Dec. 17, 1968 J. C. JASPER ET AL 3,416,700

SAFETY DEVICE FOR EASY OPENING CONTAINER ENDS

Filed Oct. 25, 1967

FIG.1

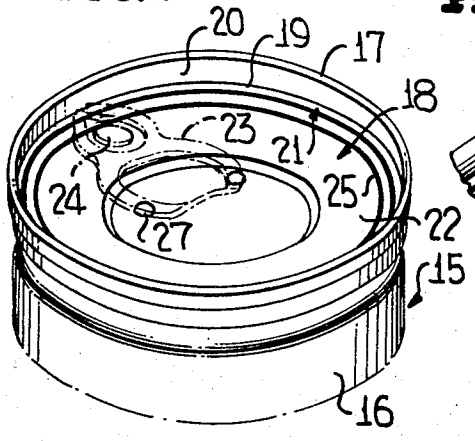


FIG.2

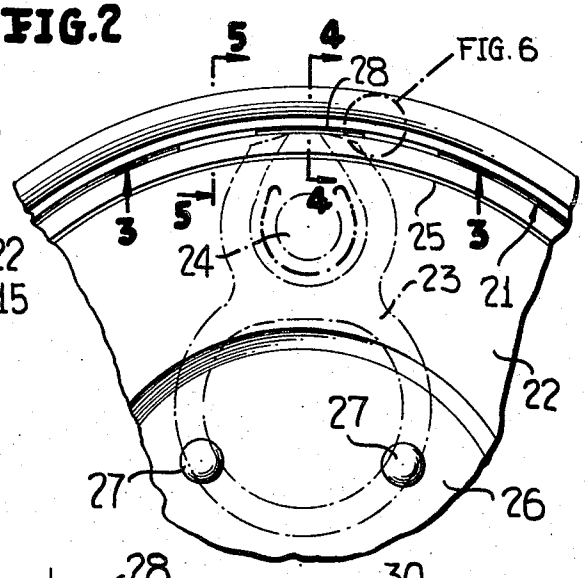


FIG.3

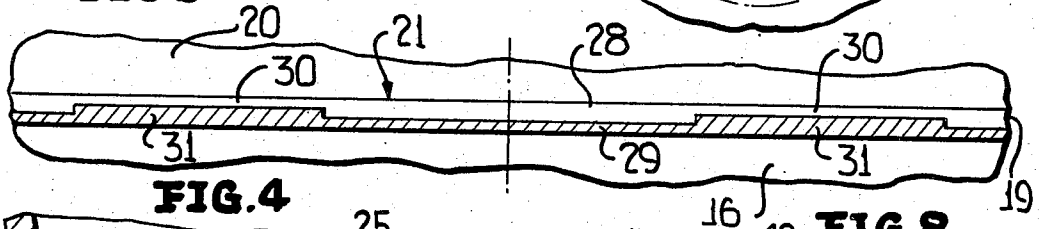


FIG.4

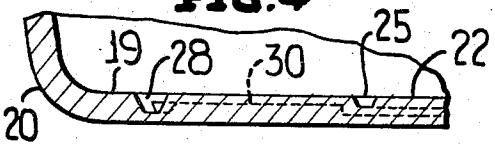


FIG.5

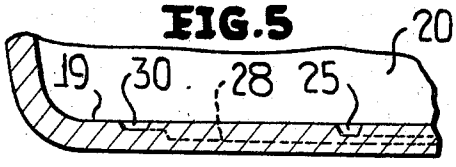


FIG.8

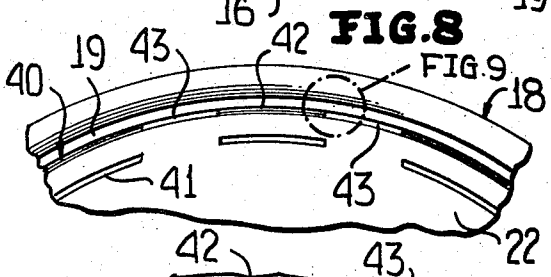


FIG.9

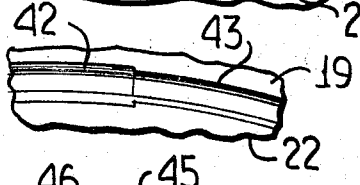


FIG.6

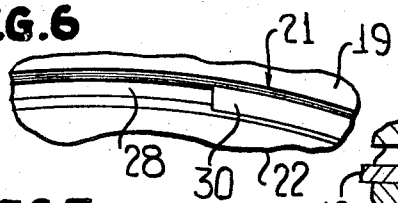


FIG.10

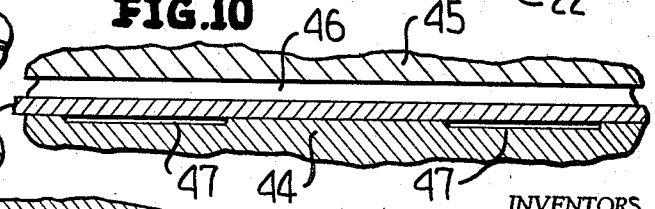
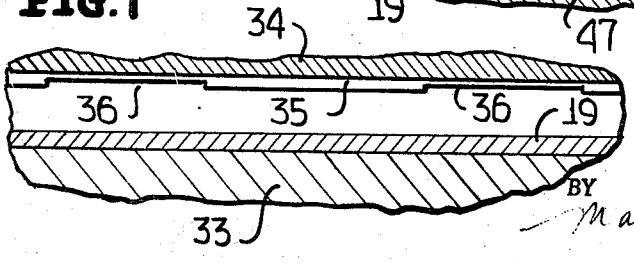


FIG.7



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SAFETY DEVICE FOR EASY OPENING CONTAINER ENDS

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10 Claims. (Cl. 220—54)

ABSTRACT OF THE DISCLOSURE

This disclosure relates to easy opening container ends of the type having a removable panel portion defined by a score line. The purpose of the invention is to prevent the sudden catastrophic implosion or explosion of container ends while being opened and subjected to varying degrees of pressure or vacuum. This failure is prevented by limiting the crack propagation along the score line to an area large enough to allow a gradual pressure equalization of the container and specifically includes two areas of different score residuals.

This invention relates to easy opening container ends which are particularly intended for use as an end of a sealed container having an internal pressure other than atmospheric, and wherein each easy opening container end has a removable panel portion defined by a peripheral weakened line, such as a score line. Such container ends are opened by means of a tab which is suitably secured thereto in a manner so as to be capable of exerting a concentrated pressure on the container end along a predetermined portion of the score line. When the pressure within the container is the same as that of the surrounding atmosphere, the opening of the container is accomplished solely by means of the pull tab. However, when there is a pressure differential of a nature wherein the force exerted by a pressure on the removable panel portion reacts in the direction of force applied by the pull tab, after there is an initial fracture of the container end, there is the probability of the uncontrolled movement of the removable panel portion and the tearing of the container end along the score line due to the influence of pressure thereon before the pressure within the container can be equalized with that of the surrounding atmosphere. This is particularly true when the removable panel portion constitutes substantially the entire end panel of the container end.

In accordance with this invention, the uncontrolled rupture of the container end along the score line is prevented by limiting the crack propagation to an area large enough to allow a gradual pressure equalization of the container. Specifically, the invention proposes two areas of different score residuals. The larger score residual area is placed such that it in no way interferes with the initial opening of the container, but prevents the crack along the score line from propagating any further. The portion of the container end thus opened is large enough to allow gradual pressure equalization and thereby prevents the undesired failure. It is to be understood, of course, that the scoring will be of a depth throughout wherein only a nominal force will be required to both initiate and complete the rupture of the container end so as to facilitate the removal of the removable portion.

Another feature of this invention is that the different score residuals may be readily provided in two different manners. First, the scoring tool may be notched. Secondly, the supporting anvil for the container end may be notched whereby the container end may deflect temporarily into the notches in the anvil so as to reduce the effect of the scoring tool thereon.

A further feature of this invention is the recessing of a central portion of the container end underlying the terminal end of the pull tab, and the provision of the recessed central portion with upstanding buttons supporting the pull tab on opposite sides of the terminal end so as to facilitate the initial engagement and lifting of the pull tab.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a fragmentary top perspective view of a can formed in accordance with this invention.

FIGURE 2 is an enlarged fragmentary plan view of the can end of FIGURE 1.

FIGURE 3 is an enlarged fragmentary vertical sectional view taken along the score line along line **3—3** of FIGURE 2 and shows the differential score residual.

FIGURE 4 is an enlraged fragmentary vertical sectional view taken along the line **4—4** of FIGURE 2.

FIGURE 5 is an enlarged fragmentary vertical sectional view taken along the line **5—5** of FIGURE 2.

FIGURE 6 is an enlarged fragmentary plan view showing the outline of the score along different portions thereof in the area indicated in FIGURE 2.

FIGURE 7 is a schematic sectional view taken through an anvil and a scoring die prior to the formation of a score line in a container end.

FIGURE 8 is an enlarged fragmentary plan view of another container end showing a slightly modified form of scoring.

FIGURE 9 is an enlarged fragmentary plan view along the score line of the container end of FIGURE 8 in the area indicated thereon and shows the specific score line configuration.

FIGURE 10 is an enlarged fragmentary schematic vertical sectional view showing generally the anvil and die arrangement for forming the score of FIGURES 8 and 9.

Referring now to the drawings in detail, it will be seen that there is illustrated in FIGURE 1 a can which is formed in accordance with this invention and which is generally referred to by the numeral **15**. The can **15** includes a conventional can body **16** of which only the upper portion is illustrated. The body **16** has secured thereto by means of a conventional double seam **17** an easy opening can end which is formed in accordance with this invention and which is generally referred to by the numeral **18**.

The can end **18** includes an end panel **19** which is surrounded by an upstanding chuck wall **20**, the chuck wall **20** forming a part of the double seam **17**. The end panel **19** is provided adjacent its inner section with a chuck wall **20** with a continuous peripheral score line which is generally referred to by the numeral **21** and which defines a removable panel portion **22**. In order to facilitate the removal of the removable panel portion **22**, there is provided a pull tab **23** which is secured in place by means of a rivet **24** which is preferably integrally formed from the removable panel portion **22**.

In the illustrated embodiment of the invention, when the inner terminal end of the pull tab **23** is lifted, there is a relative pivoting thereof with respect to the end panel **19** with the result that the outer terminal end or nose of the pull tab **23** exerts a downwardly directed pressure on the end panel **19** along the score line **21**. The force which may be readily exerted by the pull tab **23** on the end panel **19** is sufficient to effect the initial rupture of the end panel **19** along the score line **21**. Under normal circumstances, after the initial rupture occurs, further pivoting of the pull tab **23** will result in a continued fracturing of the end

panel along the score line **21** until the end panel has ruptured along a relatively large segment of the score line **21** and a part of the removable panel portion **22** has folded inwardly into the interior of the can **15**. Thereafter, the removable panel portion **22** may be readily removed by pulling out on the pull tab **23** with the rupture of the end panel **19** continuing along the score line **21**.

At this time it is also pointed out that the removable panel portion **22** is provided with an anti-fracture score line **25** which is equally spaced from the score line **21** and positioned radially inwardly thereof. The anti-fracture score line **25** permits the flexing of the end panel **19** and the absorption of stresses which would be normally imparted to the score line **21**.

The end panel **19** is also provided with a recessed central portion **26** which underlies the inner terminal end of the pull tab **23**. In order to make certain that the inner terminal end of the pull tab **23** may be readily engaged with one's finger, a pair of buttons **27** projects upwardly from the recessed portion **26** and supports the inner part of the pull tab **23** on opposite sides of the inner terminal end.

The above-described can **15** and the easy opening can end **18** thereof has proven to be quite satisfactory when the internal pressure within the can is substantially the same as that as the surrounding atmosphere. However, when the can **15** contains a product which is vacuum packed or one which is packed under very high pressures, such as beer and soft drinks, difficulties frequently arise during the opening of such cans. For example, when the can **15** is vacuum packed, at the time the pull tab is applying an axially inwardly directed force on the removable portion **22**, the pressure differential between the interior and exterior of the can **15** results in a pressure force being applied on the removable panel portion. Thus, when initial rupture occurs due to the force exerted on the removable panel portion **22** by the pull tab **23**, a portion of the support for the removable panel portion **22** is removed and the force due to the differential pressure takes over and causes an immediate implosion. This is undesirable both from the standpoint of customer reaction and the fact that the product packaged within the can **15** may be damaged by the inwardly swinging part of the removable panel portion **22**. This is particularly true of products such as nuts.

When the can **15** is internally pressurized, the pressure acting on the removable panel portion **22** at the time of initial rupture of the end panel **19** also has a tendency to force the removable panel portion **22** outwardly. With the pull tab arrangement illustrated in FIGURES 1 and 2, the force exerted by the pull tab on the removable panel portion **22** counteracts certain of this pressure force and difficulties are not as frequent. However, it will be readily apparent that when there is a slight change in the configuration of the removable panel portion and the pull tab reacts on the removable panel portion to apply an axially outwardly directed force on the removable panel portion, failure due to explosion is more likely to occur.

It is to be understood that in order that the can **15** may be opened by all intended users, the force required to open the container must remain as low as possible. Furthermore, the force required to tear out the removable panel portion **22** must remain consistently low. At the same time, uncontrolled rupture of the end panel along the score line due to either implosion or explosion must be prevented. In accordance with this invention, this is accomplished by varying the score residual.

Referring now to FIGURES 2 and 3, it will be seen that the score line **21** includes a score line portion **28** which is aligned with the nose of the pull tab **23** and along which initial rupture of the end panel **19** is intended to occur. The scoring along the score line portion **28** is relatively deep with there being a relatively small score residual **29** which must be ruptured during the initiation of the opening of the can **15**. The length of the score line portion **28** is sufficient to provide for the movement of the adjacent part of the removable panel portion **22** out of the plane of the end panel **19** whereby free flow of gases through the end panel **19** may occur and the pressure within the can **15** equalized with the surrounding atmospheric pressure.

Propagation of the crack along the score line **21** is prevented by the provision of score line portions **30** on opposite sides of the score line portion **28**, which score line portions **30** are of a lesser depth than the score line portion **28** and provide greater score residuals **31**. The score residuals **31** will be sufficient to prevent the uncontrolled propagation of the crack along the score line **21** while at the same time will not be sufficiently great so as to prevent the rupture thereof utilizing the pull tab **23**.

It is to be noted that beyond the score line portions **30** the score line **21** is of substantially the same depth as the score line portion **28** and there remains substantially the same score residual as the score residual **29**.

Referring now to FIGURE 6 in particular, it will be seen that the score line **21** is of a constant width at the surface of the end panel **19**. However, the base of the score line portion **30** is wider than the base of the score line portion **28**. This is due to the particular configuration of the tools utilized in forming the score line **21**.

Referring now to FIGURE 7 in particular, it will be seen that during the scoring of the end panel **19**, the end panel **19** is firmly seated on an anvil **33** and is engaged by a scoring die **34** having a downwardly projecting scoring rib **35**. The rib **35** is notched as at **36** so as to form the lesser depth score line portions **30**.

Reference is now made to FIGURES 8 and 9 wherein there is illustrated a slightly different score line configuration. The continuous score line along which rupture occurs during the opening of the can **15** is identified by the numeral **40** while the anti-fracture score line is identified by the numeral **41**. Like the score line **21**, the score line **40** has a portion **42** which will be aligned with the pull tab **23** and along which initial fracture or rupture of the end panel **19** will occur. Also, like the score line **21**, the score line **40** is provided with score line portions **43** of lesser depth and greater score residual on opposite sides of the score line portion **42**. A section along the score line **40** will correspond to a similar section along the score line **41** and will appear like that illustrated in FIGURE 3. However, as is clearly shown in FIGURE 9, the score line portion **42** is of a greater width at the surface of the end panel **19** than are the score line portions **43**. On the other hand, the width of the score line portion **42** at its base is the same as that of the score line portion **43** at its base.

Referring now to FIGURE 10 in particular, it will be seen that there is schematically illustrated the tooling with which the score line **40** is formed. This tooling includes an anvil **44** which underlies and supports the end panel **19**. The scoring is performed by means of a scoring die **45** having a depending score forming rib **46**. The rib **46**, unlike the rib **35**, is of a constant depth. On the other hand, the anvil **44** is notched or recessed as at **47**. The notches **47** are in alignment with the lesser depth score line portions **43**. While the scoring tool **45** engages the end panel **19**, those portions of the end panel **19** overlying the notches **47** downwardly depress under the pressure of the scoring rib **46** and as a result the score line portions **43** of lesser depth are formed.

It is pointed out here that for ease of machining the anvil **44**, normally notches **47** will also underlie the scoring rib (not shown) which is utilized to form the anti-fracture score **41**. As a result, the end panel **19** will also deflect under this unillustrated scoring rib and in radial alignment with the score line portions **43**, the anti-fracture rib **41** will be of a lesser depth or, as illustrated, will be discontinued.

It is to be understood that the respective tooling for forming the score lines **21** and **40** have their individual advantages and disadvantages. However, the resultant

score lines **21** and **40** have equivalent functions, each serving to prevent uncontrolled implosion or explosion due to differential pressure forces exerted on the removable panel portion **22**.

Although only preferred embodiments of the invention have been specifically illustrated and described herein, it is to be understood that minor variations may be made in the disclosed easy opening can end and the method of forming the same without departing from the spirit and scope of the invention, as defined by the appended claims.

We claim:

1. An easy opening can end particularly intended for use as an end of a sealed can having an internal pressure other than atmospheric, said can end comprising an end panel having a removable panel portion defined by a continuous score line, a pull tab secured to said removable panel portion and being reactable on said end panel to stress said end panel along a predetermined portion of said score line in the direction of the application of force on said end panel due to the pressure differential, said end panel being resistant to uncontrolled movement of said removable panel after initial rupture due to the differential pressure with said score line being of a lesser depth than said predetermined portion on opposite sides of said predetermined portion.

2. The easy opening can end of claim **1** wherein said can end is particularly intended for use as an end of a can having a pressure therein below atmospheric pressure and said pull tab, when actuated exerts an inwardly directed force on said removable panel portion.

3. The easy opening can end of claim **1** wherein said removable panel portion constitutes substantially the entire end panel and said score line is generally linear whereby rupture of said end panel along said score line in opposite directions from said predetermined portion is assured.

4. The easy opening can end of claim **1** wherein said predetermined score line portion and said lesser depth score line portions are of the same width at the surface of said end panel.

5. The easy opening can end of claim **1** wherein said predetermined score line portion and said lesser depth score line portions are of the same width at the surface of said end panel, and are of different widths at the bases thereof.

6. The easy opening can end of claim **1** wherein said predetermined score line portion and said lesser depth score line portions are of the same width at the bases thereof and of different widths at the surface of said end panel.

7. The easy opening can end of claim **6** wherein said removable panel portion has an anti-fracture score adjacent to said continuous score line for facilitating flexing of said removable panel portion when stressed and for preventing undue stressing of said end panel along said continuous score line, said anti-fracture score being reduced in depth in alingnment with said lesser depth score line portions.

8. The easy opening can end of claim **1** wherein said removable panel portion has an anti-fracture score adjacent to said continuous score line for facilitating flexing of said removable panel portion when stressed and for preventing undue stressing of said end panel along said continuous score line.

9. The easy opening can end of claim **1** wherein said end panel has a recessed central portion underlying a terminal end of said pull tab, and a pair of buttons projecting upwardly from said recessed central portion in underlying supporting engagement with said pull tabs on opposite sides of said terminal end to facilitate the initial lifting of said pull tab.

10. The easy opening can end of claim **1** wherein said can end forms one end of a can including a body and wherein said can end has a peripheral attaching portion seamed to said body in sealed relation.

References Cited

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