ABSTRACT
An easy opening container wall including a container wall having a line of weakness therein defining a tear portion at least partially removable from the container wall and a tab affixed to the tear portion to initiate severance thereof from the container wall. The tab has a rupturing portion which overlies a location on the container wall closely adjacent the line of weakness. The tab has a hinge line which extends between said location and the region of attachment of the tab to the tear portion so that by manipulating the tab, a segment of the tear portion is forced inwardly generally about a bend line. The tear portion has a weakened region therein positioned to facilitate the inward bending of the segment about the bend line. Although various kinds of tabs may be used, the tab preferably includes a lever portion and an attachment portion joined by a connecting wall. A marginal portion of the tab is bent inwardly to form a curl having a double layer portion which is engageable with the connecting wall to support the latter. According to another feature of the present invention, the tab is made in a strip of sheet material and the carrying strip therefor is positioned at the lifting end of the tab.

18 Claims, 16 Drawing Figures
EASY OPENING CONTAINER WALL

BACKGROUND OF THE INVENTION

An easy opening container wall typically includes a container wall, a primary line of weakness in the container wall defining a tear portion at least partially removable from the container wall and a tab connected to the tear portion by suitable attaching means such as a rivet to initiate severance of the tear portion from the container wall. The tab may be of the front opening type in which the tab has a rupturing portion which overlies a location on the container wall closely adjacent the primary score line and is operable upon pivotal movement of the tab to push a segment of the container wall inwardly about a bend line. Alternatively, the tab may be of a rear opening type in which lifting of the lifting end of the tab lifts the leading end of the tear portion upwardly to initiate severance thereof.

Front opening tabs are often used when the tear portion is a relatively large panel such as in a full panel pullout. One problem with this construction is how to facilitate the initial rupturing of the panel from the container wall. Another problem is how to maximize the length of arc which is ruptured in response to pivoting of the tab. If an insufficient length of arc is ruptured, continuation of rupture of the tear portion in response to an outward pulling force on the tab is made more difficult.

It is also important that the tab be sufficiently strong to avoid tearing and structural failure during use thereof. One form of tab which has been used includes a tab body and an attachment portion interconnected by a connecting wall. The tab body has a lifting end and a rupturing or nose end which is forced against the container wall in response to lifting of the lifting end of the tab to initiate severance of the tear portion. The tab has a hinge line intermediate the attaching means and the rupturing end. A problem with tabs of this type is that they have been subject to structural failure and tear out particularly when used on large panels.

Tabs for easy opening containers are typically formed in a strip of sheet material and several operations are performed thereon at several different stations. When the tab is being formed, it is carried between stations in the strip and it is attached thereto by one or more webs or carrying strips. When the tab is nipped from the strip, the web is cut and this results in interruption of the usual outer periphery curl of the tab. This causes weakening of the tab or interference with the construction of various portions of the tab such as the rupturing end thereof.

SUMMARY OF THE INVENTION

The present invention facilitates the initiation of severance of the tear portion with a front opening tab. The present invention employs a tab with a hinge line between the attachment means and the rupturing end of the table and a secondary score line in the container wall. Pivotal movement of the tab about the hinge line thereof bends a segment of the container wall inwardly about a bend line, and the secondary score line is positioned to facilitate the inward bending of such segment of the tear portion.

The secondary score line can advantageously lie at least in part between the tab attaching means and the rupturing end of the tab. Preferably at least a portion of the secondary score line lies generally along the bend line about which the segment of the tear portion bends. The secondary score line can advantageously be located immediately under the hinge line in the tab and it may extend in chord-like fashion toward the periphery of the tear portion.

The shape and position of the bend line affects the length of arc of initial rupture. The secondary score line can be used to influence bend line configuration and thus the length of the initial arc of rupture. Specifically, the bend line, within limits, tends to take the shape of the secondary score line if the secondary score line lies at least in part along the region which the bend line would inherently fall. Thus, if the secondary score line is generally chord-like, the bend line will also tend to be generally chord-like.

Another aspect of this invention is to interrelate the secondary score line with an anti-fracture score line. An anti-fracture score line is sometimes provided in the tear portion adjacent the primary score line for allowing flexure of a section of the tear portion when the container is subjected to an impact force such as when the container is dropped. According to this aspect of the present invention, a segment of the anti-fracture score line is positioned to facilitate the inward bending of the segment about the bend line.

The tab is preferably constructed of sheet material and may include a tab body and an attachment portion interconnected by a connecting wall with the sheet material of the tab adjacent the juncture of the attachment portion and the connecting wall being sufficiently pliable to form the hinge in the tab. To strengthen the tab, a marginal portion of the sheet material of the tab body is turned inwardly to form an outer reinforcing bead or curl along the periphery of the tab body. To strengthen the tab adjacent the connecting wall, a section of the curl adjacent the connecting wall is bent over to form a double layer of sheet material. The double layer of sheet material is positioned so that it is engageable with the connecting wall to support and reinforce the latter during operation of the tab.

The tab is preferably formed at one end of the tab body with a rupturing element. The rupturing element may be formed by merely appropriately shaping the outer curl or by interrupting the outer curl to form a rupturing flange.

Upon manipulation of the tab to sever the primary score line, the tab body pivots about a hinge line extending generally transverse to the tab intermediate the ends thereof. This pivotal movement of the tab body causes the rupturing element to move in an arc toward the container wall and rearwardly, i.e., toward the central region of the container wall. The movement of the rupturing element rearwardly about the hinge line is known as travel back and should be minimized in front opening applications. Travel back also occurs after initial rupture of the primary score line because the tab and tear portion bend about different hinge lines.

One reason travel back is undesirable in front opening applications is that it causes the rupturing element to scrape across the container wall. This scraping action may scrape metal particles from the container wall, which upon severance of the primary score line may mix with the contents of the container. To
facilitate initial severance of the primary score line, the rupturing flange should be forced generally perpendicularly downwardly at about the moment that sufficient pressure has been created to rupture the primary score line. This is more difficult to provide for as travel back increases. Furthermore, the rupturing element should apply its force directly to the sheet material at the primary score line and this is also more difficult to provide for as travel back increases.

To minimize travel back, the present invention provides for moving of the hinge line of the tab closer to the plane of the tear portion. This also moves the hinge line of the tab closer to the bend line in the tear portion. Specifically it has been found that the hinge line in the tab can be moved by using a portion of the outer curl to support the connecting wall. Moreover, the location at which the connecting wall is supported by the curl or bead affects travel back. By moving the support region nearer the container wall, the hinge line of the tab is moved closer to the container wall and closer to the hinge line in the tear portion. Accordingly, travel back is reduced.

Normally, the sheet material from which the tab is constructed is thicker than the width of the primary score line. Accordingly, to ensure that the rupturing element will interlock with the sheet material at the score line, a portion of the rupturing element preferably overhangs a region of the container wall ahead, i.e., outside, of the tear portion.

To avoid weakening of the tab due to ripping the tab from the strip of sheet material in which it is formed, the present invention provides for the tab to be carried in the strip at the lifting end of the tab. According to this aspect of the present invention, the sheet material of the strip is severed to form a tab blank with the tab blank being integrally connected to the strip by a web at the lifting end of the tab. Preferably, the web is located generally centrally of the lifting end of the tab. The tab blank is then deformed to form a tab of the desired configuration with the tab being retained in the strip by the web. When the tab is lifted out of the strip, the outer curl of the tab is interrupted at the lifting end of the tab. Accordingly, to the extent that the tab is structurally weakened as a result of a nip-out, such weakening occurs at the lifting end of the tab where such weakening effect can be tolerated. If the outer curl is weakened in the longitudinally extending portions of the curl, the ability of the tab to withstand bending forces during use would be reduced. Also, if the web or carrying strip were at the nose end of the tab, it may interfere with the construction of the nose end. The nip-out point is preferably recessed to avoid possible injury to the user as a result of contact with the severed sheet material.

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.

**BRIEF DESCRIPTION OF THE DRAWINGS**

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

FIG. 2 is an enlarged fragmentary sectional view taken generally along line 2–2 of FIG. 1.

FIG. 3 is an enlarged fragmentary sectional view taken on the same plane as FIG. 2 and showing the rupturing end of the tab and the adjacent portions of the container wall.

FIG. 3A is a fragmentary elevational view of the tab looking generally in the direction of the arrows 3A—3A of FIG. 3.

FIG. 4 is a bottom plan view of a tab constructed in accordance with the teachings of this invention.

FIG. 5 is a top plan view of a tab and tab blank in a strip of sheet material.

FIG. 6 is an enlarged fragmentary sectional view similar to FIG. 2 with the tab body having been pivoted to initiate severance of the tear portion.

FIG. 7 is a top plan view similar to FIG. 6 showing another configuration of secondary score line.

FIG. 8 is a top plan view of another form of easy opening container constructed in accordance with the teachings of this invention.

FIG. 8A is a sectional view taken generally along line 8A–8A of FIG. 8 with the lifting end of the tab body having been raised slightly to illustrate the idle lift obtainable with this embodiment of the invention.

FIG. 9 is a bottom plan view of another form of tab constructed in accordance with the teachings of this invention.

FIG. 10 is an enlarged fragmentary sectional view taken generally along lines 10–10 of FIG. 12.

FIG. 11 is a fragmentary elevational view of the tab looking generally in the direction of the arrows 11–11 of FIG. 10.

FIG. 12 is a top plan view showing the tab of FIG. 9 installed on a can end.

FIGS. 13 and 14 are sectional views similar to FIG. 2 showing the effect of supporting the connecting wall at different locations.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring to the drawings and in particular to FIG. 1 thereof, reference numeral 11 designates an easy opening container wall constructed in accordance with the teachings of this invention. The easy opening container wall 11 includes a container wall in the form of a can end 13 constructed of sheet material such as aluminum. The can end 13 has a primary score line 15 therein defining a tear portion or panel 17 which is removable from the can end 13. In the embodiment illustrated, the primary score line 15 and the panel 17 are circular in plan, it being understood that other configurations may be utilized if desired. Although the primary score line 15 and the panel 17 can be of any size desired, in the embodiment illustrated the panel 17 covers substantially the entire area in plan of the can end 13. The can end 13 has a peripheral attaching flange 19 for attaching the can end 13 to a can body 21 (FIG. 2).

The easy opening container wall 11 also includes a tab 23 connected to the panel 17 by attaching means such as a rivet 25 formed integrally with the sheet material of the panel 17. A secondary score line 27 is formed in the panel 17 adjacent the rivet 25 as shown in FIG. 1.

The tab 23 includes a tab body 29 and an attachment portion 31 integrally joined to the tab body by a connecting wall 33 (FIG. 2). The tab 23 is preferably integrally formed of sheet material such as aluminum and
the tab body 29 surrounds the attachment portion 31. The tab body 29 defines an opening 35 sized to accommodate the finger of a user. The tab body 29 is relatively rigid longitudinally and includes a lifting end 37 and a rupturing or nose end 39 which overlies a location 41 (FIG. 2) on the can end 13 closely adjacent the score line 15. The tab 23 is positioned generally radially on the panel 17 with the lifting end 37 lying radially inwardly of the rupturing end 39.

The connecting wall 33 attaches the attachment portion 31 to the tab body 29 at a region adjacent the rupturing end 39. The sheet material of the tab along and adjacent the connecting wall 33 is sufficiently pliable to hingedly attach the tab body 29 to the attachment portion 31. The construction of the tab is such as to form a hinge line 42 (FIGS. 3 and 6). Thus, the tab body 29 serves as a lever.

The details of the tab 23 can best be seen in FIGS. 2-4. An inner peripheral region of the sheet material of the tab surrounding the opening 35 is turned outwardly to form an inner reinforcing bead 43 which extends completely around the opening 35 except in the region on the attachment portion 31. Similarly, a marginal portion of the sheet material of the tab body 29 is turned inwardly to define an outer reinforcing bead or curl 45 which extends substantially completely around the outer periphery of the tab body. The lifting end 37 of the tab body 29 has a recess or notch 47 therein. The outer reinforcing bead 45 is interrupted at the notch 47 and is severed along a radial line 49 at the rupturing end 39 of the tab to facilitate formation of the rupturing end. The bead 45 is uninterrupted at the nose end 39 except for the radial line 49.

The connecting wall 33 slopes downwardly as shown in FIGS. 2 and 3. The attachment portion 31 has a rivet receiving aperture 51 therein.

The sheet material at the rupturing end 39 is deformed to form a solid rupturing element or point 53 which overlies the location 41 on the score line 15. The sheet material of the outer curl 45 at the rupturing end 39 is used to support the connecting wall 33 as shown in FIGS. 2 and 3. Specifically, the construction includes first and second layers of sheet material 55 and 57 inter-connected by a bend portion 59 of the sheet material, to define a reinforcing section of the connecting wall 33. The bend portion 59 forms a curved surface which is engageable with a face 61 of the connecting wall 33 at a region as close to the can end as the dimensions of the sheet material permit to support the connecting wall 33 during use of the tab. The layers 55 and 57 support the connecting wall 33 to a greater extent than would be possible if only a single layer were utilized for this purpose. This also gives a greater bend radius to help avoid fracturing.

The hinge line 42 lies substantially along the region of contact between the bend portion 59 and the face 61. It is apparent from FIGS. 1 and 4 that the hinge line 42 of the tab 23 lies intermediate the rivet 25 and the rupturing end 39. Furthermore, the hinge line 42 extends in a direction generally transverse of the longitudinal direction of the tab 23.

The secondary score line 27 in the embodiment illustrated has a straight line segment underlying the tab 23 and curved end portions which terminate adjacent regions of the primary score line 15. A central region of the secondary score line 27 substantially underlies the hinge line 42 of the tab 23 as shown in FIG. 1. Thus, this region of the secondary score line 27 lies intermediate the rivet 25 and the location 41 (FIG. 2). However, as shown in FIG. 3, the score line 27 lies intermediate the hinge line 42 and the rivet 25.

In operation of the easy opening container wall 11, the lifting end of the tab 37 is moved away from the panel 17 to thereby pivot the tab body 29 about the hinge line 42. This forces the rupturing end 39, and more specifically the rupturing point 53 against the location 41 of the can end 13 to thereby stress the primary score line 15. Continued upward movement of the lifting end 39 results in rupture of the sheet material along the score line 15 as shown in FIG. 6.

During after initial rupture or breaking of the score line 15, a segment 63 of the panel 17 is bent inwardly about a bend line which generally lies along a central region of the secondary score line 27. The secondary score line 27 facilitates the inward bending of the segment 63 and makes initiation of severance of the sheet material along the primary score line 15 easier. The sheet material along the secondary score line 27 does not rupture during ordinary pivotal movement of the tab body 29. The secondary score line 27 also tends to increase the length of arc of the primary score line 15 which is ruptured in response to pivotal movement of the tab body 29. Thus, with the construction shown in FIG. 1, the primary score line 15 would be ruptured from the location 41 outwardly to the regions of the primary score line 15 which are substantially in alignment with the central portion of secondary score line 27. If the secondary score line 27 were not provided, the initial arc of rupture may be shorter than this for a given angular displacement of the tab body 29.

Following initiation of severance of the primary score line 15, the user exerts an outward pulling force on the tab body 29 to completely remove the panel 17 from the can end 13. During tab manipulation, the layers 55 and 57 are operative to support and strengthen the connecting wall 33. It should be apparent that the concepts of this invention are applicable to tabs of different constructions provided that the tab has a hinge line intermediate the rivet 25 and the rupturing end thereof.

A preferred method for making the tab 23 is illustrated in FIG. 5. A tab blank 65 of the desired configuration is formed in an elongated strip of sheet material 67 by appropriately severing the strip 67 to form a slot 69 and openings 71 and 73. The tab blank 65 is integrally connected to the strip 67 by a web 75 and the remainder of the periphery of the tab blank 65 is separated from the strip 67 by the slot 69. As shown in FIG. 5, the web 75 is located centrally at the lifting end 37. The slot 69 and the openings 71 and 73 may be formed simultaneously or sequentially at one or more stations by suitable tooling (not shown). The strip 67 is moved between work stations by any suitable strip stock feeding means (not shown). Subsequently, additional work operations are performed on the tab blank 65 while the tab blank is retained in the strip 67 by the web 75 to thereby convert the tab blank into a tab 23' which may be identical to the tab 23. Finally, the tab 23' is severed from the strip 67 by cutting the web 75.

With reference to FIG. 4, it can be seen that the outer curl 65 is substantially uninterrupted except for
the notch 47 which is at a location corresponding to the web 75 when the tab was in the strip 67. The notch 47 recesses raw edges 78 and 78a to protect the user against lacerations. The interruption of the outer curl 45 at the lifting end 37 is the result of cutting the web 75 to free the tab from the strip 67. Thus, the outer curl 45 is not interrupted along the longitudinal sides of the tab body 29 where such interruption would result in some weakening of the tab. Nor is the outer curl 45 interrupted at the rupturing end 37 as a result of carrying the tab 23 in the strip 67.

FIG. 7 shows a second embodiment of the invention and portions of the embodiment of FIG. 7 corresponding to portions of the embodiment of FIG. 1 are designated by corresponding reference numerals followed by the letter a. The embodiment of FIG. 7 is identical to the embodiment of FIG. 1 except for the shape of the secondary score line 27a. In the embodiment of FIG. 7, the secondary score line 27a has end portions 79 and 81 which curve outwardly from a straight central portion 83. The end portions 79 and 81 curve away from the lifting end 37a of the tab 23a generally toward an adjacent region of the primary score line 15a. Generally the secondary score line 27a is shaped to conform to the bend line which would inherently be formed in the panel 17a if no secondary score line were provided. Except for the curved end portions 79 and 81, the positioning and configuration of the score line 27a is identical to the positioning and configuration of the secondary score line 27 (FIG. 1).

FIG. 8 shows an easy opening container wall 85 which represents a third embodiment of the invention. The easy opening container wall 85 includes a container wall in the form of a circular can end 87 having a peripheral attaching flange 89 to secure the can end to a can body (not shown). A primary score line 91 in the can end 87 defines a tear portion 93 in the can end 87. The tear portion is elongated with the direction of elongation extending generally radially of the circular can end 87 and the tear portion covers a relatively small area of the can end.

A tab 95 (FIGS. 8 and 8a) is attached to the leading end of the tear portion 93 adjacent the center of the can end 87 by a rivet 97 formed integrally with the sheet material of the can end 87. The tab 95 includes a tab body 99 and an attachment portion 101 interconnected by a connecting wall 103. The tab 95 has a lifting end 105 and a nose end 107 which overlies a region of the can end 87 outside of the tear portion 93. The tab 95 is preferably identical to the tab 23 except the former has no rupturing element or point. Rather, the tab 95 has an arcuate cam 108 at the nose end thereof adapted to bear against the can end 87 during manipulation of the tab. In addition the rivet 97 is spaced from the connecting wall 103 as shown in FIG. 8a. This provides idle lift, i.e., allows the tab body 99 to be pivoted relatively easily to the position shown in FIG. 8a without rupturing the score line 91. Idle lift is advantageous in allowing the user to get his finger beneath the lifting end 105. The tab 95 also has a double layer reinforcing section 109 substantially as described hereinabove with reference to FIGS. 1-3.

In operation of the easy opening container wall 85, the lifting end 105 of the tab 95 is moved away from the can end 87 and during idle lift such movement of the handle end is substantially unrestrained. Following idle lift the nose end 107 bears on the region of the can end 87 outside of the tear portion 93 and is given relatively rigid support with the result that an upward lifting force is applied to the leading end of the tear portion 93 through the connecting wall 103, the attachment portion 101 and the rivet 97. By continuing such pivotal movement of the tab body 99, the sheet material of the score line 91 at the leading end of the tear portion 93 will be ruptured. A portion of the tab covers the area of initial opening to deflect spray of the contents. Following such initial rupture, the user exerts an outward pulling force on the tab body 99 to thereby completely sever the tear portion 93 from the container wall 87 to form a pouring opening.

FIG. 9 shows a tab 121 of somewhat different construction than the tabs illustrated in FIGS. 1-8. The tab 121 includes a tab body 123 and an attachment portion 125 integrally joined to the tab body by a connecting wall 127 (FIG. 10). The connecting portion has an arcuate cutout or notch 128. The tab 121 is preferably integrally formed of sheet material such as aluminum and the tab body 123 surrounds the attachment portion 125. The tab body 123 defines an opening 129 sized to accommodate the finger of a user. The tab body 123 is relatively longitudinally rigid and includes a lifting end 131 and a rupturing or nose end 133.

The tab body 123 is of less rounded appearance than the tab body 29 (FIG. 4). The tab body 123 has an inner reinforcing bead or curl 135 and an outer reinforcing bead or curl 137 which is interrupted at the lifting end 131 and at the nose end 133 by a rupturing flange 139. The rupturing flange 139 differs from the rupturing point 53 (FIG. 4) in that the outer bead 133 is severed along lines 141 and 143 (FIG. 11) to thereby free the sides of the flange 139 so that it is connected to the remainder of the tab only along the upper end thereof. The outer bead 133 also includes a double layer portion 145 which supports the outer surface 147 of the connecting wall in the same manner described hereinabove with reference to FIGS. 3 and 4. The edges of the metal segments formed by severing along lines 141 and 143 abut along a radial line 149 at the nose end 133 as shown in FIG. 9. Accordingly, the tab 121 is very similar to the tab 23 shown in FIGS. 3 and 4 except that the former provides a rupturing flange 139 in lieu of the integral rupturing point 53 of the former.

FIGS. 10 and 12 show an easy opening container wall 151 utilizing the tab 123, it being understood that the tab may be used with easy opening container walls of different construction than that illustrated in FIGS. 10 and 12. The easy opening container wall 151 includes a can end 153 having a peripheral attaching flange 155 for attaching the can end to a container body 157 (FIG. 10). The can end 153 is constructed of sheet material such as aluminum and has a primary score line 159 therein defining a panel 161 which is removable from the can end 153 upon complete severance of the primary score line.

The panel 161 covers a major portion of the area in plan of the can end 153 and has a secondary score line 163 therein closely adjacent and spaced radially inwardly from the primary score line 159. The secondary score line 163 constitutes an anti-fracture score which permits the segment of the panel 161 circumscribed
thereby to flex if the container is dropped to thereby prevent such impact from rupturing the primary score line 159. Except for a section 165 of the score line 163, the score line 163 is spaced a constant radial distance from the primary score line 159. Thus, except for the section 165, the secondary score line 163 is geometrically similar to the score line 159.

The tab 123 is attached to the panel 161 by a rivet 167 formed integrally with the panel with the rivet 167 projecting through an aperture 169 of the attachment portion 125. The tab 123 is oriented radially of the panel 161 with the lifting end 131 being at an inward position and with the rupturing flange 139 overlying a location on the primary score line 159. Such orientation is maintained by a dimple 168 integral with the panel 161 which projects into the arcuate cutout 128 of the tab 121. The panel 161 has an upsetting integral rib 170 to space the lifting end 133 above the panel.

In the embodiment of FIGS. 9–12, the rupturing flange 139 projects generally perpendicular relative to the panel 161. The thickness of the rupturing flange 139 is greater than the width of the primary score line 159 and a portion of the rupturing flange 139 overlies the can end 153 outside of the panel 161. Upon raising of the lifting end 131, the tab body 123 pivots generally about a pivot axis 171 lying on or closely adjacent the region of contact between the connecting wall 127 and the double layer portion 145. This forces the rupturing flange 139 downwardly towards the can end. In addition, the rupturing flange 139 travels back, i.e., toward the central region of the panel 161 somewhat. The rupturing flange 139 tends to interlock with the primary score line 159. As pivotal movement of the tab body 123 continues, the tip of the rupturing flange 139 tends to remain interlocked with the score line and to bend as the remainder of the rupturing flange travels back somewhat more. Ultimately, the rupturing flange 139 applies sufficient force to the sheet material along the primary score line 159 to rupture the same and thereafter further pivotal movement of the tab body 123 causes inward bending of the panel 161 generally along the section 165 of the secondary score line 163 substantially as described above with reference to FIGS. 1–6. After initial severance of the score line 159, the bending of the panel 163 and of the tab body 123 about different hinge lines may cause some additional bending of the rupturing flange 139 assuming that the latter remains interlocked with the sheet material along the ruptured primary score line 159.

FIGS. 13 and 14 illustrate the effect of changing the location at which the connecting wall is supported on the amount of travel back of the rupturing flange. FIGS. 13 and 14 show tabs 121a and 121b, respectively, each of which is identical to the tab 121 (FIGS. 9–12) except as specifically noted herein. Similarly FIGS. 13 and 14 show can ends 153a and 153b, respectively, which are identical to the can end 153 (FIG. 12) except as specifically noted herein. Parts of FIGS. 13 and 14 corresponding to parts of FIGS. 9–12 are designated by corresponding reference numerals followed by the letters a and b, respectively.

The tab 121a has a tab body 123a and an attachment portion 135a, the latter being attached to a panel 161a by a rivet 167a integral with the panel 161a. The tab 121a also has a connecting wall 127a and a rupturing flange 139a which is oriented relative to the primary score line 159a substantially as described in connection with FIGS. 9–12. The tab 121a has a double layer portion or reinforcing section 145a which engages the upper end of the connecting wall 127a. Thus, while the reinforcing section 145 (FIG. 10) engages a central portion of the connecting wall 127, the reinforcing section 145a engages the connecting wall 127a as high up on the connecting wall as the dimensions of the components of the tab 121a will permit. This causes the tab to be pivotable about a hinge line 171a which lies near the upper end of the connecting wall 127a.

The operation of the tab 121a is the same as the operation of the tab 121 except that the tab body 123a pivots about the hinge line 171a which is higher up on the connecting wall 127a than is the hinge line 171. This has the effect of moving the hinge line 171a further away from the section 165a of the secondary score line and from the panel 161a thereby tending to increase travel back. Accordingly, the travel back of the rupturing flange 139a is greater than the travel back of the rupturing flange 139 (FIG. 10).

The tab 121b is identical to the tab 121 except that the reinforcing section 145b engages the connecting wall 127b at a lower point thereby forming a relatively low hinge line 171b. The panel 161b is identical to the panel 161a except for the formation of an upwardly opening rib 173 which receives a portion of the reinforcing section 145b to thereby permit the latter to engage the connecting wall 127b at a lower region than would be possible if the rib 173 were not formed in the panel 161b.

The tab 121b operates in the same manner as the tabs 121 and 121a except that the hinge line 171b is lower relative to the panel 161b and closer to the section 165b of the secondary score line to thereby reduce travel back of the rupturing flange 139b. The rib 173 preferably is somewhat longer than the reinforcing section 145b and is dimensioned so as to loosely receive the portion of the reinforcing section which is positioned therein.

Although exemplary embodiments of the invention have 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.

1. A tab of the type attachable to a wall of an easy opening container to initiate severance of a segment of said wall, said tab comprising:
   an attachment portion constructed of sheet material and adapted to lie contiguous to the wall;
   a tab body constructed of sheet material and substantially circumscibing said attachment portion, said tab body having a connecting wall adjacent one end thereof joined to said attachment portion, at least a section of said connecting wall extending away from said attachment portion and from an adjacent portion of the wall, the other end of said tab body defining a lifting end, the sheet material of said tab being sufficiently pliable adjacent said connecting wall and said attachment portion to define hinge means for allowing said tab body to pivot relative to said attachment portion whereby moving of the lifting end of the tab body away
from the container wall forces said one end of the tab body toward the container wall and applies a force to said connecting wall, and a marginal portion of the sheet material of the tab body adjacent said attachment portion being turned inwardly to form a curl, said curl including a section of multiple layers of sheet material and defining a curved surface closely adjacent said connecting wall, whereby said connecting wall is supported through contact with said curved surface during pivoting of said tab relative to said attachment portion.

2. A tab as defined in claim 1 wherein said curl forms a rupturing point which is engageable with the container wall closely adjacent the periphery of said segment of the container wall.

3. A tab as defined in claim 1 wherein said multiple layers of sheet material include a first layer of sheet material extending toward said connecting wall and a second layer of sheet material extending away from said connecting wall, said first and second layers of sheet material being interconnected by a reverse bend portion which lies closely adjacent said section of said connecting wall.

4. A tab as defined in claim 1 wherein said curl is an outer curl which extends substantially continuously around the outer periphery of said tab body, said curl being interrupted at said lifting end.

5. A tab as defined in claim 4 including a raw edge of metal at said lifting end positioned between the points of interruption of said curl, a notch in said lifting end, and said curl extending along said notch for a distance sufficient to shield said raw edge from contact by the user on lifting of said lifting end.

6. A tab as defined in claim 1 said tab including: a nose end at the other end of said tab body from said lifting end; a slit defining two metal segments in the marginal portion of sheet material of the tab body adjacent said nose end; said segments being turned inwardly to form a pair of curls with each of said curls abutting the other of said curls in reinforcing relation thereto, and each of said curls including a section of multiple layers of sheet material and each of said curls defining a curved surface closely adjacent said connecting wall.

7. A tab as defined in claim 1 said tab including: a nose end at the other end of said tab body from said lifting end; a pair of slits defining two metal segments and a rupturing flange in the marginal portion of sheet material of the tab body adjacent said nose end; said metal segments being turned inwardly to form a pair of curls; said curls passing on either side of said rupturing flange and each of said curls abutting the other of said curls in reinforcing relation thereto at a location positioned inwardly from said rupturing flange, and each of said curls including a section of multiple layers of sheet material and defining a curved surface closely adjacent said connecting wall.

8. An easy opening container wall comprising: a primary line of weakness in said container wall defining a tear portion at least partially removable from said container wall; a tab having a nose end in contact with said container wall and a lifting end; means for attaching said tab to an imperforate area of said tear portion; a secondary line of weakness in said tear portion, said secondary line of weakness lying radially inwardly of the primary line of weakness and located between the point of attachment of said tab and said primary line of weakness, said secondary line of weakness substantially circumscribing a region of said tear portion; said tab having hinge means for permitting hinged movement of one portion of said tab relative to another portion of said tab along a first hinge line to bring said nose end into forcible engagement with said wall to rupture said primary line of weakness and bend a segment of the tear portion inwardly generally about a second hinge line, said first hinge line lying between said means for attaching and the point of contact of said nose end with said container wall, and a section of said secondary line of weakness extending substantially along said second hinge line to thereby facilitate the inward bending of said segment about said second hinge line.

9. An easy opening container wall as defined in claim 8 wherein the distance between said primary and secondary lines of weakness is greater in the area adjacent the point of contact of said nose end with the container wall than at locations along a majority of length of said primary line of weakness.

10. An easy-opening container wall comprising: a primary line of weakness in said container wall defining a tear portion at least partially removable from said container wall; a tab having a nose end in contact with said container wall and a lifting end; means for attaching said tab to an imperforate area of said tear portion; a secondary line of weakness in said tear portion, said secondary line of weakness lying radially inwardly of the primary line of weakness and located between the point of attachment of said tab and said primary line of weakness, said secondary line of weakness substantially circumscribing a region of said tear portion; said tab having hinge means for permitting hinged movement of one portion of said tab relative to another portion of said tab along a first hinge line to bring said nose end into forcible engagement with said wall to rupture said primary line of weakness and bend a segment of the tear portion inwardly generally about a second hinge line, said first hinge line lying between said means for attaching and the point of contact of said nose end with said container wall, and a marginal portion of sheet material forming the tab being turned inwardly to form a curl which defines a curved surface in close proximity with said hinge means and engageable with said hinge means during said hinged movement, and
a section of said secondary line of weakness extending substantially along said second hinge line to thereby facilitate the inward bending of said segment about said second hinge line.

11. A tab as defined in claim 10, said tab including:
a slit defining two metal segments in the marginal portion of sheet material of the tab adjacent said nose end;
said segments being turned inwardly to form a pair of curls with each of said curls abutting the other of said curls in reinforcing relation thereto, and
each of said curls including a section of multiple layers of sheet material and each defining a curved surface closely adjacent said hinge means.

12. A tab as defined in claim 10, said tab including:
a pair of slits defining two metal segments and a rupturing flange in the marginal portion of sheet material of the tab adjacent said nose end;
said metal segments being turned inwardly to form a pair of curls;
said curls passing on either side of said rupturing flange and each of said curls abutting the other of said curls in reinforcing relation thereto at a location positioned inwardly from said rupturing flange, and
each of said curls including a section of multiple layers of sheet material and each defining a curved surface closely adjacent said hinge means.

13. An easy opening container wall comprising:
a container wall;
a line of weakness in said container wall defining a tear portion at least partially removable from the container wall;
a tab constructed of sheet material and including an attachment portion, a tab body and a connecting wall joining the attachment portion to the tab body for pivotal movement of the tab body relative to the attachment portion;
said tab body having a rupturing flange adjacent one end with the other end of said tab body being adapted for engagement by a finger of a user;
means for attaching the attachment portion to an imperforate area of the tear portion with the rupturing flange in contact with said container wall and closely adjacent a location on said line of weakness;
said container wall having a rib defining a groove closely adjacent said connecting wall; and
a marginal portion of the sheet material of the tab body adjacent said attachment portion being turned inwardly to form a bead, said bead including a reinforcing section having a curved surface engageable with the connecting wall adjacent the container wall to reinforce said connecting wall, said reinforcing section being partially received in said groove to permit said curved surface to engage said connecting wall at a location closely adjacent said container wall.

14. An easy opening container wall as defined in claim 13 including:
a pair of slits in the marginal portion of the sheet material of the tab body defining said rupturing flange and two metal segments;
said metal segments being turned inwardly to form a pair of curls;
said beads passing on either side of said rupturing flange and each of said beads abutting the other of said beads in reinforcing relation thereto at a location inwardly positioned from said rupturing flange, and
each of said beads including a reinforcing section having a curved surface engageable with said connecting wall.

15. An easy opening container wall as defined in claim 13 wherein said reinforcing section is of greater thickness than a single thickness of said sheet material.

16. An easy opening container wall as defined in claim 13 wherein a portion of said rupturing flange overhangs a region of the container wall outside of the tear portion.

17. A tab of the type attachable to an easy-opening container wall comprising:
an attachment portion of sheet material for attachment to the easy-opening container wall;
a tab body of sheet material, said tab body including a lifting end engageable by the user to cause the tab to apply force to the easy-opening container wall;
means for interconnecting said attachment portion and said tab body;
a marginal portion of the sheet material being turned to form a curl;
said curl being interrupted at the lifting end;
a raw edge of metal at said lifting end positioned between the points of interruption of said curl;
a notch in said lifting end, and
said curl extending along said notch for a distance sufficient to shield said raw edge from contact by the user on lifting of said lifting end.

18. A tab as defined in claim 17 wherein said curl extends substantially continuously around the outer periphery of said tab body.