June 7, 1966 L. G. DUNN 3,254,790

EASY OPEN TEAR STRIP CAN ENDS

Filed July 24, 1963

Fig. 1.

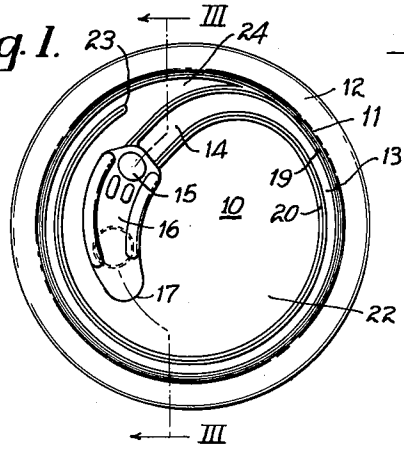


Fig. 2.

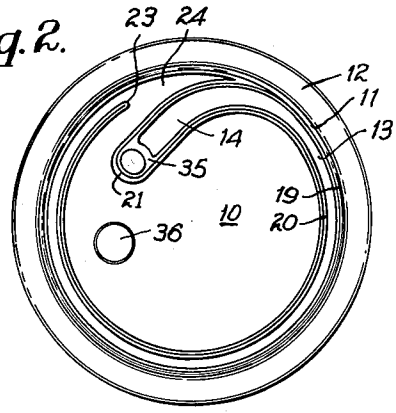
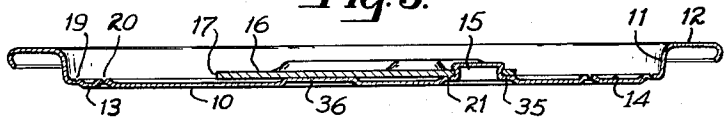


Fig. 3.



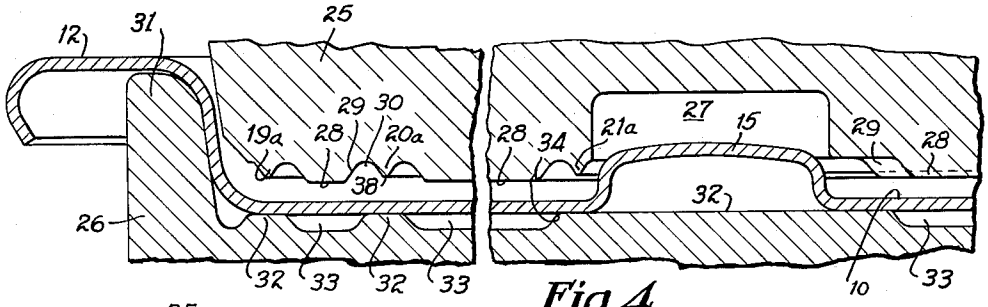


Fig. 4.

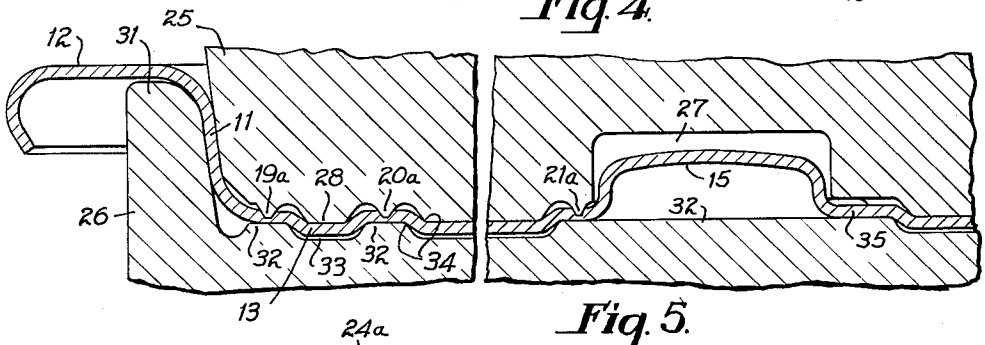


Fig. 5.

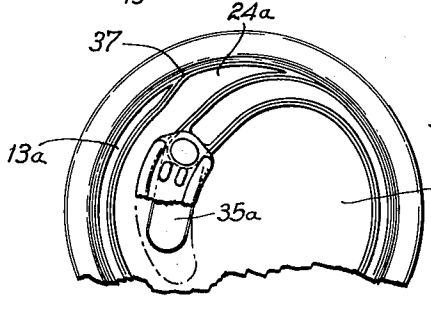


Fig. 6.

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EASY OPEN TEAR STRIP CAN ENDS

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This invention relates generally to sheet metal covers or ends for containers or cans, and more particularly to those having opening means in the form of an annular tear strip defined by a double score pattern and an attached pull tab to provide convenient and easy can opening by hand pulling without the need to use a separate tool or a can opener of any kind.

An object of the invention is to provide a simple and effective method of scoring the covers by metal displacement, as distinguished from cutting or shearing, and materially reducing buckling or wrinkling of the scored ends by the metal displaced during the scoring operation.

Another object of the invention is the production of covers of the kind above described which may be rapidly and cheaply manufactured from thin gauge sheet metal, particularly aluminum, solely by press operations and characterized by embossed scoring outlining the tear strip in the disc or panel area thereof and being substantially free from an undesired and unsightly buckled or wrinkled appearance.

Still another object is the provision of such embossed scored covers which are further characterized by the tear strip being completely removable and having a trailing end formation which affords either complete removal of the center panel which the tear strip encircles, or leaves the center panel connected to the can or container by a continuation of the outer score line so that the center panel may be hinged back out of the way or may be torn free along the outer score continuation.

The invention in respects of the foregoing and other features and advantages will be better understood from a consideration of the detailed description which follows, taken in conjunction with the accompanying drawing wherein:

FIG. 1 is a top plan view of a completed container end or cover made in accordance with my invention;

FIG. 2 is a top plan view of the cover before the pull tab has been affixed to the starting end of the tear strip in order better to show the raised tab supporting pad area at this end of the tear strip;

FIG. 3 is a cross-sectional view on an enlarged scale taken on the line III—III of FIG. 1;

FIG. 4 is a fragmentary cross-sectional view on a greatly enlarged scale showing a preformed cover in position in a scoring die set preliminary to the scoring operation to form the integral annular tear strip in the panel of the can end;

FIG. 5 is a view similar to FIG. 4, but showing the die set in closed position at completion of the scoring operation; and

FIG. 6 is a top plan view of a completed container cover similar to that of FIG. 1, with a part of the pull tab broken away, but showing a modified construction at the starting and trailing ends of the tear strip.

Referring to FIGS. 1, 2 and 3, there is shown a usual depressed panel form of end or cover for round containers or cans, the cover having a flat disc or panel 10, upstanding annular wall 11 and an edge curled attaching and sealing rim 12 adapted to receive sealing material on its underside and to be secured by double-seaming or any other convenient means to one end of a container body. Such covers may be die formed to shape in the customary well-known manner and constitute preformed covers for

the provision of easy opening means in the flat panels thereof.

The opening means comprises a narrow rip or tear strip 13 which extends annularly or peripherally around the cover adjacent to the wall 11 thereof and has a spirally inturned starting end or tongue 14, all outlined in the surface of the panel 10 by scoring which is die stamped or impressed part way through the thickness of the panel and generally to a depth substantially equal to a major portion of its thickness. Preformed in the panel by suitable draw forming is an upstanding hollow integral rivet 15 at the inner end of the tongue 14. By means of the rivet, a sheet metal pull tab 16, suitably ribbed as shown for augmented stiffness for effective lever action, is tightly staked or clamped to the inner end of the tongue as an extension thereof. The tab serves as a lever to snap open the inner end portion of the tongue which it overlies when lifting force is applied to the free end 17 of the tab. The spirally inturned end of the tear strip is advantageous in that it affords a smooth and gradual transition into the peripheral or circular portion of the tear strip and reduces the danger of transverse strip rupture occurring at this point during tearing of the strip from the cover in a can opening operation, particularly in connection with a small standard can size, such as a number 202 can for example.

Lengthwise, the tear strip is defined by double or spaced apart score lines 19 and 20 which widen out with respect to each other along the tongue 14 and are joined or closed upon themselves at 21 around the rivet base in close proximity thereto, as best seen in FIG. 2, to facilitate initial rupture of the tear strip from the cover. The outer score line 19 is a continuous ring or circle around the cover, so that the tear strip and the central panel area 22 encircled thereby may be easily torn from the cover. The inner score line 20 is terminated at point 23 spaced a short distance away from tongue 14 so that an intervening neck portion 24 of unaltered metal interconnects the central panel area 22 and the tear strip at its trailing end. In consequence, during a can opening operation, the tearing force transfers to the outer score line 19 when the point 23 is reached and tearing continues along the remainder of line 19 to effect removal from the cover of all the area encircled by the outer score line for unobstructed access to the container contents.

All of the operations to provide the preformed covers with the opening means described may be performed at successive stations of any suitable rigid press, it only being necessary to form the integral rivet in the covers before scoring them so as to avoid score line rupture at the rivet which might occur if scoring preceded rivet forming. Use of the integral rivet attachment for permanently securing the pull tab to the tear strip is particularly advantageous in the case of aluminum ends since completing the rivet connection, or rivet heading, is a simple press operation. Thereby, the important advantages are realized of providing satisfactory joint strength and rapid reproducibility by means of commercially acceptable tools and production practices and avoidance of welding difficulties which reduce production rates and frequently cause excessive product loss from defective or inadequate welds, and which are inherent in the use of various well-known welding techniques for joining tabs and tear strips of aluminum to each other.

For scoring the covers, a stamping or scoring die set as shown in FIGS. 4 and 5 is used and it is designed to produce embossed scoring in the covers. The set comprises upper die 25 and lower anvil die 26. Upper die 25 has a scoring rib formation duplicating in contour the tear strip contour or configuration projecting down from its lower face and a recess 27 to accommodate the rivet 15. The portions of the rib formation which produce the score lines heretofore identified by reference numerals in

FIGS. 1 and 2 are identified in FIGS. 4 and 5 by the corresponding reference numerals with an "*a*" added thereto. Thus, **19***a* and **20***a* indicate the rib portions which form the lengthwise scoring defining the sides of the tear strip and **21***a* indicates that portion which produces the closing score around the base of the rivet. For extended die life, the scoring rib is of truncated V-shape with a flat lower or working face **38**, of between about 0.002 and 0.003 inch width, known as "stroke" in the art, to effect displacement scoring, as distinguished from cut or shear scoring produced by knife edge score dies. Scoring part way through the thickness of the metal, leaving a uniform residual about 0.003 inch thick is desired in such thin gauge aluminum covers nominally of about 0.008 inch thick. However, the metal displaced at scoring puts the surrounding metal in a condition of compressive stress which results in giving the scored panel a buckled or wrinkled condition and appearance, instead of retaining its original flatness. This is objectionable to some users. The embossed scoring according to this invention practically eliminates this difficulty.

As seen in FIG. 4, top died **25** is provided with pad areas **28** having co-planar flat bottom faces and sloping sides **29** configured to the outline shape of the tear strip **13** and the central panel area **22**, as produced in a scored cover. Pad areas **28** are in downwardly projecting relation to the scoring rib formation, a projection of about 0.003 inch being sufficient, and their sides are spaced from the sides of the rib formation by the separating spaces **30** which provide top clearance for the panel metal thereunder. The pad areas serve as pushers to downwardly deflect the sheet metal during the scoring operation.

The lower die **26** is formed with a central recess defined by an upstanding annular shoulder **31** whose inner wall is complementary to the wall **11** of a cover to accurately centralize the cover in scoring position in the die set. The top die **25** is freely movable inside wall **11** without distorting it. The bottom wall of the recess in the lower die **26** affords continuous anvil support to the cover panel **10** seated thereon. The support is afforded by the co-planar flat top faces of boss areas **32** directly opposite the rib formation and rivet recess of the top die. Such boss areas are defined in die **26** by the formation of downwardly extending depression areas **33** directly opposite the pad areas **28** of the top die and deep enough to provide bottom clearance with respect to the cover metal deflected thereinto by the pad areas **28**. In addition, the facing corner edges **34** of the pad areas **28** and the boss areas **32** are rounded and in laterally offset relation to each other to an extent in excess of the cover metal thickness to avoid cutting of and to provide lateral clearance for the deflected cover metal.

It will be seen that, in the scoring operation, the pusher pad areas **28** of the top die in cooperation with the boss areas **32** of the bottom die will cause the unsupported areas of the panel **10** to be pushed or depressed downwardly from the initial plane of the panel into the depression areas **33** by an amount equal to the projection of pad areas **28** from the score rib formation on the top die, thereby placing the sheet metal of the panel under an initial degree of stretch or tension before the scoring rib begins to penetrate the sheet metal. Then, as the scoring rib penetrates the sheet metal to form the flat bottom scoring therein, the metal displaced or extruded laterally by the scoring rib is absorbed in the surrounding metal without putting it in a condition of compressive stress, it being seen that depression of the sheet metal continues concurrently with the scoring rib penetration so as to maintain the metal around the score area under tension until the fully closed position of the dies shown in FIG. 5 is reached. In this manner, the build-up of a condition of compressive stress which would result in buckling or wrinkling of the scored panel is eliminated. Accordingly, the panel metal retains its original flatness with the exception of the embossment or bead formation along the sides

of the tear strip and the raised terminal pad area **35** (FIG. 2) for the pull tab at the starting end of the tear strip, in the free or unconfined top and sloping sides of which the laterally displaced metal is absorbed and panel wrinkling is substantially eliminated.

For minimal embossment height in the scored covers, the total downward deflection of the sheet metal produced by die closing movement preferably is limited or made equal to the sheet metal thickness. Because the supported areas and the deflected or depressed areas of the scored panel are left free from vertical confinement at termination of rib penetration, due to the respective top and bottom clearance provided therefor, the score rib displaced metal is properly absorbed and uniformity of residual thickness along the scoring is assured regardless of variation in gauge thickness of the sheet metal of the cover. Since the embossment is by downward displacement of the unsupported areas of the panel **10**, the subsequently affixed pull tab is located at the initial plane of the panel so that its vertical height is accommodated below the level of the rim **12** without interference with stable can stacking or becoming accidentially operated, even though the panel may become upwardly bulged by internal pressure in a sealed can. In addition, the customary head space in the sealed can is practically unaffected .

As shown in FIG. 2, a raised pad **36**, spaced from the pad area **35** may be formed on the cover by the dies for supporting the pull tab **16** near its free end so that the tab may be held in a level position, or perpendicular to the rivet, for the staking operation. In the cover shown in FIG. 6, the level support for the pull tab may be provided by an elongated pad **35***a* extending from the rivet in the direction of the pull tab. While the additional supporting pad for the pull tab, in either form mentioned, may be dispensed with, its provision is of assistance in gathering the sheet metal and reducing panel wrinkling.

In the cover of FIG. 6, the terminal or trailing end of the tear strip is closed off by continuation of its inner score line laterally across the strip width and joining the outer score ring at **37**. Thereby, the tear strip **13***a* pulls completely free from the cover, leaving the skeleton central panel portion **22***a* attached by its neck portion **24***a* to the rim along the remaining length of the outer score ring. Where the neck portion connects the central panel area to the trailing end of the tear strip, as in FIG. 1, the transfer of tear force to the outer score ring and continued tearing therealong cause the skeleton panel to dip downwardly and sometimes enter the container. The strip pull-off feature of FIG. 6 eliminates this and permits the skeleton panel either to be hinged back out of the way or to be torn free along the outer score continuation, as desired.

In the aluminum covers constructed in accordance with my invention, as above described in detail, the unsightly and undesired wrinkled appearance which has been heretofore present in like covers is practically eliminated and the highly desired wrinkle free improved appearance is imparted to the covers simply, effectively and economically at high production rates so that their use on container bodies does not cause any cost increase.

What is claimed is:

1. An aluminum cover having a depressed panel encircled by a rim for attachment to a container body and having an annular tear strip defined lengthwise by flat-bottom, outer and inner score lines of a depth substantially equal to a major portion of the thickness of the panel and spirally turned inwardly to define the sides of a spirally inturned starting end for said strip;

(a) an upright hollow rivet integral with the inner end of said tongue, around the rivet base said spirally inturned score lines close upon themselves in close proximity thereto;

(b) an elongated sheet metal lever pull tab disposed in the original plane of the panel clamped at one end by said rivet to the inner end of said tongue as a lever extension thereof and operable by lifting its

free other end to snap open said tongue end from the cover and initiate tear-out of said strip from the cover along said score lines;

(c) said outer score line being a continuous ring around the cover and defining the tear-out area of the cover.

(d) and said panel being characterized by the provision of a depressed flat area peripherally bordered by said outer score line and of a depth substantially equal to the panel thickness, and this area having embossments of a height equal to said depth with the score lines defining said tongue and the inner side of the tear strip in the crests thereof, said tear strip having sloping sides throughout its length in which metal displaced laterally during formation of said score lines is absorbed.

2. An aluminum cover for containers comprising a circular panel with a raised sealing rim and having in its surface a pair of spaced, flat-bottom score lines of a depth substantially equal to a major portion of its thickness defining an annular tear strip with a spirally inturned starting tongue and the outer score line of the pair being a continuous ring and defining the tear-out area of the cover,

(a) an upright hollow rivet integral with the inner end of said tongue in close proximity to the base of which the score lines defining the sides of the tongue close upon themselves,

(b) an elongated sheet metal pull tab clamped at one end by said rivet to the inner end of said tongue as a lever extension thereof and operable by lifting its

free other end to snap open said tongue end from the cover and permit tear-out of said strip by hand pull on said tab,

(c) and said tear strip being characterized by having its score lines each in the crest of a separate bead formation extending linearly along the length of each side thereof and terminating in a flat-top pad of the same height around the base of said rivet on which pad said pull tab seats, the height of said pad and said bear formations being substantially equal to the panel thickness and in the sides of which metal displaced laterally by scoring the panel is absorbed.

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