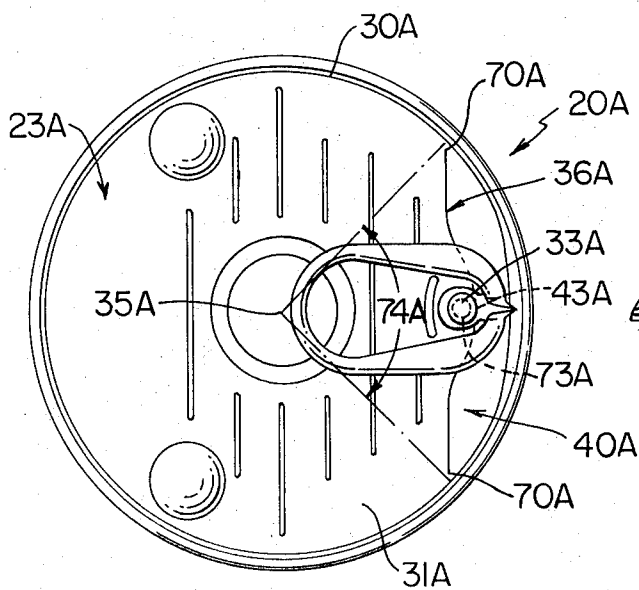


FIG. 8

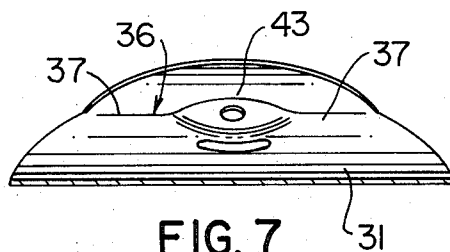


FIG. 7

EASY OPEN END CLOSURE

BACKGROUND OF THE INVENTION

In providing a tear-out panel for a container which is substantially the full size of its associated end closure or wall, it is generally impractical to provide an opening tab which will allow severing of the tear-out panel in the same way that keyhole openings are provided in beverage cans. Therefore, it is common practice to use an opening tab which is first used as a lever to sever a portion of the tear-out panel whereupon the tab is then used to sever away the remainder of the panel. However, it is generally very difficult to sever a portion of such panel initially, by pivoting or similar action, which is sufficiently large to enable complete severance of the remainder of the panel by a subsequent pulling action. In particular, it is well known that with an approximately circular tear-out panel initial severing over an arc in excess of roughly 40° enables comparatively easy subsequent severing of the entire panel.

The pull tabs and associated structures for tear-out panels proposed heretofore either do not provide initial severing over peripheral arcs each in excess of roughly 40° or are very complicated and hence unnecessarily expensive. It has also been found that many of these previously proposed devices which utilize a tab which serves as a lever for initial severing as well as a pull tab are not attached to a rigidly held or initially stationary portion of an associated tear-out panel during the initial severing action whereby the initial severing action is generally unsatisfactory. In addition, many of these previous devices include tabs which are easily broken from their tear-out panels during the process of attempting to sever such panels.

SUMMARY

This invention provides an improved end closure of simple and economical construction and comprises a wall having a peripheral edge defined by a peripheral score line therein which is arranged closely adjacent the peripheral edge and defines a tear-out panel. An opening tab is provided and fixed to the wall at a fixed position adjacent the peripheral edge and the tab has a central longitudinal axis which extends toward the center of the panel. A continuous transverse score line is provided in the wall and is arranged roughly perpendicular to the longitudinal axis and between the fixed position and the peripheral score line and the transverse score line has opposite ends arranged closely adjacent the peripheral score line and serves as a bend line about which a comparatively large area chordal portion of the tear-out panel is initially severed and bent upon pivoting the tab about the fixed position. The initially severed chordal portion results in the severance of the tear-out panel along a substantial portion of its peripheral score line so that upon applying a pulling force against the pull tab in a direction away from the tear-out panel the remainder of such panel is severed in an easier manner.

Other details, uses, and advantages of this invention will become apparent as the following description of the exemplary embodiments thereof presented in the accompanying drawings proceeds.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings show present exemplary embodiments of this invention, in which

FIG. 1 is a perspective view illustrating an exemplary container having an improved end closure in the form of a top closure which is made in accordance with this invention;

FIG. 1A is a plan view of the top closure provided on the container of FIG. 1 prior to installing such closure in position;

FIG. 1B is a greatly enlarged fragmentary plan view of the forward portion of an opening tab comprising the end closure of FIG. 1 and portions of the wall arranged therebeneath;

FIG. 2 is a fragmentary cross-sectional view illustrating the opening tab of FIG. 1 partially lifted to provide a piercing action which starts the initial severing action;

FIG. 3 is a top view of the container of FIG. 1 showing the opening tab lifted fully upright to provide initial severing of a comparatively large area chordal portion of the tear-out panel comprising the end closure;

FIG. 4 is a fragmentary view with parts in cross-section and parts broken away taken essentially on the line 4—4 of FIG. 3;

FIG. 5 is a fragmentary view with parts in cross-section and parts broken away taken on the line 5—5 of FIG. 3;

FIG. 6 is a view illustrating the tear-out panel practically completely severed from the can of FIG. 1 with such severing being achieved merely by pulling upwardly on the opening tab;

FIG. 7 is a fragmentary view looking at the bottom of the bent and severed chordal portion of FIG. 6 and looking at an angle of roughly 45° with a vertical plane; and

FIG. 8 is a plan view illustrating another exemplary embodiment of an end closure fastened in position over the container of FIG. 1.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

Reference is now made to FIG. 1 of the drawings which illustrates an exemplary container in the form of a can which is designated generally by the reference numeral 20 and the can 20 has a bottom wall 21 adjoined by an integral right circular cylindrical side wall 22 which has an end or top closure 23 made in accordance with this invention fixed thereto. The closure 23 is comprised of a wall 25 of circular outline which has a peripheral edge 24 adjoined by a conventional flange 26 and the flange 26 is fixed to an outwardly offset top portion 27 of the cylindrical wall 22 using a conventional bead construction as illustrated at 28 in FIG. 5, whereby such bead construction will not be described in detail.

The closure 23 has a peripheral score line 30 of roughly circular configuration arranged closely adjacent the peripheral edge 24 and the score line 30 defines a tear-out panel which is designated generally by the reference numeral 31 and such tear-out panel is substantially the full area of the end closure 23. The closure 23 has an opening tab 32 which is fixed to the wall 25 at a fixed position by a rivet 33 which is arranged adjacent the peripheral edge 24, and the tab 32

enables the full-area panel 31 to be easily severed with little likelihood of damage to such tab.

The tab 32 has a central longitudinal axis 34 which extends toward the center 35 of the panel 31 and has a continuous transverse score line 36 in the wall 25 which is arranged roughly perpendicular to the longitudinal axis 34 and the peripheral score line 30, see FIGS. 1 and 1A. The transverse score line has opposite ends each designated by the same reference numeral 37 which are arranged closely adjacent the peripheral score line 30 and the transverse score line 36 serves as a bend line about which a comparatively large area chordal portion 40, see FIG. 3, of the tear-out panel 31 is initially severed and bent upon pivoting the tab 32 about the fixed rivet 33. This pivoting action results in the chordal portion 40 being bent into the interior of the container 20 across practically its entire width and as illustrated in FIGS. 3-5.

The initial severing action produced by using tab 32 as a lever results in the severance of large-area chordal portion 40 and hence severance of a substantial peripheral length of the tear-out panel 31. Thus, upon applying a pulling force against the tab in a direction away from the tear-out panel 31, and as illustrated schematically by the arrow 42 in FIG. 6, a highly effective shearing action is exerted against the remainder of the tear-out panel along peripheral score line 30.

The transverse score line 36 is in the form of a roughly bell-shaped score line, see FIGS. 1, 1A, 3, and 7, having an arcuate central portion including an apex 43 arranged between the fixed position or rivet 33 and the peripheral score line 30 and having opposed end portions 44 arranged substantially along a common imaginary chord which extends roughly perpendicular to the central longitudinal axis 34 and in this example extends through the center of rivet 33. The bell-shaped score line 36 enables the chordal portion 40 to be bent smoothly into the container or can 20 free of stress concentrations, or the like.

The tab 32 is made of a single thickness of material and has a substantially circular planar attaching portion 45 adjoined by a single thickness wedge-shaped forward portion 46, see FIG. 1A. The tab 32 also has a channel-like structure 47 extending from opposite sides 48 (see FIG. 1B) of the forward position 46 and the structure 47 surrounds the attaching portion 45 and is spaced therefrom. It will be appreciated that sides 48 are in reality transition areas where opposed portions of forward portion 46 blend smoothly with structure 47.

The attaching portion 45 has a central opening 49 extending therethrough and the rivet 33 is preferably in the form of a hollow rivet made in accordance with standard practice and defined as an integral part of the wall 25. The hollow rivet extends through the opening 49 and is riveted against the attaching portion 45 to define a head 50 as illustrated in FIGS. 2 and 6; and, thus defines the sole means for attaching the tab 32 to the tear-out panel 31.

As seen in FIG. 3 of the drawings, the opposed end portions 44 are arranged in a symmetrical manner on opposite sides of the longitudinal axis 34. Further, upon lifting the tab 32 upwardly a pivoting action occurs resulting in a pivoting of the forward portion 51 of the tab 32 (FIG. 2) causing severing of the comparatively large area chordal portion over a substantial peripheral length of the score line 30 with such substantial peripheral

length having an arcuate length in excess of 45°. This arcuate length is defined by the angle between two radii, indicated in FIG. 3 by dot dash lines 52 and 53, which extend from the center 35 of the panel 31 and closely adjacent the terminal ends 37 of the transverse bell-shaped score line 36, and, in the example of FIG. 3, this arcuate length is approximately 75° and is indicated by the angle at 54. Thus, it is seen that by initially severing the large area chordal portion 40 there is a severing over approximately 75° of the roughly circular score line 30; therefore, the subsequent severing of the remainder of the tear-out panel 31 may be accomplished with the application of comparatively little force.

As previously mentioned, the tab 32 is made of a single thickness of material; and, the forward portion 46 and central attaching portion flow smoothly together along a pair of opposed arcs 55 each having a generous radius which prevents the forming of stress concentrations, see FIG. 1B, during lifting and pulling of the tab. The tab 32 also has a knife-like forward end 56 which with the tab 32 installed in position adjoins the peripheral score line 30.

The knife-like end 56 is defined by forming a sharp "V" in the forward end of the wedge-shaped portion 46 and end 56 provides a sharp indentation in the panel 31 adjoining the peripheral score line to start the initial severing action. Once this initial indentation is provided, further lifting of the tab 32 upwardly in the manner illustrated in FIG. 3 results in pivoting the chordal portion 40 into the can 20 and the provision of what is popularly referred to as a "wide smile" in the tear-out panel 31.

The channel-like structure 47 of this example extends in a closed loop or endless path and has an oval outline and an approximately U-shaped cross-sectional configuration as shown at 60 in FIG. 6. The channel-like structure provides optimum rigidity for the tab 32 not only during operation thereof as a lever to provide initial severing of the chordal portion 40 but also during subsequent pulling of the tab 32 to remove the remainder of the tear-out panel 31. Further, by attaching the tab 32 to the initially unsevered portion of the tear-out panel 31, other than chordal portion 40, the chordal portion 40 is severed easily without imposing undue stresses on the tab 32.

As seen in FIGS. 1A and 1B, the apex 43 of score line 36 is arranged immediately beneath the area 62 where coplanar portions of attaching portion 45 and forward portion 46 flow smoothly together. The arcuate configuration of portions of score line 36 adjoining apex 43 is such that upon bending the tab 32 upwardly as a lever, a smooth arcuate configuration is provided in the forward end of attaching portion 45, as shown at 64 (FIGS. 5 and 6) which minimizes stress concentrations and assures that the attaching portion will not be severed during subsequent pulling thereof as indicated by the arrow 42.

The end closure 23 may also be provided with a plurality of upwardly convex projections 65 which aid in stacking a plurality of cans 20 and to improve the rigidity of the tear-out panel 31 during final severing a plurality of indentations of different lengths and each designated by the same reference numeral 66 are provided therein at various locations in the panel. The closure 23 preferably has a central recess 67 therein which facilitates insertion of a fingernail, or the like, therebeneath

to start lifting the tab upwardly in the manner illustrated in FIG. 2.

Another exemplary embodiment of this invention is illustrated in FIG. 8 of the drawings and is presented in the form of an end closure installed in position on the container 20. The end closure of FIG. 8 is very similar to the end closure 23; therefore, such end closure will be designated generally by the reference numeral 23 followed by the letter designation "A" and parts thereof which are similar to corresponding parts of the end closure 23 will be designated by the same reference numeral as previously and not described again. Only those component parts which are substantially different from corresponding parts of the end closure 23 will be designated by a different reference numeral also followed by the letter designation A and described in detail.

The main differences between the end closure 23 and the end closure 23A are that the end closure 23A has a bell-shaped transverse score line 36A provided with opposed end portions 70A which terminate at terminal ends 70A arranged closely adjacent the peripheral score line 30A and the portions 70A are arranged substantially in alignment with an imaginary chordal line which extends inwardly of the center of rivet 33A toward the center 35A. This imaginary chordal line is closely adjacent the surface 73A of the rivet barrel which faces center 35A. In addition, the apex 43A of score line 36A is arranged approximately adjoining the surface of the rivet barrel which is displaced 180° from surface 73A.

With the above arrangement of score line 36A, upon initially severing chordal portion 40A there will be a severing of score line 30A over an angle slightly in excess of 90°, as indicated by the angle at 74A, whereby subsequent severing of the remainder of panel 31A is achieved with even less force than that required to sever the remainder of panel 31 after initially severing its chordal portion 40.

The improved end closure of this invention is particularly adapted for use on comparatively large diameter cylindrical cans having diameters of roughly three and a half inches, and more. Further, with an end closure made in accordance with this invention it has been possible to provide the peripheral score line in a full size tear-out panel of roughly three and one-half inches or more so that approximately 0.004 - 0.005 inch residual material remains when using a metallic material such as 5050-2H34 aluminum alloy to define such an end closure.

It has also been found that the pull tabs 32 and 32A may be made utilizing a minimum amount of material and as a single piece construction. In one application of this invention 5182-H19 aluminum alloy having a thickness ranging between 0.00185 and 0.00195 inch was successfully used to sever a tear-out panel having a 3.30 inch diameter.

While present exemplary embodiments of this invention, and methods of practicing the same, have been illustrated and described, it will be recognized that this invention may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. An end closure for a container comprising, a wall having a peripheral edge, a peripheral score line in said wall arranged closely adjacent said peripheral edge and defining a tear-out panel, an opening tab attached to

said wall at a fixed position adjacent said peripheral edge, said tab having a central longitudinal axis which extends toward the center of said panel, and a continuous transverse score line in said wall arranged roughly perpendicular to said longitudinal axis and between said fixed position and said peripheral score line, said continuous transverse score line passing across said central longitudinal axis and having opposite ends arranged closely adjacent said peripheral score line and serving as a continuous bend line about which a comparatively large area chordal portion of the tear-out panel is initially severed and bent upon pivoting said tab about said fixed position, said fixed position remaining substantially stationary during the initial severing of said chordal portion, said initially severed chordal portion being the first portion of said wall which is severed upon pivoting said tab and resulting in the severance of said tear-out panel along a substantial portion of its peripheral score line so that upon applying a pulling force against said tab in a direction away from said tear-out panel a comparatively large component of said force is effective in providing efficient severing of the remainder of said tear-out panel along said peripheral score line, said transverse score line comprising a roughly bell-shaped score line having an apex arranged between said fixed position and said peripheral score line and having opposed end portions arranged substantially along a common chord which extends perpendicular to said central axis.

2. An end closure as set forth in claim 1 in which said peripheral edge comprises a circular edge and said peripheral score line comprises a substantially circular score line.

3. An end closure as set forth in claim 1 and further comprising a flange adjoining said peripheral edge, said flange being adapted to fasten said end closure to said container.

4. An end closure as set forth in claim 1 in which said tab is fixed to said wall at said fixed position by a rivet extending through a portion of said tab.

5. An end closure as set forth in claim 4 in which said rivet comprises a cylindrical hollow rivet defined in said wall as an integral part thereof.

6. An end closure as set forth in claim 1 in which said common chord extends through the center of said rivet and said opposed end portions are arranged in a symmetrical manner on opposite sides of said central axis.

7. An end closure as set forth in claim 1 in which said common chord is arranged between the center of said rivet and the center of said panel.

8. An end closure as set forth in claim 1 in which said peripheral score line comprises a substantially circular score line, said severance of said tear-out panel along a substantial portion of its peripheral score line results in severing along said score line over an arcuate length of at least 45°, said arcuate length being defined by the angle between two radii extending from the center of said panel and closely adjacent to said opposite ends of said transverse score line.

9. An end closure as set forth in claim 8 in which said arcuate length ranges roughly between 45° and 100°.

10. An end closure as set forth in claim 1 in which said tab is fixed to said wall at said fixed position by a rivet which serves as a fixed pivot about which the forward portion of said tab is pivoted, said forward portion having a knife-like forward end adjoining said peripheral

eral score line which provides a sharp indentation in a portion of said panel adjoining said peripheral score line and enables easier initial severing of said chordal portion.

11. An end closure as set forth in claim 10 in which said forward portion comprises a single thickness of material, and said knife-like forward end is defined by shaping said single thickness in the form of a V with the apex thereof adjoining said peripheral score line.

12. An end closure as set forth in claim 1 in which said tab comprises, a planar attaching portion, a single thickness wedge-shaped forward portion adjoining said attaching portion, and a channel-like structure extending from opposite sides of said wedge-shaped portion and surrounding said attaching portion in spaced relation therefrom, said attaching portion having a central opening therethrough, and said end closure further comprises a rivet extending through said central opening and fixing said attaching portion and tab at said fixed position, said rivet serving as a substantially stationary pivot about which said wedge-shaped portion is

pivoted to provide said initial severing.

13. An end closure as set forth in claim 12 in which said single thickness wedge-shaped portion has a knife-like forward end which provides a sharp indentation in said panel adjoining said peripheral score line and enables easier starting of the severing action which results in initial severing of said chordal portion.

14. An end closure as set forth in claim 12 in which said roughly bell-shaped transverse score line has a central arcuate portion which serves as a smooth bend line about which the edge of said wedge-shaped portion adjoining said attaching portion is bent in a smooth manner substantially free of stress concentration.

15. An end closure as set forth in claim 12 in which said tab is made of a single thickness of material and said forward portion and attaching portion flow smoothly together along a pair of opposed arcs each having a generous radius which prevents the forming of stress concentrations.

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