United States Patent [19]

Henning et al.

[11] **3,762,596**

[45] **Oct. 2, 1973**

[54] **EASY OPENING CAN END**

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[73] Assignee: **Van Dorn Company**, Cleveland, Ohio

[22] Filed: **July 24, 1970**

[21] Appl. No.: **58,077**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 16,451, March 4, 1970, abandoned.

[52] **U.S. Cl.** **220/54**

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

[58] **Field of Search** 220/54, 48, 53, 27; 222/541; 215/46

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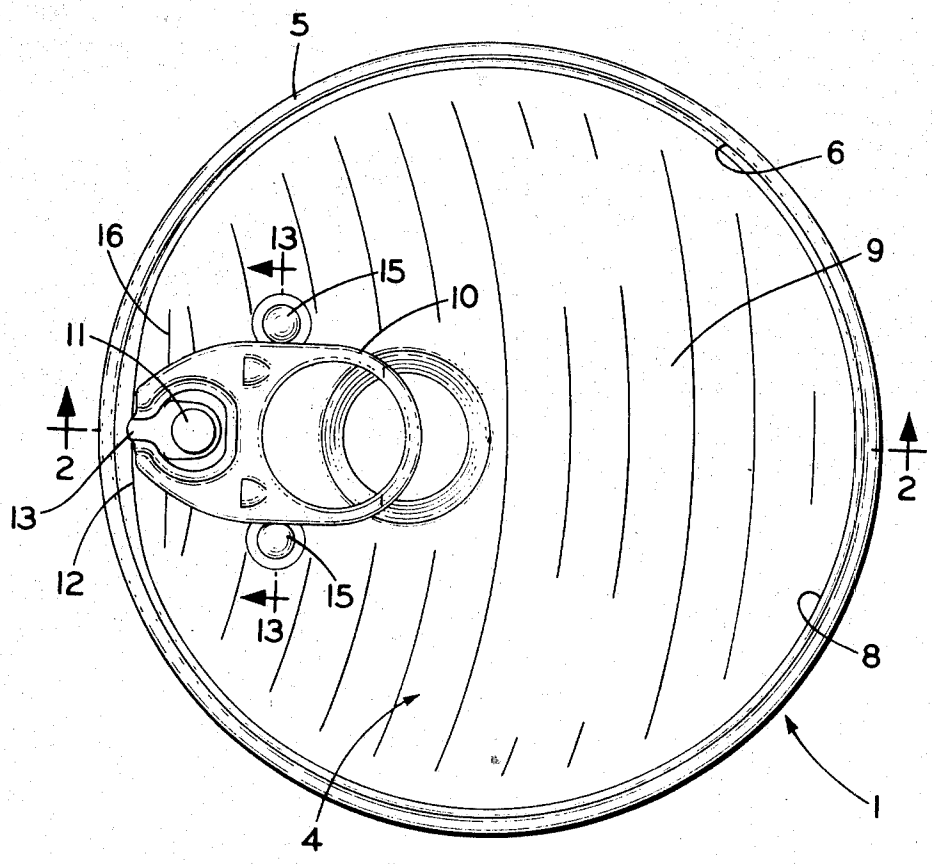
Primary Examiner—George T. Hall

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[57] **ABSTRACT**

An outwardly convex elliptical portion is provided in an area where initial rupture is to occur in the generally circular end-panel-defining score line located in the can end wall immediately adjacent the can side wall of an easy open metal can. Projections are formed in the end wall to locate and hold the can ring pull tab which is riveted to the end wall in predetermined position with respect to the elliptical score line portion with the rounded tab nose overlapping and its axis extending radially of the end-panel-defining score line. A straight secondary score line shallower than the end-panel-defining score line and perpendicular to the axis of the ring pull tab is formed in the can end wall between the pull tab riveted connection with the end wall and the elliptical score line portion.

5 Claims, 13 Drawing Figures



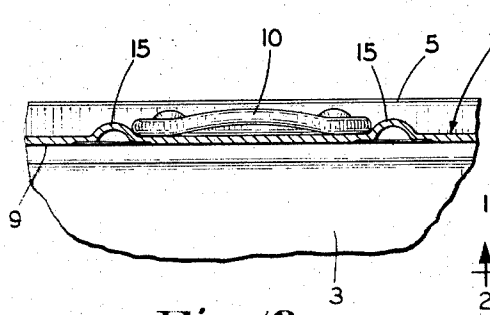


Fig. 13

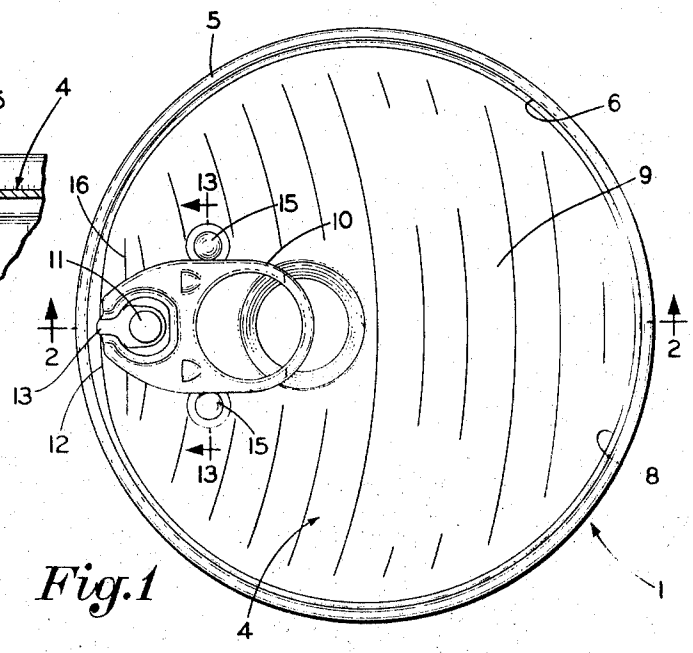


Fig. 1

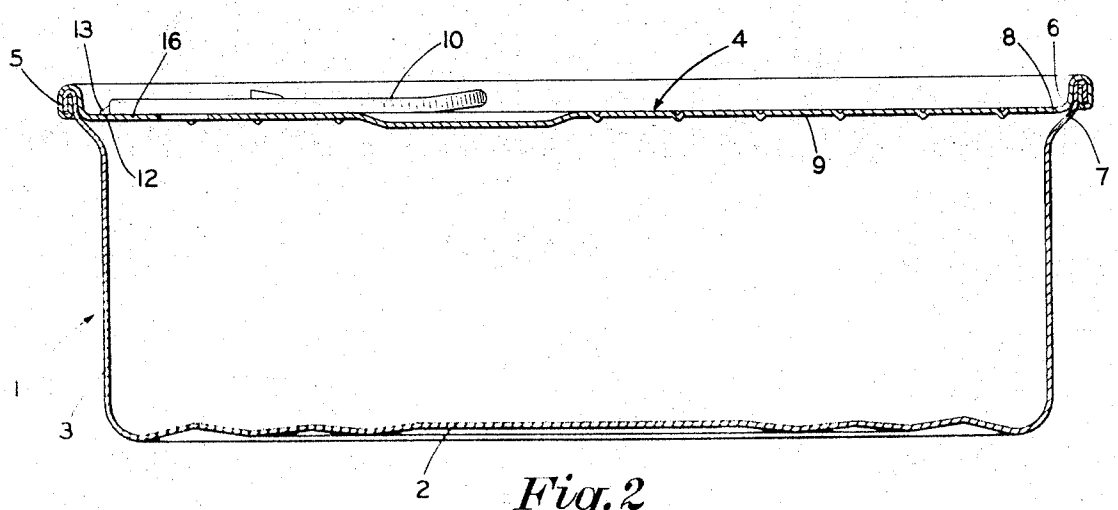


Fig. 2

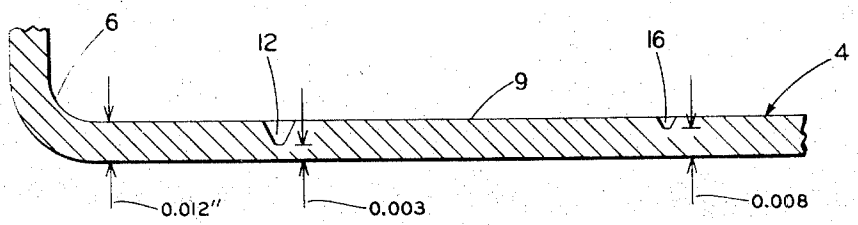


Fig. 12

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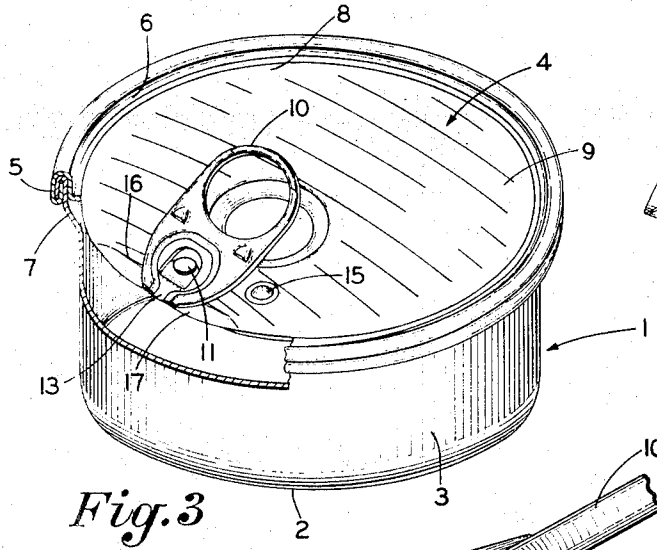


Fig. 3

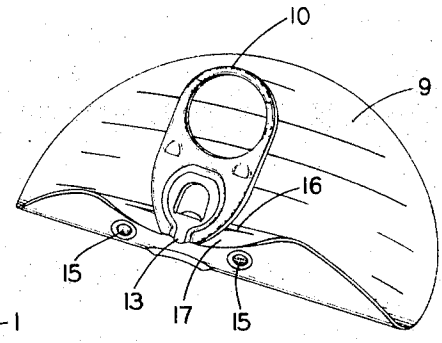


Fig. 6

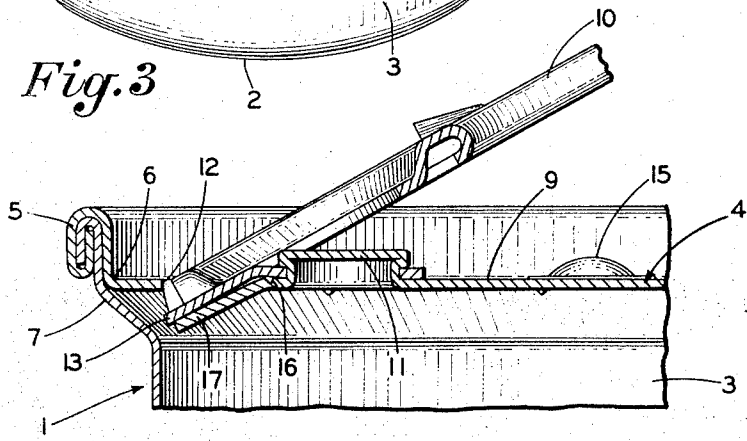


Fig. 4

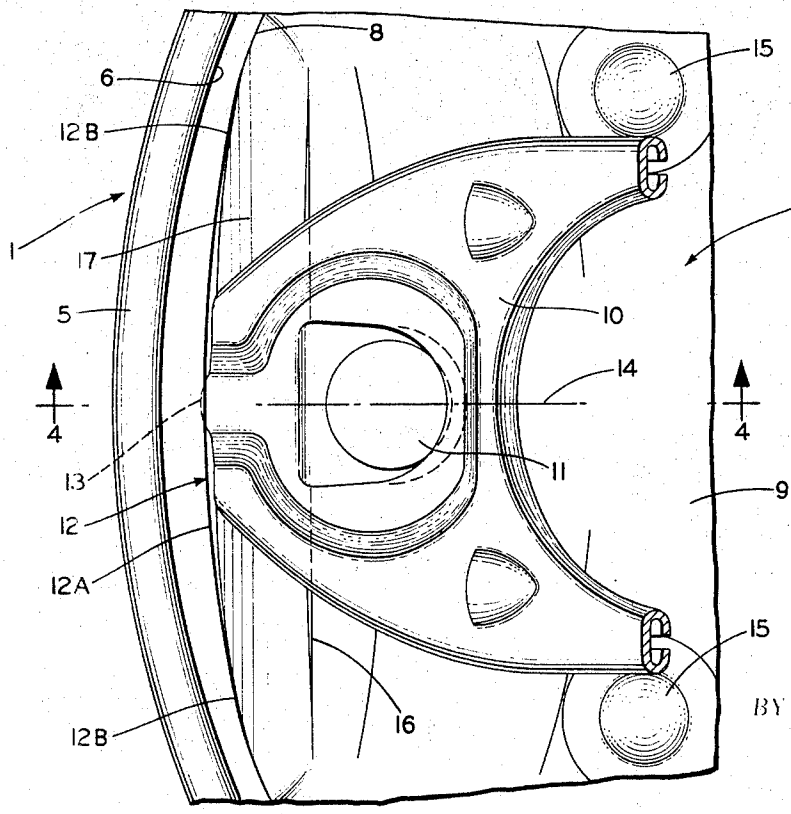


Fig. 5

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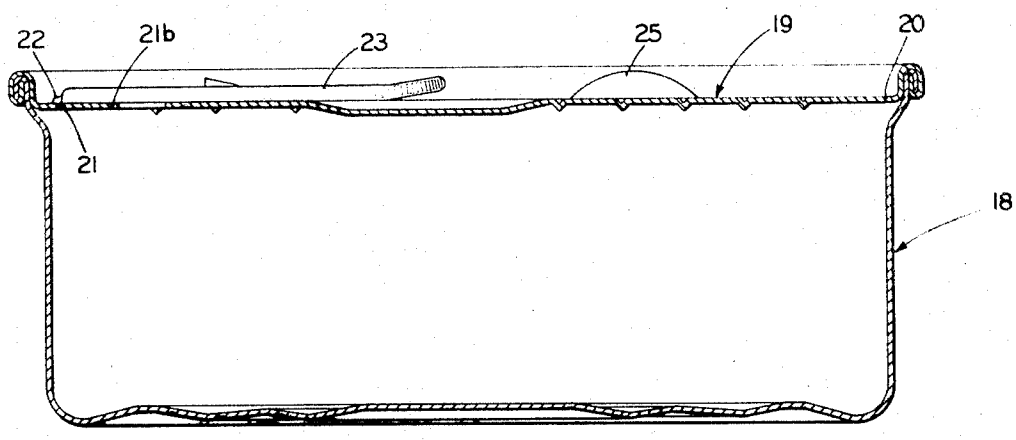


Fig. 8

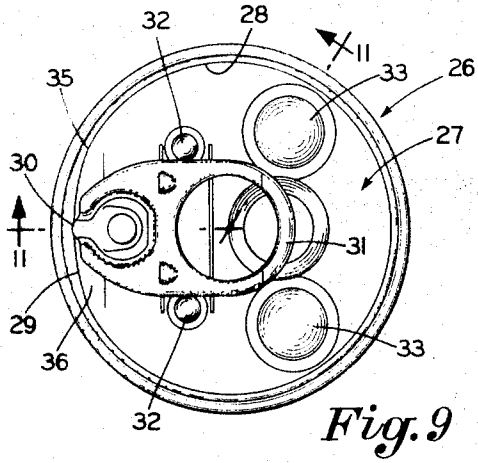


Fig. 9

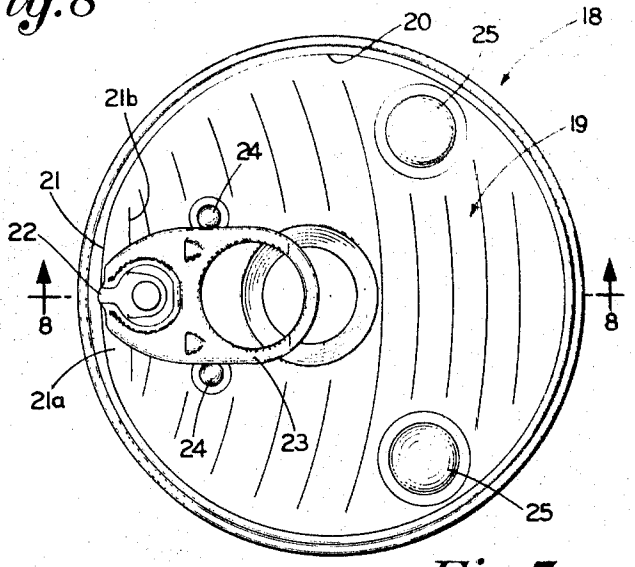


Fig. 7

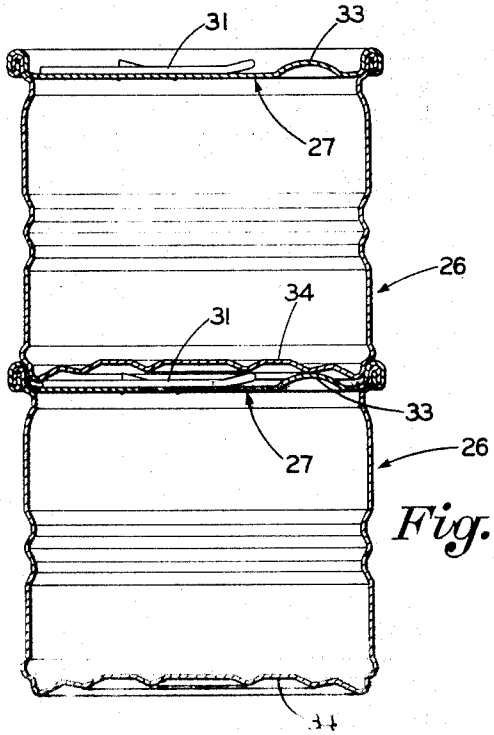
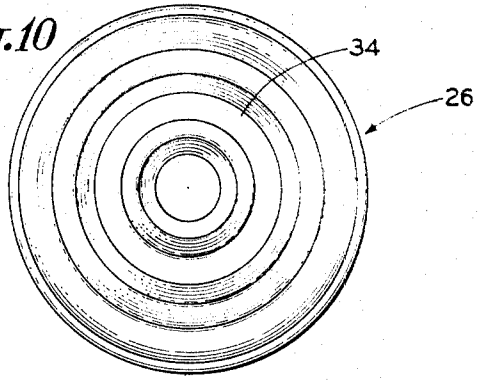


Fig. 11

Fig. 10



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EASY OPENING CAN END

Related Patent and Application

The structures and concepts of the invention are improvements on the structures set forth in U.S. Pat. No. 3,490,643 of Jan. 20, 1970, and this application is a continuation-in-part of our copending application, Ser. No. 16,451, filed Mar. 4, 1970, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to easy open metal cans in which a ring pull tab is riveted to a can end wall seamed to the open end of can side walls wherein pulling of the pull tab removes an end panel from the can providing a full opening permitting complete access to and removal of the can contents. More particularly the can end wall, score lines, ring pull tab, and end wall formations are so arranged, located, and coordinated that the end wall may be properly connected to the can side walls with a usual double seam while permitting full opening of the can upon end panel removal; that assures proper initial rupture of a predetermined portion of the score line and proper distortion of a predetermined area of the end panel upon movement of the ring pull tab; and that insures bending of a small flap-like portion of the end panel on a straight line upon initial rupture of the can end wall for opening the can.

2. Description of the Prior Art

The construction and arrangement of the can end wall, score lines, ring pull tab, and the rounded nose of the ring pull tab in the easy open can shown in U.S. Pat. No. 3,490,643 provides very advantageous characteristics for the can facilitating easy opening of the can, and enabling complete access to the can contents while protecting the raw metal edge of the can end metal where the end panel is torn from the end wall from accidentally cutting the user.

This feature results from the location of the end-panel-defining score line very close to the recessed corner of the end wall just below the zone of the double seam connecting the end wall to the can side walls. The proper initial rupture of the end panel along the score line depends upon the location of the rounded nose of the ring pull tab overlapping and extending slightly outward beyond the score line. Thus, the location of the score line and extended pull tab nose leaves little room for the chuck of the seaming tool to engage and hold the recessed corner of the can end wall during the seaming operation. Difficulties with chuck wear and breakage and with faulty seams thus have arisen because of the closeness of the tab nose to the recessed corner of the can end wall.

Proper and easy opening of the cans shown in U.S. Pat. No. 3,490,643 also depends upon the accurate positioning of the ring pull tab with its nose and rivet connection aligned radially of the can and score line. The rivet-like connection of the ring pull tab with the can end wall has been found to permit the tab to be turned or rotated accidentally or intentionally out of proper exact position. An improperly located or positioned pull tab normally will prevent easy and correct tearing out of the can end panel.

Also the rate of curvature of the tear-out score line is such that a considerable zone of the score line is involved in the initial rupture, and as a consequence a considerable area of the end panel also is involved in the initial distortion and bending of the end panel as it is ruptured and peeled from the can. These factors and particularly when accompanied by improperly located ring pull tabs have caused difficulties in opening the cans.

SUMMARY OF THE INVENTION

Objectives of the invention include providing a predetermined outwardly convex elliptical score line portion at the zone of initial rupture connecting in curved fashion with the remaining score recessed zone located close to the recesses corner of the can end wall seamed to the can, so that the elliptical score line portion is spaced further from the recessed end wall corner than the remainder of the normally circular end-panel-defining score line and so that the elliptical score line portion determines the zone of initial rupture and directs the rupture along a smoothly curved line without resistance; providing means for locating in exact predetermined position and for holding in such position the ring pull tab as it is being connected or riveted to and after being connected to the can end wall so that the pull tab axis extends radially of the end-panel-defining score line or radially of that curved elliptical portion which the axis intersects; providing a secondary straight score line in the can end wall perpendicular to the axis of the pull tab and of lesser depth than that of the elliptical score line portion, and located spaced from and between the tab rivet connection with the can end wall and the elliptical score line portion; and providing for elimination of difficulties heretofore encountered, and achieving the stated objectives simply, effectively, and inexpensively.

These objectives and advantages are obtained by the easy opening metal can and can end construction, the general nature of which may be stated as including a metal can end wall adapted to be secured to the side walls of a metal can by a usual double seam, the end wall having a recessed end panel extending from a recessed corner, the corner being located below the seam; an end-panel-defining continuous score line formed in the end wall very close to the recessed corner, a predetermined portion of the score line being outwardly convexly elliptically shaped and being connected with the remainder of the end-panel-defining score line by smoothly curved portions defining the zone of initial rupture of the score line, and the score line including the elliptical portion providing a tear line on which the end panel may be torn from the end wall member; metal pull tab means, rivet means securing the pull tab means to the end panel, the pull tab means having a projecting rounded nose, and the axis of the pull tab means passing through the center of the rivet means and the center of the rounded nose extending radially of the end-panel-defining score line and radially of that elliptically curved portion which the pull tab axis intersects; projection means engageable between the pull tab means and end panel holding the pull tab means located in the position with its axis extending radially of the end-panel-defining score line; a secondary straight score line in the can end wall perpendicular to the axis of the pull tab and of lesser depth than the elliptical score line portion; said secondary straight score line being located between and spaced from the rivet means and the rounded pull tab nose; and the rounded nose of the pull tab means being located in a position overlapping and extending slightly outward beyond the elliptical score line portion.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention — illustrative of the best modes in which applicants have contemplated applying the principles — are set forth in the following description and shown in the drawings and are particularly and distinctly pointed out and set forth in the appended claims:

FIG. 1 of the drawings is a top plan view of a can provided with the new can end wall structure;

FIG. 2 is a vertical section on a larger scale taken on the line 2—2, FIG. 1 showing the new structure;

FIG. 3 is a perspective view of the can shown in FIGS. 1 and 2, with parts broken away, showing the initial stage of manipulating the pull tab for end panel removal,

FIG. 4 is a fragmentary sectional view on line 4—4, FIG. 5, on a further enlarged scale showing the pull tab in the position shown in FIG. 3;

FIG. 5 is a fragmentary plan view of the parts in the position of FIGS. 3 and 4;

FIG. 6 is a perspective view similar to FIG. 3 showing the removed end panel and pull tab illustrated in FIGS. 1 to 5;

FIG. 7 is a view similar to FIG. 1 of a smaller sized can provided with the new can end wall structure;

FIG. 8 is a sectional view similar to FIG. 2 of the can shown in FIG. 7, taken on the line 8—8, FIG. 7;

FIG. 9 is a view similar to FIGS. 1 and 7 of a still smaller sized can provided with the new can end wall structure;

FIG. 10 is a bottom plan view of the can illustrated in FIG. 9;

FIG. 11 is a vertical section looking in the direction of the arrows 11—11, FIG. 9 illustrating two of the cans shown in FIG. 9 stacked one on top of the other;

FIG. 12 is an enlarged fragmentary section illustrating the relative depths of the predetermined and secondary score lines; and

FIG. 13 is a fragmentary section taken on the line 13—13, FIG. 1.

Similar numerals refer to similar parts throughout the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment

The invention is illustrated typically in FIGS. 1 through 6 and 12 and 13 as applied to a large sized can, an intermediate sized can being illustrated in FIGS. 7 and 8, and a small sized can in FIGS. 9 through 11.

A can 1, generally of conventional construction, has a cup-shaped body with a bottom wall 2 and side walls 3, and a can end wall 4 is connected by a usual double seam 5 to the upper or open end of side walls 3. End wall 4 has a recessed corner 6 at the lower end of double seam 5 seated on a ledge 7 formed adjacent the upper end of side walls 3, and a curved score line 8 is formed in the end wall 4 very close to the recessed corner 6. The score line 8 defines an end panel 9 which is completely removable from the remainder of the end wall 4 when torn or peeled along score line 8 to provide a fully open top for the can 1.

A ring pull tab 10 preferably is connected by a rivet formation 11 with the end panel 9 which may be made in any conventional manner or may be accomplished as set forth in Henning et al. U.S. Pat. No. 3,346,948. Ring pull tab 10 preferably is formed of sheet metal of somewhat heavier gauge than the sheet metal from which can 1 and end wall 4 are formed. Members 1, 4 and 10, preferably, but not necessarily, may be formed of aluminum. End wall 4 and ring pull tab 10 as thus far generally described may be made as shown in Henning et al. U.S. Pat. No. 3,490,643.

In accordance with the invention, a predetermined portion 12 of the score line 8 which forms the zone of initial rupture is formed to have an outwardly convex elliptical shape, as shown, and connects with the remainder of the score line 8 by smoothly curved portions. Pull tab 10 has a rounded nose 13 located in a position, as shown, slightly overlapping and extending slightly outward beyond the elliptical score line portion 12. The axis 14 of pull tab 10, which passes through the center of rivet 11 and the center of rounded nose 13 is radial with respect to the score line 8 and radial to that curved elliptical portion which axis 14 intersects. A pair of buttons or projections 15 are formed projecting upward of the end panel 9 on either side of the pull tab 10 and its axis 14. Buttons 15 engage straight side edge portions OF the pull tab 10 outside the ring portion, as shown in FIGS. 1, 5, 7 and 9 and hold pull tab 10 in the described radial position and prevent pull tab 10 from accidentally turning on rivet 11. In this manner the pull tab is held in proper position with respect to the elliptical score line portion 12 so that the initial rupture of the score line 8 can be accomplished properly and easily. Also, the buttons 15 function to center and locate pull tab 10 as it is being riveted at 11 to the end wall 4.

A secondary straight score line 16 is formed in end panel 9 perpendicular to pull tab axis 14, and extends between and is spaced from the rounded nose 13 and rivet 11. Score line portion 12 and score line 8 have a greater depth (FIG. 12) than secondary score line 16. For example, where the end wall 4 is 0.012 inch sheet metal, score line portion 12 and score line 8 may leave a residual metal thickness of 0.003 inch and secondary score line 16 may leave a residual metal thickness of 0.008 inch.

The opening of can 1 is shown in FIGS. 1, 3, 4, 5, and 6. FIG. 1 shows the parts in normal position with the can closed or sealed. Pull tab 10 is grasped and pulled upward initially to the position shown in FIGS. 3, 4, and 5. The tab nose 13 wipes across straight score line portion 12 where the initial rupture occurs. The metal bends readily on secondary score line 16 and a flap-like portion 17 is distorted downward as shown in FIG. 4. This rupture occurs readily, the down-tear occurring easily and smoothly along curved portion 12 outward from either side of rounded nose 13. The secondary score line 16 permits ready bending along score line 16 and thus permits flexing of the flap-like portion 17 as the metal is torn along score line portion 12.

After the initial rupture along line 12 and distortion of flap-like portion 17, the metal in end wall 4 tears along score line 8 from either end of portion 12 circumferentially in both directions quite easily as the tab is continued to be pulled upward until end panel 9 is completely severed when it has the shape shown in FIG 6.

It has been discovered that where any corner-like portions occur in the complete score line which defines the end panel removed, some resistance to tearing occurs at such corners. Further, any such score line corner-like portions may contribute to possible score line

breakage from bumping in handling and shipment of a filled can.

The particular elliptical shape of the score line portion **12** eliminates these problems. That elliptical portion **12A** overlapped by the rounded pull ring nose **13** has a greater radius of curvature and thus is flatter than the radius of curvature of the main end panel defining score line **8.** More sharply curved elliptical portions **12B** smoothly connect the flatter elliptical portion **12A** with the main score line **8,** as indicated in FIG. **5.**

Thus, the elliptical shape of the score line portion **12** at the area of initial rupture provides most efficient and smooth continuous breaking along the score line portions from the pressure and pull of the pull ring **10.** At the same time the bending of the flap-like portion **17** along secondary score line **16** eliminates pressure on the rivet **11** as the pull ring **10** is manipulated.

Second Embodiment

A medium or intermediate sized can **18** and can end wall **19** are shown in FIGS. **7** and **8** which are very similar to the can **1** and can end wall **4** of FIGS. **1** and **2.** Can end **19** has a score line **20** with an elliptical score portion **21** which is ruptured by rounded nose **22** of pull tab **23** when end wall flap-like portion **21a** bends on secondary straight score line **21***b*. Tab **23** is held in proper position by buttons **24.** End wall **19** has two rounded upwardly projected bosses or knobs **25** preferably located triangularly with respect to pull tab **23** so as to form a three point support for cans **18** when in a stack one above another. The can **18** of FIGS. **7** and **8** contains all the new features, and operates the same way and obtains the same results as the can **1** of FIGS. **1** and **2.** FIG. **7** shows clearly the differing curvatures of the elliptical portion **21** and main score line **20** because of the smaller size and sharper curvatures in can **18** as compared to can **1.**

Third Embodiment

A small sized can **26** and can end wall **27** are shown in FIGS. **9, 10,** and **11,** similar to the can **1** and can end wall **4** of FIGS. **1** and **2;** and also similar to the can **18** and can end **19** of FIGS. **7** AND **8.**

Can end **27** has a score line **28** with an elliptical score line portion **29** which is ruptured by rounded nose **30** of pull tab **31.** Tab **31** is held in proper position by buttons **32.** Knobs or bosses **33** permit stacking of the cans **26** as shown in FIG. **11,** the tabs **31** avoiding interference when stacked because of the special bottom formation **34** illustrated in FIGS. **10** and **11.**

Can end **27** also has a secondary score line **35** to facilitate bending of the initially distorted portion **36** of the end panel as it is torn from end wall **27.**

The improved construction combines a number of important improved features and advantages over the construction of U.S. Pat. No. 3,490,643 resulting from the shape and location of an elliptical score line portion for the zone of initial rupture, from maintaining the pull tab radially located and from the provision of the secondary straight score line to facilitate initial rupture bending of the removed end panel; and provides structures which eliminate difficulties encountered with prior devices; and provides structures which achieve the objectives and solve problems existing in the art in a simple manner.

In the foregoing description, certain terms have been used for brevity, clearness, and understanding; but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art because such terms are used for descriptive purposes and are intended to be broadly construed.

Moreover, the description and illustration of the invention is by way of example, and the scope of the invention is not limited to the exact details shown or described since the features of the invention may be applied to end walls for different sized cans.

Having now described the features, discoveries and principles of the invention, the manner in which the improved structures are made, assembled and used, the characteristics of the new construction, and the advantageous, new and useful results obtained; the new and useful structures, devices, elements, arrangements, parts, combinations, and subcombinations, and the cooperative relationship therebetween, and mechanical equivalents obvious to those skilled in the art are set forth in the appended claims.

We claim:

1. In metal end wall construction for an easy open can of a type in which a continuous generally circular marginal score line located close to the recessed corner of a recessed can end wall seamed to can side walls defines a removable end panel, and in which ring pull tab means having a ring portion, side edge portions and a nose is secured by rivet means to the end panel; the combination of an elliptically shaped score line portion, in the can circular end-panel-defining score line, defining the zone of initial rupture of the score line; the axis of the pull tab means which passes through the rivet means and nose being radial of that curved elliptical portion of the score line which the axis intersects, and being radial of the end-panel-defining score line; means independent of the rivet means which secures the pull tab means to the end panel, and engageable with side edge portions of the pull tab means outside the ring portion of the pull tab means, holding the pull tab axis in said radial position; the pull tab nose being rounded, and the rounded portion of the nose extending radially along said pull tab axis to a position outwardly overlapping the elliptical score line portion; a secondary straight score line formed in the end panel perpendicular to said pull tab axis; and said secondary score line being spaced from each of and extending between the pull tab rivet means and the elliptical score line portion.

2. The construction defined in claim **1** in which the elliptical portion has a flatter curvature than that of the generally circular marginal score line, and in which the elliptical portion is connected by more sharply curved portions to the circular marginal score line.

3. The construction defined in claim **1** in which the pull tab means has straight side edges, and in which the engageable means includes buttons projecting from the end panel engaging the pull tab straight side edges and holding the pull tab means in said radial position against movement on the rivet means which secures the pull tab means to the end panel.

4. The construction defined in claim **1** in which the elliptical score line portion has a greater depth than that of the secondary score line.

5. Easy open metal can construction including a metal can having a bottom wall and side walls forming an open upper end, an end wall, a double seam between the end wall and open upper end of the side walls, the end wall having a recessed corner below the seam and a recessed end panel extending from the recessed corner; an end-panel-defining continuous score line

formed in the recessed end wall corner immediately adjacent the open upper end of the side walls and double seam; an outwardly convex elliptically shaped score line portion connected with the remainder of the score line defining the zone of the initial rupture of the score line and located further from the can side wall and double seam than the remainder of the score line; metal pull tab means, rivet means securing the pull tab means to the end panel, the pull tab means having a rounded nose, the axis of the pull tab means which passes through the rivet means and nose being radial of that elliptical score line portion intersected by the axis, and radial of the remainder of the end-panel-defining score line; the pull tab means having a ring portion and side edges outside the ring portion, means interengageable between the pull tab side edges and end panel holding the pull tab means axis in said radial position; the rounded nose overlapping and extending slightly outward beyond the elliptical score line portion; and a secondary straight score line formed in the end panel perpendicular to said pull tab axis, the elliptical score line portion having greater depth than that of the secondary score line, the secondary score line being spaced from and located between the pull tab rivet means and the elliptical score line portion, and the secondary score line and elliptical score line portion defining a flap-like portion which bends on the secondary score line when the elliptical score line portion is initially ruptured.

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