United States Patent [19]

Ashton

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[54] **STOWABLE TAB AND TEAR STRIP**

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[52] **U.S. Cl.** **220/54**
[51] **Int. Cl.** **B65d 17/20**
[58] **Field of Search** 220/54, 53, 48, 27

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Attorney, Agent, or Firm—Christensen, O'Connor, Garrison & Havelka

[57] **ABSTRACT**

A stowable tab for use with an aluminum end closure for a beverage container includes a pull ring having a ring handle portion and a lever portion attached to a tear strip, the latter of which is formed by scoring lines in the top of the end closure. A centrally located depressed region and, preferably, a volume compensating raised region spaced from the depressed region is formed in the end closure. The score lines terminate in spaced-apart relationship at or near the depressed region. The tear strip is formed with a leading edge adjacent the periphery of the end closure and has two spaced side portions which extend from the leading edge of the tear strip toward and preferably partially into the depressed region. The tear strip and lever portion of the pull tab are designed such that the forward half of the tear strip bends inwardly from the end closure, while the rearward half of the tear strip bends outwardly from the end closure. The tear strip bends along two areas, a first laterally disposed area centrally located on the tear strip and a second area located near its root end in the depressed region. When the tear strip has been severed along its score lines, it will be resting above the depressed region. By exerting a slight pressure on the top of the tear strip, it will bifold along the two areas into the depressed region. Thus the tear strip is stowed in the depressed region while the pull ring is stowed at a location where it will not interfere with the use of the can.

47 Claims, 25 Drawing Figures

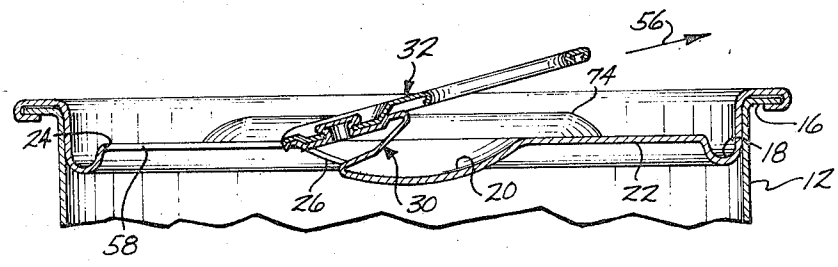


Fig. 1

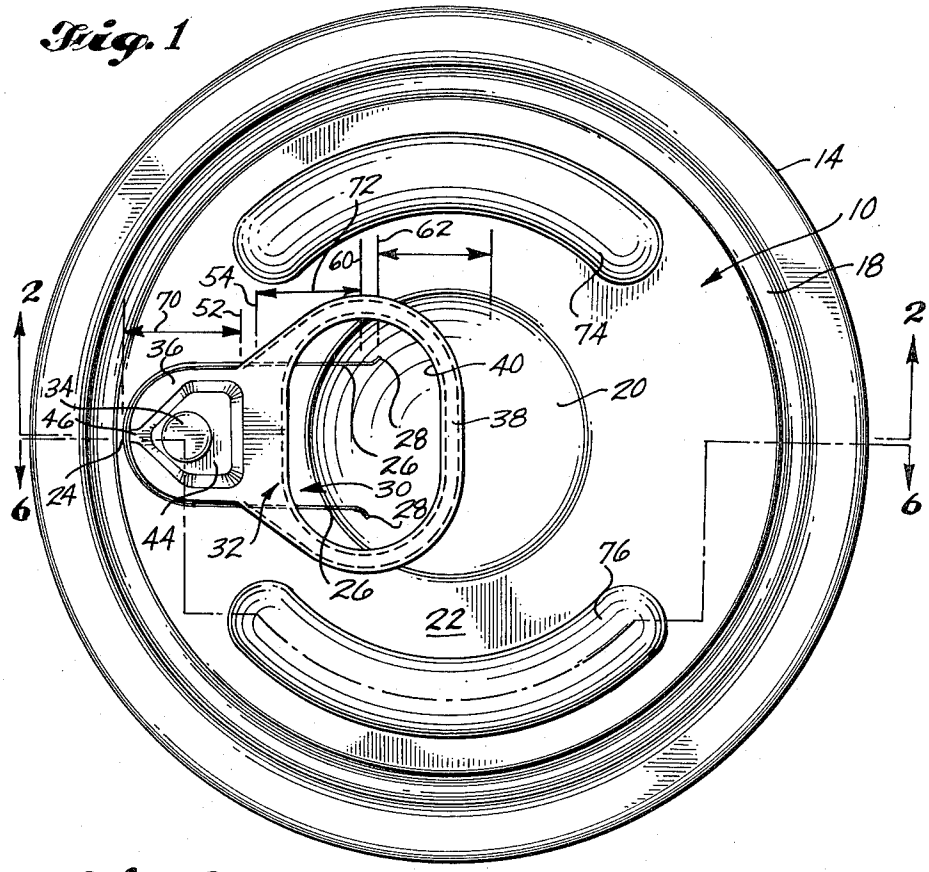


Fig. 2

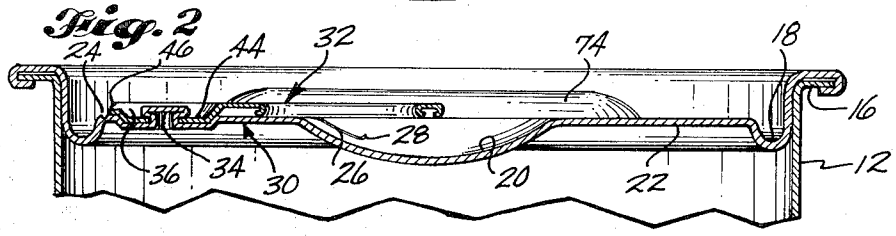


Fig. 3

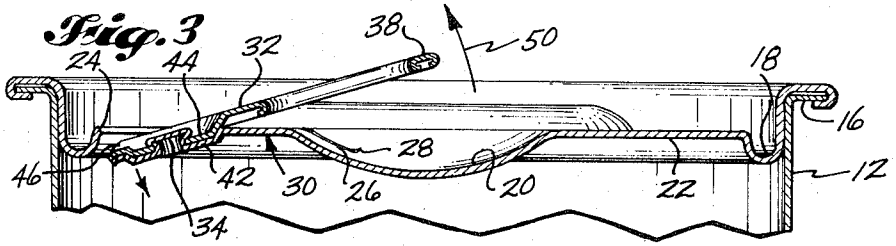


Fig. 4

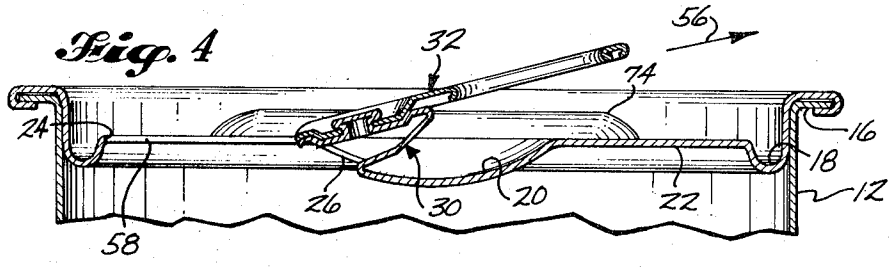


Fig. 5

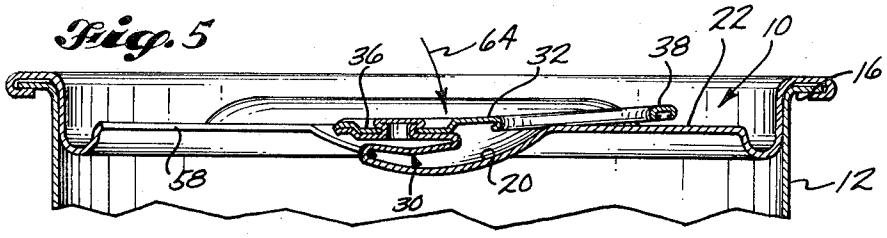
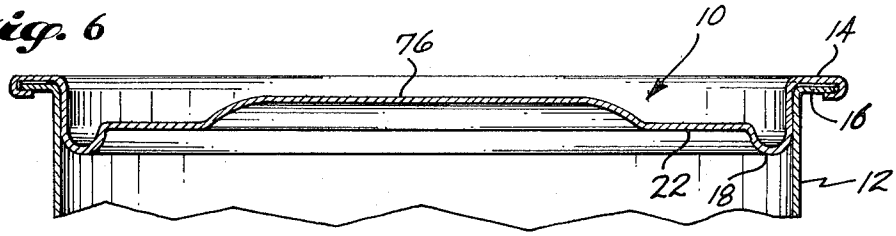


Fig. 6



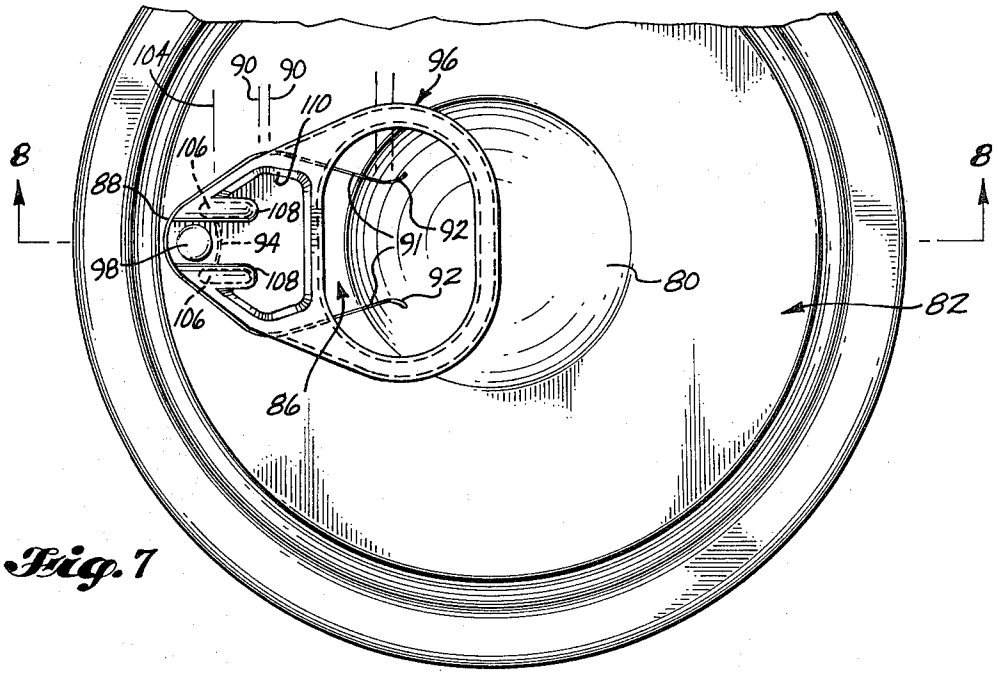


Fig. 7

Fig. 8

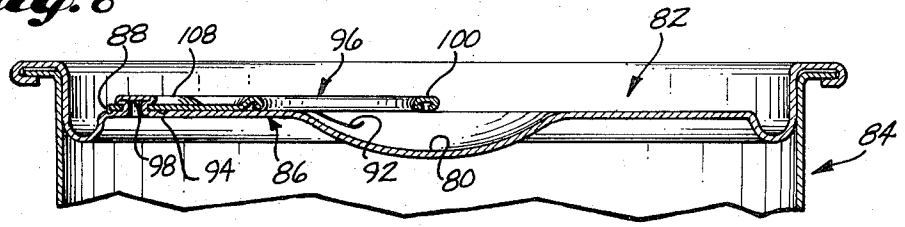


Fig. 9

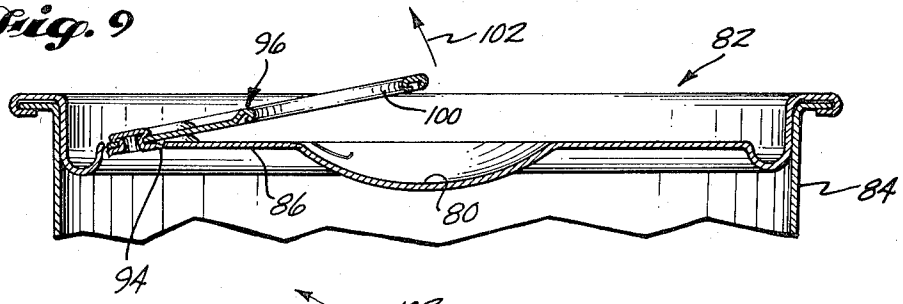


Fig. 10

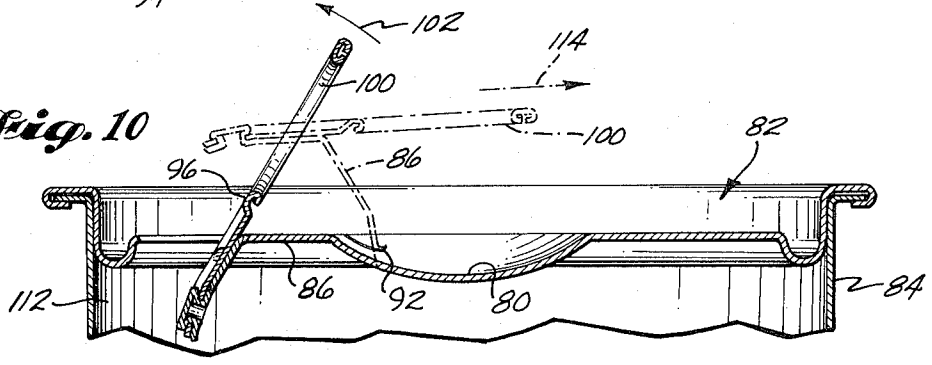
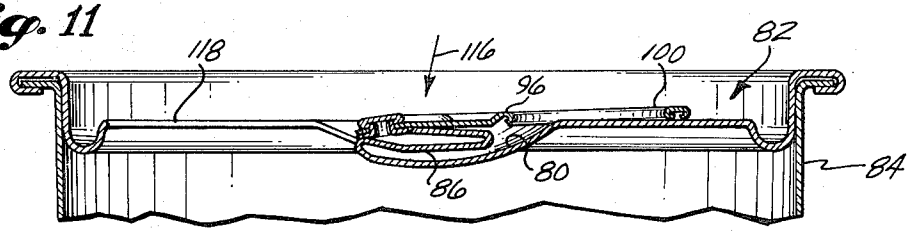


Fig. 11



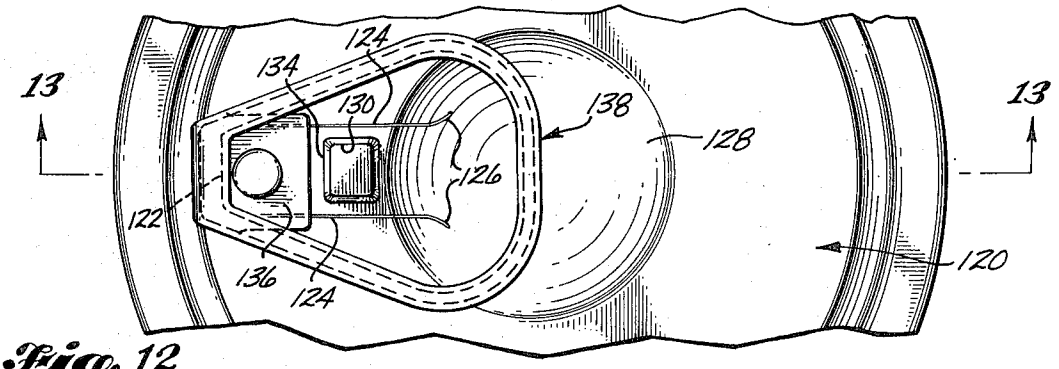


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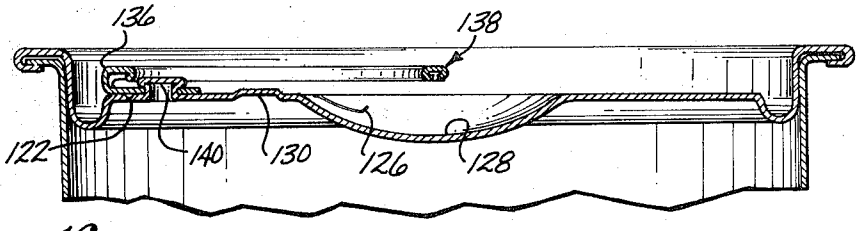


Fig. 13

Fig. 14

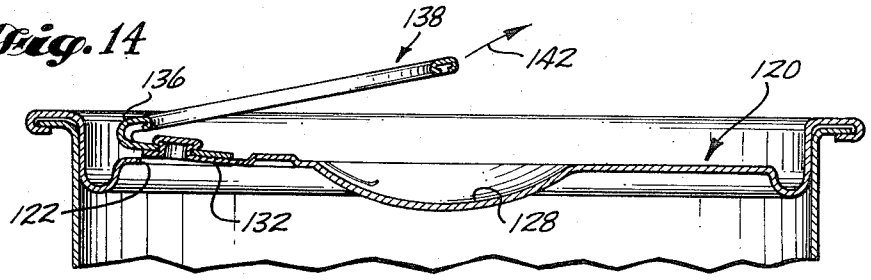


Fig. 15

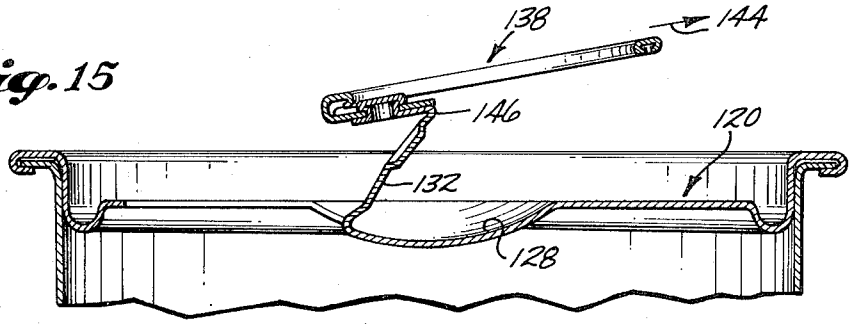
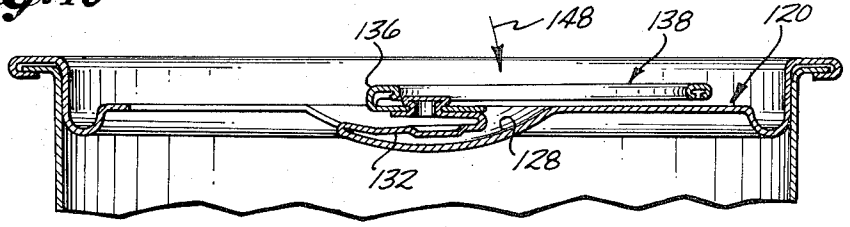


Fig. 16



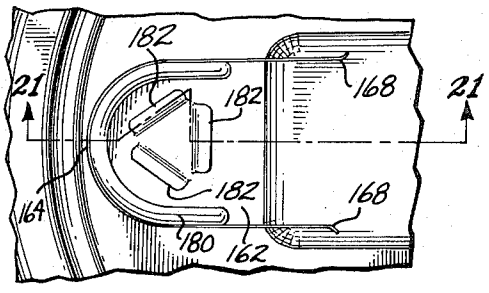


Fig. 20

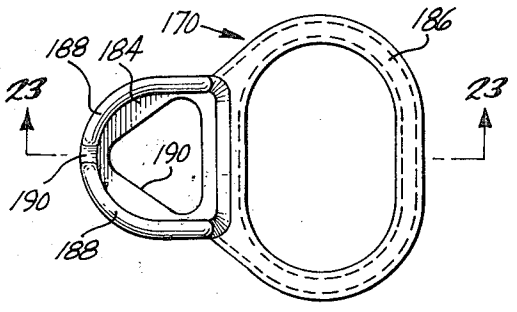


Fig. 22

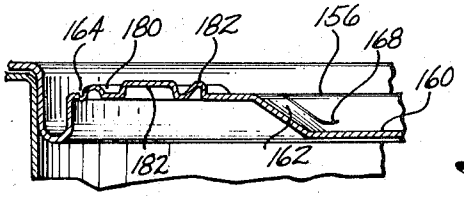


Fig. 21

Fig. 23

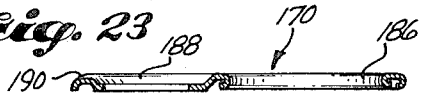


Fig. 24

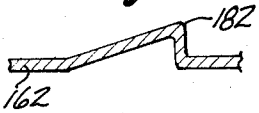
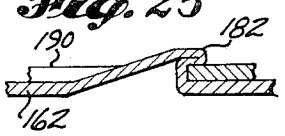


Fig. 25



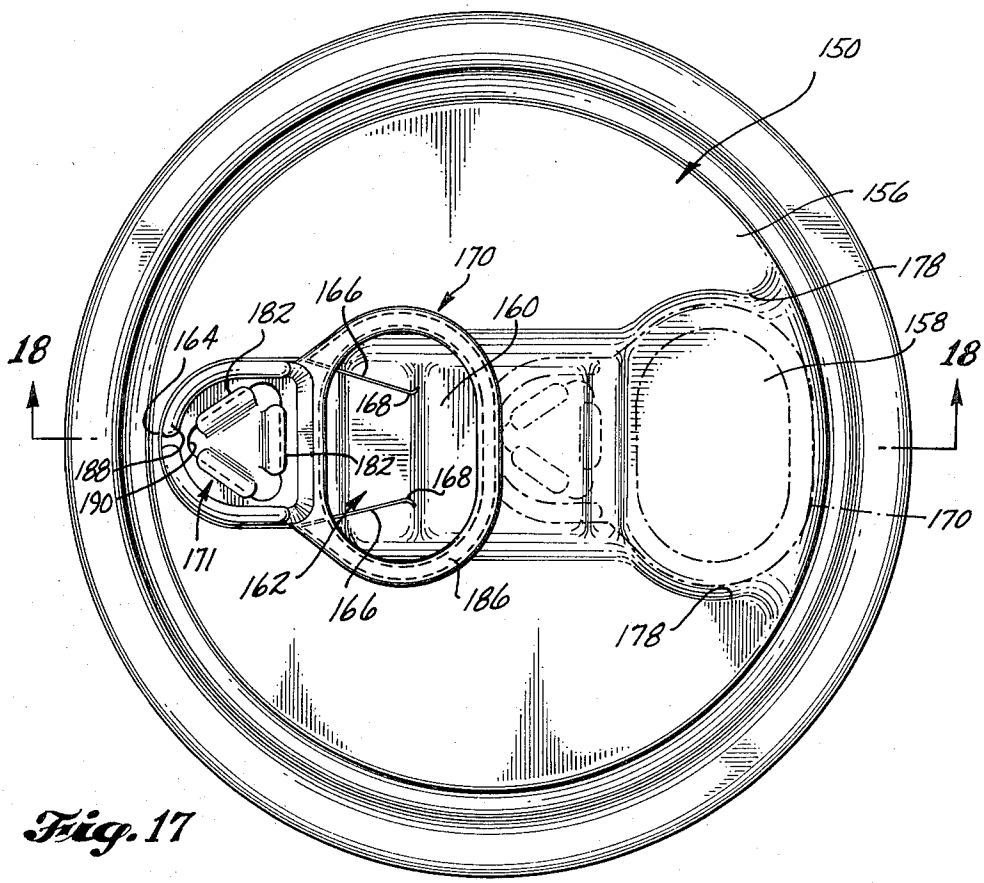


Fig. 17

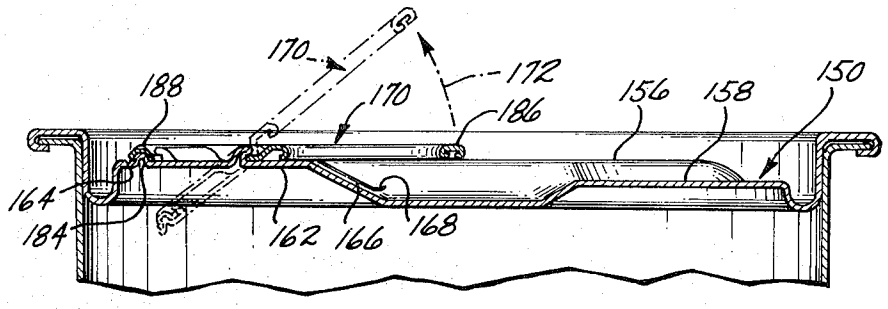


Fig. 18

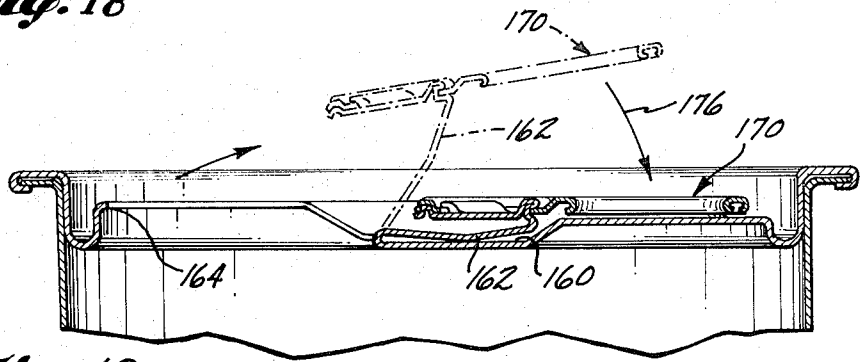


Fig. 19

STOWABLE TAB AND TEAR STRIP

BACKGROUND OF THE INVENTION

The present invention relates to a container and an end closure means therefor, and more particularly to a stowable tear strip and pull ring on an aluminum end closure for use with a beverage can.

In the last few years, the beverage container industry has evolved almost exclusively to the use of a steel or aluminum can having a top end closure with a removable pull tab and tear strip. The end closure is usually formed from aluminum sheet stock or end blanks in a press or other suitable forming apparatus and is then fitted onto the body of the can.

The removable tab and tear strip of the prior art have been of two types. The first type severs completely from the end closure leaving an opening port for pouring or drinking directly from the can. These removable tabs and strips are generally formed by scoring the top surface of the end closure in a desired shape to form a tear strip. A pull tab is then attached to the rear end of the tear strip, the end nearest the center of the end closure. These tabs and strips have been removable by an upward motion on the pull ring followed by a rearward motion to sever completely the tear strip from the end closure. This first type of tab and tear strip has been very convenient to utilize since it dispenses with the use of can openers and the like. However, it has presented a tremendous disposal problem to the consumer. Everyone is rather familiar with parks and other recreational areas where disposable containers are utilized and has seen the litter problem which has occurred. Unfortunately, the consumer has the tendency to dispose of the removable pull tabs with attached tear strip at the location where he opens the can rather than disposing of it in trash receptacles or retaining the tab for disposal with the can. This consumer tendency has led to a tremendous disposal problem, and, moreover, has led to proposed legislation in some states and a law in at least one state to prohibit the use of cans with a completely removable pull tab and tear strip.

In addition, the amount of aluminum in the pull tab is significantly large so that it is desirable for recycling purposes to be able to collect the pull tab and tear strips for recycling along with the rest of the aluminum can and end closure. With a completely removable pull tab and strip, however, it is impractical to recover the pull tabs since they are usually mixed in with all kinds of other trash and garbage.

The foregoing problems encountered with the completely removable pull tab tear strip have led to the development of a second type of easy open end where the pull tab and tear strip are not removable from the can. Several issued patents are directed to pull tabs of this second type. However, several additional problems are encountered with these prior art devices. Most of the nonremovable pull tabs and tear strips of the prior art provide for severance of the tear strip substantially across the entire top surface of the end closure. The tear strips are formed by score lines having a leading edge and two spaced apart side edges which extend substantially across the end closure. The root end of the score lines terminate at a spaced apart distance near the opposite side of the periphery of the can from the leading edge of the tear strip. As the tear strip is severed by force exerted on a pull tab, a relatively large amount of sharp severed metal edge is exposed. According to the prior art, the sharp tear strip is then bent over toward the far side of the can and left there along with the pull ring. If the consumer does not carefully manipulate the can, he could contact the sharp severed edges of the tear strip leading to the possibility of laceration or other injury. In addition, it is evident that there are nose interference and general handling problems associated with a design which leaves excessive metal material protruding above and outside of the container.

Apparently, the can industry has been working toward a solution for a stowable pull tab, but prior to this time has not formulated a solution sufficiently adequate to result in a commercial product.

Accordingly, it is a primary object of the present invention to provide a safe and stowable easy open end. Further objects of the present invention include: provision of a depression in the end closure in which the tear strip can be stowed; provision of a tear strip which extends only partially across the end closure; provision of a tear strip which when stowed does not leave exposed, sharp, severed edges at a location where inadvertent interference and injury can occur to the consumer; provision of a pull ring or tab which can be grasped for quick, easy severence of the tear strip along the score lines; provision of raised regions on the end closure to compensate for container volume losses caused by the depressed region; and provision of an end closure having raised portion and a depressed portion which allow both the pull ring and tear strip to be completely stowed below the top level of the end closure.

Still further objects of the present invention include: provision of a tear strip having means thereon for facilitating folding of the tear strip along two fold lines, one centrally located along the longitudinal dimension of the tear strip and one located adjacent the root end of the tear strip; provision of a tear strip which when severed along the score lines leaves an adequately sized opening for liquid egress and air ingress, i.e., breathing; and provision of a novel reinforced tear strip and pull tab which facilitate appropriate bending of the tear strip in accord with the present invention.

Other problems have occurred in the prior art with relation to attachment of the pull tab to the tear strip. One of these problems has occurred in maintaining the proper relationship of the pull tab to the tear strip. When applying force to the pull tab to sever the tear strip, it is usually necessary for the pull tab to be in substantial longitudinal alignment with the tear strip. If the pull tab is not in longitudinal alignment, it becomes very difficult, if not impossible, to initiate severing of the tear strip. It is therefore an object of the present invention to provide novel tab attachment means which will prevent rotation of the tab after initial fastening to the strip. In addition, it is an object of the invention to provide tab attachment means which will generally improve the operating characteristics and manipulation of the stowable pull tab and tear strip.

An additional problem with the prior art tab attachment means has been with the use of the integral hollow rivet. Prior designs incorporating the integral hollow rivet have not provided adequate rivet head contact area with the tab. Under some circumstances, a portion or all of the head can sever from the body of the rivet when force is applied to the tab, i.e., the tab can rip away from the rivet. It is therefore another object of the present invention to provide novel fastening

means which greatly improves the overall reliability and integrity of the fastening means by providing a larger and better distributed attachment area. It is a still additional object of the present invention to provide a a novel fastening means which holds the tab to the tear strip over a greater area to provide a prestressed load condition on the the tear strip for easy manipulation characteristics. The present invention further provides an attachment means for connecting the pull tabs to the tear strip which functions to facilitate bending of the tear strip at the appropriate locations in accord with the stowable tab and strip of the present invention without sacrificing the ease of manipulation.

Still an additional object of invention is to provide a method for forming a container and end closure therefor by providing either one or both of a depressed region and a raised region which can accommodate a bifolded tear strip in accord with the present invention.

SUMMARY OF THE INVENTION

The present invention therefore provides a container closure member comprising end wall means defining a depressed region, tear strip means in the end walls means defined by a first score line having a leading portion positioned adjacent the peripheral portion of the end wall means, the score line having spaced side portions extending along the end wall means, the side portions terminating at a spaced distance from each other in proximity of the depressed region, preferably the side portions terminate in the depressed region.

The present invention also provides a process for manufacturing an easy open end closure for a container comprising forming a depressed region on the top of an end closure blank, scoring a line in the top of said blank to form a tear strip, the line having a leading portion adjacent the periphery of the end closure, and having two spaced apart portions extending across the closure and terminating in spaced apart relationship at least adjacent the depressed region, attaching a pull tab to the forward portion of the tear strip. Alternatively, the process can include forming a raised region on the top of the end closure, the raised region surrounding a centrally located portion of the end closure, scoring a line on the top of the raised region to form a tear strip, the line having a leading portion adjacent the periphery of the end closure and having spaced apart portions extending across the raised region and terminating in spaced apart relationship at least the central portion of the end closure, attaching a pull tab to the forward portion of the tear strip.

The present invention further provides an easy-open end closure including a tear strip and a pull tab, the improvement comprising at least two spaced projections extending upwardly from and integral with the tear strip, the pull tab having a lever portion conforming to the leading edge of the tear strip and having an aperture in the lever portion sized to fit over the projections, the projections being deformed over the sides of the aperture and onto the top of the pull tab whereby the pull tab is retained on the tear strip. Preferably the easy-open end closure includes a tear strip having a peripheral relief region adjacent the leading edge and the forward portions of the side edges, the pull tab having a peripheral relief region mating with the peripheral relief region on the tear strip.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the present invention can be acquired by reading the ensuing specification in conjunction with the accompanying drawings wherein:

FIG. **1** is a top view of the first embodiment of the present invention;

FIGS. **2–5** are cross-sectional views taken along section lines similar to **2—2** showing sequence of operation of the pull tab and tear strip of the present invention;

FIG. **6** is a cross-sectional view of FIG. **1** taken along line **6—6**;

FIG. **7** is a plan view of a second embodiment of the present invention;

FIGS. **8–11** are cross-sectional views of FIG. **7** similar to those taken along section **8—8** showing the operational sequence of the second embodiment;

FIG. **12** is a plan view, partially broken away, of a third embodiment of the present invention;

FIGS. **13–16** are cross-sectional views similar to those taken along section line **13—13** showing the operational sequence of the third embodiment;

FIG. **17** is a plan view of the fourth embodiment of the present invention;

FIGS. **18** and **19** are cross-sectional views similar to those taken along section line **18—18** of FIG. **17** showing the operational sequence of the fourth embodiment of the present invention;

FIGS. **20** and **21** are plan and partial cross-sectional views respectively of the tear strip of the present invention used with the embodiment of FIG. **17** incorporating a novel tab fastening means;

FIGS. **22** and **23** are plan and cross-sectional views of a pull tab to be utilized with the tear strip of FIG. **20**; and

FIGS. **24** and **25** are enlarged cross-sectional views of a portion of the tear strip of FIG. **20** and that portion of the strip attached to the tab.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring first to FIGS. **1** and **2**, an end closure generally designated **10** is shown attached to side walls **12** of a container. The end closure **10** is formed by typical die stamping or other suitable forming methods utilized in the art. The periphery **14** of the end closure **10** is formed or rolled onto a flange **16** provided on the top edge of the sidewalls **12.** The bottom reinforcing loop portion **18** is also formed as is conventional. A central depressed region **20** is formed, preferably in the central portion of the end closure **10** and has a depth preferably on the order of one-quarter of an inch. The sidewalls of the central depression slope upwardly to the primary level **22** of the end closure **10.**

A score line is formed in the top of the end closure by conventional techniques. The leading edge **24** of the score line is located adjacent the peripheral reinforcing loop **18.** The score line also has two side portions **26** which extend toward the center of the end closure **10** and join with the leading edge **24.** The ends **28** of the tear strip **30** formed by the score lines terminate most preferably along the walls of the depressed region **20,** although under certain circumstances the root ends can be located on the primary level **22** or at the bottom of the depression **20.** The root ends **26** of the tear strip **30** are preferably formed by the score lines flaring slightly away from each other. This configuration will tend to

prevent tearing of the strip 30 from the depression wall along the unscored root of the strip 30.

A pull tab, generally designated 32, is attached to the tear strip 30 by means of a rivet 34. As shown, the rivet 34 is of hollow type construction formed integrally with the tear strip 30. The body or rivet 34 can be formed during the stamping operation. A hole is provided in the lever portion 36 of the pull tab 32 which mates with the body of the rivet 34. A mandrel or other die surface is then brought down upon the top of the projection to form the head of the rivet 34. The pull ring 38 is formed integrally with the lever portion 36 of the pull tab 32. The pull ring 38 is sized so that the rearward portion of the ring 38 is disposed over the depression 20. By so disposing the rear portion of the pull ring 38, easy entry of the finger into the opening 40 in the ring 38 is provided.

The lever portion 36 of the pull tab 32 conforms generally to the peripheral outline of the leading edge 24 of the score line and the forward portion of the side score lines 26. A central depressed region 42 is formed in the forward half of the tear strip 30. A mating depressed region 44 in the lever portion 36 is also provided. A stamped, very narrowed depression 46 is also located in the forward end of the lever portion 36 to provide an application of localized force to the central part of the leading edge 24 of the score line upon manipulation of tab 32. The rivet 34 connects the depressed region 42 in the tear strip 30 and the depressed region 44 in the pull tab 32.

Referring to FIG. 3 when force is applied in the direction of arrow 50 to the pull ring 38 of the tab 32, the stamped localized depression 46 acts to sever the leading edge 24 of the score line forming the tear strip 30. It will be noted that the rear edge of the depressed regions 42 and 44 terminates adjacent the midpoint of the tear strip 30. As the pull tab 32 is rotated in the direction of 50, a bend in the tear strip 30 will occur along the central fold line indicated between dot-dash lines 52 and 54 (FIG. 1). The central fold line is preferably located at or near the longitudinal center of the tear strip 30.

As shown in FIG. 4, a rearward force in the direction of arrow 56 is then applied to the pull tab 32. This will sever the remaining side portions of the tear strip 30 along the side portions 36 of the score lines, leaving an opening 58. As force is applied in the direction of arrow 56, the tear strip 30 will bend a second time at its root along a fold line indicated between dot-dash lines 60 and 62 (FIG. 1).

Thereafter as shown in FIG. 5, force is applied in the direction of arrow 64 by pressing downwardly with the thumb after releasing the ring 38 of the pull tab 32. As can be seen, the tear strip 30 is now bifolded adjacent its root end and adjacent its midpoint so that it rests within the depression 20 formed on top of the end closure 10. The lever portion 36 of the pull tab 32 will substantially cover the front half of the tear strip 30. The sharp severed edges on both the front and rear portions of the tear strip 30 will be disposed below the primary level 22 of the end closure 10 in FIG. 5. Thus, the sharp side edges of the severed tear strip 30 will not be exposed to the user of the container, thus preventing interference and injury during use. Furthermore, the opening 58 will provide adequate beverage flow out of the can, and will provide sufficient ingress of air to allow the can to breathe, in turn facilitating even flow of liquid from the can.

Referring again to FIG. 1, it will be noted that the distance denoted by dimension line 70 between leading edge 24 and the forward edge 52 of the central fold line is preferably equal to the distance between the rear edge 54 of the central fold line and the front edge 60 of the root fold line. This distance is indicated by dimension line 72. It is preferable that the distance indicated by dimension line 70 either be equal to or greater than the distance indicated by dimension line 72. In a later embodiment these dimensions are reversed as will be discussed.

Also as shown in FIG. 1 the end closure 10 contains a pair of raised regions 74 and 76 which surround a portion of the depressed region 20. As shown in the cross-sectional view of FIG. 6, the raised region 76 extends upwardly from the primary level 22 of the end closure 10. The raised regions 74 and 76 compensate for the volume taken from the interior of the container by the depressed region 20. Raised regions 74 and 76 are usually necessary since internal volume tolerances within a given beverage container are usually quite precise.

Referring now to FIGS. 7 through 11 a second embodiment of the invention is disclosed. In this embodiment the depressed region 80 in the end closure 82 is substantially the same size as that previously and has a central location in the closure 82. The closure 82 is connected to the sidewalls of the container 84 in a conventional manner. The tear strip 86 has a different configuration from that previously described. Tear strip 86 is formed by a score line having a leading edge 88 which almost immediately recedes inwardly toward the central depression 80 leaving a narrow leading edge 88. The side portions 91 of the score line diverge to about their midpoint location, indicated between the dot-dash lines 90, and begin to converge as they continue toward the central depression 80. The score line terminates in outwardly flared root ends 92.

Tear strip 86 is designed to fold along a lateral region between the dot-dash lines 90 which is slightly forward of the longitudinal midpoint of the tear strip. A second score line 94 is formed in tear strip 86 rearwardly of the location where the pull tab 96 is attached thereto by rivet 98. Score line 94 is positioned rearward of rivet 98 so that when pressure is applied to the ring 100 of pull tab 96 in the direction of arrow 102, FIG. 9, additional downward flexure is provided in the forward region of the tear strip 86. The bending occurs along the dot-dash line 104 (FIG. 7). By allowing a limited amount of bending along line 104 additional force can be applied to the tear strip 86 adjacent leading edge 88 of the score line to provide easier initial severing of the tear strip 86 from the end closure 82.

It is not desirable, however, that the tear strip bend substantially along the line 104. Therefore, two raised relief regions 106 running longitudinally along the strip 86 are provided. The relief regions 106 flank the score line 94 and run from adjacent rivet 98 to adjacent the fold line indicated by dot-dash lines 90. The relief regions 106 allow slight bending of the tear strip 96 but will not allow substantial bending. The lever portion of the pull tab 96 has raised relief regions 108, mating with regions 106, which prevent bending of the pull tab along the line 104. Additionally, a raised peripheral region, i.e., a depressed central area 110, is formed on

tab 96 to provide structural integrity in the lever portion of the tab 96.

In operation, the lever portion of the pull tab 96 is depressed wholly within the container cavity 112 as force is applied in direction of arrow 102 as shown in FIGS. 9 and 10. As this occurs, tear strip 86 is folded downwardly along line 104 adjacent the midpoint region thereof. Thereafter, force is applied to the ring 100 of the pull tab 96 in the direction of arrow 114 which will sever the rearward portion of the tear strip 86 along the score line. As the tear strip is severed, it will additionally fold adjacent its root ends 92 as shown in ghost outline in FIG. 10.

Referring to FIG. 11, the pull tab 96 is pulled as far rearwardly in the direction of arrow 114 as it can be pulled, being limited by the connection of the root of the tear strip to the end closure 82. A downward force in the direction of arrow 116 is then applied to the top of the pull tab 96, thus causing the completion of bifold of the tear strip 86 so that it is completely recessed in the central depression 80. Wide opening 118 is provided for fluid egress from the container 84.

The widened central portion of the tear strip 86 in this embodiment is provided so that as the forward half of the tear strip 86 is being severed, less force need be applied to the pull tab 96. Likewise, the widest portion of the tear strip 86 is located adjacent its midpoint. Thus when rearward force in the direction of arrow 114 is applied to the pull tab 96, easier severing will occur since the score lines are converging upon each other toward their root ends 92.

A third embodiment of the invention is illustrated in FIGS. 12 through 16. In this form of the invention, the tear strip is formed by a score line in the end closure 120. The score line has a leading edge 122 and rearwardly directed side portions 124. The side portions terminate at divergent root ends 126 in a centrally located depression 128 in the end closure 120. In this embodiment a raised relief region 130 is formed in the tear strip, generally designated 132, the relief region 130 is located so that its forward edge 134 is located forward of the longitudinal midpoint of the tear strip 132. The relief region 130 will facilitate bending of the tear strip forward of the longitudinal midpoint of the tear strip 132 and prevent reverse bending of the tear strip between the midpoint and terminus of the strip 132. If desired, additional reinforcement can be incorporated between the center fold line to prevent bending of the strip 132 between the rivet and the fold line. Also, the attachment means shown below in FIGS. 20 through 25 can be advantageously employed. A U-shaped flange 136 forms the lever portion of pull tab 138. The U-shaped flange 136 is connected to the forward portion of the tear strip 132 by means of a hollow rivet 140.

In FIG. 14 as the pull tab 138 has force applied to it in the direction of arrow 142, the U-shaped flange 136 will flex slightly, but will also exert pressure on the leading edge of the tear strip 132, thus initiating severing along the leading edge 122 of the score line. When force is applied to the pull tab 138 in the direction of arrow 144 as shown in FIG. 15, the tear strip 132 will bifold forward of its midpoint region, as indicated at 146 and at its root in depression 128. Thereafter, a downward force in the direction of arrow 148 is applied to pull tab 138 as shown in FIG. 16. Thus again, the tear strip 132 is recessed in the depressed region 128 of the end closure 120.

As can be seen in this embodiment of the invention, the U-shaped flange 136 of the pull tab 138 extends forwardly of the leading edge of the tear strip 132. Additionally, the U-shaped flange 136 covers the forward side edges of the tear strip, i.e., the part of the tear strip forward of the pull tab lying in front of the raised region 134. Thus, when the tear strip 132 and tab 138 are in their stowed position, as shown in FIG. 16, the sharp side edges of the tear strip 132 are substantially covered to prevent possible interference and injury by using the type of pull tab 138 in this embodiment, a slightly longer tear strip 132 can be employed if desired.

A fourth embodiment of the present invention, as well as a novel fastening means for a tear strip pull tab is illustrated in the remaining FIGS. 17–25. In this embodiment of the invention, an end closure 150 is provided with a raised region 156 which extends around a substantial portion of the top of the end closure 150. The raised region 156 extends above the primary level 158 of the end closure 150. A central depressed region 160 is again provided in the central portion of the closure 150. The depressed region 160 extends below the primary level 158 of the end closure 150. In addition, the depressed region 160 is surrounded on the three sides as illustrated in FIG. 17 by the raised region 156.

A tear strip generally designated 162 is formed by a score line having a leading edge 164 and spaced apart side portions 166. The spaced apart side portions 166 extend down the wall of the depression 160 and terminate in root ends 168 which again are flared slightly outwardly. A pull tab, generally designed 170, is affixed to the forward end of the tear strip 162 by fastening 171 which will be described in detail later in conjunction with the FIGS. 22 through 25.

As illustrated sequentially in FIGS. 18 and 19, operation of this embodiment is commenced by applying force to the pull tab 170 in the direction of arrow 172. This action will sever the leading edge of the tear strip at the leading edge 164 of the score line. In addition, the tear strip 162 will tend to bend immediately behind the fastening means 171. This will occur at approximately the midpoint of the tear strip 162. Thereafter, force is applied in the direction of arrow 174 to move the tear strip 162 and pull tab 170 to the position shown in ghost outline in FIG. 19. Thereafter, force is applied to the pull tab 170 in the direction of arrow 176 to stow the tab 170 and the tear strip 162 in the depressed region 160. At this point it will be noted that the raised region 156 in end closure 150 leaves a portion of the primary level 158 of the end closure 150 exposed. In addition, the rearward sides 178 of the raised regions 156 are formed to conform to the general outline of the ring portion of pull tab 170. As shown in ghost outline in FIG. 17, a pull tab 170 when in stowed position (as shown also in cross-section in FIG. 19) will rest preferably completely below the upper level of the raised region 156. The tear strip 162 and pull tab 170 are completely removed from a position which will interfere with the use of the opening for egress of liquids. The sharp side edges of a tear strip 162 are completely removed from an accessible location by being recessed in the depressed region 160. Thus, in this embodiment of the invention, no inconvenience whatsoever is encountered with the use of the stowable pull tab of the present invention.

As shown in FIGS. 20 and 21, plan and cross-sectional view of the tear strip utilized with the embodiment of FIGS. 17 through 19 is illustrated. The tear strip is shown after formation of projections 182 and prior to the time that the pull tab is attached. As will be noted, the tear strip 162 has a leading edge raised portion 180 which follows the general outline of the leading edge 164 of the score line and extends backwardly to adjacent the longitudinal midpoint of the tear strip 162. The raised region 180 and the tear strip 162 facilitates bending of the tear strip along its longitudinal midpoint as shown in FIG. 18. Additionally, the tear strip 162 has three small raised projections 182 which are arranged in a triangular pattern. An enlarged sectional view of one projection 182 is illustrated in FIG. 24. The use of the three raised regions 182 will be explained after describing the pull tab utilized with the present invention.

The pull tab, generally designated 170 as shown in FIGS. 22 and 23, has a forward lever portion 184 and a rearward ring portion 186. Preferably the lever portion 184 and the ring portion 186 are formed integrally. The lever portion 184 has a peripheral raised ridge 188 which will mate with the raised portion 180 on the tear strip 162. In addition, a narrow depression 190 is stamped at the forward center of the lever portion 184. The center of the lever portion 184 contains a triangular cut-out 192 which is sized to be placed on the outside edges of the raised projections 182 of the tear strip 162. After the pull tab 170 is placed over the raised projections 182, a tool is brought down upon the top of the raised projections 182 flattening them over the edges of the triangular opening 192 as shown in FIG. 25. Thus, the pull tab 170 is firmly fixed to the tear strip 162, as shown in FIG. 17, and causes a prestressed load condition on the forward portion of the tear strip. This preload condition will substantially reduce the pull force 172 required by the consumer when piercing the tear strip 162 at point 164. In addition, the rearward raised projection 182 when deformed over the top of the pull tab 170 will serve the additional function of ensuring folding of the tear strip 162 rearward of the projection, since the rear most projection 182 is situated adjacent the longitudinal midpoint of the tear strip 162. Thus, as shown in FIG. 18, ease of manipulation bending at the desired location is facilitated by this fastening means of the present invention.

Although the present invention has been described in relation to several embodiments, various changes, alterations and substitutions of equivalents can be made by those of ordinary skill in the art to the concept as disclosed. For example, the raised reinforcing regions on the tear strips which facilitate bending at the desired locations can be replaced or supplemented by weakened areas of reduced thickness along score lines extending partially across the desired fold lines on the tear strip. In addition, the present invention can be incorporated as an insert into a steel end closure for a steel can. It is presently contemplated that the end wall means can be composed of both steel and aluminum and that the central depressed region can be located either in an aluminum insert or in a steel end closure wall itself. Therefore it is intended that the present invention be limited only by the definition contained in the appended claims.

What is claimed is:

1. A container closure member comprising:
end wall means defining a depressed region;
tear strip means integral with said end wall means defined by a first score line having a leading portion positioned adjacent the peripheral portion of said end wall means, said score line having spaced side portions extending along said end wall means, said side portions terminating a spaced distance from each other in said depressed region.

2. The closure member of claim 1 wherein said depressed region is centrally located on said end wall means.

3. The closure member of claim 1 wherein said depressed region has a width at least as wide as said tear strip means and a length at least one-half the length of said tear strip means.

4. The closure member of claim 1 further comprising:
pull tab means having a lever portion affixed to the forward portion of said tear strip means and having a pull ring integral with and extending rearwardly from said lever portion, the rearward portion of said pull ring positioned above said depressed region.

5. The closure member of claim 4 further comprising:
rivet means attaching the forward half of said tear strip means to said lever portion forward of and adjacent to the longitudinal midpoint of said tear strip means.

6. The closure member of claim 5 wherein the forward portion of said lever portion conforms to the shape of the score lines defining the forward half of said tear strip means, said lever portion including means at its forward end for concentrating an initial tearing force in a localized region of the leading portion of said score line.

7. The closure member of claim 5 wherein said spaced side portions of said score line defining said tear strip means diverge from the leading portion thereof to a given spaced distance adjacent the longitudinal midpoint of said tear strip means and diverge from said midpoint to a lesser spaced distance at the terminus thereof.

8. The closure member of claim 5 wherein the peripheral edges of said lever portion are smooth and rounded.

9. The closure member of claim 1 further comprising:
pull tab means attached to the forward end of said tear strip means by rivet means, said tear strip having a second score line running generally laterally thereof and located rearwardly of said rivet means, said score line being noncoextensive with said tear strip means, the forward end of said pull tab means having a downwardly directed flange portion thereon immediately adjacent the rearward side of said leading portion of said first score line.

10. The closure member of claim 9 wherein said second score line is positioned near the central portion of said tear strip means.

11. The closure member of claim 10, said tear strip means further defining a longitudinal structural relief region therein running from adjacent the leading portion of said first score line to adjacent the midpoint of said tear strip means.

12. The closure member of claim 4, said lever portion having a relief region therein, said tear strip means having a relief region therein mating with the relief region in said lever portion, at least the substantial part of said

relief regions positioned forward of the longitudinal midpoint of said tear strip means.

13. The closure member of claim 1 wherein said end wall means has a primary level, said depressed region extending below said primary level and being located proximately centrally of said end wall means, said end wall means defining a raised region at least partially surrounding said depressed region, said raised region extending above said primary level, said side portions of said tear strip means extending along said raised region and terminating proximate said depressed region.

14. The closure member of claim 13, wherein said raised region extends along said end wall means from adjacent said depressed region to adjacent the peripheral portion of said end wall means, and wherein the leading portion of said score line is positioned in said raised region.

15. The closure member of claim 14 further comprising pull tab means having a lever portion affixed to the forward portion of said tear strip means and having a pull ring connected to said lever portion, a region of said end wall means defining at least part of said primary level being positioned opposite said depressed region from the location of said tear strip means, said region defining primary level being sized to accommodate said pull ring when said tear strip means is severed from said end wall means along said score line and is folded to fit in said depressed region.

16. The closure member of claim 1 wherein said end wall means further defines a raised region extending above said depressed region, said raised region at least partially surrounding said depressed region, said leading edge of said score line and at least part of said side portions of said score lines being located in said raised region.

17. A container and end closure therefor comprising:

container means defining a cavity for holding a substance;

wall means having an inside and an outside, said wall means defining a recess means extending inwardly of said wall means, said wall means connected to an end of said container means to close said end;

tear strip means in said wall means having a leading edge and having a terminus, said leading edge located outside said recess means, said terminus located in said recess means, said tear strip means severable from said end wall means along its leading edge and side edges and integral with said wall means at its terminus.

18. The container of claim 17 wherein said recess means is sized to accommodate said tear strip means when said tear strip means is bifolded.

19. The container of claim 17 further comprising:

pull tab means attached to said tear strip means for severing said edges from said end wall means.

20. The container of claim 19, said tear strip means being elongate from its leading edge to its terminus.

21. The container of claim 20 wherein said tear strip means defines first means for initiating a first fold line between said leading edge and said terminus.

22. The container of claim 21 wherein the distance between said leading edge and said first means is substantially equal to the distance between said first means and said terminus.

23. The container of claim 21 wherein the distance between said leading edge and said first means is greater than the distance between said first means and said terminus.

24. The container of claim 23 wherein said tear strip means defines second means for initiating a second fold line adjacent the terminus thereof.

25. The container of claim 23 wherein said tear strip means further defines means for preventing substantial bending forward of said first means.

26. The container of claim 23 wherein said tear strip means further defines means for preventing substantial bending rearward of said first means.

27. The container of claim 23 further comprising:

pull tab means attached to the forward portion of said tear strip means, said pull tab means cooperating with the forward portion of said tear strip means to initiate inward folding along said first means, said pull tab means further cooperating with said tear strip means to prevent substantial bending forward of said first means.

28. The container of claim 23 wherein said tear strip means diverges to a greater width from its leading edge to adjacent said first means and converges therefrom to a lesser width adjacent its terminus.

29. The container of claim 28 further comprising:

pull tab means attached to said tear strip means forward of said first means, said pull tab means and said tear strip means cooperating to facilitate folding of said tear strip means along said first fold line, said pull tab means conforming generally to the shape of said tear strip means forward of said first means and having a slightly lesser width than said tear strip means forward of said first means.

30. The container of claim 17 wherein said wall means further defines a volume-compensating relief region spaced from said recess means.

31. The container of claim 17 further comprising:

pull tab means including a forward lever portion attached to said tear strip means and a rearward ring portion, the rearward end of said ring portion positioned above said depression to facilitate hand manipulation thereof.

32. The container of claim 21 wherein said first means comprises at least one reinforcing relief region in said tear strip means forward of said first means and a mating reinforcing relief region in said lever portion of said pull tab means.

33. The container of claim 21 further comprising:

rivet means attaching said pull tab means to said tear strip means, said rivet means located within said mating relief regions.

34. The container of claim 21 wherein the distance between said leading edge and said first means is less than the distance between said first means and said terminus.

35. In an easy-open end closure including a tear strip and a pull tab, the improvement comprising:

at least two spaced projections extending upwardly from and integral with the tear strip, said pull tab having a lever portion conforming to the leading edge of said tear strip and having an aperture in said lever portion sized to fit over said projections, a first of said projections positioned along the rearward edge of said aperture, at least one other projection positioned forwardly of said first projection, said projections being deformed over the sides of said aperture and onto the top of said pull tab whereby said pull tab is retained on said tear strip.

36. In the end closure of claim 35 said aperture being triangular, said tear strip having three of said projections extending upwardly therefrom in a triangular pattern corresponding to the dimensions of said triangular aperture, said projections being elongate.

37. In the end closure of claim 36, an apex of said triangular apertures being adjacent the leading edge of said pull tab, the side of said aperture opposite said apex being laterally disposed across said pull tab.

38. In the end closure of claim 35, said tear strip having a peripheral relief region adjacent the leading edge and the forward portions of the side edges, said pull tab having a peripheral relief region mating with said peripheral relief region on said tear strip.

39. A container closure member comprising:

end wall means defining a depressed region, said depressed region being positioned a spaced distance from the peripheral portion of said end wall means;

tear strip means in said end wall means defined by a first score line having a leading portion positioned adjacent said peripheral portion and within said spaced distance, said score line having spaced side portions extending along said end wall means, said side portions terminating a spaced distance from each other in said depressed region.

40. The closure member of claim 39 wherein said depressed region is centrally located on said end wall means.

41. The closure member of claim 39 further comprising:

pull tab means having a lever portion affixed to the forward portion of said tear strip means and having a pull ring integral with and extending rearwardly from said lever portion, the rearward portion of said pull ring positioned above said depressed region.

42. The closure member of claim 40 further comprising:

pull tab means attached to the forward end of said tear strip means by rivet means, said tear strip having a second score line running generally laterally thereof and located rearwardly of said rivet means, said score line being noncoextensive with said tear strip means, the forward end of said pull tab means having a downwardly directed flange portion thereon immediately adjacent the rearward side of said leading portion of said first score line.

43. The closure member of claim 42 wherein said second score line is positioned near the central portion of said tear strip means, said tear strip means further defining a longitudinal structural relief region therein running from adjacent the leading portion of said first score line to adjacent the midpoint of said tear strip means.

44. The closure member of claim 41, said lever portion having a relief region therein, said tear strip means having a relief region therein mating with the relief region in said lever portion, at least the substantial part of said relief regions positioned forward of the longitudinal midpoint of said tear strip means.

45. The closure member of claim 39 wherein said end wall means has a primary level, said depressed region extending below said primary level and being located proximately centrally of said end wall means, said end wall means defining a raised region at least partially surrounding said depressed region, said raised region extending above said primary level, said side portions of said tear strip means extending along said raised region and terminating proximate said depressed region.

46. The closure member of claim 45 wherein said raised region extends along said end wall means from adjacent said depressed region to adjacent the peripheral portion of said end wall means, and wherein the leading portion of said score line is positioned in said raised region, said closure member further comprising pull tab means having a lever portion affixed to the forward portion of said tear strip means and having a pull ring connected to said lever portion, a region of said end wall means defining at least part of said primary level being positioned opposite said depressed region from the location of said tear strip means, said region defining primary level being sized to accommodate said pull ring when said tear strip means is severed from said end wall means along said score line and is folded to fit in said depressed region.

47. The closure member of claim 39 wherein said end wall means further defines a raised region extending above said depressed region, said raised region at least partially surrounding said depressed region, said leading edge of said score line and at least part of said side portions of said score lines being located in said raised region.

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