

United States Patent

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Fullerton, Calif.
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No. 559,511, now abandoned

[56]

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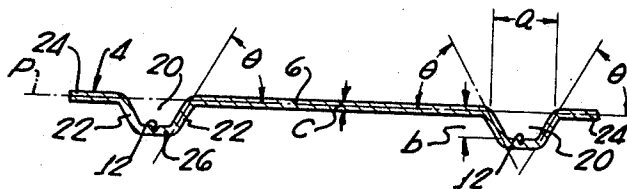
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[54] CAN TOP CONSTRUCTION AND METHOD OF FABRICATION

4 Claims, 10 Drawing Figs.

[52] U.S. Cl. **113/121,**
 220/54
 [51] Int. Cl. **B21d 51/38**
 [50] Field of Search 113/15,
 120Q, 121C; 220/27, 53, 54

ABSTRACT: A tear strip for a can top is formed by first forming a narrow groove having a central portion which defines the tear strip edge and inclined walls on the opposite sides of such central portion, and thereafter scoring the central portion of the groove to form the tear strip. The stress attendant to scoring is absorbed by the inclined opposite walls rather than being transmitted to the remainder of the can top metal.



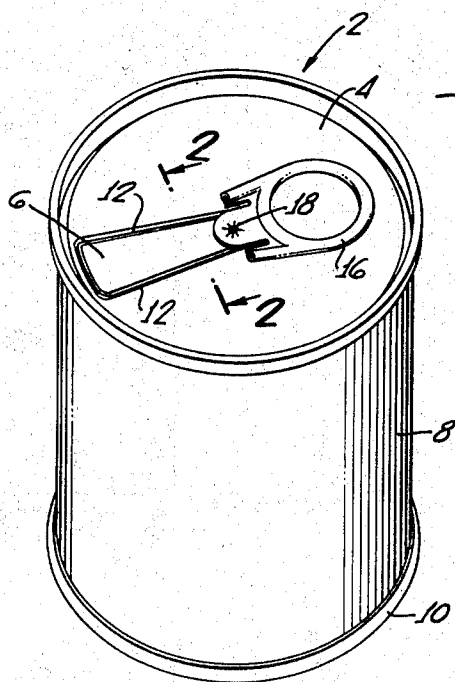


FIG. 1.

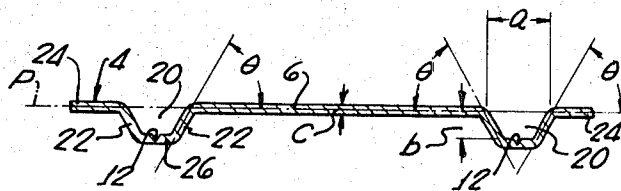


FIG. 2.

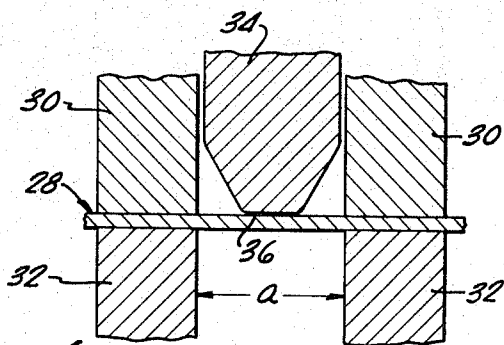


FIG. 3.

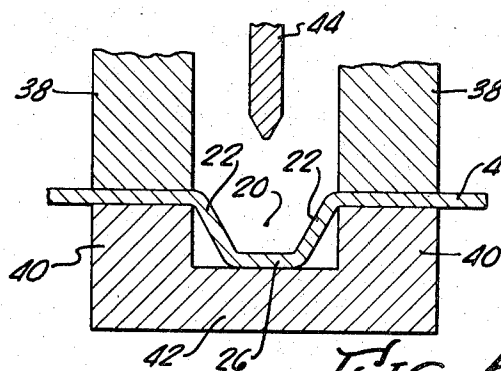


FIG. 5.

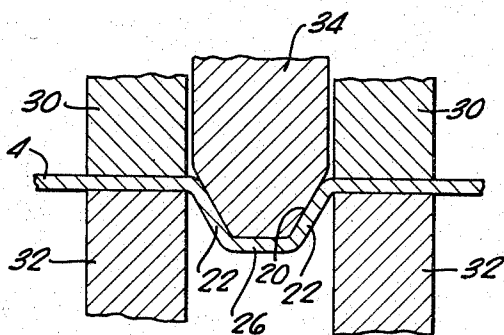


FIG. 4.

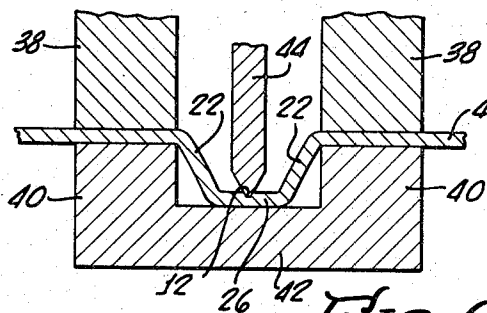


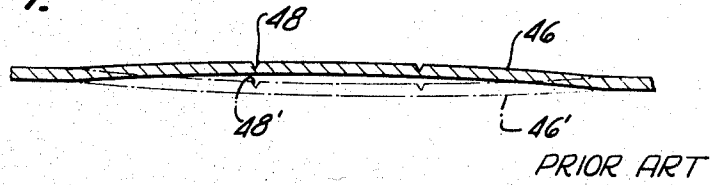
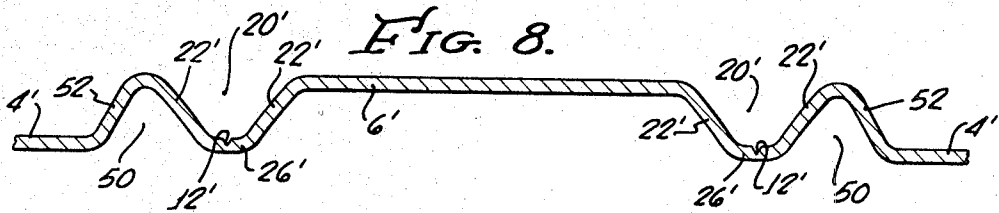
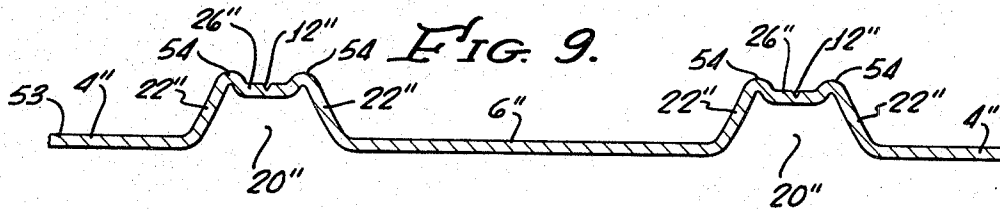
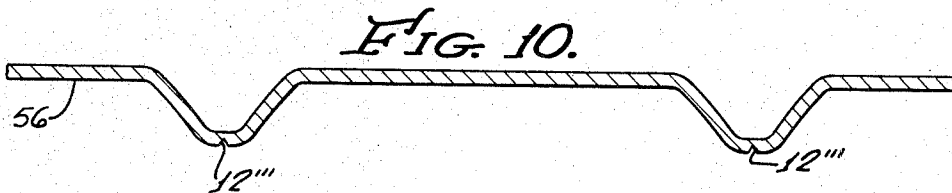
FIG. 6.

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FIG. 7.



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CAN TOP CONSTRUCTION AND METHOD OF FABRICATION

This is a division of application Ser. No. 559,511, filed Jun. 22, 1966, now abandoned.

CAN TOP CONSTRUCTION AND METHOD OF FABRICATION

This invention relates to cans which have removable strips of various shapes on their ends so that the cans may be opened by manually tearing the strip from the can end and to a method of fabricating such can ends.

Cans which have a tear strip on one end generally are of two types-- those in which the tear strip defines a limited opening for pouring out the contents and those in which the tear strip is formed around the periphery of the can end so that the central panel of the end is removed with the tear strip. The former type are often referred to as "pop top" cans and are widely used for beverages, whereas the latter type are sometimes referred to as "zip top" cans and are more popular for holding solid or semiliquid materials.

Both types generally have been fabricated by stamping the can end to score the outline of the tear strip. The strip can then be removed by pulling a tab attached to the strip to tear it loose from the can end.

Before the advent of the scored can ends, most can tops were made of steel. However, scoring these lids has created a number of problems. Unfortunately, the scoring dies work harden the can ends adjacent the score. Moreover, in scoring lids by prior art methods, the scoring die has a tendency to buckle the can end because of the tremendous stresses set up in the relatively thin panel as the metal is literally pushed away from the score. The buckled lid often flexes up and down as the can is handled in packaging, shipping and displaying. Moreover, the can is particularly subjected to rough handling by the consumer who throws it into a shopping basket. As the lid flexes, the brittle, work-hardened steel frequently cracks at the minimum thickness defined by the score causing the can to leak. Needless to say, even a pinhole air leak can cause the contents of the can to spoil. This not only results in a dissatisfied customer, but may create substantial legal liabilities as well.

In an effort to avoid these shortcomings, many can manufacturers have started using aluminum. It is more ductile than steel and does not become work hardened or as brittle when stamped by the scoring die. In fact steel has largely been replaced by aluminum in the fabrication of can ends having tear strips even though the tin-plated steel ends are generally more economical than aluminum ends and are also preferred for use with certain food products.

The present invention overcomes the disadvantages of prior art techniques to provide a steel can end having a tear strip which does not tend to leak due to excessive buckling when it is formed. The improved can end disclosed herein is obtained by a novel method of forming the score. In accordance with this method, an elongate groove or channel is formed along the portion to be scored, and the can end is gripped adjacent the groove as the central portion of the groove is stamped to score the outline of the tear strip. The stress from the stamping deforms the walls of the narrow, preformed groove rather than buckling the entire can end diaphragm. Although the metal adjacent the score mark is work hardened, the lid is not buckled and therefore does not tend to flex with the consequent loss of the airtight integrity of the can.

A container end fabricated in accordance with this invention is a relatively thin metal sheet forming a taut diaphragm with an elongate score in the sheet. An elongate buffer formed in the sheet cooperates with the score to absorb any buckling stresses transmitted away from the score. Generally, the score defines an edge of a tear strip and a tab is fixed to one end of the strip for use in manually tearing the strip from the can end. In an exemplary embodiment, the buffer is a groove having sidewalls transverse to the diaphragm disposed on opposite sides of the score. The groove is substantially deeper than the

thickness of the sheet from which the can end is formed to make certain the stress accumulates in the inclined walls of the groove and not in the diaphragm proper.

Inasmuch as the can end fabricated in accordance with this invention does not involve any complex fabrication steps, it can be formed using conventional can forming machinery. Thus, it is economically competitive with prior art forms of can ends, yet it overcomes the tendency of the prior art scored steel ends to break down at the score.

These and other features, objects and advantages of this invention will be apparent from the following detailed description when read with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of an exemplary can including a lid constructed in accordance with this invention;

FIG. 2 is an enlarged partial vertical section through the tear strip portion of the lid taken generally along lines 2-2 of FIG. 1 showing the profile of the tear strip portion of the lid, and particularly showing two portions of the groove in which the score is located;

FIGS. 3-6 are enlarged vertical sections through a steel sheet and exemplary stamping dies showing the sequential steps for forming a groove and scoring a lid in accordance with the method of this invention;

FIG. 7 is a partial vertical section through a representative prior art scored steel can end showing the buckling of the end and the tendency of the buckled end to flex; and,

FIGS. 8-10 are enlarged partial vertical sections through can lids constructed in accordance with this invention showing several modified groove shapes and score locations.

Referring first to FIG. 1, an exemplary can 2 is illustrated with the lid or upper end 4 having a removable tear strip 6 or "pop top" fabricated in accordance with the teaching of this invention. The particular configuration of the tear strip is exemplary only, as this invention is applicable to other types and shapes of strips.

The can includes a conventional cylindrical can body 8 and a conventional bottom 10. The lid 4 is fabricated of a relatively thin sheet which may, for example, be tin-plated steel. A score 12 outlines the tear strip 6 on the lid and a finger tab 16 is affixed at one end of the strip 6 by a weld 18. The tear strip 6 is removed by pulling upwardly and outwardly on the tab 16 to tear the strip loose from the can top along the score 12.

Referring now to FIG. 2, the can end 4 is taut and its major portion is parallel to the plane p . The score 12 is disposed in the valley of a depressed groove 20 which follows a particular configuration to define the edges of the tear strip 6. The generally U-shaped groove 20 has a pair of outwardly sloped sidewalls 22 depending from the diaphragm or main panel 24 and a central wall portion 26. The sidewalls 22 are inclined at an acute angle θ relative to the plane p , greater than 60° having been found satisfactory.

The score 12 is disposed along the middle of the central wall 26 of the groove. The width a of the groove 20 is narrow relative to the overall diameter of the can lid 4 so that the groove itself is not likely to be flexed during handling, e.g. by a person's thumb. In no event should the groove 20 be wider than one-eighth inch and preferably it is considerably narrower than that. The depth b of the groove is at least several times the thickness c of the steel plate, which by way of example is often between 0.006 and 0.011 inches for a tin-plated steel lid. With can ends of this thickness it has been found satisfactory to penetrate about 40 percent to 60 percent of the thickness c of the lid with the score 12.

Referring to FIGS. 3-6, an exemplary method of fabricating the groove 20 and scoring the tear strip 6 is illustrated. Initially, the thin steel sheet 28 is gripped between two pairs of pressure pads 30 and 32 which are spaced apart by approximately the desired width a of the groove 20 (see FIG. 3). A die member 34, having a tapered generally U-shaped forming edge 36, to conform to the desired groove configuration, is operated to depress the portion of the sheet 28 between the pads 30 and 32 to form the groove 20 (See FIG. 4). Generally,

it is preferred that the pressure pads 30 and 32 permit some metal from the diaphragm portion 4 of the steel sheet 28 outside the confines of the pads 30 and 32 to creep into the groove area so that the walls 22 and 26 of the groove are not stretched too thin by the deformation.

After the groove 20 has been formed, two pairs of gripping pads 38 and 40 are clamped on opposite faces of the diaphragm 28 adjacent the groove (See FIG. 5). The lower gripping pads 40 are joined by a central die member 42 which acts as a stop for the convex side of the groove central wall 26. With the can end tightly clamped, a scoring die 44 is brought down to stamp a score 12 into the central wall 26 of the groove 20. As the scoring die 44 penetrates the steel sheet, stresses move transversely from the score line 12 as excess metal is literally pushed away from the score. However, the stress and creep is absorbed or buffered in the inclined walls 22 of the groove which tend to buckle rather than transmit the stress into the plane of the diaphragm. Thus, although the steel adjacent the score 12 is work hardened, the diaphragm 4 itself is not buckled, all the buckling being confined to the walls 22 of the relatively narrow groove.

While FIGS. 3-6 illustrate only the forming of the score at one portion of the tear strip edge, it is to be understood that the shape of the groove 20 and the scoring die 44 conform to any desired outline of the tear strip 6.

Referring to FIG. 7 a representative prior art scored lid 46 is illustrated. As the prior art lid has no groove portion surrounding the score 48 to absorb the scoring stress, the major portion of the lid 46 has buckled under the stress of the scoring die. Thus, for example, the lid 46 is normally bowed upward, until it is pressed downward to the phantom position 46' as it is handled. It may then pop back upward and may be reverse flexed numerous times before ultimately being opened for consumption of the contents. As noted above, the steel adjacent the score 48 is relatively brittle because it has been work hardened by the scoring die. Thus, the numerous flexures tend to overstress the scored steel and cause it to crack at the brittle score 48. On the other hand, the can ends in accordance with this invention have virtually eliminated this problem by confining the buckling to the groove walls.

In addition to avoiding leaks at the brittle score, the can end construction and fabrication method taught by this invention are advantageous with respect to other container ends such as those coated with a nonelastic material which might crack if the container end is flexed.

Referring now to FIG. 8, a modified profile of the tear strip is illustrated in which the strip 6' is raised relative to the main panel 4' of the can end and a pair of oppositely oriented grooves 20' and 50 forming somewhat of an S-shaped cross sectional configuration are disposed on each side of the tear strip 6'. The score 12' is disposed in the central wall 26' of one groove 20' of each pair, and the stresses from the scoring operation are taken up in the walls 22' and 52 of the grooves in a manner similar to that described above with reference to the embodiment of FIG. 2.

FIG. 9 illustrates another modified profile in which the tear strip 6'' is in the same plane as the main panel 4'' but the grooved portion 20'' is raised rather than depressed relative to

the can end so as to be convex rather than concave to the can exterior side 53. Moreover, the groove 20'' includes a rib 54 at the juncture of each inclined wall 20'' with the central wall 26'' on opposite sides of the score 12''. The ribs 54 strengthen the edge of the tear strip 6'' as the strip is removed and the edge of the can end remaining thereafter.

FIG. 10 illustrates yet another modified embodiment of the can end constructed in accordance with this invention. The embodiment of FIG. 10 is quite similar to that illustrated in FIG. 2 except that the score 12''' is on the underside or interior side 56 of the can top.

While this invention has been described with reference to a particular shape of tear strip and particular fabricating equipment, the disclosed embodiments are intended to be exemplary only and the invention should not be limited except in accordance with the following claims.

I claim:

1. The method of forming a scored tear strip on a steel can end, comprising the steps of:

forming an elongate narrow groove in a steel sheet, said groove having a central portion defining an edge of the tear strip and a pair of inclined walls on opposite sides of the central portion; and

after said groove has been formed, scoring the central portion of the groove so that the stress resulting from the stamping is absorbed in the inclined walls rather than being transmitted to the remainder of the sheet.

2. The method of forming a scored tear strip on a can end, comprising the steps of:

forming an elongate narrow groove in a metal sheet, said groove having a central portion defining an edge of the tear strip and a pair of inclined walls on opposite sides of the central portion;

gripping the sheet adjacent the groove; and

scoring the central portion of the groove of the gripped sheet after the groove has been formed so that the stress resulting from the stamping is absorbed in the inclined walls rather than being transmitted to the remainder of the sheet or to the tear strip.

3. A method of forming a can end having a manually removable tear strip thereon, including the following steps in the order recited:

clamping a relatively thin steel sheet on opposite sides of at least one elongate portion;

forming an elongate buffering groove in said elongate portion of the clamped sheet having opposite sidewalls inclined at between about 60° and 90° with respect to the major portion of the lid, and a central wall joining the sidewalls;

clamping the sheet on opposite sides of the groove; and stamping a score in the central wall of said groove of the clamped sheet to define the edges of a manually removable tear strip.

4. The method of forming a scored tear strip on a steel can end in accordance with claim 1 wherein the step of forming the groove includes the step of forming the groove to a depth at least several times the thickness of the sheet.