

[72] Inventors Omar L. Brown;
Ermal C. Frazee, both of Dayton, Ohio

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[73] Assignee Ermal C. Frazee
Dayton, Ohio
a part interest

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Primary Examiner—George T. Hall
Attorney—Smyth, Roston & Pavitt

[54] EASY OPENING CONTAINER WALL HAVING
STRESS RELIEF SCORES
9 Claims, 4 Drawing Figs.

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ABSTRACT: An easy-opening container wall having a line of weakness therein defining a panel at least partially removable from the container wall and a tab attached to the panel to initiate severance of the panel from the container wall. The panel is weakened along a plurality of circumferentially extending regions. Preferably, the panel includes first and second axially offset sections interconnected by a connecting wall with one of the weakened regions being formed in each of the sections closely adjacent the connecting wall.

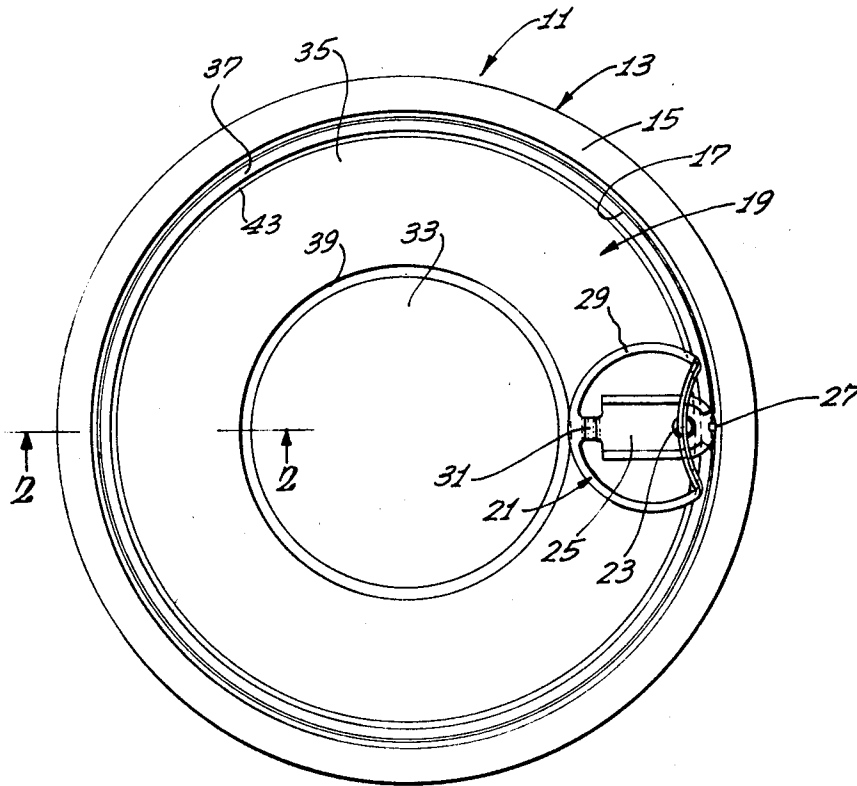


Fig. 1

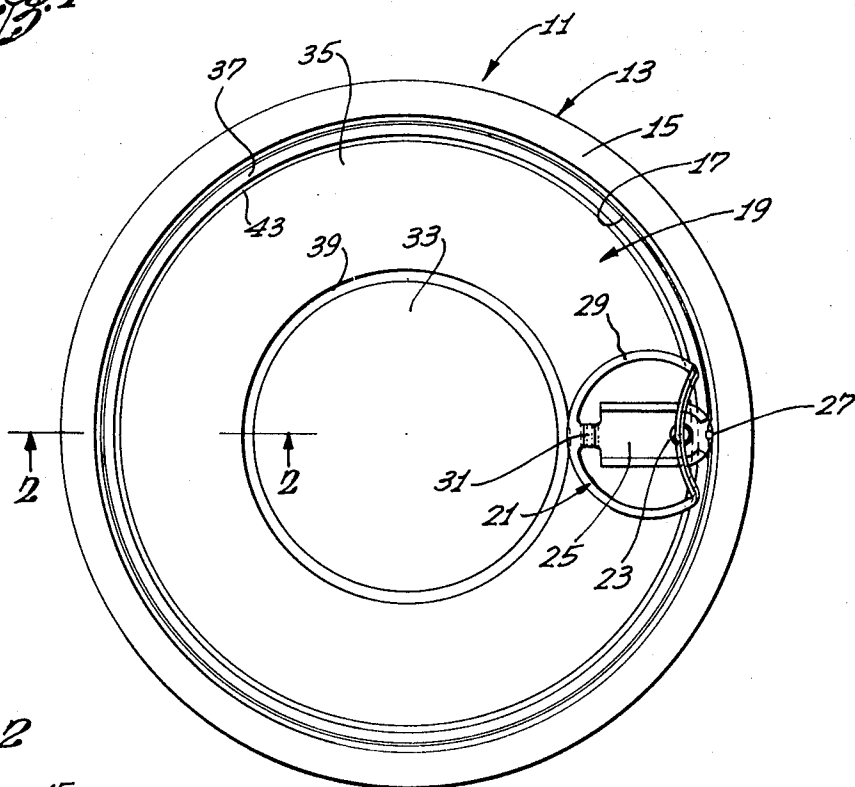


Fig. 2

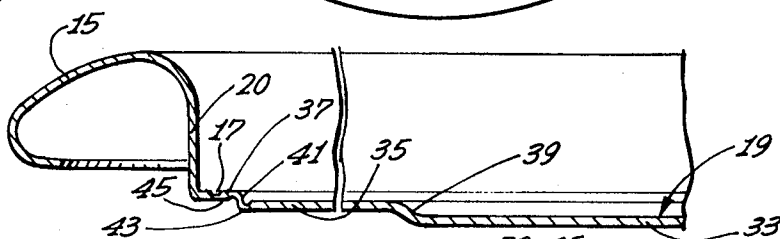


Fig. 3

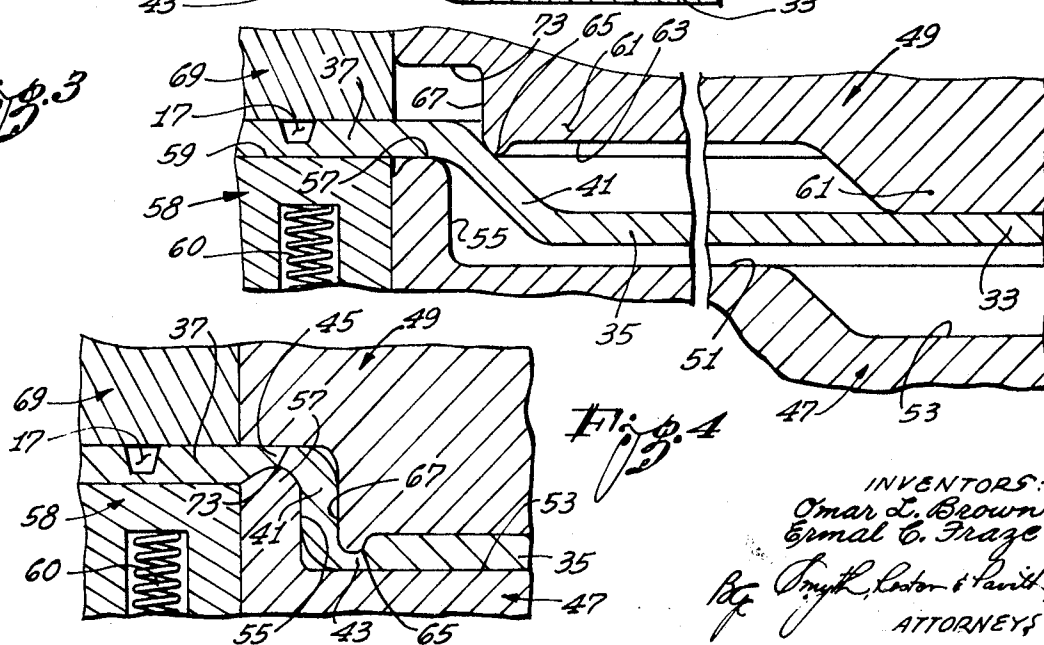


Fig. 4

INVENTORS:
Omar L. Brown
Ernest C. Fraze
By *[Signature]* *[Signature]*
ATTORNEYS

EASY OPENING CONTAINER WALL HAVING STRESS RELIEF SCORES

BACKGROUND OF THE INVENTION

An easy-opening container wall typically includes a container wall of sheet material having a main scoreline therein defining a panel removable therefrom and a tab to initiate severance of the panel from the container wall. Often times the panel is large relative to the size of the container wall and it may cover a major portion of, or substantially all of, the area of the container wall.

During transit the easy-opening container is subjected to shock and vibration forces as a result of product movement within the container. Specifically the usual shocks encountered during transit cause the product to be repeatedly forced against the container wall.

The stress thus imparted to the container wall is not evenly distributed throughout the container wall because of the irregular cross section of the container wall due to the weakening of the container wall by the main scoreline. Rather, the stress is concentrated at the main scoreline. This repeated stressing of the main scoreline is so substantial that it can result in the rupture of the sheet material along the main scoreline, through fatigue or otherwise, with consequent spillage and/or spoilage of the product. In some instances the rupturing along the main scoreline will be assisted by a positive or negative pressure within the container.

SUMMARY OF THE INVENTION

The present invention solves this problem by reducing the stress on the container wall along the line of weakness. This is accomplished by distributing the stress to other areas of the panel which ordinarily would absorb little stress. Thus, the stress concentration which existed heretofore along the main scoreline is eliminated.

To distribute the stress, the present invention teaches weakening of the panel along circumferentially extending regions so that the weakened regions will absorb greater stress than they would in an unweakened condition. In this manner the stress at the main scoreline is reduced so that the weakened regions serve to protect the main scoreline.

The weakened regions are preferably in the form of coined regions which extend circumferentially of the panel with each of the coined regions forming a complete loop. In a preferred form of the invention, the coined regions are concentric and lie closely adjacent the line of weakness which defines a panel. By locating the weakened regions closely adjacent the scoreline which defines the panel, they absorb greater proportions of stress and thereby provide greater protection for the scoreline.

Coining of the panel to produce the weakened regions causes flow of metal away from or outwardly of the coined regions. This produces excess metal in the panel adjacent the coined regions. The presence of excess metal renders the container wall bistable or produces a tendency to "oil can." To avoid this problem, the present invention teaches that the material displaced in the coining operation can be used if sections of the panel are offset axially relative to each other, i.e., panel formed. Specifically, first and second sections of the panel are axially offset relative to each other and integrally joined by a connecting wall. According to the present invention, the material displaced in the coining operation is displaced into the connecting wall. By relocating the displaced material in the connecting wall, no adverse effects on the stability of the container wall are produced.

In the resulting construction, each of the axially offset sections of the panel has one weakened region contiguous adjacent the connecting wall. This makes the panel quite flexible longitudinally. In addition, the axially extending wall and the weakened regions make a central portion of the panel flexibly resilient in the lateral or transverse directions. Thus, stress resulting from forces acting on the panel in the transverse

direction are absorbed in large part by the weakened regions to thereby protect the scoreline. To avoid excessively weakening the panel the sheet material along the weakened regions is preferably thicker than the sheet material along the line of weakness which defines the panel.

The invention, both as to its organization and method of operation, together with further features and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying illustrative drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of an easy-opening container wall constructed in accordance with the teachings of this invention.

FIG. 2 is an enlarged fragmentary sectional view taken on a radial plane along line 2-2 of FIG. 1.

FIG. 3 is a fragmentary sectional view taken on an axially extending plane through the easy-opening container wall of this invention and illustrating the easy-opening container wall after a portion of the offsetting step has been carried out and with the tooling for the coining operation being advanced to approximately the point at which reforming and coining of the panel begins.

FIG. 4 is a fragmentary sectional view similar to FIG. 3 with the coining and reforming tooling fully advanced.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing and in particular to FIG. 1 thereof, reference numeral 11 designates an easy-opening container wall constructed in accordance with the techniques of this invention. The easy-opening container wall includes a container wall 13 having a peripheral attachment flange 15 for attaching the container wall to a can body (not shown). The container wall 13 has a scoreline 17 therein defining a tear portion or panel 19 which is removable from the container wall. In the embodiment illustrated, the scoreline 17 and the panel 19 are circular in plan; however, other configurations may be employed, if desired. The scoreline 17 lies closely adjacent a chuck wall 20 (FIG. 2) so that the panel 19 covers substantially the entire area in plan of the container wall 13.

A tab 21 which is preferably integrally constructed of a single piece of sheet material is attached to the panel 17 by suitable means such as a rivet 23 formed integrally with the panel. Although many different kinds of tabs may be employed, in the embodiment illustrated, the tab 21 includes a longitudinally rigid lever portion 25 having a rupturing nose 27 which preferably overlies a region of the scoreline 17. The tab 21 also includes a ringlike handle portion 29 and a pliable connecting portion 31 integrally joining the handle portion and the lever portion 25.

In use of the tab 21, the radial outer end of the handle portion 29 can be lifted with ease because of the pliable nature of the connecting portion 31. Thus, the first phase of operation of the tab 21 involves raising or moving of the outer end of the handle portion 29 away from the panel 19. In so doing, the handle portion 29 will pivot generally about the connecting portion 31 relative to the lever portion 25. This raises the end of the lever portion 25 adjacent the connecting portion 31 slightly. When the handle portion 29 has been raised to the appropriate angle, the user may firmly grasp the ring thereof and exert an outward pulling force thereon. The outward pulling force causes the end of the lever portion 25 opposite the rupturing nose 27 to be lifted substantially. This tends to impart pivotal motion to the lever portion 25 tending to depress the rupturing nose 27 against the scoreline 17 with sufficient force to rupture the scoreline. By continuing to exert an outward pulling force in the proper direction, the entire panel 19 can then be torn from the container wall 13.

The panel 19 is provided with an inner panel section 33, an intermediate panel section 35, and an outer panel section 37 with the inner and intermediate sections being integrally connected by a connecting wall 39 and with the intermediate and

outer sections being integrally connected by a connecting wall 41. As shown in FIGS. 2 and 3, the sections 33, 35 and 37 are axially offset with respect to each other with the inner section 33 being located axially inwardly of the intermediate section 35 and with the intermediate section 35 being located axially inwardly of the outer section 37.

A pair of weakened regions 43 and 45 are formed in the panels 35 and 37, respectively, contiguous the connecting wall 41. The weakened regions 43 and 45 extend circumferentially of the panel 19 and preferably lie closely adjacent the scoreline 17. Preferably each of the weakened regions form a complete loop and in the embodiment illustrated the weakened regions are circular and concentric with each other and with the panel 19. In the embodiment illustrated, the weakened regions 43 and 45 are radially and axially offset.

A preferred manner of making the container wall 13 is shown in FIGS. 3 and 4. First the panel is scored and panel formed using conventional tooling to form to the scoreline 17 and to offset the section 35 relative to the section 37. The panel forming operation stretches the panel 19.

The formation of the weakened regions 43 and 45 and offsetting of the section 33 relative to the section 35 can advantageously be carried out in a single work operation utilizing a pair of tools 47 and 49. The tool 47 has a cavity 51 shaped generally to the desired contour of the lower face of the sections 33 and 35 and the connecting walls 39 and 41. Thus, the cavity 51 has a stepped bottom wall 53 and a peripheral wall 55. The tool 47 also has an annular, upwardly protruding, coining surface 57 which completely surrounds the rim of the cavity 51 contiguous thereto. A workholder 58 which has a generally planar supporting surface 59 and is biased upwardly by a spring 60 surrounds the tool 47.

The tool 49 has a protruding head 61 with a working surface 63 which is generally flat except for the presence of a downwardly protruding annular coining surface 65. The head 61 also has a peripheral surface 67 which, in the advanced position of the tools 47 and 49 shown in FIG. 4 is spaced inwardly of the peripheral wall 55, an amount sufficient to readily accommodate the radial thickness of the connecting wall 41. As shown in FIGS. 3 and 4, the coining surface 65 is contiguous the peripheral surface 67. The tool 49 may be supported and guided by an annular holder 69 also clamps an annular region of the sheet material against the surface 59. Although the coining surfaces 57 and 65 are annular in the embodiment illustrated, they may assume a configuration in plan which conforms to the desired configuration in plan of the weakened regions 43 and 45.

After the panel forming the section 35 and scoring, the tools 47 and 49 are advanced to the position shown in FIG. 3. As shown in FIG. 3, the connecting wall 41 slopes. The wall 41 is engaged by the tools 47 and 49 as shown in FIG. 3 with the result that upon further advancing of the tools the wall 41 is reformed and the coining surfaces 57 and 65 coin the panel to form the weakened regions 45 and 43, respectively. The reforming operation straightens the wall 41 as shown in FIG. 4 and axially offsets the section 33 relative to the section 35.

In the coining operation, an annular region of sheet material of the section 37 contiguous the connecting wall 41 (FIG. 4) is squeezed between the coining surface 57 and a surface 73 of the tool 49 while an annular region of the sheet material of section 35 contiguous the connecting wall 41 (FIG. 4) is squeezed between the coining surface 65 and the bottom wall 53. This squeezing action is carried out with sufficient force to cause flow of the metal from the squeezed regions with consequent thinning of these regions to form the weakened regions 43 and 45. The amount of coining and consequent thinning of the regions 43 and 45 can be varied depending upon the amount which it is desired to weaken the sections 35 and 27. When the surface 73 strikes the can end, it forces the latter downwardly against the coining surface 57 and the resulting downward movement of the can end may cause slight retraction of the workholder 58 against the force of the spring 60. If the holder 69 is biased downwardly, it will also move

downwardly slightly to keep the can end clamped against the holder 58.

The metal displaced in the coining operations will follow the path of minimum resistance. Because of the liberal spacing between the peripheral surfaces 55 and 67, a relatively large volume of free space is provided into which the displaced material can flow. Accordingly, a major portion of the extruded material flows into and form a portion of the connecting wall 41.

In use of the container wall, the product carried within the container to which the container wall is affixed will, during transit, be repeatedly forced against the panel 19. If the weakened regions 43 and 45 were not provided, the stress in the panel would be concentrated at the scoreline 17 due to the reduction in cross section thereof. A related factor is that the panel would be repeatedly tend to flex about the scoreline 17 in response to such force to tend cause a structural failure along the scoreline.

The weakened regions 43 and 45, however, absorb some of the stress which would have been absorbed by the scoreline 17 with the result that the stress is distributed and the scoreline is protected. The weakened regions 43 and 45 produce a bellows type flexing action. For example, in response to an upward force both of the regions 43 and 45 would yield to permit the sections 33 and 35 to move upwardly. Similarly, a laterally directed force would result in resilient yielding of the regions 43 and 45 to permit lateral movement of the sections 33 and 35.

Although an exemplary embodiment of the invention has been shown and described, many changes, modifications, and substitutions may be made by one having ordinary skill in the art without necessarily departing from the spirit and scope of this invention.

We claim:

1. In an easy-opening container wall wherein a line of weakness is formed in a container wall to define a panel at least partially removable from the container wall and a tab is connected to the container wall to initiate severance of the panel from the container wall and wherein the container wall is subjected to a force prior to manipulation of the tab tending to sever the line of weakness, the improvement to reduce the amount of stress which is absorbed by the container wall at the line of weakness in response to the application of the force to the panel comprising:

the panel being weakened at a plurality of radially spaced, circumferentially extending regions closely adjacent said line of weakness with said weakened regions being weakened sufficiently to cause said panel along said weakened regions to absorb more of the stress resulting from said force than they would absorb in an unweakened condition to thereby reduce the amount of stress which is absorbed by said line of weakness, the panel being non-rupturable at said weakened regions in response to manipulation of said tab.

2. An improvement as defined in claim 1 wherein each of said regions forms a substantially complete loop, a first of said regions being surrounded by a second of said regions.

3. An improvement as defined in claim 1 wherein each of said regions defines a residual web and said line of weakness defines a rupturable residual web, said rupturable residual web being thinner than major portions of at least one of said first-mentioned residual webs.

4. An improvement as defined in claim 1 wherein a first of said weakened regions is axially offset from a second of said weakened regions.

5. In an easy-opening container wall wherein a line of weakness is formed in a container wall to define a panel at least partially removable from the container wall and a tab is connected to the container wall to initiate severance of the panel from the container wall and wherein the container wall is subjected to a force other than through the manipulation of the tab tending to sever the line of weakness, the improvement to reduce the amount of stress which is absorbed by the con-

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tainer wall at the line of weakness in response to the application of the force to the panel comprising:

a plurality of circumferentially extending weakened regions in said panel, each of said weakened regions forming a substantially complete loop and being weakened sufficiently to permit the panel to deflect therealong in response to said force.

6. An improvement as defined in claim 5 wherein a first of said weakened regions is axially offset from a second of said weakened regions.

7. In a easy-opening container wall wherein a line of weakness is formed in a container wall to define a relatively large panel at least partially removable from the container wall and a tab is connected to the container wall to initiate severance of the panel from the container wall, the improvement comprising:

the panel including first and second axially offset sections integrally joined by a connecting wall with the first section substantially circumscribing the second section, said second section covering a major area of the panel;

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one of said sections of the panel being weakened and thinned in a region extending circumferentially of the panel closely adjacent the connecting wall with the region extending for a substantial distance circumferentially of the panel; and

said connecting wall containing material displaced from said region.

8. An improvement as defined in claim 7 wherein both of said sections of said panel are weakened and thinned in a region extending circumferentially of the panel closely adjacent the connecting wall with both of the regions extending for a substantial distance circumferentially of the panel, said connecting wall containing material displaced from both of said regions.

9. An improvement as defined in claim 7 wherein each of said weakened regions substantially forms a loop and said weakened regions are generally concentric, said weakened regions being contiguous said connecting wall.

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