

[54] **FULL OPEN END HAVING CHORDAL
START TEAR SCORE SECTIONS**

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[73] Assignee: **American Can Company**, Greenwich, Conn.

[22] Filed: **Oct. 26, 1970**

[21] Appl. No.: **84,072**

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

[51] Int. Cl. **B65d 17/24**

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

[56] **References Cited**

UNITED STATES PATENTS

3,232,474	2/1966	Dunn	220/54
3,576,272	4/1971	Colly	220/54

Primary Examiner—George T. Hall

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[57] **ABSTRACT**

A score in a "full-open" end closure for a can, which defines a removable section in the end panel, has sections in the form of chords to the generally circular configuration of the score located equally distant from, and adjacent to, an opening tab secured to the removable section of the end panel. By providing these chordal score sections at the tear starting section of the score at either end of the pop or initial rupture section of the score, the load or force required to be exerted by the user to initiate the starting tear of the removable section from the end panel is substantially reduced and, thereby, openability of the "full-open" end closure is substantially improved and enhanced.

3 Claims, 6 Drawing Figures

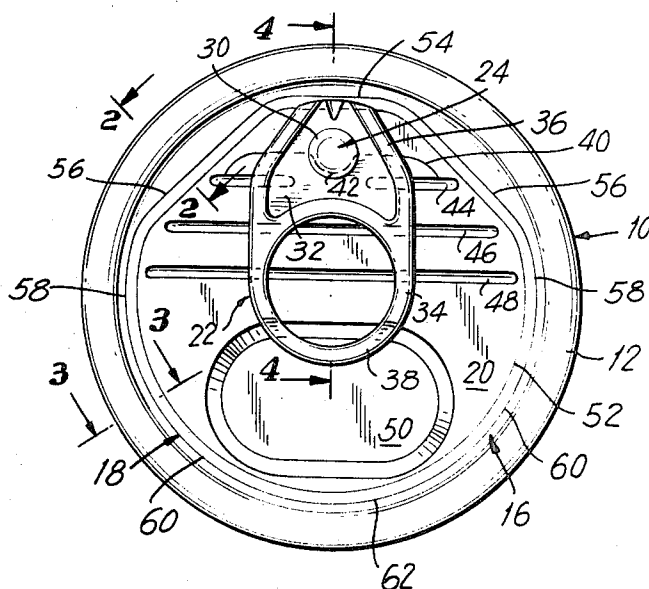


FIG. 1

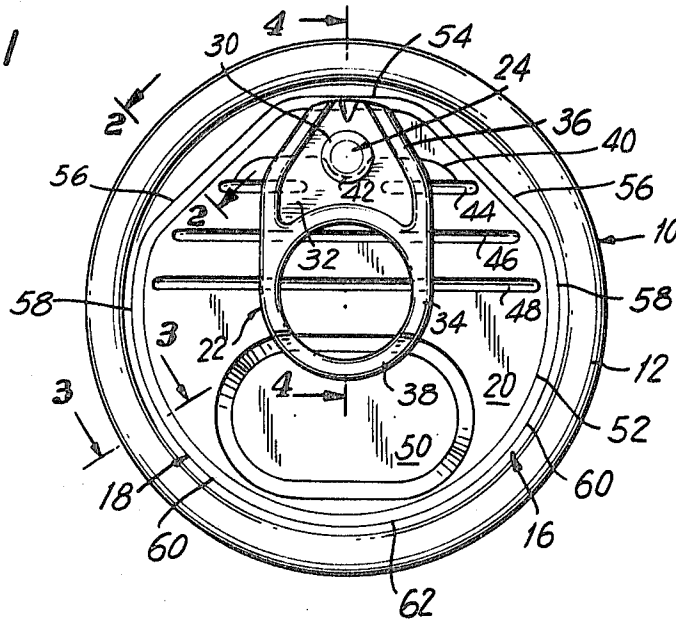


FIG. 2

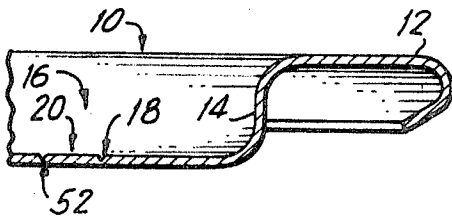


FIG. 3

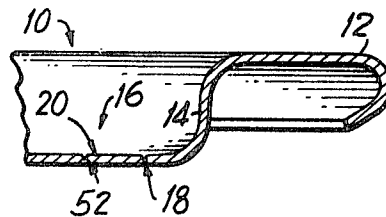
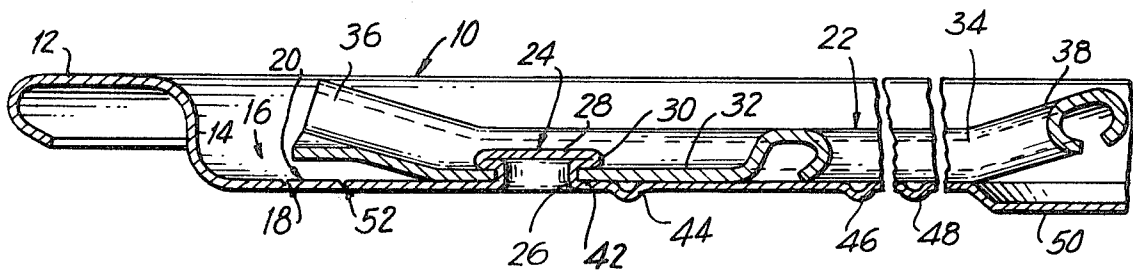


FIG. 4



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FIG. 5

RELATIONSHIP OF SCORE RESIDUAL
TO START TEAR LOAD

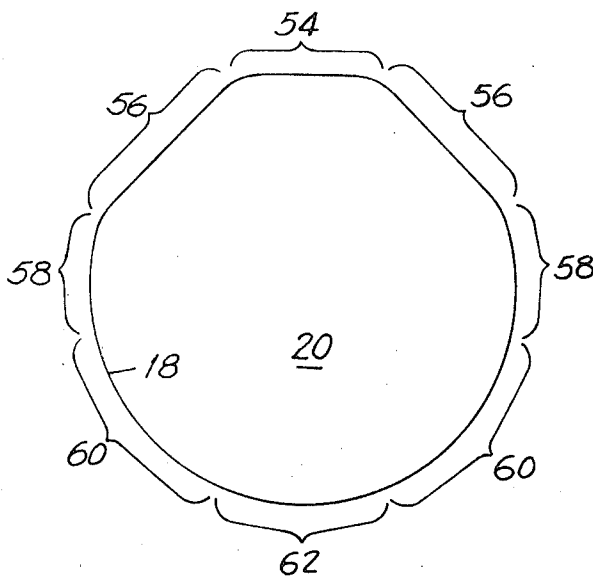
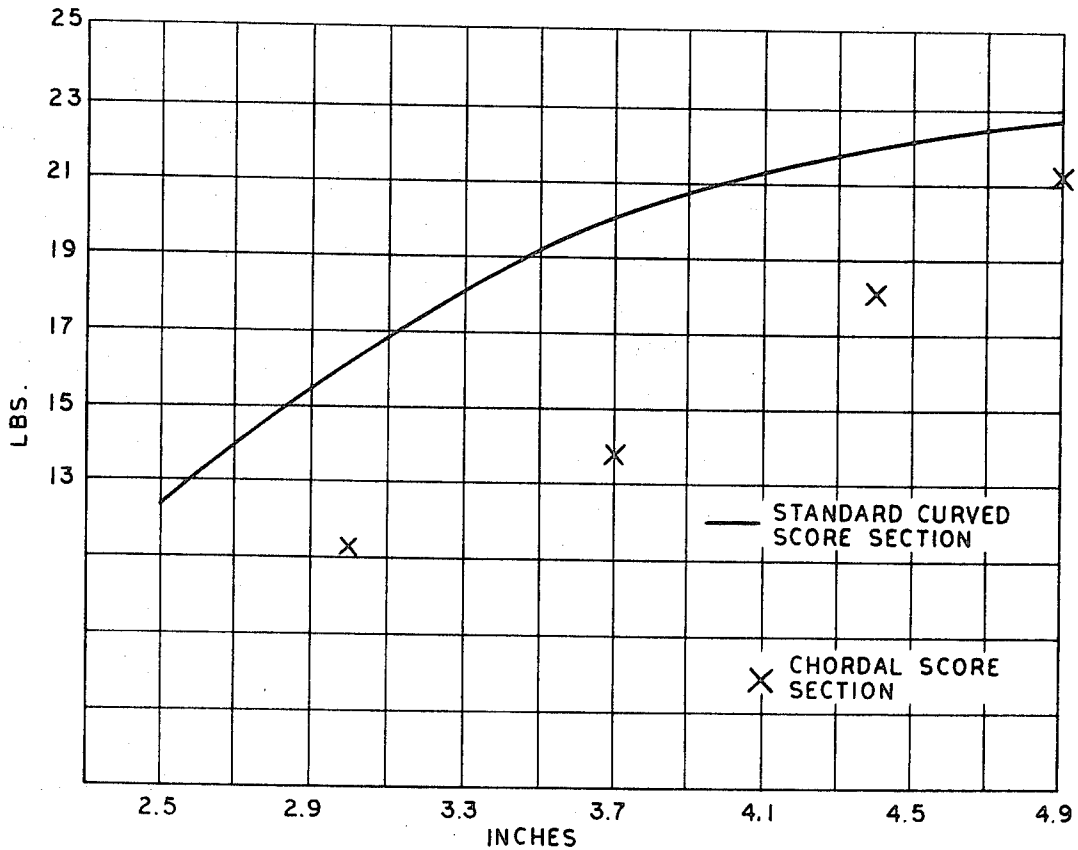


FIG. 6

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FULL OPEN END HAVING CHORDAL START TEAR SCORE SECTIONS

BACKGROUND OF THE INVENTION

One of the more important recent developments in the can making industry is the trend toward scored "self-opening" cans which can be opened by means of an opening tab which is secured to the can. The most common form of such a can is the beer and beverage can in which the product is dispensed through a comparatively small hole which is opened in the can end when the opening tab is lifted to tear away a small removable section which is defined by a score line in the end panel.

Another form is the "full-open" can in which a circular score line is formed proximate to the periphery of the end panel to permit its complete removal. Such "full-open" cans are suitable for use in the packaging of solid or chunky products such as processed or frozen vegetables and fruits, and frozen juices which are to be removed from the container in their entirety. They are also desirable for the packaging of products which are customarily removed by insertion of an instrument or the fingers of the user into the container. Examples of such products are candy, shelled nut meats and coffee.

Heretofore, in one form of such "full-open" can, the removable section has been defined by impressing a fully circular score line closely adjacent to the junction between the end panel and the countersink wall of the end. The opening tab has been secured to the removable section at a point thereon which is close to the score line so that the user can pull upwardly on the opening tab to exert a force at or near the score line to initiate pop or fracture of the score adjacent to the nose of the opening tab. Subsequently, the tab is pulled back by the user over the removable section by the exertion of a tear pulling force to cause the initially popped or ruptured score to tear around the peripheral sides of the removable section until the entire peripheral score has been torn and the removable section has been detached from the end panel.

In regard to the "full-open" end closure, the openability, or ease of opening, of the removable section of the end panel is a particularly important characteristic. Openability may be viewed, in an over-all sense, in terms of the total work or effort required to open the "full-open" end closure. Further, the work required to open the end closure may be broken down in terms of the various component loads or forces required to be exerted by the user to pop, tear and detach the removable section from the end panel for a standard range of score residual thicknesses, such range being that required to insure the integrity of the scored end closure when it is incorporated into a commercial container package. If any one of the pop, tear or detach loads required to be exerted by the user is very great as compared to the normal pull load expected of the average user, the removal section of the end panel may not be openable by most users. Further, even though the end closure may be openable by the exertion of a greater level of force to either pop, tear or detach the removable section than that normally expected, but not so great as to preclude opening of the end panel altogether, such force level requirement increases the total work required to be expended and, thus, in many instances, discourages the average user from attempting to completely open such end closures.

In the case of "full-open" end closures, experience has shown that the load requirements for initiating the starting tear of the removable section tend to approach an excessive level as compared to the subsequent tearing load requirements and disproportionately contribute to the total work required to be expended by the normal user.

The present invention provides a novel score configuration at the particular locations on the periphery of the removable section where the starting tear load is required to be exerted by the user. At these peripheral locations, score sections in the form of chords to the generally circular configuration of the score are provided between the ends of the pop section of the score and the forward ends of the approximately full diameter tear sections of the score. By providing these chordal sections at the aforesaid locations on the score, the load or force required to be exerted by the user to initiate the starting tear of the removable section from the end panel is substantially reduced, and, thereby, the openability of the "full-open" end is substantially improved and enhanced. Furthermore, the reduction in start tear load desirably reduces the total work required to be expended by the user in opening the "full-open" end.

SUMMARY OF THE INVENTION

A score in an end for a container, which defines a removable section in the end panel, has sections in the form of chords to the generally circular configuration of the score located equally distant from, and adjacent to, an opening tab secured to the removable section of the end panel. These chordal score sections are provided at the starting tear sections of the score between the ends of a substantially straight pop section of the score and the forward ends of a full diameter tear section of the score. By providing these chordal sections at the starting tear sections of the score, the load required to be exerted by the user to initiate the starting tear of the removable section from the end panel is substantially reduced and, thereby, openability of the end closure is substantially improved and enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of an end closure made in accordance with the present invention;

FIG. 2 is an enlarged fragmentary view partially in section taken substantially along line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary view partially in section taken substantially along line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary view partially in section taken substantially along line 4—4 of FIG. 1;

FIG. 5 is a graph illustrating the reduction in the load required for a given range of score residual thicknesses by the present invention as compared to the load required by the standard fully circular score, to initiate starting tear of the removable section; and

FIG. 6 is a schematic illustration of the score incorporating the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An end closure, generally designated 10, embodying the present invention is shown in FIG. 1. Preferably, it is circular and made of aluminum, tinplate, or other rupturable material. The end closure 10 includes a peripheral outwardly extending curled flange 12 which

may be interfolded with the end flange of a can body (not shown) to form an end seam (not shown). The peripheral flange 12 merges into an annular countersink wall 14 which extends downwardly from the peripheral flange 12 to an imperforate central end panel 16.

Impressed in the top surface of the central end panel 16 is a score, generally designated 18, which defines a removable section 20 which becomes detached from the end closure 10 when the score 18 is completely ruptured. The score 18 is close to the periphery of the central end panel 16 so that it defines a removable section 20 which is almost as large as the central end panel 16.

In order to provide means for rupturing the score 18, an opening tab 22 is fastened to the removable section 20 at a location adjacent to the score 18 by a hollow rivet 24. The rivet 24 is integral with the removable section 20 and has a vertical annular side wall 26 which merges at its top into a transverse wall 28 having about its periphery an annular bead 30 which overlies and bears down on the opening tab 22 to secure it on the removable section 20.

The opening tab 22 includes a web portion 32 through which the rivet 24 passes, a handle portion 34 rearwardly of the web portion 32 and a nose portion 36 forwardly of the web portion 32 which is urged downwardly when the handle portion 34 is raised to initiate pop or rupture of the score 18. The handle portion 34 includes an upturned end 38 to facilitate the insertion of a finger under it so that it can be easily rocked upwardly by the user.

The removable section 20 has a mustache score 40 impressed therein having a curved central portion 42 which passes immediately behind the rivet 24 which portion 42 initially ruptures during the first stage of the upward rock of the opening tab 22 to allow a venting of the container thereby equalizing the internal pressure of the container and the atmospheric pressure on the top of the central end panel 16. The removable section 20 further has several parallel and downwardly projecting beads 44, 46, 48 formed therein which promote the formation of a bend in the removable section 20 in a direction which is generally perpendicular to the direction in which the opening tab 22 is moved, to facilitate the progressive rupture of the peripheral score 18. The removable section 20 still further has a depression 50 formed in the rearward portion of the section 20. The advantages of providing the mustache score 40 is disclosed in greater detail the application for Letters Patent, Ser. No. 728,518 and does not form any part of the present invention. The advantages of providing the beads 44, 46, 48 and the depression 50 are disclosed in greater detail in U.S. Pat. No. 3,478,918 which issued on Nov. 18, 1969 and do not form any part of the present invention.

The removable section 20 may also be provided with a second score 52. The score 52 is an anti-fracture score and is formed in the removable section 20 immediately adjacent the score 18. However, the anti-fracture score 52 is shallower than the peripheral score 18 as is clearly shown in FIGs. 2 through 4. The advantages of providing the second score 52 is disclosed in greater detail by U.S. Pat. No. 3,406,866 which issued on Oct. 22, 1968 and does not form any part of the present invention.

The novel configuration of the score 18 which forms the present invention is schematically illustrated in FIG. 6. The score 18 is comprised by a substantially

straight pop section 54 at the forward end of the removable section 20, adjacent to the nose portion 36 of the opening tab 22, which merges into adjoining start tear sections 56, which are located equally distant from, and adjacent to, the sides of the opening tab 22. The rearward ends of the start tear sections 56 merge into adjoining substantially full diameter tear sections 58. The rearward ends of the full diameter tear sections 58 merge into adjoining minimum panel tear sections 60 whose rearward ends merge into a detach section 62 at the rearward end of the removable section 20.

The start tear sections 56 of the score 18 are novelly provided in the form of chords to the generally circular configuration of the score 18 located equally distant from, and adjacent to, the sides of the opening tab 22 as clearly shown in FIG. 1. The displacement of the center of the chordal start tear sections 56 inwardly from the countersink wall 14 is shown in FIG. 2. The displacement of the remaining tear sections 58, 60 inwardly from the countersink wall 14 is shown in FIG. 3. As hereinbefore explained, by providing these chordal start tear score sections 56 at the starting tear location of the score 18 at either end of the substantially straight pop section of the score 18, the load required to be exerted by the user to initiate the starting tear of the removable section 20 from the end panel is substantially reduced and, thereby, openability of the end closure 10 is substantially improved and enhanced.

Test results illustrated graphically in FIG. 5 demonstrate the advantage of the novel chordal start tear score sections 56 over the standard curve start tear sections which form part of a standard fully circular score. The end closures tested were 85 lbs. L-TU easy open tinplate ends having four score residual thicknesses which include and extend beyond either side of the range of score residuals which are required to insure the integrity of the scored end closure when it is incorporated into a commercial container package, such range of score residuals being from approximately 0.003 inch to 0.004 inch. For any score residuals within the aforementioned range, the pounds of load or force required to be exerted by the user to initiate starting tear of the score is significantly lower in the end closures incorporating the novel chordal start tear score sections as compared to those incorporating standard curved start tear sections.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A full open end closure for a container, said end closure comprising:

- an end panel;
- a generally circular score adjacent the periphery of said panel defining a removable section within said panel;
- an opening tab having a handle portion, a web portion secured to said removable section adjacent to said score, and a nose portion;
- a countersink wall extending upwardly from the periphery of said panel;

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a flange extending outwardly from the top of said countersink wall; and

said score including a substantially straight pop score section located adjacent to the nose portion of said opening tab, the ends of said pop score section 5 merging into sections located equally distant from, and adjacent to, said opening tab which form chords to the generally circular configuration of said score.

2. A full open end closure for a container, according 10 to claim 1, wherein said chordal score sections encompass the portions of the score at which a pulling force must be exerted to cause starting tear of the removable section from the end panel.

3. A full open end closure for a container, said end 15 closure comprising:
an end panel;

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a generally circular score adjacent to the periphery of said panel defining a removable section within said panel;

an opening tab secured to said removable section adjacent to said score;

a countersink wall extending upwardly from the periphery of said panel;

a flange extending outwardly from the top of said countersink wall; and

said score including a substantially straight pop score section the ends of which merge into chordal score sections which encompass the portions of the score at which a pulling force must be exerted to cause starting tear of the removable section from the end panel.

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