United States Patent [19]

Brown

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[54] **EASY OPEN CAN END/AND HINGED OPENING TAB**

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[52] **U.S. Cl.** **220/269**

[51] **Int. Cl.** **B65d 17/20**

[58] **Field of Search** 220/54, 48, 27

[56] **References Cited**

UNITED STATES PATENTS

3,662,916	5/1972	Holk	220/54
3,749,275	7/1973	Smith et al	220/48
3,752,353	8/1973	Shade	220/54

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[57] **ABSTRACT**

An easy open can end in which a lifting tab is connected to a tear portion circumscribed by a primary line of weakness in the can end. The tab has a body which includes a nose portion, a lifting end and a support strip. The support strip is connected to the tear portion by a front connection positioned adjacent the tab nose and a rearward connection positioned between the front connection and the lifting end with the front and rearward connections lying on about the centerline of the tab while the nose portion of the tab is positioned in rupturing proximity to the primary line of weakness. The support strip is circumscribed by a slit in the tab body which begins at a point adjacent the front connection, extends rearwardly about the rearward connection and then forwardly to end adjacent the the front connection with the beginning and ending points of the slit spaced transversely of each other. The beginning and ending portions of the slit may include tear retarding portions and are positioned with respect to the front connection to provide a bend line in the strip which lies rearward of the front connection when the lifting end of the tab is raised to rupture the line of weakness through contact with the tab nose. During lifting of the tab, the support strip provides a supportive force between the front and rearward connections of the tab to the tear portion. The support strip may include spring means positioned intermediate the front and rearward connections which permits the support strip to elongate during bending of the tab with respect to the can end. The tab nose may be constructed to rupture an arcuately shaped line of weakness by providing a rupturing contact which causes initial rupture of the line of weakness and spreading surfaces which are progressively brought into contact with the extremities of the opening produced in the can end to spread the opening during lifting of the tab.

In addition to an easy open can end, a tab is provided as defined above, for use with an easy open can end.

24 Claims, 7 Drawing Figures

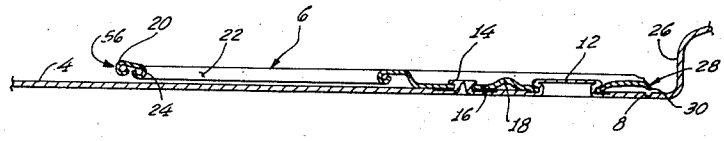


Fig. 1

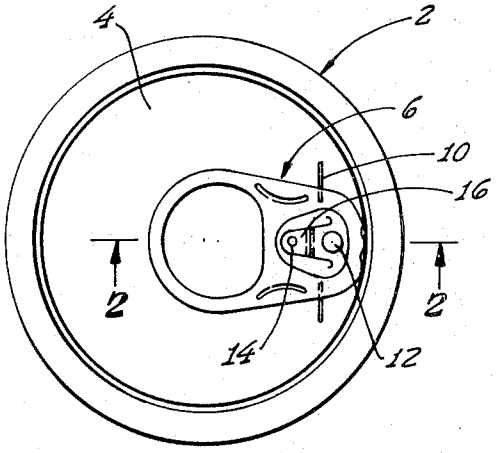


Fig. 2

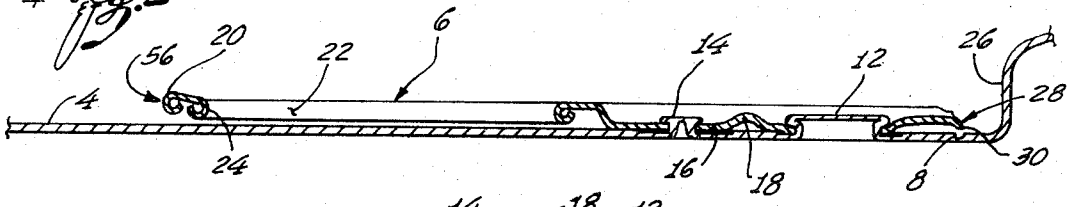


Fig. 2a

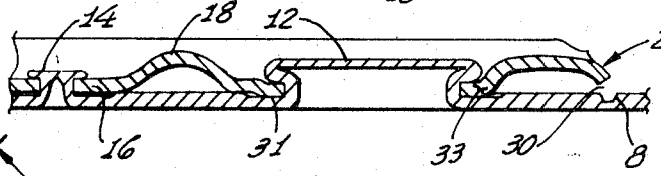


Fig. 3

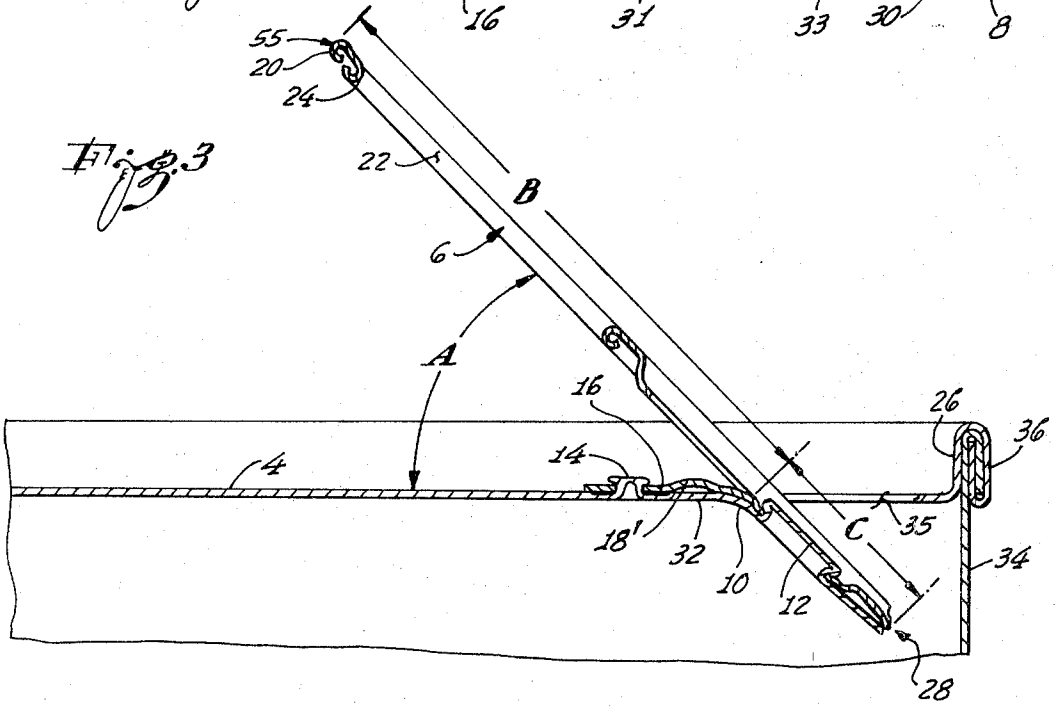


Fig. 4

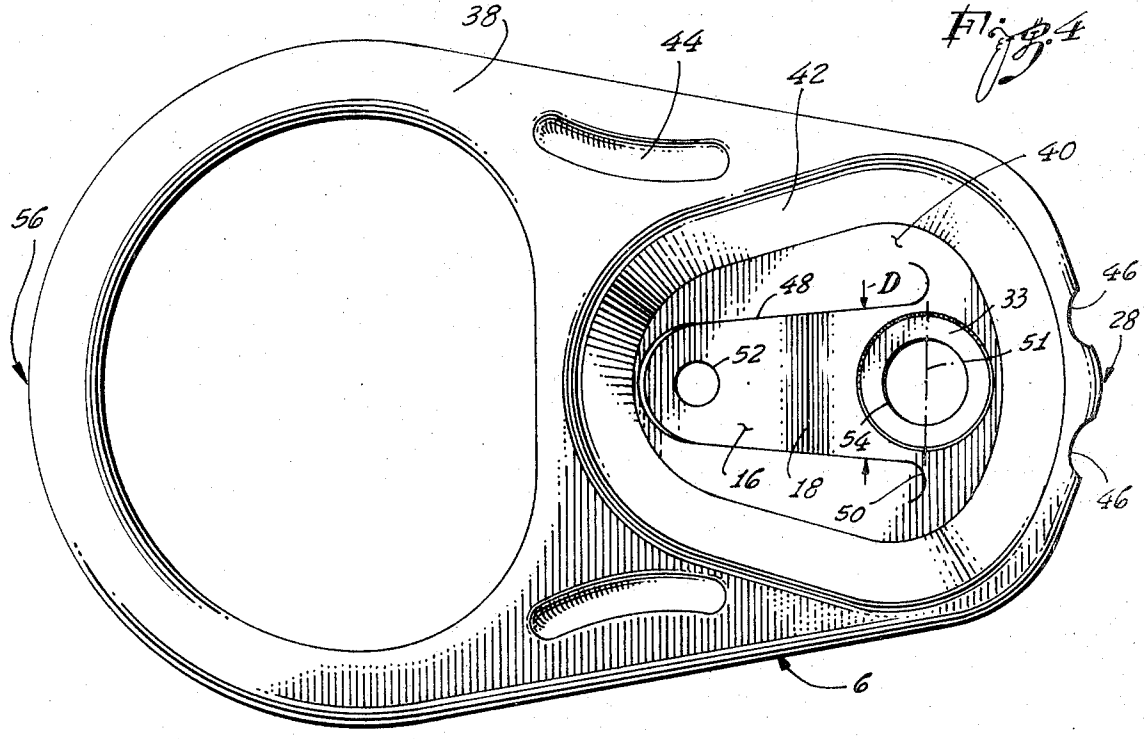


Fig. 6

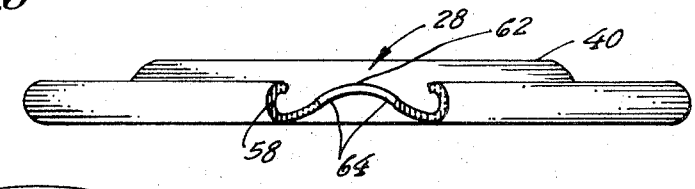
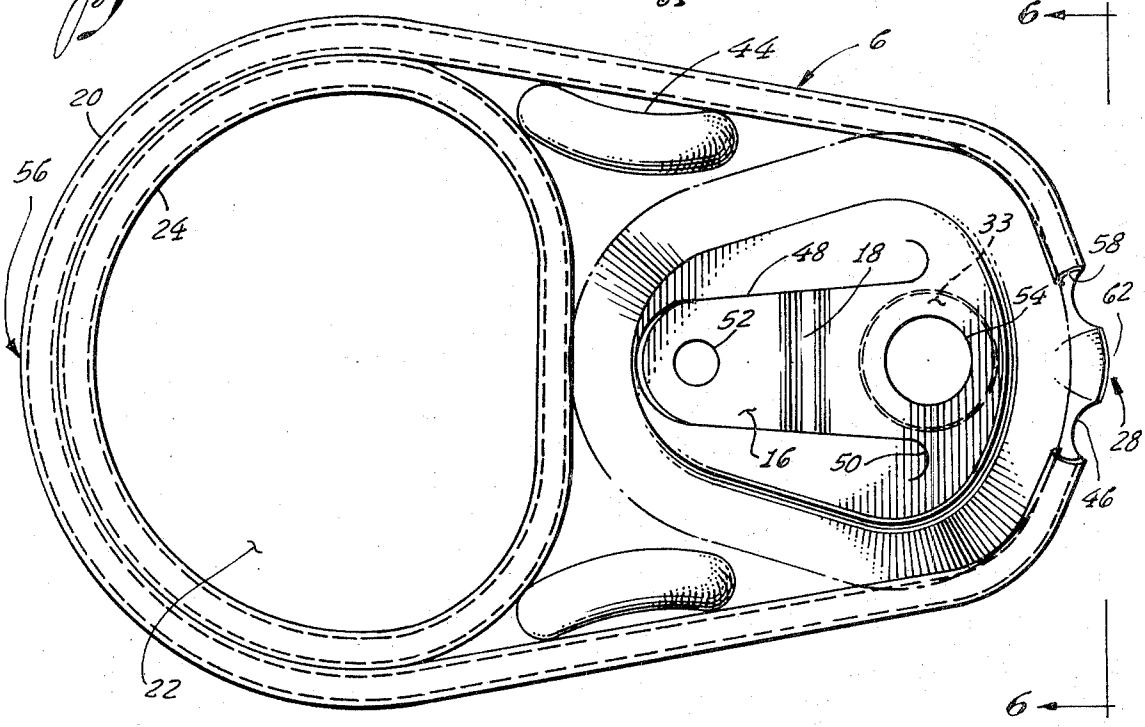


Fig. 5



EASY OPEN CAN END/AND HINGED OPENING TAB

BACKGROUND OF THE INVENTION

Easy open can ends are now widely used for packaging a wide variety of products ranging from liquids, such as carbonated beverages, to solids such as shoe string potatoes or sardines. In the various can end constructions which have been previously utilized, a tear portion, which may be a spout in the case of a beverage can, or a full panel pullout in a can used for packaging solid products, is formed in the can end by a line of weakness which circumscribes the tear portion. Generally, the line of weakness circumscribing the tear portion is a score line in the can end which reduces the thickness of the material and the strength of the can end along the score line. An opening tab is affixed to the can end in some manner so that lifting of the tab causes the line of weakness to rupture with the tear portion being removed by severing it from the can end along the line of weakness.

A common problem in the usage of easy open can ends involves separation of the tab from the can end before the can end has been completely opened. During opening, considerable strain is applied to the connection between the tab and the can end which may cause separation of the tab before the tear strip is removed. When this occurs, the desired ease of function of the can end is lost and it is then necessary to resort to whatever hand tools may be available at the time, such as a pair of pliers, to remove the tear portion. If the tab separates from the can end before initial rupturing of the line of weakness, it may be necessary to employ a hand tool, such as a punch, to initiate rupture of the primary line of weakness to separate the tear portion to whatever extent necessary to provide a gripping surface for a pair of pliers to complete removal of the tear portion.

Needless to say, there is no satisfactory way to remove the tear portion from an easy open can end after premature separation of the tab from the can end. Thus, the premature tab separation is a very serious problem for the can end manufacturer. When the incidence of premature tab separation becomes unaceptably high, the can end manufacturer may lose future business and may be forced to take back unused can ends from his customers or to assume the cost to his customer in recalling unacceptable cans of merchandise from retailer's shelves. The latter type of exposure is the most serious one, since the cost of a filled can will vary tremendously depending upon what merchandise is in the can.

Many types of canned food products are sterilized after being placed in the can by an in-can sterilization procedure. When such products are recalled, it may be literally impossible to save the contents of the can by repackaging it in another can. Also, even when it is possible to repackage the contents, this might not be economically feasible. Thus, when canned merchandise is recalled, there is a good likelihood that the merchandise will simply have to be destroyed with the cost being borne by the can end manufacturer who supplied the faulty can ends.

One form of a full-panel pullout can end construction which has been used in preventing tab separation is illustrated in U.S. Pat. No. 3,322,296 to Khoury. In the Khoruy construction, a front-opening pull tab is constructed with a mounting ear which is rigidly connected to the can end. The mounting ear is formed with a central aperture which receives a rivet formed in the tear portion. The mounting ear is formed by a C-shaped slit in the tab which opens toward the nose of the tab and terminates at points positioned forwardly of the connection of the mounting ear to the can end. The C-slit, thus, defines a hinge line for the tab that is located between the mounting ear and the tab nose.

As thus described, the Khoury construction minimizes separation of the tab from the can end by reducing distortion of the removable panel portion at the rivet connection of the tab to the tear portion and by reducing the stresses which occur between the tab and the removable panel portion at the connection between the tab and panel portion.

Although the structure of the Khoury tab does reduce tab separation, it has the disadvantage of placing the hinge line about which the tab rotates at a point between the rivet connection and the nose of the tab. By thus forcing the location of the hinge line outwardly toward the primary line of weakness which circumscribes the removable tear portion, the hinge line is moved relatively close to the nose of the tab. As a result, when the nose of the tab is pivoted downwardly through lifting of the rear portion of the tab, the opening produced by the tab is relatively small.

After upward rotation of the tab of the Khoury patent to a vertical position with respect to the can end, the relatively small opening produced in the can end must then be enlarged by an upward pulling force applied to the tear portion through the tab. The pulling force applied to the removable tear portion is not fully utilized in severing the tear portion along the line of weakness unless the direction of the line of weakness is the same as the direction fo the pulling force. When a circular line of weakness defines the tear portion, the direction of the line of weakness will change uniformly from one point to another. At the point of initial rupture where the line of weakness crosses the axis of the tab, the direction of the line of weakness will be at right angles to the tab. As the initial opening in the can end is enlarged, the direction of the line of weakness approaches the direction of the tab axis.

The pull force transmitted to the removable tear portion through the tab is most efficiently utilized in severing the tear portion from the can end when the direction of the line of weakness is parallel to the axis of the tab. In the Khoury can end construction, the pulling force applied to the can end is not effectively utilized in removing the tear portion since the initial opening produced by rotation of the tab to an upright position is relatively short.

If the initial opening produced by rotation of a tab to an upright position with respect to the tear portion of the tab could be increased in length to produce an opening having a greater opening chord, a pulling force applied to the tear portion by the tab would be more effectively utilized in removal of the tear portion. By increasing the width of the initial opening, the direction of the line of weakness at the extremities of the opening have a greater force component along the line of pull exerted on the tear panel by the tab. Thus, a greater portion of the pulling force would be transmitted to the line of weakness in causing severance of the tear portion.

Referring again to the Khoury patent, during bending of the tab about a hinge line positioned in front of the rivet connecting the tab to the removable tear portion, there is a tendency for the tab to fail by tearing through the metal at the ends of the C-slit. This is particularly a problem when the lifting force applied to the tab is not applied along the center line or lifting axis of the tab. When the lifting force is at an angle to the tab lifting axis, the tab may be cocked to one side during its upward rotation with failutre of the tab through tearing of one of the ends of the C-slit or bending of one of the sides of the tab nose portion. The extension of the C-slit in the Khoury construction to a position in front of the rivet connecting the tab to the can end reduces the strength of the tab nose. This, in turn, increases the incidence of tab failure by bending of the tab nose portion during lifting.

In an effort to cure certain of the problems inherent in the Khoury construction, a recent patent to Holk, Jr. — U.S. Pat. No. 3,662,916 — proposes to stiffen the tear portion by placing downwardly extending beads on either side of the rivet which extend outwardly to end in close proximity to the score line. In this purported construction, the beads stiffen the removable panel so that it will not bend in front of the rivet when an upward lifting force is applied through a Khoury tab with a C-slit which terminates at points in front of the rivet. By providing the stiffening beads, the tear portion in the Holk, Jr. construction purportedly bends behind the rivet connecting the tab to the can end to produce a larger opening in the can end.

The Holk, Jr. construction is not a practical solution to the problems of Khoury because it would be very difficult, if not impossible, to fabricate the purported Holk, Jr. structure. As shown and described by Holk, Jr., the stiffening beads depend downwardly from the plane of the can end and are positioned in close proximity to the rivet. However, there is no disclosure of how to fabricate such a structure.

During formation of a rivet in a can end, metal is moved from the can end into the rivet. This produces a thinning of the can end in the region around the rivet. If it were then attempted to form beads in the can end in close proximity to the rivet, as in Holk, Jr., these beads would have to pass through the already thinned region of the can end. The formation of a downwardly depending bead in a can end also requires moving metal from the can end—in this case into the bead. How or where this metal could be obtained from the already thinned portion of the can end used to form the rivet is not explained by the Holk, Jr. patent.

In reducing the stresses at the connection of a tab to a can end, it would be desirable to provide an elongatable support strip between the tab and the can end. In bending the tab about a hinge line to produce inward bending of a portion of the can end, the stresses in the support strip could then be reduced through elongation of the support strip while providing a supporting force for maintaining the position of the tab with respect to the can end.

Also, in providing an improved front opening tab and full-panel pullout can end construction, it would be desirable to have a tab having increased strength in the tab nose portion. Then, in the event that a lifting force was applied to the tab at an angle to the lifting axis, this would have less tendency to cause tab failure through bending of the tab nose during lifting of the tab.

During opening of a can end through inward bending of a tear portion with respect to the can end, the angular relationship between the plane of the opening tab and the plane of the can end will vary. During initial rupture of the line of weakness circumscribing the tear portion, the plane of the tab may be parallel to the plane of the can end. However, after initial rupture, the tab is rotated so that its plane progressively approaches a plane that is perpendicular to that of the can end.

In designing the nose for an opening tab, it is customary to provide a rupturing point or contact on the nose which makes initial contact with the line of weakness to cause rupture. Following the initial rupture, however, the tab nose then essentially ceases to function in terms of transmitting force to the extremities of the opening to spread the opening through further severance of the line of weakness.

In providing a more effective tab and easy open can end construction, it would be desirable to have a tab which functions not only to provide initial rupture along a line of weakness, but also to effectively spread the opening during rotation of the tab with respect to the can end. In this regard, it would be desirable to provide a tab whose nose provided not only a rupturing contact but also provided spreading surfaces which would be brought into progressive contact with the extremities of the opening in the can end so as to spread that opening during rotation of the tab with respect to the can end.

SUMMARY OF THE INVENTION

In providing a can end construction which solves the aforementioned problems, a front opening tab is provided which has a body that includes a nose portion, a lifting end and a support strip that is affixed to a removable tear portion circumscribed by a primary line of weakness. The support strip is connected to the tear portion by a front connection positioned adjacent to the tab nose and a rearward connection positioned between the front connection and the lifting end of the tab. Both the front and rearward connections are positioned on or about the center line or lifting axis of the tab with the nose portion of the tab positioned in rupturing proximity to the primary line of weakness.

The support strip is defined by a slit in the tab body which begins at a point adjacent to the front connection, then extends rearwardly about the rearward connection, and then forwardly to end at a point adjacent the front connection. The beginning and ending points of the slit are spaced transversely from each other and both the beginning and ending points may include tear retarding portions to reduce tearing at these points during use of the tab. The beginning and ending points of the slits are positioned with respect to the front connection to define a bend line which lies rearward of the front connection when the lifting end of the tab is raised to bring the tab nose into rupturing contact with the line of weakness. During pivotal movement of the tab with respect to the tear portion, the rearward connection and the support strip provide support for the front connection between the tab and the tear portion.

The support strip which interconnects the front and rearward tab connections may include a spring loop positioned intermediate to the front and rearward connections. The spring loop permits the support strip to elongate during inward bending of the tab with respect

to the can end, so as to reduce the stresses in the connections between the tab and the tear portion.

The front and rearward connections between the tab and the can end are preferably formed by rivets formed in the tear portion of the can end which extend through apertures in the tear strip. In a full-panel pullout, the tear portion is generally defined by a line of weakness which lies in close proximity to the chuck wall where the can end is connected to a can body through a conventional double seaming operation. The front connection between the support strip and the tear portion may then be placed in relatively close proximity to the chuck wall with the bend line of the tab lying rearwardly of the front connection. This provides an opening having a relatively large opening chord when the tab is rotated with respect to the can end.

By providing an opening having a larger opening chord, removal of a full-pannel pullout is more efficiently accomplished when a pulling force is transmitted to the panel. During initial rotation of the tab with respect to the can end, an opening is provided which has a relatively large opening chord, as measured across the opening from its extremities at the line of weakness. When a pulling force is then exerted on the can end through the tab, the direction of the line of weakness at the extremities of the opening more closely approximates the direction of the pulling force and a larger force component is transmitted to the line of weakness in severing the tear portion from the can end.

In the can end construction of the invention, the distance between the lifting end of the tab and the bend line of the tab will be relatively large in comparison to the distance between the bend line of the tab and the tab nose. This provides a mechanical advantage in increasing the downward force applied by the tab nose with respect to the upward force which is applied to the lifting end of the tab. To provide a tab which is relatively stiff and has a high resistance to bending, the tab may include an outer stiffening bead.

In another embodiment of the invention, the primary line of weakness may include an arcuate portion which is positioned in rupturing proximity to the tab nose. In severing the arcuate portion, the tab nose may be shaped to provide a rupturing contact which provides the initial rupture of the line of weakness. During continued rotation of the tab with respect to the can end, the nose may provide spreading surfaces which are progressively moved into contact with the extremities of the opening in the can end to cause spreading contact with the arcuate portion of the line of weakness at the extremities of the opening. Thus, during rotation of the tab, the tab nose functions to first rupture the line of weakness and to provide an opening and to then spread this opening during continued rotation of the tab with respect to the can end.

In addition to providing a can end, the present invention provides a tab which has particular suitablity for use in rupturing and spreading an arcuate line of weakness in a can end. The tab, as described previously, includes a lifting end and a nose with the nose having a configuration to provide a rupturing contact and spreading surfaces which are brought into progressive contact with the line of weakness at the extremities of the opening during rotation of the tab.

In the further embodiment of the invention, an opening tab is provided for an easy-open can end in which the tab body includes a lifting end, a rupturing nose, and a support strip defined by a slit in the body. The support strip is positioned along the axis of the tab body and is connected to the tab body at a point adjacent to the tab nose. At least two connecting means are positioned on the support strip for connecting the tab to a can end. The ends of the slit terminate adjacent the forward connecting means to provide a bend line which is positioned rearwardly of the forward connecting means. The connecting means provided in the support strip may conveniently be apertures adapted to receive rivets in the can end. Tear retarding means may be provided at the ends of the slit to retard tearing of the slit at its extremities during usage of the tab.

The support strip through which the tab is connected to the can end may include spring means positioned between the connecting means. As a result of the spring means, a yieldable supporting force is provided between the connecting means during usage of the tab to permit elongation of the support strip during pivoting of the tab about the tab bend line in opening of a can end.

BRIEF DESCRIPTION OF THE DRAWINGS

For purposes of illustration, an embodiment of the invention is depicted in the enclosed drawings in which:

FIG. 1 is a top view of a can end having an opening tab whose nose is positioned in rupturing proximity to a line of weakness in the can end;

FIG. 2 is a partial side sectional view of the can end of FIG. 1 illustrating a tab support strip having a spring loop positioned between foward and rearward connections of the support strip and the can end;

FIG. 2*a* is an enlarged side sectional view of the forward tab connection of FIG. 2 showing a rivet well surrounding the forward connection and a downwardly dished tab portion which extends into and engages the rivet well;

FIG. 3 is a side sectional view of the can end construction of FIG. 1 during opening of the can end by pivoting the opening tab about a tab hinge line positioned rearwardly of the front connection between the support strip and the can end;

FIG. 4 is a top view of an opening tab having a support strip defined by a slit in the tab body with apertures in the support strip for connecting the tab to a can end;

FIG. 5 is a bottom view of the tab shown in FIG. 4, and

FIG. 6 is an end view of the tab nose taken along the lines 6—6 of FIG. 5.

DETAILED DESCRIPTION

With reference to FIG. 1, there is illustrated a can end 2 having a tear portion 4 which is circumscribed by a primary line of weakness 8. A tab 6 is connected to the tear portion 4 through a support strip 16 by a front rivet 12 and a rear rivet 14. A line of bending weakness 10 may be provided in the tear portion 4 to facilitate bending of the tab 6 behind or rearward of the front rivet 12 during usage.

Turning to FIG. 2, a spring loop 18 may be provided in the support strip 16 with the spring loop positioned between the front and rear rivets 12 and 14. The spring loop 18 provides a resilient supporting force between

the rear rivet 14 and front rivet 12 during bending of the tab 6.

An outer stiffening bead 20 about the periphery of the tab 6 provides support for the tab during usage. In usage, an upward force is applied to the tab 6 at its lifting end 56 through a finger opening 22 surrounded by an inner bead 24. As shown, the lower surface of the outer bead 20 may be positioned above the lower surface of the inner bead 24 so that the finger of the user may be more readily inserted in the opening 22.

As shown in FIG. 2, the primary line of weakness 8 is positioned closely to a chuck wall 26 when the can end 2 is connected to a can body in a conventional manner. A tab nose 28 is positioned in rupturing proximity to the primary line of weakness 8 and, with the tab 6 positioned against the can end 2, a gap 30 may be provided between the upper surface of the can end and the nose 28.

FIG. 2a is an enlarged sectional view of the tab 6 and the front rivet 12 as shown in FIG. 2. During formation of the rivet 12, the metal in the ara surrounding the rivet may be reduced in thickness or coined through application of a compressive force to produce a flow of metal into the rivet and a well 31. To provide supportive contact between the tab 6 and the surface of the can end 2 during usage of the tab, the metal of the tab may be downwardly dished at 33 to conform generally to the contour of rivet well 31.

The position of the tab 6 during usage is illustrated in FIG. 3 in which the tab is shown as rotated upwardly through an angle A to rupture the primary line of weakness 8 and to form an opening 35 in the can end. As shown, the can end 2 is connected to a can body 34 through a conventional double seam 36 adjacent to the chuck wall 26. During lifting of the tab 6, the spring loop 18 is extended and deformed to assume the position illustrated as 18'. Also, a metal end portion 32 which underlies support strip 16 undergoes bending about bend line 10 as the tab 6 is rotated upwardly. As metal portion 32 bends, the overlying support strip 16 is also bent about a larger bending radius since the strip 16 is positioned on top of the metal portion 32. The elongation of support strip 16 through extension of spring loop 18 permits the strip to bend about a large radius without imposing an undue stress on the front rivet 12.

As illustrated in FIG. 3, the distance between the tab liting end 56 and the bend line 10, denoted as B, is relatively large as compared with the distance C between the bend line 10 and the tab nose 28. This provides a relatively high mechanical advantage in which upward force exerted at lifting end 56 is multiplied in exerting a downward force by nose 28 in relation to the ratio of the distance B to the distance C.

As illustrated, the front rivet 12 is positioned relatively close to chuck wall 26 to strengthen the portion of the tab between the bend line 10 and nose 28. The strengthening effect of rivet 12 provides a tab which is quite stiff. Due to its increased strength and stiffness, the tab 6 may be used in rupturing a score line having a relatively high residual, i.e., a relatively thick metal web underlying the score. Further, becuase of its increased strength, the tab 6 may be used in rupturing can ends formed of a relatively strong metal such as steel, as well as can ends formed of aluminum.

Since the bend line 10 about which the tab 6 pivots during usage is positioned rearwardly of the front connection or rivet 12, upward rotation of the tab 6 provides a relatively large opening 35 in the can end. As viewed from above, the distance across the opening at the bend line 10 (termed the opening chord) is relatively large. Thus, the direction of the line of weakness 8 at the extremities of the opening 35 more closely approach the axis of the tab 6. When a pulling force is then applied to the tear portion 4 through the tab 6 acting as a strut, the pulling force is more effectively utilized in completing the severance of the tear strip 4 from the can end. During application of a pulling force through the tab 6, the multiple connection of support strip 16 to the tear portion 4 through rivets 12 and 14 provides additional strength in securing the tab 6 to the tear portion.

The position of the bend line 10 rearwardly of the front rivet 12 provides still another advance in the present can end by reducing the degree of bending which must be experienced by the tab 6 during its upward rotation in providing an opening 35 in the can end. Since the bend line 10 is positioned further from the line of weakness 8, the tab 6 generally does not need to be rotated to a vertical position with respect to the can end in producing the opening 35. Thus, for example, the tab 6 may be rotated through an angle A of 45° or 60° in producing opening 35 and may then be used as a strut in transmitting a pulling force to the tear portion 4 in completing the severance of the tear portion. As the angle of the tab rotation A is reduced, the degree of the tab bending about bend line 10 is likewise reduced which results in less bending stress in the tab 6 and a reduction in premature tab separation.

Turning to FIG. 4, there is shown an enlarged top view of a tab of the type used in the present invention and as described in FIGS. 1–3. In a top surface 38 of the tab 6 is formed a bathtub depression 40 having sloping sidewalls 42. A pair of stiffening ribs 44 may be positioned along either side of the tab to provide additional stiffness when the tab is lifted and used as a lever in rupturing a line of weakness in a can end. The tab nose 28 is formed by a pair of cutout portion 46 adjacent the front portion portions the tab.

A slit 48 in the bathtub depression 40 defines the support strip 16. As illustrated, the slit 48 begins at a point adjacent the center line 51 of a front hole 54. The front hole 54 is adapted to receive a front rivet formed in the tear portion of the can end as described previously. The dished down area 33, formed about the hole 54, provides for seating of the tab 6 in the coined area surrounding the front rivet formed in the can end. The slit 48 extends rearwardly and passes about a rearward hole 52 and then extends forwardly to terminate at a point adjacent the center line 51. As illustrated, the beginning and ending points of the slit 48 are transversely spaced with respect to each other, and the portions of the slit 48 which extend forwardly from diverging lines so that the width of the support strip 16 generally increases from its rear to its front. This provides a greater thickness of metal across the portion of the support strip 16, denoted as D, where bending occurs.

The slit 48 may include a pair of reverse curved portions 50 positioned at the beginning and ending points of the slit 48. The reverse curved portions 50 serve as tear retarding means to prevent tearing of the slit 48 at the beginning and ending points of the slit during bending of the tab 6.

FIG. 5 is a bottom view of the tab 6 as shown in FIG. 4, which illustrates the outer bead 20 which provides stiffening around the periphery of the tab and the inner bead 24 which also provides stiffening as well as a smooth curved surface about the finger opening 22. As illustrated, the cutout portions 46 sever the outer bead 20 at a cut surface 58.

The configuration of the tab nose 28 is shown in detail in FIG. 6 which is a side view of the tab taken along the lines 6—6 in FIG. 5. The tab nose 28 is curved downwardly to form a rupturing contact 62 which makes contact with the line of weakness in providing initial rupture of the can end. Upwardly and rearwardly curved expansion surfaces 64 extend from the rupturing contact 62 with the surfaces 64 having a configuration which assists in spreading the opening formed in the can end after initial rupture of the line of weakness. As the tab 6 is rotated with respect to a can end which has a line of weakness therein that includes an arcuate portion, the position of the tab nose 28 is changed with respect to the can end. As tab 6 is being rotated, the primary line of weakness is progressively severed through progressive contact of the curved expansion or spreading surfaces 64 with the extremities of the opening in the can end at the line of weakness. Thus, the tab nose 28 functions to not only rupture the line of weakness in the can end to form an opening, but also to progressively spread and enlarge that opening during rotation of the tab 6 with respect to the can end.

As described, the can end and tab of the present invention provide a construction which is quite strong and resistant to premature tab separation. Further, the invention provides a tab and can end in which bending of the tab during usage occurs behind the front connection of the tab to the can end. On rotation of the tab with respect to the can end, a large opening is, thus, produced in the can end with the result that a subsequent pulling force applied to the can end through the tab is used more effectively in severing the tear portion from the can end. In severing a tear portion from a can end along a line of weakness which includes an arcuate portion, the tab of the present invention provides a nose structure which both produces and enlarges an opening in the can end during rotation of the tab with respect to the can end. In accomplishing this result, the tab nose includes a rupturing contact to produce the initial rupture on the line of weakness and spreading surfaces which progressively contact the extremities of the opening in the can end to progressively enlarge the opening during rotation of the tab with respect to the can end.

I claim:

1. An easy open can end construction comprising:
- a tear portion circumscribed by a primary line of weakness;
- a tab having a body including a nose portion, a lifting end and a support strip;
- said support strip connected to the tear portion by a front connection positioned adjacent the tab nose and a rearward connection positioned between the front connection and the lifting end.
- said front and rearward connections lying on about the centerline of the tab with the nose portion of the tab positioned in rupturing proximity to said line of weakness;
- said support strip defined by a slit in the tab body, with the slit beginning at a point adjacent the front connection, extending rearwardly around the rearward connection and then extending forwardly to end at a point adjacent the front connection with the ending point spaced transversely from the beginning point of the slit and with the beginning and end portions of said slit including tear retarding portions;
- the beginning and ending of said slit positioned with respect to said front connection to define a tab bend line which lies rearward of the front connection when the lifting end of the tab is raised to rupture the line of weakness through contact with the tab nose, and
- said rearward connection providing support for said front connection through said support strip during rupturing of the line of weakness.

2. The can end construction of claim 1, including a spring loop in said support strip positioned intermediate the said front and rearward connections;
- whereby said support strip is permitted to elongate during inward bending of the tab with respect to the can end.

3. The can end construction of claim 1 wherein said support strip is connected to said tear portion by rivets formed in said tear portion which extend through apertures in said tear strip.

4. The can end construction of claim 1, including:
- a chuck wall,
- said line of weakness lying in close proximity to said chuck wall, and
- said front connection positioned in relatively close proximity to said chuck wall.

5. The can end construction of claim 1 including an outer bead on said tab body to provide stiffening of the body when it is rotated upwardly in rupturing the line of weakness.

6. The can end construction of claim 1 wherein the tab nose is upwardly spaced from the tear portion, whereby the nose is rotated downwardly into contact with the line of weakness during lifting of the tab.

7. The can end construction of claim 1 wherein the distance between the lifting end and the bend line is relatively large in comparison with the distance between the bend line and the tab nose to provide a mechanical advantage in increasing the downward force applied by the tab nose with respect to the upward force applied to the lifting end of the tab during opening of the can end.

8. The can end construction of claim 7 including a stiffening peripheral bead on said tab.

9. The can end construction of claim 1 including stiffening ribs positioned on either side of the tab body between the lifting end and the bend line.

10. The can end construction of claim 1 including a line of bending weakness in said tear portion positioned rearwardly of said front connection to facilitate bending of the tear portion during lifting of the tab.

11. The can end construction of claim 1 wherein said primary line of weakness includes an arcuate portion positioned adjacent said tab nose,
- the tab nose having a curved configuration in cross section including a rupturing contact positioned adjacent to the arcuate portion of the primary line of weakness and upwardly and rearwardly curved expansion surfaces, whereby
- said rupturing contact first encounters said line of weakness during lifting of the tab to cause initial

rupture and the curved expansion surfaces are progressively brought into contact with the arcuate portion of the primary line of weakness during lifting of the tab to assist in spreading the opening along the primary line of weakness.

12. An easdy open can end construction comprising:

a tear portion circumscribed by a primary line of weakness,

a tab connected to the tear portion by at least two connections through elongatable connection means which means elongate during lifting of the tab in rupturing the primary line of weakness,

said elongatable connection means including loop means positioned between said two connections, and

said loop means being operative to deform and elongate in response to lifting of said tab whereby said loop generally follows the bending curvature of the end wall beneath said loop.

13. The can end construction of claim **12** wherein said elongatable connection means includes spring means positioned between the connections of the tab to the tear portion to provide a yieldable supporting force between the connections.

14. An easy opening can end construction comprising:

a tear portion circumscribed by a primary line of weakness;

an opening tab having a nose and a lifting end;

said line of weakness including an arcuate portion;

said tab positioned with the tab nose adjacent said arcuate portion, and

said tab nose shaped to provide a downwardly depending rupturing contact with the line of weakness and adjacent curved spreading surface for spreading contact with the arcuate portion of the line of weakness during downward movement of the tab nose with respect to the can end,

whereby the tab nose ruptures the line of weakness to provide an opening and then spreads the opening during lifting of the tab.

15. The can end construction of claim **14** wherein said tab is connected to the can end by yieldable support means,

whereby said support means are permitted to elongate during lifting and rotation of said tab with respect to the can end in opening of the can end.

16. The can end construction of claim **15** wherein

said yieldable support means is connected to said tear portion by at least two connections with said tear portion being bent inwardly at a point intermediate the connections during lifting of the tab in opening of the can end.

17. A tab for use in rupturing and spreading an arcuate line of weakness in a can end comprising:

a tab body including a lifting end and a nose;

said nose having a curved cross-sectional configuration providing a downwardly depending rupturing contact and upwardly and rearwardly curved spreading surfaces,

whereby when the nose is brought into contact with an arcuate line of weakness in a can end, the line of weakness is initially ruptured by the rupturing contact to form an opening and the opening is then spread through progressive contact of the spreading surfaces with the ends of the opening at the arcuate line of weakness.

18. An opening tab for an easy open can end comprising:

a tab body having a lifting end and a rupturing nose;

a support strip defined by a slit in said tab body;

said support strip positioned along the axis of the tab body and connected to said body at the forward end of the strip adjacent to the tab nose;

at least two connecting means positioned on said support strip for connecting the tab to a can end, and

the ends of said slit terminating adjacent the leading connecting means to provide a tab bend line positioned rearwardly of the leading connection means,

whereby the tab pivots about the bend line during usage with the support strip providing support between the leading connecting means and the other connecting means.

19. The tab of claim **18** wherein the said connecting means are apertures in the support strip adapted to receive rivets formed in the can end.

20. The tab of claim **18** including tear retarding means positioned at the ends of said slit to retard tearing of the slit at its ends.

21. The tab of claim **18** wherein said slit includes a reverse curved portion at either of its ends.

22. The tab of claim **19** wherein said slit includes a reverse curved portion at either of its ends with the reverse curved portions extending to as far as the centerline of the aperture forming the leading connecting means.

23. The tab of claim **18** including spring means in the support strip positioned between the said connecting means, whereby a yieldable supporting force is provided between the connecting means while permitting elongation of the support strip during pivoting of said tab about the bend line in the support strip.

24. The tab of claim **18** including a peripheral supporting rib positioned about said tab body to stiffen the body.

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