Jan. 2, 1968 E. C. FRAZE 3,361,291

THIN WALLED EASY OPENING CAN

Filed June 14, 1965

Fig. 1 (Top)

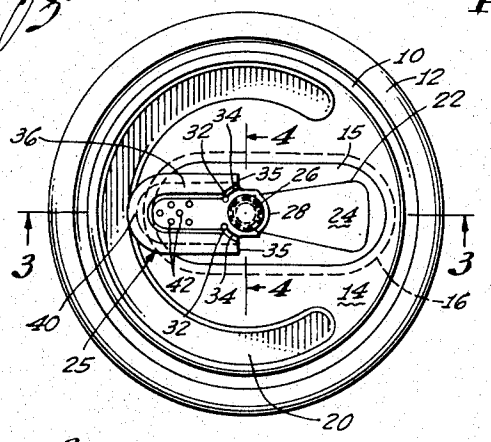


Fig. 2 (Bottom)

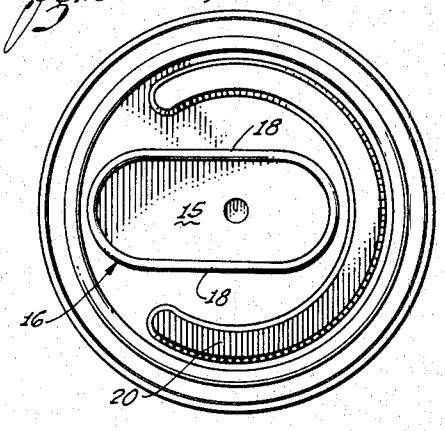


Fig. 3

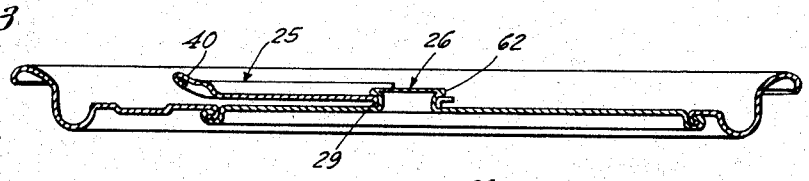


Fig. 4

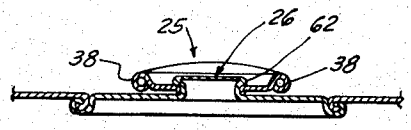


Fig. 5

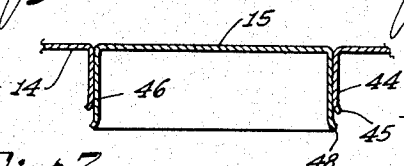


Fig. 11

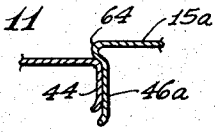


Fig. 6

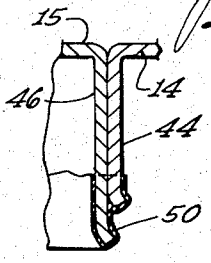


Fig. 12

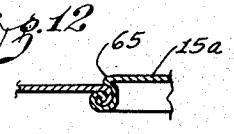


Fig. 7

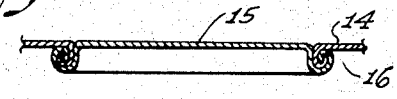


Fig. 8

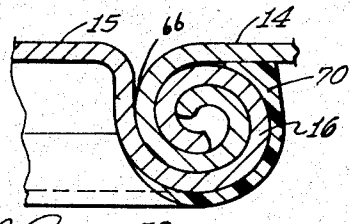


Fig. 9

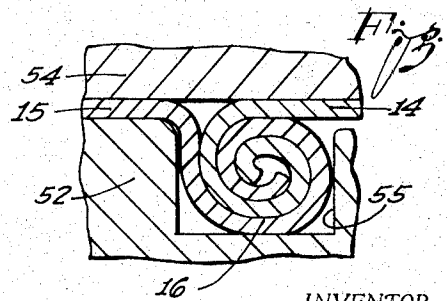
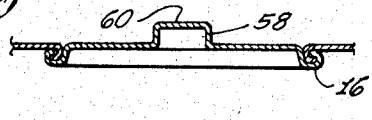


Fig. 10



INVENTOR.

Ermal C. Fraze

By Smyth, Roston & Pavitt

Attorneys

United States Patent Office 3,361,291
Patented Jan. 2, 1968

3,361,291

THIN WALLED EASY OPENING CAN

Ermal C. Fraze, 355 W. Stroop Road,
Dayton, Ohio 45429

Filed June 14, 1965, Ser. No. 463,831
18 Claims. (Cl. 220—54)

ABSTRACT OF THE DISCLOSURE

This disclosure describes an easy opening container wall including a container wall segment of sheet material having an elongated opening therein and an elongated panel covering the opening. The panel is secured to the container wall segment by rolling together portions of both the panel and the container wall segment. The elongated opening and panel extend across a central region of the container wall segment so that the rolled seam will form stiffening bars to stiffen the container wall against bulging.

This invention relates to an easy opening can of the type in which a portion of the can top is scored to form a tear strip which may be manually severed by means of an attached tab. More particularly the invention teaches how such a can top may be substantially reduced in cost by using sheet material that is 20 to 30% thinner than heretofore feasible.

The top of a sheet metal can is formed with a multiple layer rim or chime where the sheet metal of the can top and the sheet metal of the cylindrical body of the can are folded together to form a fluid tight seam. The chime must extend to a level above the can top and in an easy opening can must extend above the tab that is attached to the tear strip. If the can top or any component thereof extends above the chime, difficulties are encountered in handling the can tops during the fabrication of the cans and the finished cans will not stack properly. Accordingly, if a can top is bulged outwardly by the internal pressure of beer or of a carbonated beverage, the chime must be deepened to a corresponding extent and if a tab is connected to a tear strip of the bulged can top the chime must be even deeper.

It is readily apparent that increasing the depth of the chime necessitates increase in the dimension of the peripheral flange of a can top that forms the chime with consequent increase in the cost of the can top. Since the top of a beverage can of the self-opening type is made of relatively expensive aluminum alloy instead of relatively cheap tin-coated steel, the cost of increasing the dimension of the peripheral flange of the can top is substantial. In addition increasing the depth of the chime increases the amount of the body sheet that is taken up by the chime and accordingly the width of the body sheet must be increased to avoid reduction in the capacity of the can. Here again the increase in cost is substantial even if the body sheet is made of tin-coated steel.

The extent to which a can top bulges in response to internal fluid pressure depends upon the thickness of the sheet metal and conventional aluminum alloy can tops for pressurized beverages are necessarily of a thickness of approximately 0.015 inch to avoid excessive bulging. Actually an aluminum alloy can top of a thickness of only 0.010 inch has sufficient strength to withstand the internal pressure with a wide margin to spare but if such a thin can top is of conventional construction it is bulged outwardly by the internal pressure to an unacceptable extent.

The present invention teaches that a can top of such thin material may be constructed with two pieces of thin sheet material in such manner as to incorporate sufficient reinforcement to prevent undue bulging of the can top

by internal fluid pressure. For this purpose a can top of the thin sheet material is fabricated with a central opening therein and a panel of thin sheet material, which may be of the same sheet material as the can top, is mounted across the opening with the two sheet materials joined in a sealed manner by a continuous seam. The basic purpose of the two-piece construction is to provide a continuous steam in the form of a multiple-layer rolled bead to serve as an effective bar-like reinforcement. In addition the sheet material of the can top outside of the area of the panel is offset to form at least one elongated arcuate depression shaped and dimensioned to stiffen the can top.

In the preferred practice of the invention the panel is of substantial width and elongated configuration, extending across the major portion of the diameter of the can top and terminating at one end near the periphery of the can top. The advantage of the elongated configuration of substantial length is that the continuous seam forms two parallel reinforcement bars that are effective to prevent undue bulging of the can top because they are of substantial strength, of substantial length and are appropriately spaced apart. Fortuitously a panel of this shape and size is wide enough and long enough to provide an area that is appropriate for a tear strip. If desired, the panel may be an exceptionally thin sheet made of a special aluminum alloy selected to meet the requirements for a readily removable tear strip and the remainder of the can top may be an exceptionally thin sheet of less expensive material such as tin-coated steel.

The features and advantages of the invention may be understood from the following detailed description together with the accompanying drawings.

In the drawings, which are to be regarded as merely illustrative:

FIG. 1 is a plan view of a can top embodying the presently preferred practice of the invention;

FIG. 2 is a bottom view of the same can top;

FIG. 3 is an enlarged sectional view along the line 3—3 of FIG. 1;

FIG. 4 is a fragmentary transverse sectional view along the line 4—4 of FIG. 1;

FIG. 5 is an enlarged fragmentary section illustrating the first step in the mounting of a panel in the opening in the can top;

FIG. 6 is an enlarged fragmentary section showing how the structure shown in FIG. 5 may be dipped into a sealant;

FIG. 7 is a view similar to FIG. 5 showing the flanges of the panel and the surrounding can top rolled together to form a seam of the character of a bead with the bead protruding on the underside of the can top;

FIG. 8 is an enlarged fragment of FIG. 7 showing the rolled bead in cross-section;

FIG. 9 is an enlarged sectional view showing how dies may be employed to tighten and slightly flatten the rolled bead;

FIG. 10 is a view similar to FIG. 7 after a hollow rivet is formed in the tear strip in preparation for attaching a tab to the tear strip;

FIG. 11 is a fragmentary view similar to FIG. 5 showing how the panel may be initially formed with a flange that bows outward at its base to form a shoulder for abutment against the rim of the opening in the can top in which the panel is mounted; and

FIG. 12 is a similar view showing how the outwardly bowed portion of the panel may be folded to form a flat peripheral flange which overlies and conceals the juncture between the panel and the can top in the finished product.

FIG. 1 shows a can top which is formed with the usual peripheral groove 10 and flange 12 whereby the can top

may be joined to a cylindrical body sheet with the joint forming the usual chime. The major portion of the can top is a sheet or container wall segment 14 of especially thin sheet material and a minor portion of the can top is in the form of a panel 15 of sheet material that spans an opening in the sheet 14. The panel 15 is connected to the sheet 14 by a continuous seam in the form of a multiple layer bead, generally designated 16, which protrudes from the underside of the can top and is of substantial strength to reinforce the can top against bulging.

In this particular embodiment of the invention the panel 15 is of elongated configuration dimensioned to extend across the major portion of the diameter of the can with one end extending close to the peripheral groove 10. By virtue of this elongated configuration of the panel the continuous bead 16 has two coextensive longitudinal portions 18 which, in effect, constitute a pair of spaced parallel reinforcement bars on the inner face of the can top. These two reinforcement bars effectively reinforce the can top against bulging because they span the major portion of the width of the can top and because they are appropriately spaced apart.

The material of the sheet 14 that surrounds the panel 15 is offset from the plane of the can top, being preferably offset inwardly to form an arcuate recess 20 which, as shown is preferably concentric to the can top and straddles the panel 15.

The panel 15 is scored along a line 22 to form a tear strip 24 which may be removed to leave a pouring opening in the can top. A sheet metal tab 25 is attached to the leading end of the tear strip 24 to serve as manual means for removing the tear strip. Within the scope of the invention the tab 25 may be attached to the tear strip in any suitable manner and the tab itself may be of any suitable construction.

In the present embodiment of the invention, the leading end of the tear strip is formed with a hollow rivet 26 which extends through an aperture of the tab 25 and is suitably headed or staked into permanent engagement with the tab. Preferably the tab itself is of the construction shown in which the tab has an end portion 28 formed with a hub or flange 29 (FIGS. 3 and 4) in engagement with the hollow rivet, the remaining portion of the tab being a second-class lever and the sheet metal at the juncture of the two portions being freely pliable to permit the lever to be swung upward relative to the end portion.

The sheet metal of the tab 25 has two small apertures 32 which define the bend line between the two portions of the tab and the sheet metal of the tab is slit along two lines 34 that diverge from the two apertures 32. Thus the lever 30 is of forked construction with two fulcrum ends 35 that straddle the leading end of the tear strip and are positioned to press against the panel 15 outside of the area of the tear strip for the purpose of lifting one side of the hollow rivet 26 upward to initiate severance of the tear strip 24. The sheet metal that forms the tab 25 is stiffened by being offset to form a relatively wide rib 36 which, as may be seen in FIG. 1, is U-shaped in plan and extends to the two fulcrum ends 35. For additional stiffness the sheet metal that forms the lever 30 may be rolled under at its margin to form a peripheral stiffening bead 38. The outer or free end 40 of the tab may be bent upward, as best shown in FIG. 3, to make it easy to lift the lever initially and in addition the sheet metal of the tab may be offset to form minute projections 40 which serve as "hob nails" to facilitate manual gripping of the lever.

The manner in which the panel 15 is installed in the can top may be understood by referring to FIGS. 5 to 8. The sheet 14 that constitutes the major portion of the can top is formed with an opening of the desired configuration of the panel and is further formed with a downwardly extending continuous flange 44 around the rim of the opening. Preferably the edge of the flange 44 is slightly flared

as indicated at 45. The sheet material that forms the panel 15 is dimensioned to fit into the opening in the sheet 14 and is formed with a continuous peripheral flange 46 that is substantially deeper than the flange 44 and like the flange 44 is outwardly flared at its edge as indicated at 48.

The next step is to position the panel 15 in the plane of the sheet 14 with the continuous peripheral flange 46 of the panel telescoped into the flange 44 as shown in FIG. 5. Preferably but not necessarily the telescoped flanges 44 and 46 are then provided with a suitable sealant, such as plastisol, to insure that the joint between the panel 15 and the sheet 14 will be fluid tight. For this purpose the assembly shown in FIG. 5 may be simply dipped into a sealant to form a sealant coating 50 shown in FIG. 6.

The next step is to roll the two flanges 44 and 46 helically together to form the desired rolled multiple-layer bead 16 shown in cross section in FIG. 7. The dies required to carry out this operation are conventional and well known.

In the preferred practice of the invention, the next step is to tighten and slightly flatten the bead 16. It is to be understood, however, that this flattening step may be omitted if desired.

The step of tightening and slightly flattening the rolled bead or seam 16 may be carried out in the manner shown in FIG. 9 wherein a lower die 52 supports a can top and cooperates with an upper die 54. The lower die has a continuous groove 55 to receive the continuous rolled bead 16 and the depth of the groove is slightly less than the depth of the initial configuration of the rolled bead. When the two dies close together the rolled bead is slightly compressed while held against lateral expansion by the walls of the groove 55. As a result, the rolled bead is tightened and is slightly flattened against the underside of the can top sheet 14 in the region designated by numeral 56.

The can top is now ready for processing to form the tear strip 24 and for the further procedure of attaching a tab 25 to the leading end of the tear strip. The first step in the further processing is to form a hollow rivet 53 in the panel 15 of an initial configuration as shown in FIG. 10. The next step is to score the panel 15 along the line 22 to form the tear strip 24. Then the tab 25 is placed on the panel 15 with the preliminary hollow rivet 53 extending through the aperture of the tab and hollow rivet 53 is staked to form the final hollow rivet 26 in permanent engagement with the tab. Preferably the step of deforming or staking the preliminary hollow rivet 54 is carried out by squeezing the transverse end wall 60 of the hollow rivet across its thickness to extrude the metal of the transverse end wall radially in all directions thereby forming the final hollow rivet 26 with a peripheral bead 62 as shown in FIGS. 3 and 4.

The arcuate recess 20 may be formed in the can top sheet 14 at any point in the fabrication procedure after the panel 15 is installed. The offsetting of the sheet metal by the formation of the arcuate recess stiffens the can top and cooperates with the continuous seam 16 to minimize bulging of the can top by internal fluid pressure.

It has been found that if a top of a pressurized beverage can is made entirely of an aluminum alloy and the new construction is followed, the thickness of the sheet 14 and the thickness of the panel 15 may both be reduced from the usual thickness of approximately 0.015" to a thickness on the order of 0.010"–0.012" without the can top bulging unduly in response to the pressure of the confined fluid.

Since the purpose of using aluminum alloy is primarily to provide a tear strip that is easily removable, the sheet 14 that surrounds the panel 15 need not be made of sheet material as expensive as aluminum alloy. Thus the sheet 14 may be thin tin-coated steel.

FIGS. 11 and 12 illustrate a modification of the invention wherein the peripheral flange 46*a* of a panel 15*a* is

outwardly bowed at the base of the flange as indicated at **64**. When the panel **15***a* is initially positioned in the opening in the can top the outwardly bowed peripheral portion **64** serves as a shoulder which abuts the rim of the can opening as shown in FIG. 11. When the two flanges **44** and **46***a* of FIG. 11 are rolled to form a seam or bead **16** on the underside of the can top, the same dies that roll the two flanges serve to collapse or flatten the outwardly bowed peripheral portion **64** of the panel, the result being a flattened bead or double layer flange indicated at **65** in FIG. 12, the double layer flange overlapping and concealing the juncture between the can top and the panel. In the absence of such an overlapping flange **65** there is an exposed crack or crevice at the juncture between the panel and the can top which crack is indicated at **66** in FIG. 8. Dust may tend to accumulate in such a crack. No such dust accumulation is noticeable in the construction shown in FIG. 12.

In one practice of the method of the present invention, a sealant is applied to the rolled seam **16** after the rolled seam is formed, such a sealant being indicated at **70** in FIG. 8 of the drawing. If the sealant **70** is used, the sealant **50** in FIG. 6 may be omitted if desired.

Sheet metal to be used for fabricating containers is commonly prepared with a so-called seal coat that seals off the raw metal from the contents of the container. Since this seal coat may be scratched or otherwise damaged in the course of forming the rolled seam **16**, the final application of the sealant **70** may be depended upon to repair any such damage to the seal coat in addition to acting further to very effectively seal the rolled seam **16**.

My description in specific detail of the selected embodiment of the invention will suggest various changes, substitutions and other departures from my disclosure within the spirit and scope of the appended claims.

I claim:

1. In the construction of an easy opening can to confine a beverage under pressure with the can top bulging in response to the pressure, the improvement to reduce the cost of the can top without the penalty of undue bulging of the can top in comparison to the bulging of a conventional can top of sheet material of conventional thickness, comprising:

the can top being made of sheet metal of a thickness no greater than approximately .012" with an elongated opening extending over a central area of the can top;

said opening having an axis extending in the direction of elongation of the opening, said opening extending outwardly from the center of the can top for substantial distances in both directions along the axis of the opening;

an elongated panel of aluminum alloy with a thickness no greater than approximately .012" spanning and sealing said opening;

the panel being joined to the surrounding sheet metal by a continuous seam in the form of a helically rolled bead having a plurality of layers,

longitudinal spaced portions of said bead extending across the central area of the can top and serving as pair of spaced reinforcement bars to stiffen the can top against bulging,

one end of said panel being rounded in plan configuration and extending close to the peripheral margin of the can top,

said panel having an easily removable tear strip extending close to said end of the panel.

2. A combination as set forth in claim **1** in which said panel is substantially co-planar with the rest of the can top with said bead protruding from the lower face of the can top.

3. A method of increasing the stiffness of a can top of aluminum alloy to make it possible to use aluminum alloy of conventional thickness with less bulging of the can top in response to a given internal fluid pressure or to make it possible to use aluminum alloy at least 20% thinner than conventional thickness with the usual degree of bulging of the can top in response to the given fluid pressure, characterized by the steps of:

forming a can top of aluminum alloy with an opening therein and with an inwardly directed continuous flange around the rim of the opening, said opening being centrally located and being of a dimension greater than the radius of the can top;

forming a panel of aluminum alloy to fit into said opening with the panel formed with a continuous peripheral flange;

positioning the panel in the opening with the flange of the panel telescoped into the flange of the opening in the can top; and

rolling the two flanges together helically to interlock the two flanges to form a continuous multiple-layer bead extending across a central area of the can top to serve as means to reinforce the can top against bulging.

4. A method as set forth in claim **3** which includes the further step of offsetting the metal of the can top outside of the area of the panel to siffen the can top against bulging.

5. A method as set forth in claim **3** in which the opening in the can top is an elongated opening with curved ends;

in which one end of the opening is closer to the periphery of the can top than the other end; and

in which the can top is formed with a C-shaped offset that straddles the other end of the panel.

6. A method of increasing the stiffness of a can top of aluminum alloy to make it possible to use aluminum alloy of conventional thickness with less bulging of the can top in response to a given internal fluid pressure or to make it possible to use aluminum alloy at least 20% thinner than conventional thickness with the usual degree of bulging of the can top in response to the given fluid pressure, characterized by the steps of:

forming a can top of aluminum alloy with an opening therein and with an inwardly directed continuous flange around the rim of the opening, said opening being centrally located and being of a dimension greater than the radius of the can top;

forming a panel of aluminum alloy to fit into said opening with the panel formed with a continuous peripheral flange;

positioning the panel in the opening with the flange of the panel telescoped into the flange of the opening in the can top; and

rolling the two flanges together helically outwardly of the area of the panel to form a multiple layer rolled bead abutting the inner surface of the can top outside of the area of the panel.

7. A method as set forth in claim **6** in which the peripheral flange of the panel is formed deeper than the flange around the rim of the opening.

8. A method as set forth in claim **6** in which the opening in the can top is formed to an elongated configuration with curved ends and with parallel sides whereby two parallel portions of the rolled seam serve as spaced parallel reinforcement bars in the finished can top.

9. A method of increasing the stiffness of a can top of aluminum alloy to make it possible to use aluminum alloy of conventional thickness with less bulging of the can top in response to a given internal fluid pressure or to make it possible to use aluminum alloy at least 20% thinner than conventional thickness with the usual degree of bulging of the can top top in response to the given fluid pressure, characterized by the steps of:

forming a can top of aluminum alloy with an opening therein and with an inwardly directed continuous flange around the rim of the opening, said opening being centrally located and being of a dimension greater than the radius of the can top;

forming a panel of aluminum alloy to fit into said opening with the panel formed with a continuous peripheral flange;

positioning the panel in the opening with the flange of the panel telescoped into the flange of the opening in the can top;

rolling the two flanges together helically to interlock the two flanges to form a continuous multiple layer bead extending across a central area of the can top to reinforce the can top against bulging; and

compressing the rolled bead perpendicular of the can top to tighten the rolled bead.

10. A method of increasing the stiffness of a can top of aluminum alloy to make it possible to use aluminum alloy of conventional thickness with less bulging of the can top in response to a given internal fluid pressure or to make it possible to use aluminum alloy at least 20% thinner than conventional thickness with the usual degree of bulging of the can top in response to the given fluid pressure, characterized by the steps of:

forming a can top of aluminum alloy with an opening therein and with an inwardly directed continuous flange around the rim of the opening, said opening being centrally located and being of a dimension greater than the radius of the can top;

forming a panel of aluminum alloy to fit into said opening with the panel formed with a continuous peripheral flange;

positioning the panel in the opening with the flange of the panel telescoped into the flange of the opening in the can top;

rolling the two flanges together helically to interlock the two flanges to form a continuous multiple layer bead extending across a central area of the can top to reinforce the can top against bulging;

placing one face of the can top against a first die having a continuous groove of the configuration in plan of the rolled bead and of lesser depth than the rolled bead, the groove being of a width to confine the bead;

placing a second die against the opposite face of the can top with the rolled bead of the can top positioned in said groove; and

closing the two dies against the can top to tighten the rolled bead.

11. A method of mounting a panel of sheet metal in a sheet metal wall of a container, characterized by the steps of:

forming an opening in the container wall with an inwardly turned flange around the rim of the opening;

forming a panel of sheet metal to fit into the opening with the panel formed with a continuous peripheral flange and with the peripheral flange bowed outwardly near its base to form a peripheral shoulder;

positioning the panel in the opening with the flange of the panel telescoped into the flange of the opening and with the peripheral shoulder of the flange abutting the rim of the opening;

rolling the two flanges together helically to interlock the two flanges to form a continuous multiple layer bead protruding inwardly from the container wall; and

collapsing the outwardly bowed portion of the flange of the panel to form a continuous double layer flange overlapping the juncture between the container wall and the panel.

12. A method of increasing the stiffness of a can top of aluminum alloy to make it possible to use aluminum alloy of conventional thickness with less bulging of the can top in response to a given internal fluid pressure or to make it possible to use aluminum alloy at least 20% thinner than conventional thickness with the usual degree of bulging of the can top in response to the given fluid pressure, characterized by the steps of:

forming a can top of aluminum alloy with an opening therein and with an inwardly directed continuous flange around the rim of the opening, said opening being centrally located and being of a dimension greater than the radius of the can top;

forming a panel of aluminum alloy to fit into said opening with the panel formed with a continuous peripheral flange;

positioning the panel in the opening with the flange of the panel telescoped into the flange of the opening in the can top;

applying sealant to the telescoped flanges; and

rolling the two flanges together helically to interlock the two flanges to form a continuous multiple-layer bead extending across a central area of the can top to serve as means to reinforce the can top against bulging.

13. A method of increasing the stiffness of a can top of aluminum alloy to make it possible to use aluminum alloy of conventional thickness with less bulging of the can top in response to a given internal fluid pressure or to make it possible to use aluminum alloy at least 20% thinner than conventional thickness with the usual degree of bulging of the can top in response to the given fluid pressure, characterized by the steps of:

forming a can top of aluminum alloy with an opening therein and with an inwardly directed continuous flange around the rim of the opening, said opening being centrally located and being of a dimension greater than the radius of the can top;

forming a panel of aluminum alloy to fit into said opening with the panel formed with a continuous peripheral flange;

positioning the panel in the opening with the flange of the panel telescoped into the flange of the opening in the can top;

rolling the two flanges together helically to interlock the two flanges to form a continuous multiple-layer bead extending across a central area of the can top to serve as means to reinforce the can top against bulging; and

applying sealant to the continuous bead to seal the bead and to keep the contents of the can from making contact with the aluminum alloy.

14. In an easy opening container wall, the combination of:

a container wall segment of sheet material, said container wall segment having an elongated opening substantially longer than one half the diameter of the container wall segment and extending across a central region of the container wall segment;

an elongated panel covering said opening in said container wall segment, said elongated panel being scored to form a tear strip at least partially removable from the panel;

portions of said panel and said container wall segment being rolled together to form a seam extending around said panel to interconnect said panel and said container wall segment, said seam having two spaced longitudinal portions, each of said longitudinal portions extending across a major portion of the container wall to form a reinforcement bar to stiffen the container wall against bulging; and

means for initiating severance of said tear strip from the panel.

15. A combination as defined in claim 14 wherein said seam is continuous and at least partially encased with a sealant coating to seal the seam.

16. A combination as defined in claim 14 wherein said elongated panel has a first end portion lying closely adjacent the periphery of the container wall segment and a second opposed end portion disposed on the opposite side of the center of the container wall segment and a substantial distance therefrom.

17. A combination as defined in claim 14 wherein the opening has a rim and the elongated panel is folded

around its periphery to form a flat double layer flange which overlies the rim of the elongated opening.

18. A combination as defined in claim 14 wherein said container wall segment and said panel are both constructed of aluminum alloy having a thickness no greater than approximately .012".

References Cited

UNITED STATES PATENTS

1,809,451	6/1931	Quinn	220—53
2,112,231	3/1938	Speidel	220—54
2,723,778	11/1955	Rabak	220—48
3,223,277	12/1965	Zundel	220—53

DONALD F. NORTON, *Primary Examiner.*

THERON E. CONDON, *Examiner.*

G. T. HALL, *Assistant Examiner.*