

[54] **FULL OPEN END CLOSURE**

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[58] Field of Search **220/54, 27, 48, 53**

[56] **References Cited**

UNITED STATES PATENTS

3,653,536 4/1972 Schrecken **220/54**

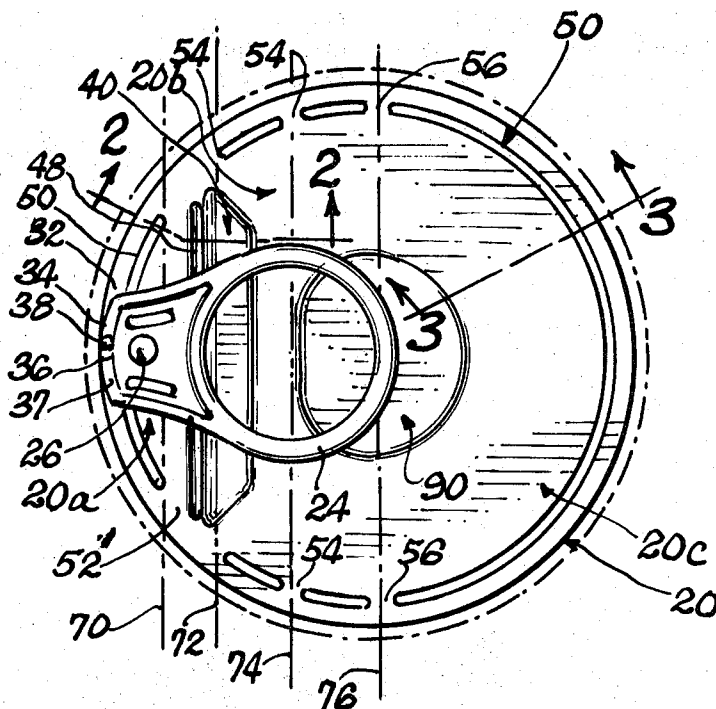
3,662,916 5/1972 Holk **220/54**
3,478,918 11/1969 Zundel **220/54**

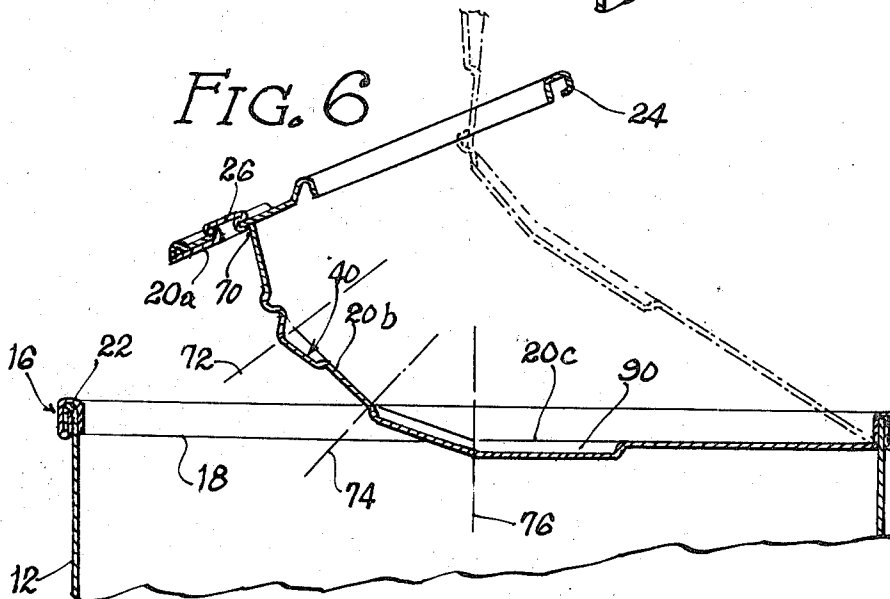
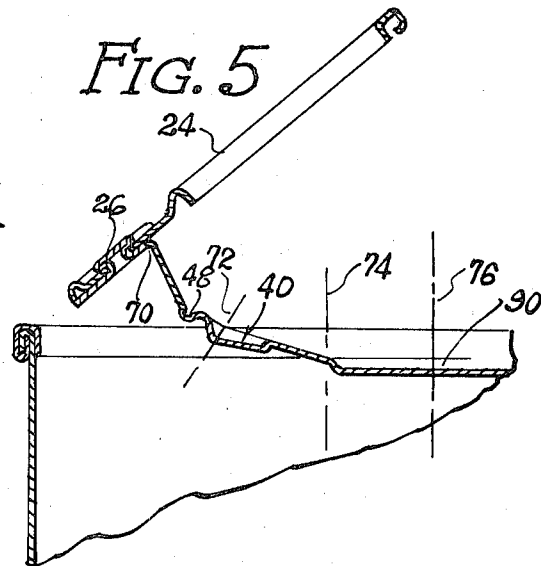
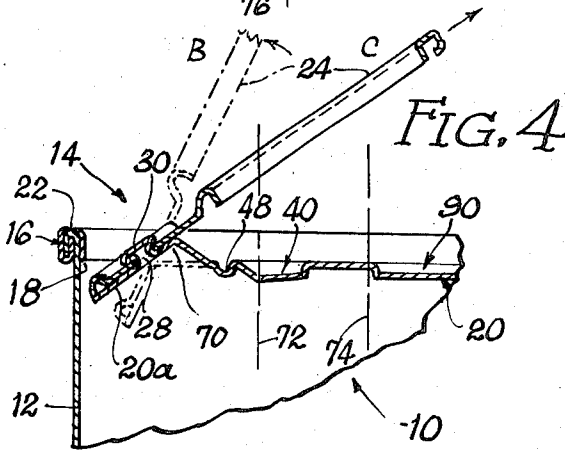
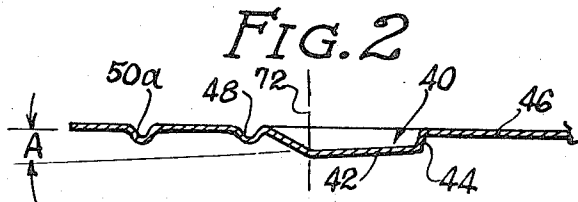
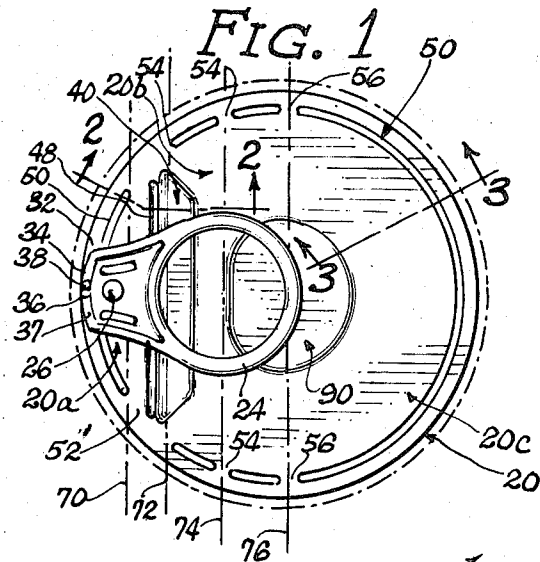
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[57] **ABSTRACT**

A full open end that is permanently seamed onto one end of the container body with a peripheral score line in the end defining a removable section. The removable section incorporates means for preventing crowning between opposite edges of the section as the section is removed from the container body.

9 Claims, 6 Drawing Figures





FULL OPEN END CLOSURE

BACKGROUND OF THE INVENTION

The present invention relates generally to container ends and more particularly to an improved fully opened end.

Containers having so-called easy open ends have become well-known in recent years and now enjoy a considerable measure of consumer acceptability. A full open end closure of the easy open type normally includes an end closure or panel that is permanently secured to one end of a container body and has a weakened score line adjacent the permanent connection to define a removable section. An opening tab is secured to a front portion of the removable section, normally through an integral rivet forming part of the removable section.

Various types of products such as coffee, nuts, candy, and foods containing liquids are normally packaged in containers of this type.

In removal of the removable section, the opening tab is moved along a path by initially pivoting the tab towards the permanent seam to cause a downward movement of the portion of the removable section between the rivet and the score line to initiate rupture of the score line. Subsequently, the tab is pulled in an opposite direction along the path away from the initially ruptured section until the entire score line has been ruptured and the removable section has been detached.

One disadvantage of such containers is that the removable section has a tendency to crown during removal and thereby prevent the removable section from being bent transversely of the direction of pulling force being applied to the removable opening tab so as to facilitate such opening. This crowning may be described as an upward bulge along areas inwardly of the peripheral score line.

Another difficulty encountered in full open end closures is that during initial rupture of the score line by pivotal movement of the tab away from the surface of the removable section the metal tends to flow or move outwardly. This is believed in part to be caused by loose metal (in the removable section) present due to the scoring operation which forms the weakened score line which defines the removable portion of the end. This outward movement or relaxation of the metal tends to cause the adjacent portion of the removable section to be displaced under the permanently secured portion of the end closure and make it extremely difficult, if not impossible, to remove the closure.

SUMMARY OF THE INVENTION

The present invention contemplates the formation of an easy full open enclosure that is capable of being removed smoothly and with a minimum amount of force. The removable section of the fully open end is deformed in selected locations to reinforce the end in a manner that (1) crowning of the removable section during rupture of the score line is prevented and (2) the adjacent edges of the removable section and the permanently secured section are prevented from being placed in overlapping relation.

According to the invention, a container, consisting of a container body having an end panel permanently secured thereto, has a peripheral weakened score line

adjacent the outer edges of the panel defining a removable section having a front portion and a rear portion with an opening tab connected to the front portion. The removable section includes means for preventing crowning between opposed points of the score line as the section is severed from the permanently secured portion of the end panel. The means for preventing crowning includes an elongated trough extending substantially the entire transverse dimension between opposed points of the weakened score line with the trough being located in close proximity to the connection of the opening tab to the removable section that is in close relationship to the area where initial upward force is applied to initiate severing of the main body portion of the removable end section. The trough has a generally flat bottom wall that is inclined relative to the planar main body portion of the removable section with the bottom wall being integrally joined to the main body portion by a side wall.

The means for preventing crowning further includes a circumscribing bead that is located a substantially constant dimension from the peripheral score line and is interrupted at selected locations to define bend lines extending transversely or substantially perpendicular to the direction of force being applied to the tab when the end panel removable section is removed. The bend lines may be considered to divide the removable section into a nose or front portion, an intermediate portion and a rear portion.

The circumscribing bead is continuous along the nose portion and assists in enabling the nose portion to be bent in its planar condition to a position substantially perpendicular to the main body of the removable section during initial pivotal movement of the opening tab away from the main body of the removable section. The trough is located in the intermediate portion in close proximity to the front portion of the removable section and maintains this front portion as well as the adjacent area of the intermediate portion in a substantially flat condition as the removable section is severed along the score line after initial rupture of the score line. The intermediate section preferably has at least two lines of bend which are arranged in such a manner that the amount of bending of the removable section is just sufficient to place the nose portion and the elongated dimension of the pull tab substantially parallel to the line of force which would normally be applied by a person standing adjacent the rear portion of the panel and applying a pulling force with one hand while holding the container with the other hand on a kitchen counter top.

The configuration of the removable section of the end panel will initially cause the nose portion to be bent perpendicular to the main body of the panel so as to prevent any possibility of the adjacent edges of the removable section and the permanently secured section of the panel to be overlapped and interfere with further relative movement of the panel and the seam so as to retard or prevent further rupture of the score line. The trough extending across the end panel maintains a portion of the panel adjacent the nose portion in a substantially flat condition upon rupture of the score line along the area adjacent the nose portion while the intermediate portion allows the removable section to be bent along spaced bend lines extending transversely of

the direction of force just sufficiently to place the tab in alignment with the path along which the force is applied.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF DRAWINGS

FIG. 1 is a plan view of the removable section of a fully open end closure;

FIG. 2 is a sectional view taken generally along line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken generally along line 3—3 of FIG. 1; and

FIGS. 4, 5 and 6 show various stages of the removable section as the score line is being severed.

DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

FIG. 4 of the drawings discloses a fragmentary portion of a container, generally designated by the reference numeral 10, consisting of a container body 12 and an end panel 14 that is permanently secured by a double seam 16 to the upper end of the container body. The end panel 14 has a peripheral continuous score line 18 located in close proximity to the double seam 16 and dividing the end panel 14 into a removable section, generally designated at 20, and a permanently secured section 22. An inspection of FIG. 4 reveals that the score line is in close proximity to the upwardly directed portion of the permanently secured section 22 that is in contacting engagement with the container wall so as to minimize any inwardly directed lip formed on the container body after the removable end section has been severed.

The removable end section has an opening tab 24 riveted thereto by a rivet 26 that is preferably integral with the removable section and includes an annular vertical side wall 28 extending through an opening in the tab 24 and an upper transverse wall 30 (FIG. 4) which overlies the upper surface of the pull tab 24 to permanently secure the opening tab to the removable section 20. The metal of the removable section, which is preferably of tin coated steel, is scored at 32 adjacent the rear portion of the annular wall 28, for a purpose to be described later.

The opening tab 24 has a nose 34 that extends beyond the connection or securing means, defined by rivet 26, with the free or nose edge 36 of the nose 34 being located in substantially overlying relation to the score line 18. Thus, pivotal movement of the tab in a counterclockwise direction as viewed in FIG. 4, will initially cause the nose edge 36 of the tab to initiate the rupture along the score line 18 in the area adjacent the edge 36.

In order to facilitate initial rupture of the score line 18 with a minimum amount of opening force, the nose 34 is reinforced around its entire periphery by a bead 37 and the bead is deformed towards the panel 20 at 38 to provide substantially point contact between the edge of the nose portion and the surface of the panel 20. The

outer walls of the portions of the bead 37 that extend away from the score line are substantially vertical to provide rigidity to the nose 34. In addition, integral reinforcing ribs 39 are produced in the nose so that the nose will remain in a planar condition during rupture of the score line.

As was indicated above, during the rupture of the score line to sever the removable section from the permanently secured section of the end panel 14, it has been found that a counterclockwise pivotal movement of the pull tab 24 will cause only a small initial rupture adjacent the edge 36. The small area of rupture, combined with the flow or movement of metal in the removable section as previously described has been found to cause the severed portion of the removable section to move underneath the severed edge of the permanently secured section 22 and prevent further severing of the score line without an extreme force being applied to the tab 24 in an opposite direction. This could result in separating the tab from the removable portion of the end. Furthermore, the initial rupture of the score line has a tendency for the removable section to bulge upwardly or crown transversely of the direction of the application of force being applied to the tab. This appears to result from the fact that fulcrum point for the downwardly directed force on the edge of the nose is in the area of the rivet and also from the excess metal in the panel section 20 resulting from the scoring operation.

However, according to the present invention, this problem is eliminated by maintaining the nose portion of the removable section in a substantially planar condition to increase the size of the initial rupture during pivotal movement of the tab and also preventing crowning of any portion of the removable section as the score line is initially ruptured and, subsequently, completely severed. All of this is accomplished by strategic location of reinforcing beads, ribs and a trough.

The means for preventing crowning between opposed points of the score line as the section is severed from the front portion to the rear portion includes means defining an elongated trough 40 that extends substantially the entire dimension between opposed points of the weakened score line 18 and is located in close proximity to the connection of the tab to the removable section. The trough 40 is shown in detail in FIGS. 1 and 2 and includes a substantially flat bottom wall 42 that is integrally joined to the planar main body portion of the removable section by a side wall 44. As is more clearly shown in FIG. 2, the flat bottom wall of the trough 40 that is deformed from the main body of the removable section is inclined relative to the lower flat surface 46 of the removable section and defines a small acute angle A which opens inwardly towards the body 12 adjacent the nose or front portion of the removable section. The arrangement of the acute angled bottom wall of the trough and the remainder of the removable section will be described in more detail hereinafter.

In addition, the trough is substantially trapezoidal in configuration, as shown in FIG. 1, for a purpose which will be described later.

The first means for preventing crowning further includes means defining an elongated rib 48 that is

deformed downwardly from the main body of the removable section 20 at a location between the rivet 26 and the trough 40. More specifically, the downwardly deformed rib 48 is located adjacent the forward edge of the trough 40. The rib is placed as located to take up an excess of metal in the area between the trough 40 and the integral rivet 26.

The means for preventing crowning further includes a bead 50 that circumscribes substantially the entire periphery of the removable section and is located a substantially constant dimension from the score line 18. The bead 50 has opposed pairs of interruptions 52, 54 and 56 that define bend lines for the removable section when the section is severed from the remainder of the container. The interruptions 52, 54 and 56 will result in having the panel bent along bend lines 70, 72, 74 and 76 during removal of the section as will be described later. Also, the removable section may be considered to have a front portion 20a, in one side of bend line 70, an intermediate portion 20b, between bend lines 70 and 76, and a rear portion 20c, extending beyond bend line 76.

As is more clearly shown in FIG. 1, the interruptions or interrupted portions 52 define a first bead portion 50a that circumscribes the front edge of the front portion 20a of the removable section. These interrupted portions 52 of the bead will allow the front portion 20a to be bent along the bend line 70. The trough will maintain the adjacent area of the intermediate portion in a flat planar condition. It should be noted that the formation of the bead portion 50a adjacent the outer edge of the removable section takes up excess metal between the rivet 26 and the adjacent score line.

In order to facilitate insertion of the finger between the upper surface of the removable section and the adjacent surface of the tab, it is desirable to provide a dished portion 90 that is deformed downwardly from the planar main body portion of the panel to provide a small space between the upper surface of the removable section and the lower surface of the ring portion of the tab 24. This downwardly dished portion 90 also assists in the accumulation of excess metal resulting from the scoring operation described above.

The advantages derived from the reinforcing means that prevent crowning will now be described in connection with the opening of a fully open end closure. Initially, the pull tab 24 extends substantially parallel to the upper surface of the removable section 20. The pull tab is initially pivoted counterclockwise, as viewed in FIG. 4, to produce an initial rupture of the score line by the point contact between the nose 34 and the panel 20 resulting from the deformed portion 37 of the bead 36.

During the initial pivotal counterclockwise movement of the tab along a path across the top of the container, the portion 50a of the circumferential bead 50 will insure that the front portion 20a of the removable section 20 will remain in a substantially planar condition and will be bent approximately 90° relative to the remainder of the removable section substantially along the bend line 70 indicated as Position B and illustrated by the dotted line portion of FIG. 4. The cooperation between the bead portion 50a and the tab 24, particularly the nose portion 34 and the connection or rivet 26, will insure that the score line 18 will be ruptured to approximately the bend line 70 during the initial coun-

terclockwise pivotal movement of the tab 24. This results in locating the front portion or nose portion substantially perpendicular to the main body of the panel and results in a sufficient amount of rupture circumferentially along the score line to prevent any overlapping of the severed portions of the removable section and the fixed portion of the end panel remaining with the main body of the panel.

While the score line 18 is being severed in the front portion 20a, the trough 40, particularly the inclined bottom wall 42, will maintain the intermediate portion adjacent the bend line 70 in a flat condition and thus prevent crowning. While the following is not completely understood, it has been found that the (1) angle of inclination of the bottom wall, (2) size and configuration of the trough in relation to the diameter of the removable section, and (3) the location of the trough in relation to the bead 50 and interruptions 52, will result in moving the fulcrum for counterclockwise pivoting of the tab 24 in the general area where the plane of the inclined bottom wall intersects the plane defined by the main body of the removable section. This arrangement prevents any crowning of the removable section during initial rupture or severing of the front portion.

After this initial pivotal movement of the tab 24 has been completed, to locate the front portion substantially 90° relative to the main body of the section, the operator removing the panel produces a pulling force in an opposite direction along the path as he grasps the main body of the container with one hand and the pull tab with the opposite hand as illustrated by Position C. During this pulling force, the trough 40 and rib 48 cooperate to prevent any crowning of the intermediate portion of the removable section that is located adjacent the front portion 20a. Also, the plane of intersection between the front portion of the side 44 and the bottom wall 42 of the trough 40 produces a first bend line 72 in the intermediate portion 20b as the section is severed from the remainder of the container. Continued pulling force on the tab will result in a severing of the intermediate portion of the removable section from the remaining portion of the end panel with the interrupted portions 54 and 56 defining further bend lines 74 and 76 for the bending of the intermediate portion of the removable section into an arcuate configuration.

It will be noted from an inspection of FIG. 1, that the last bend line 76 extends substantially through half of the removable section. It has been found that, once the score line has been severed beyond the center of the circular removable section, it is desirable to have the remaining portion remain in a substantially flat condition to insure that the score line is completely severed without any undue bending adjacent the rear edge of the rear portion.

An inspection of FIGS. 4, 5 and 6 reveals that the bending along the bend lines 72, 74 and 76 is relatively small and places the longitudinal dimension of the tab 24 in a position where the normal pulling force from the operator will be directed substantially along a plane parallel to the elongated dimension of the tab 24 as the rear portion of the section is removed. This position is shown in the solid line in FIG. 6 wherein any subsequent pulling force will tend to sever the rear portion 20c of the removable section 20 from the remainder of

the permanent portion 22. This arrangement has considerable advantage since it allows the operator to produce a maximum pulling force along a rather comfortable angle relative to the container thereby allowing him to apply substantial force for removing the latter portion of the container's removable section.

Summarizing briefly, the first portion of the circumferential bead 50 insures that the front or nose portion 20a of the removable section remains in a substantially planar condition and is bent approximately 90°. The transversely extending trough 40 and the segments of the bead between the interruptions 52, 54 and 56 prevent any upward crowning of the intermediate portion as it is being removed from the remainder of the container.

As was indicated above, the size and configuration of the trough 40 are critical in preventing crowning during initial rupture of the score line. It is desirable to have the trough as long as possible to locate the ends of the trough as close as possible to the score line without affecting the integrity of the connection of the panel sections along the score line 18. Thus, the length of the trough is determined by the characteristics of the score line.

In addition, the inclination of the bottom wall 44 of the trough 40 and the included angle between the bottom wall and the forward portion of the side wall 44 is important. It is desirable to have the angle of inclination of the bottom wall at least 4° or more and to have the included angle between the adjacent surfaces of the bottom wall 42 and the forward portion of the side wall 44 as small as possible. It will be appreciated that the included angle between the bottom and side walls will be, to a large extent, dependent upon the tooling used in deforming the end 14. Also, the depth of the trough will be determined by the amount of loose metal in the end and the trapezoidal configuration of the trough will insure that the end bends along bend line 72.

While the invention is not limited to any specific size or configuration of container, an example of a circular container, approximately 2 3/4 inches in diameter, will now be described. The bottom wall of the trough preferably defines an angle of 4 degrees or more relative to the planar main body portion and the bead segment 50a is of sufficient length to sever approximately 90° of the score line as the front portion is pivoted down. This insures that enough of the score line is severed during initial pivotal movement of the tab while preventing any crowning of intermediate portion of the crown.

Thus, it will be appreciated that the present invention provides a simple and inexpensive expedient of preventing crowning of the removable section of a container while having a rather pleasing container.

What is claimed is:

1. In a container comprising a body and at least one metal end closure secured to the body by a permanent seal with a weakened score line in said end closure defining the contour of a removable closure section, said removable closure section having a generally planar main body portion and an opening tab connected thereto adjacent said score line, said tab being movable along a path to sever said score line, the improvement of means defining an elongated trough extending transversely of said path substantially the entire

dimension between opposed points of said weakened score line and located in close proximity to said tab, said trough having a generally flat bottom wall inclined relative to said planar main body portion and integrally joined thereto by a side wall, said trough preventing crowning of said removable closure section between said opposed points during removal of said closure section.

2. A container as defined in claim 1, in which said bottom wall defines a relatively small acute angle with said main body portion and located adjacent an inner surface of said end closure section, said angle extending toward the container body adjacent said tab.

3. A container as defined in claim 1, further including a peripheral bead circumscribing said removable closure section adjacent said score line, said bead having opposed pairs of interrupted portions along which said closure section is bent during removal.

4. A container as defined in claim 1, in which said bottom and side walls of said trough intersect along a plane extending perpendicular to said path, said plane defining a bend line for said closure section during removal of said section.

5. In a container having an easy open end consisting of an end panel connected to a container body with a peripheral score line adjacent the outer edge of said end panel defining a removable section, said removable section having a front portion, an intermediate portion and a rear portion with an opening tab connected to the front portion, the improvement of means for preventing crowning between said opposed points of said score line as said section is severed from the front portion to the rear portion, said means including a bead circumscribing substantially the entire periphery of said section and being located a substantially constant dimension from said score line, said bead having pairs of interrupted portions at opposed locations to allow said section to be bent during removal.

6. A container as defined in claim 5, in which said means for preventing crowning further includes means defining an elongated trough extending across said intermediate portion, said trough being in general alignment with a pair of interrupted portions adjacent said front portion and having a generally flat bottom wall spaced below a planar main body portion of said section and integrally joined thereto by a side wall.

7. A container as defined in claim 6, in which said bottom wall defines a small acute angle with an inner surface of said removable section, one edge of said bottom wall defining a bend line when said section is removed.

8. A container comprising a circular body; a metal end closure permanently secured to one end thereof, said closure having substantially circular score line defining a removable section having front, intermediate and rear portions; an opening tab secured to said front portion of said removable section; means defining a peripheral bead in said removable section said bead being spaced a substantially constant dimension from said score line and having spaced means defining at least two spaced bend lines extending transversely between said front and rear portions; and means in said intermediate portion adjacent said tab for maintaining an area of said intermediate portion adjacent said front portion in a substantially flat condition during removal

of said removable section; said means including an elongated trough extending transversely to the direction of removal of said section, said trough having a flat bottom wall inclined relative to a flat lower surface of said removable section and defining a small acute angle opening towards said body adjacent said front portion, said bead being interrupted in the areas

aligned with opposite ends of said bottom wall to allow said front portion to be bent along said trough during removal of said removable section.

5 9. A container as defined in claim 8, in which said small acute angle is at least 4°.

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