SAFETY DEVICE FOR EASY OPENING CONTAINER ENDS

Filed Oct. 25, 1967, Ser. No. 678,087
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 exceeds 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 enlarged 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.
3,416,700

3 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. The length of the score line portion 25 is sufficient to allow the removal of the panel portion 22 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 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 applied on 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 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 panel portion 22 also has a tendency to fold the non-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 the 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 thereof has proven to be 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 are 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 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 score line 21 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 at as 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 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 line 41. As a result, the end panel 19 will also deflect under this unillustrated scoring rib and the radial alignment with the score line portion 42 which is an anti-fracture score line 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 alignment 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 sealed to said body in sealed relation.

References Cited

UNITED STATES PATENTS

3,366,270 1/1968 Khoury 220—54
3,339,789 9/1967 Stolle et al. 220—54

THERON E. CONDON, Primary Examiner.
G. T. HALL, Assistant Examiner.