ANALYSIS

The patent describes an improved method for tearing the end of a can, which results in a more safe and user-friendly experience.

### ABSTRACT

An aluminum food product container or can having an easily opened can end seamed to one end of the can body. The outer surface of the can end member has a score line along which the can end is sever for opening the can and removing an end panel. The score line is located adjacent and above a shoulder in the can body extending inwardly below the seam. A protective bead is formed in the can end immediately adjacent and within the location of the score line. The score line has a special profile in cross section cooperatively interrelated to the profile of the bead in cross section. The score line and bead formation present a dull, hazard-free edge for the end panel when torn from the can end member.

12 Claims, 10 Drawing Figures

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**References Cited**

- 3,447,713 6/1969 Stec
- 3,601,279 8/1971 O'Neil
- 3,696,961 10/1972 Halk

**United States Patents**

- 3,605,514 3/16/1972
- 3,698,590 10/1972

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**Diagram**

The diagram illustrates the cross-sectional view of the can end with the protective bead and score line.
1 CAN END WITH PROTECTIVE BEAD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to food product cans that are provided with can end members which may be opened easily by tearing a portion thereof along a score line formed in the end member. Such food product cans including their bodies and end members desirably frequently are formed of aluminum. These cans, particularly in small sizes, have been popular for packing pudding and other snacks for children's lunch boxes. The food product cans may be of the types shown in Henning et al. U.S. Pat. No. 3,490,643 and in McKernan copending application Ser. No. 70,843, filed Sept. 9, 1970 now U.S. Pat. No. 3,784,048, dated Jan. 8, 1974.

2. Description of the Prior Art

A number of can designs have been supplied to and used by food packers for packaging small quantities of snack foods such as puddings for children's lunch boxes. These cans have been made of aluminum and have had full opening container ends, the end panels of which are torn out using pull-rings attached to the can end panels.

Problems have been encountered in the use of such cans. Zipping off the lid or removable end panel in the can end wall is not always easy for children; all to frequently they cut their fingers on the sharp lid edge or on the rim left inside the can, and the lid almost never comes off without a thick coating of pudding sticking to its underside. The child tempted to lick the lid stands a good chance of cutting his tongue on the sharp edge. The removed lid has been found to be sharp enough to slice a chicken leg.

A report by a school teacher about cut tongues suggested that the can design should be changed to eliminate the hazard, and suggested that this would be easier than attempting to change the natural tendencies of a child to lick pudding sticking to the underside of a removed lid. One trade journal has described the cans as dangerous and has questioned whether the convenience of the cans is worth their hazard.

As a result, food packers that have used such cans have called for a solution to the problem which will eliminate the dangers and hazards.

SUMMARY OF THE INVENTION

Objectives of the invention include providing a new can end and container construction having a full opening removable end wall panel torn from the can end wall along a score line located immediately adjacent the seam between the can body and end wall in which the removed end panel has a dull protective edge formation which normally and ordinarily will not cut the finger, tongue or other body part of a person drawn along or across the edge of the removed panel; providing a new can end construction which has a removable panel that is not dangerous and does not present a hazard to a child who has zipped the end panel from a snack-containing can; providing a new can end construction which readily may be incorporated in prior can end structures of types which heretofore presented the hazards described; providing a new can end structure having the new hazard-eliminating protective beaded dull edge formation on the removed end panel incorporated in a container construction having desirable features of the products shown and described in U.S. Pat. Nos. 3,179,282 and 3,490,643 and in said application Ser. No. 70,843 now U.S. Pat. No. 3,784,048, dated Jan. 8, 1974; and providing a construction eliminating difficulties heretofore encountered, achieving the indicated objectives simply, effectively and inexpensively, and solving existing problems and satisfying existing needs in the canned food products field.

These objectives and advantages are obtained by the easy opening metal can and can end construction, the general nature of which may be stated as including an aluminum can end wall adapted to be seamed to the side walls of a metal can body by a usual double seam; the end wall having a recessed end panel extending from a recessed corner; the corner being located below the seam and being seated on an inwardly projecting annular shoulder or bead formed in the can body side wall below the seam; an end-panel defining continuous main score line formed in the end wall close to the recessed corner; the can body bead projecting inwardly beyond the score line location so that when the end is torn on the score line for end panel removal the severed edge remaining on the can is protected by the bead in hazard-free condition; pull tab means having a nose and rivet means connecting the tab means to the end panel for tearing the end panel from the end wall; a protective bead formed downwardly in the end wall and extending continuously around the end wall immediately within and adjacent the main score line; the recessed end panel having a center and upper and lower surfaces; the cross-sectional profile or contour of the score line comprising outer and inner side surfaces converging with respect to a center line perpendicular to the upper panel surface from the upper toward the lower panel surface, a score line bottom surface intersecting at outer and inner corners with and connecting the lower ends of the converging outer and inner side surfaces, and the score line bottom surface extending angularly inward with respect to the panel center and downward toward the lower panel surface; the protective bead having a channel-shape in cross section with outer and inner side walls and a connecting bottom wall; the cross-sectional profile or contour of the outer bead side wall comprising upper and lower surfaces, a curved wall portion extending inward from the score line and connected with the upper end of the outer bead side wall, the curved wall portion having upper and lower arcuate surfaces formed on radii about a common center, the upper arcuate surface connecting the upper end of the inner score line side surface with the upper surface of the outer bead side wall, and the lower arcuate surface connecting the lower panel surface with the lower surface of the outer bead side wall; a vertical line passing through said common center parallel with the score line center line intersecting the score line bottom surface between the inner and outer score line corners, the inner score line corner being located radially closer than the common center to the panel center; the inner bead side wall being connected with the main end panel portion at a corner; a secondary straight score line extending between the rivet means and pull tab nose perpendicular to a line passing through the centers of the rivet means and nose; the secondary score line facilitating bending of the end wall along such line during rupture of the wall; and gauge indentation means formed in the upper sur-
face of the main end panel portion within the confines of the protective bead.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a top plan view of a can provided with the new construction;

FIG. 2 is an enlarged vertical section taken on the line 2—2, FIG. 1;

FIG. 3 is a greatly enlarged view of the upper left-hand corner portion of FIG. 2, on line 3—3, FIG. 7;

FIG. 4 is a further enlarged view similar to FIG. 3, showing the parts after initiating the tearing out of the end panel by manipulation of the pull ring;

FIG. 5 is a further enlarged section taken on the line 5—5, FIG. 1 showing the cross-sectional contour of the bead and score line formation;

FIG. 6 is a still further enlarged fragmentary section illustrating in detail the structural relationship and cross-sectional contour of the bead and score line formation;

FIG. 7 is a fragmentary enlarged plan view of the can end, illustrating the special shape of the bead at the elliptical portion of the score line where tearing-out is initiated;

FIG. 8 is a fragmentary sectional view looking in the direction of the arrows 8—8, FIG. 1;

FIG. 9 is a view similar to FIG. 4 showing a modified form of score line contour; and

FIG. 10 is a view similar to FIG. 6 further showing the modified score line contour.

Similar numerals refer to similar parts throughout the drawing.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

First Embodiment

The invention is illustrated typically in the drawings applied to a small-sized can although the can may be of any one of a number of sizes or capacities, or of any one of a number of types made by various manufacturers, and which have a continuous score line in the can end wall adjacent the double seam between the can body and end wall.

The can 1, generally of conventional construction, has a cup-shaped body with a bottom wall 2, and side walls 3, and a can end wall 4, connected through a seam flange 4a by a usual double seam 5 to the upper or open end of the side walls 3. End wall 4 has a recessed corner 6 at the lower end of the double seam 5 preferably seated on a ledge or shoulder 7 formed by an inwardly projecting annular bead 8 formed in the side walls 3 below the seam 5.

A curved main score line 9 is formed in the end wall 4 very close to the recessed corner 6. The score line 9 defines an end panel 10 which is completely removable from the remainder of the end wall 4, when torn or peeled along score line 9 to provide a fully opened top for the can 1. The score line 9 has a special formation described below.

A ring pull tab 11 preferably is connected by a rivet 12 with the end panel 10 which may be made in any conventional manner, or may be accomplished as set forth in Henning et al. U.S. Pat. No. 3,346,948. Ring pull tab 11 preferably is formed of sheet metal of somewhat heavier gauge than the sheet metal from which can 1 and end wall 4 are formed. Members 11 and 4 are formed of aluminum. End wall 4 and ring pull tab 11 except for the shape of score line 9, as thus far generally described may be made and have the same general structure that is shown in Henning et al. U.S. Pat. No. 3,490,643.

Also the interior can and end wall surfaces may be provided with an enamel coating to withstand the corrosive attack of food products packed in can 1. Further, the can end 4 may be coated with a sealing compound material on its undersurface beneath the score line 9 to protect the end wall metal in this area against corrosive attack as set forth in said copending application Ser. No. 70,843 now U.S. Pat. No. 3,784,048, dated Jan. 8, 1974.

In accordance with the invention the end wall 4 is formed with a protective bead generally indicated at 13 surrounding the main panel portion 10. Bead 13 projects downwardly in end wall 4 and extends continuously around the panel portion 10 immediately within and adjacent the main score line 9. The recessed end panel 4 has a center indicated by the dot 14 in FIGS. 1 and 2, and panel 4 has upper and lower surfaces 15 and 16.

The score line 9 has an elliptical portion 9a best shown in FIG. 7 which is spaced further radially inwardly of seam 5 opposite the outer end of pull tab 11 than the remainder of score line 9 for about 30° at either side of the center line of the pull tab 11 running through the panel center 14 and the center of the rivet 12. In this same zone of the can end wall 4, the protective bead 13 is shallower, as indicated at 13a in FIGS. 3 and 7 than in the remaining extent of bead 13.

More particularly, the elliptical score line portion 9a blends into and with the remainder of the circular score line 9 at about 30° at either side of the pull tab center line. However, the shallower protective bead portion 13a extends to about 35° to 40° at either side of the pull tab center line to enable the proper opening force for tearing out the lid to be transmitted. This important feature otherwise may be described by stating that the shallower protective bead portion 13a has a greater length than the elliptical score line portion 9a.

The cross-sectional profile or contour of the main score line 9, best shown in FIGS. 5 and 6, comprises an outer side surface 17 and an inner side surface 18 which converge with respect to a center line 19 shown in dot-dash lines in FIG. 6 which is perpendicular to the upper panel surface 15. The score line side surfaces 17 and 18 converge from the upper panel surface 15 toward the lower panel surface 16, as shown.

Score line bottom surface 20 intersects at outer and inner corners 21 and 22 with the lower ends of the converging outer and inner score line side surfaces 17 and 18, and bottom surface 20 connects the lower ends of said converging side surfaces as shown. The score line bottom surface 20 extends angularly inward with respect to the panel center 14 and downward in a direction toward the lower panel surface 16, that is, downward to the right viewing FIGS. 5 and 6.

The protective bead 13 has a channel-shape in cross section with outer and inner side walls 23 and 24 and a connecting bottom web wall 25. The cross-sectional profile or contour of the outer bead side wall 23 includes upper and lower surfaces 26 and 27. A curved wall portion 28 extends inward from the main score line 9 and is connected with the upper end of the outer bead side wall 23. The curved wall portion 28 has upper and lower arcuate surfaces 29 and 30, and the
surfaces 29 and 30 are formed on radii 31 and 32 extending from a common center 33.

The upper arcuate surface 29 connects the upper end of the inner score line side surface 18 with the upper surface 26 of the outer bead side wall 23. The lower arcuate surface 30 connects the lower panel surface 16 with the lower surface 27 of the outer bead side wall 23. A vertical line, indicated by the dot-dash line 34 in FIG. 6, passing through the common center 33 parallel with the score line center line 19 intersects the score line bottom surface 20 between the inner and outer score line corners 22 and 21. The inner score line corner 22, as shown, is located radially closer than the common center 33 to the panel center 14, that is, the corner 22 is located to the right of the common center 33, viewing FIG. 6.

The inner bead side wall 24 is connected with the main end panel portion 10 at a corner 35. A straight score line 36 forming a bend line, later described, extends between the rivet means 12 and pull tab nose 38 perpendicular to a line passing through the centers of the rivet means 12 and nose 38.

Gauge indentations 40 are formed in the upper surface 15 of the main end panel portion 10 within the confines of the main end panel 10. Two indentations 40 are shown in FIG. 4, one of which is shown in cross section in FIG. 5. However, any number of indentations 40 located at desired positions in the main end panel portion 10 may be formed for a purpose to be described.

A recess 41 may be embossed in the main panel 10 to facilitate grasping the ring portion 42 of pull tab 11 to open the can. Pull tab 11 may be lanced at 43 (FIG. 1) to permit easy flexing as the pull tab is moved to the position shown in FIG. 4 to rupture the end wall 4 along elliptical score line portion 9a. Bending of the end wall as shown in FIG. 4 during rupture is further facilitated by the straight score line 36, between rivet 12 and the nose 38 of pull tab 11.

The can end wall 4 is ruptured for removing the main panel portion 10 by grasping the ring portion 42 of pull tab 11 and pulling upward thereon to depress the nose 38 of pull tab 11 downward as shown in FIG. 4, when the removable main panel portion 10 bends downward, as shown, along the straight score line 36.

The isthmus 44 of metal below the bottom surface 20 of the cross-sectional profile of score line portion 9a is thinnest between the score line corner 22 and lower surface 16 of end wall 4, as shown. Thus when the main panel portion 10 is ruptured at score line portion 9a for removal from end member 4, as shown in FIG. 4, the metal tears at this thinnest portion of the isthmus 44, that is, downward from the score line corner 22 to the lower surface 16 of end wall 4. The outer edge 45 of the removable main panel 10 is dull, as shown in FIG. 4, and contains no projecting raw metal edge. The dull edge 45 thus does not present a cutting hazard characterizing prior devices.

This characteristic of the dull edge 45 of the removable main panel portion 10 arises because a portion of the edge 45 is formed by the score line side surface 18. The remainder of the edge 45 is formed by the torn metal at the thinnest portion of the isthmus 44 which extends to the concave-convex or arcuate surface 30 which is shielded by the outer lower rounded channel corner 46 of the bead 13.

Thus the relationship of the contour or profile of the main score line 9 and bead 13, particularly described with reference to FIG. 6, and the dull edge 45 resulting when the removable main panel portion is ruptured from the end wall 4, are of the essence of the invention in providing a structure which avoids the cutting hazard characterizing prior devices.

It is important that the profile and depth in cross section of the main score line 9 be obtained and maintained in manufacture of the can ends, and that the score line depth be capable of gauging for quality control. However, because of the angular formation of the score line bottom surface 20, to provide the isthmus 44 thinner below corner 22 than below corner 21, it is difficult with usual gauges or instruments to check the depth of score line 9.

The gauge indentations 40 are provided to eliminate this difficulty. The indentations 40, as shown, have a flat bottom surface 47 (FIG. 5). The shape and depth of the indentations 40 are related to the shape and depth of score line 9 so that measurement of the depth of one or more of the indentations 40 provides a measure of the depth of score line 9.

The location of the profile 9b (FIG. 4) of the elliptical score line portion 9a that remains on the portion of the can end 4 on can 1 after main panel 10 is torn from end wall 4 is radially inward of the minimum diameter of the bead 8 on the can side wall 3 (FIGS. 3 and 4).

This condition only occurs at the elliptical portion 9a of the score line 9. Throughout the remainder of the score line 9, the profile of the score line is located radially outward of the minimum diameter of can side wall bead 8 as is well shown in FIG. 8. That is, the bead 8 protects the torn edge of the remaining metal of the can end 4 after the main panel 10 has been completely removed, throughout the major portion of the diameter of the can excepting at the elliptical score line portion 9a. In this manner there is substantial protection against finger cutting in the can body upon removal of the can end.

Second Embodiment

FIGS. 9 and 10 show a slight modification, as compared with FIGS. 3 and 6, of the new construction. All shapes, relationships, etc., of the can 1 and the can end 4 are the same in FIGS. 9 and 10 as in FIGS. 3 and 6 excepting for the contour of the score line, generally indicated at 48, and its location in the can end 4 relative to other parts of the protective bead 13 and 13a.

The score line 48 has a flat bottom 49 and side surfaces 50 and 51 closer together and narrower at the top surface 15 of can end 4 than corresponding parts of the score line portions 9 and 9a shown in FIGS. 1 to 8.

The depth of the flat bottom 49 of the score line 48 is preferably about the same as the depth of the corner 22 of score line 9 (FIG. 6). However, because the contour of the flat bottomed score line 48 is narrower than the contour of the score line 9, the bottom inner corner 52 of score line 48 is located outside of a vertical line, indicated by dot-dash line 53, passing through the common center 33 for the curved corner portions 29 and 30 of the protective bead 13. This corner 52 lies between the vertical line 53 and a parallel vertical line indicated by dot-dash line 54 in FIG. 10, constituting the vertical center line of the profile of score line 48.

This score line contour, relationship and location of the score line 48 in FIGS. 9 and 10 with respect to other elements insures a resulting dull edge 55 (FIG. 9) on the panel portion 10 when removed or torn from the
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IN GENERAL

The relationship of the shallower bead portion 13a to elliptical score line portion 9a, the shallower bead portion 13a has greater length than the elliptical score line portion 9a, permits an opening force to be applied by the pull tab when raised 90° sufficient to rupture the can end initially at the elliptical portion 9a without a locking out condition. Also the force required is small enough to be exerted by children opening cans of the types shown in the drawings, and for which the hazard-free structure of can and torn-out can end is provided by the protective bead concept of the invention.

The improved construction of the protective bead for the can end eliminates the dangers and hazards that have characterized prior constructions, and answers the problem, which has existed in the aluminum canned food products field, in a practical manner and, thus, provides a construction which achieve the objectives and satisfies the needs that have existed in the art.

In the foregoing description, certain terms have been used for brevity, clearness and understanding; but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art because such terms are used for descriptive purposes and are intended to be broadly construed.

Moreover, the description and illustration of the invention is by way of example, and the scope of the invention is not limited to the exact details shown or described since the features of the invention may be applied to different sized cans.

Having now described the features, discoveries, and principles of the invention, the manner in which the improved structure achieves the objectives, and the advantageous, new and useful results obtained; the new and useful structures, devices, elements, arrangements, parts, combinations, and sub-combinations are set forth in the appended claims.

1. Easy opening metal food products can construction including a metal can body, an end wall, double seam means connecting the end wall to the can body; the end wall having a recessed corner located below the seam, and having a recessed portion extending from said corner, an end-panel-defining continuous main score line formed in the recessed portion close to the recessed corner, pull tab means secured to the end panel for tearing the end panel from the end wall; a protective bead formed downwardly in the end wall recessed portion and extending continuously around the end wall immediately within and adjacent the main score line; the recessed end panel having a center and upper and lower surfaces; the cross-sectional profile of the main score line comprising outer and inner side surfaces converging with respect to a centerline perpendicular to the upper panel surface from the upper toward the lower panel surface, a score line bottom surface intersecting at outer and inner corners and connecting the lower ends of the converging outer and inner side surfaces, and the score line bottom surface extending angularly inward with respect to the panel center and downward toward the lower panel surface; the protective bead having a channel-shape in cross section with outer and inner side walls and a connecting bottom web wall; the cross-sectional profile of the outer bead side wall comprising upper and lower surfaces, a curved wall portion extending inward from the main score line and connected with the upper end of the outer bead side wall, the curved wall portion having upper and lower arcuate surfaces formed on radii about a common center, the upper arcuate surface connecting the upper end of the inner score line side surface with the upper surface of the outer bead side wall, and the lower arcuate surface connecting the lower panel surface with the lower surface of the outer bead side wall; and a vertical line passing through said common center parallel with the score line centerline intersecting the score line bottom surface between the inner and outer score line corners.

2. A metal can end adapted to be seam to a can body, the can end having a seam flange and a recessed corner located below the seam flange, a recessed portion extending from the corner; an end-panel-defining continuous main score line formed in the recessed portion close to the recessed corner; pull tab means secured to the end panel for tearing the end panel from the end; a protective bead formed downwardly in the end wall recessed portion and extending continuously around the end wall immediately within and adjacent the main score line, the bead presenting an upwardly open channel shape having outer and inner side walls and a connecting web wall; the cross-sectional profile of the score line including a slanted score line bottom surface forming an isthmus of metal below the score line, the isthmus being thinnest adjacent the bead; and the bead having an upwardly convex curved wall connecting the isthmus with the outer bead side wall; whereby the panel when torn from the end wall about said main score line presents a dull edge.

3. The construction defined in claim 2 in which the curved wall is formed on a radius having a center, and in which the thinnest portion of the isthmus is located closer to the bead outer side wall than said center.

4. The construction defined in claim 3 in which the main score line has a centerline perpendicular to the end wall, in which the curved wall is formed on a radius having a center, and in which a vertical line passing through the center parallel with the score line centerline intersects the isthmus intermediate the ends of the isthmus.

5. The construction defined in claim 4 in which the pull tab means has a radially extending centerline, in which that portion of the main score line adjacent the pull tab means is elliptically formed for about 30° on either side of said pull tab centerline, and in which the protective bead is shallower along the elliptically formed main score line portion than along the remainder of the main score line.

6. The construction defined in claim 5 in which the shallower protective bead portion has greater curved length than that of the elliptical main score line portion.

7. The construction defined in claim 6 in which the pull tab means has a nose and is secured to the end wall by rivet means; and in which a secondary straight score line perpendicular to the pull tab centerline is located between the pull tab rivet means and nose.

8. Easy opening metal food products can construction including a metal can body, an end wall, double seam means connecting the end wall to the can body; an annular shoulder formed by an inwardly projecting annular bead in the can body side wall below the seam.
means; the end wall having a recessed corner located below the seam; said recessed corner being seated on said can body shoulder; the end wall having a recessed portion extending from said corner, an end-panel defining continuous main score line formed in the recess portion close to the recessed corner; pull tab means secured to the end panel for tearing the end panel from the end wall along said main score line; a protective bead formed downwardly in the end wall recessed portion and extending continuously around the end wall immediately within and adjacent the main score line; the bead presenting an upwardly open channel-shape having outer and inner side walls and a connecting web wall; the cross-sectional profile of the score line including upwardly outwardly slanted score line side surfaces and a score line bottom surface forming an isthmus of metal below the score line, the isthmus terminating in a corner adjacent the bead formed by one of said slanted surfaces; the bead having an upwardly convex curved wall connecting the isthmus with the outer bead side wall; whereby the panel when torn from the end wall about said main score line presents a dull edge; said pull tab means having a radially extending centerline; that portion of the main score line adjacent the pull tab means being elliptically formed for about 30° on either side of said pull tab centerline; the protective bead being shallower along the elliptically formed main score line portion than along the remainder of the main score line; and the can body annular shoulder projecting inwardly beyond the main score line location along said remainder of the main score line portion.

9. The construction defined in claim 8 in which the shallower protective bead portion has greater curved length than that of the elliptical main score line portion.

10. The construction defined in claim 9 in which the pull tab means has a nose and is secured to the end wall by rivet means; and in which a secondary straight score line perpendicular to the pull tab means centerline is located between the pull tab rivet means and nose.

11. The construction defined in claim 8 in which the score line bottom surface forming the isthmus is slanted; in which the isthmus is thinnest at said isthmus corner; in which the curved wall is formed on a radius having a center; and in which the corner is located closer to the bead outer side wall than said center.

12. The construction defined in claim 11 in which the main score line has a centerline perpendicular to the end wall, and in which a vertical line passing through the center parallel with the score line centerline intersects the isthmus intermediate the ends of the isthmus.

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