

- [54] CONTAINER END WITH PRE-BULGE
- [75] Inventors: **Leon M. Patarini**, Palos Hills; **Frank R. Pileggi**, Bridgeview; **Frank Kratochvil**, Stickney, all of Ill.
- [73] Assignee: **National Can Corporation**, Chicago, Ill.
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- [51] Int. Cl. .... **B65d 17/20**
- [58] Field of Search..... 220/48, 54, 27

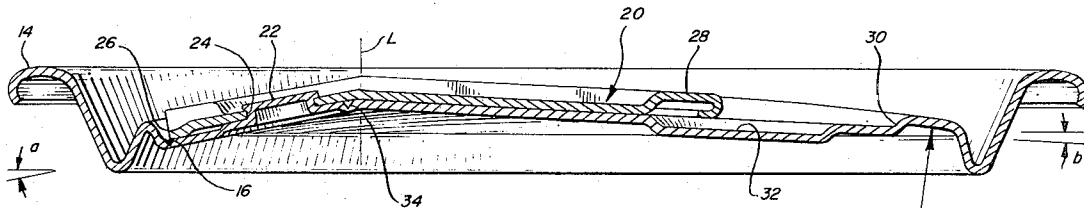
*Primary Examiner*—George T. Hall  
*Attorney, Agent, or Firm*—Dressler, Goldsmith, Clement & Gordon, Ltd.

[57] **ABSTRACT**

A container end having a permanently attached tear strip is disclosed herein. The tear strip has opposite ends with one end located adjacent the periphery of the main body of the end which has a rim extending above the main body around the periphery. A tab is connected to the tear strip adjacent the periphery of the end. The main body and the tab have a transverse bend that extends across the tear strip and the tab adjacent the connection to produce a bulge that extends towards the outside of the container end which will maintain the tab flat against the end after the end has been inserted on a container and pressurized during filling.

- [56] **References Cited**
- UNITED STATES PATENTS**
- 3,441,171 4/1969 Stec ..... 220/54
- 3,612,341 10/1971 Franek et al..... 220/48

**8 Claims, 3 Drawing Figures**



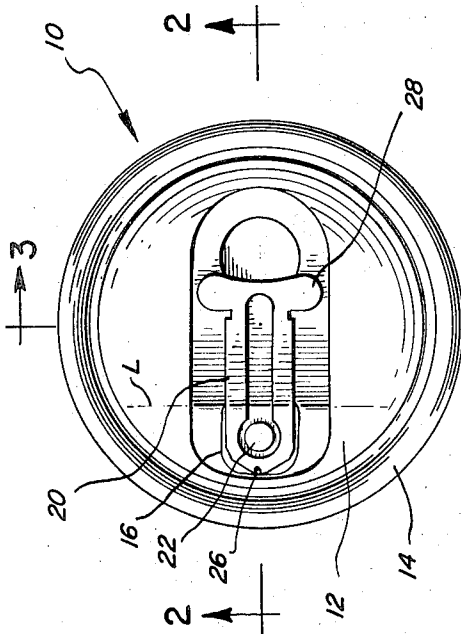


FIG. 1

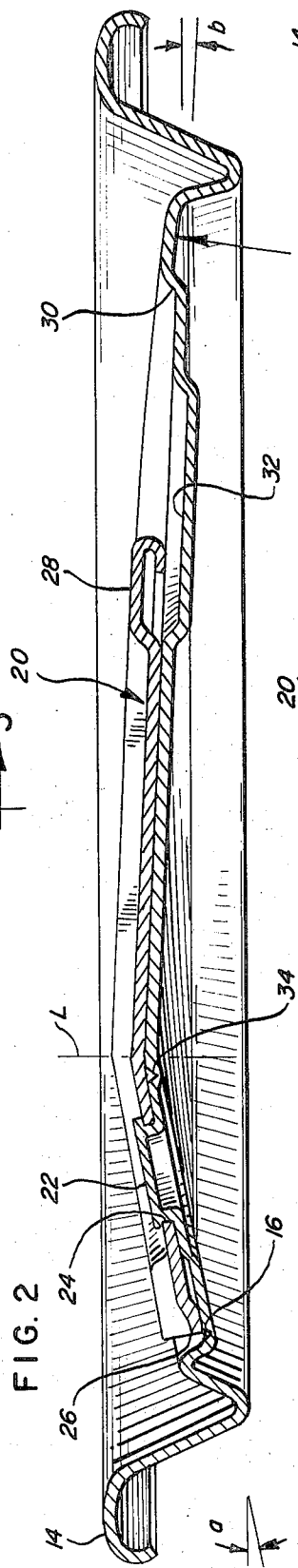


FIG. 2

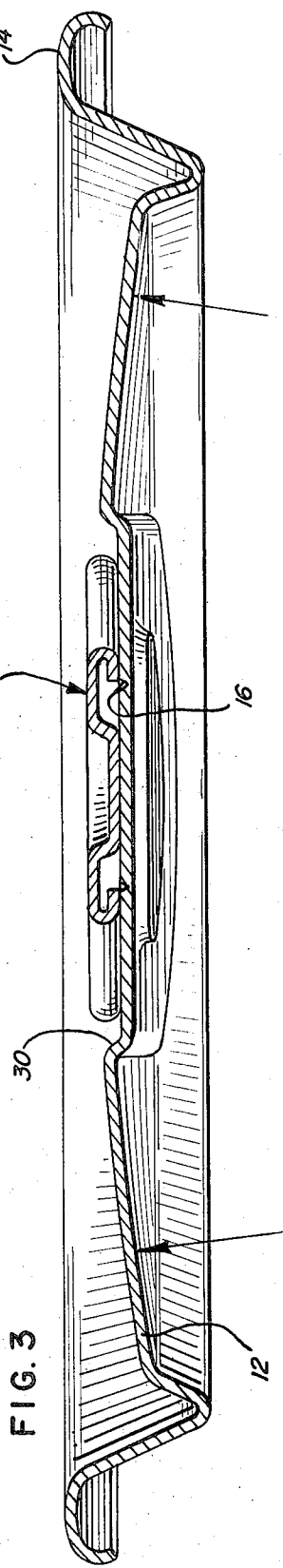


FIG. 3

## CONTAINER END WITH PRE-BULGE

## BACKGROUND OF THE INVENTION

In recent years, containers for soft drink, beer and other beverages have almost universally formed by producing a weakened line in one end of the container which serves as a tear strip that can be removed by the manipulation of a tab connected thereto. In fact, containers of this type have met with such wide-spread acceptance that the normal can opener has almost become extinct.

For some time now, container ends of this type have had a tear strip that is completely severed from the remainder of the end which has resulted in a rather serious ecology problem. Therefore, many local and state agencies have been considering laws that prohibit the use of a container that has a tear strip which is completely severed.

To overcome this problem, it has more recently been proposed to maintain a permanent connection between the tear strip and the container end so that the tear strip cannot be removed from the end.

One such permanently attached tear strip consists of an elongated score line that defines an elongated tear strip having one end adjacent the periphery of the container end and the opposite end located in close proximity to the center of the container. In this type of container end, the tab is connected to the tear strip adjacent the periphery of the end and extends across a major portion of the diameter of the end.

The container making industry has recently made it a requirement that some ends must be capable of withstanding substantial pressures without undue deformation of the end as it is being inserted onto the container. For example, some products require that the container and the end must withstand pressures of at least 60 P.S.I. This has resulted in a rather severe problem in the formation of the ends. For example, it has heretofore been customary to provide a predetermined spherical configuration to the main body of the end inside the periphery of the rim so that the same body of the end will not deform beyond the upper edge of the rim during the filling and pressurization of the container. However, with the increased pressure requirements mentioned above, and particularly with containers having permanently attached tear strips of the above type, it has been found that the end may bulge sufficiently after the filling and seaming process that at least the gripping end of the tab extends above the periphery of the rim which results in what is known as "a rocker." Rockers are completely unacceptable in the industry because they create serious problems in the automatic handling machinery that is usually utilized for containers of this type.

While this problem could easily be solved by increasing the thickness of the container end panel, such solution is not economically feasible because of the cost of the material that is utilized in forming the ends. Another solution to the problem would be to increase the depth of the rim extending around the periphery of the main body of the end to have the deformed main body and tab remain within the confines of the rim. However, such a solution is completely unacceptable since it would require a complete change over in automatic handling machinery that is presently in existence.

## SUMMARY OF THE INVENTION

The present invention will overcome the problem of having the tab extend above the rim of the container by forming a pre-bulge into the end during the formation thereof. This pre-bulge will preclude any substantial further bulging of the end when the container is filled and pressurized.

More specifically, the pre-bulge is formed by producing a bend extending transversely of the tab and tear strip between the connection for the tear strip and tab and the opposite ends of the tab and tear strip. The tab and tear strip are substantially planar on opposite sides of the bend and the portions of the tab and tear strip having the connection define a small angle with respect to a plane that extends generally parallel to the main body of the end panel. The portions of the tab and tear strip located adjacent opposite sides of the bend are also substantially planar and form a small acute angle with respect to the plane extending parallel to the main body.

More specifically, the tab and tear strip portions having the connection define an angle with respect to a plane extending parallel to the main body that is greater than  $5^\circ$  and the tear strip and tab portions located on the opposite side of the transverse bend define an angle that is less than  $5^\circ$  with respect to the plane extending parallel to the main body.

In addition, a substantial portion of the main body defines a spherical surface that has a radius greater than five inches with the center of the radius located on the side of the main body that is opposite the side of the peripheral rim. The tab is also bent transversely along a bend line that coincides with a transverse bend in the main body.

With the arrangement described above, the tab will remain in contact throughout a substantial portion of its length even after the end panel has been attached to a container body and the container has been filled and pressurized. This results from the fact that the pre-bulge formed in the end panel will preclude substantial bulging when substantial pressures are developed inside the container.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 shows a plan view of a container end having the present invention incorporated therein;

FIG. 2 is an enlarged vertical section, as viewed along line 2—2 of FIG. 1; and

FIG. 3 is an enlarged vertical section, as viewed along line 3—3 of FIG. 1.

## DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a preferred embodiment of the invention, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

Referring to the drawings, there is shown an easy open end 10 that is generally of the type disclosed and claimed in U.S. Pat. No. 3,738,526 issued on June 12, 1973.

The easy open end or container end is of the type that has a main body 12 with a rim 14 extending around the periphery of the main body. The rim 14 is adapted to be attached to one end of a container body by the usual seaming process. The main body 12 of end 10 has a weakened line 16 defined therein which produces an elongated tear strip that has one end located in close proximity to the periphery of the container end and the opposite end permanently connected to the remainder of the main body 12 in close proximity to the center of the end. A tab 20 is permanently attached adjacent the end of the tear strip which is located adjacent the periphery of the container, through a permanent connection 22. The connection 22, as most clearly shown in FIG. 2, consists of an integral rivet that is deformed from the tear strip and extends through an opening 24 in the tab with the upper end of the rivet being flattened against the upper surface of the tab. The adjacent end of the tab 20 is what is commonly referred to as the nose portion 26 that has its free end in general vertical alignment with the weakened line 16 as clearly shown in FIG. 2.

The opposite end of the tab 20 has a handle portion 28 that is capable of being grasped by the operator in a manner to be described later. The entire tab and the tear strip are located in a recessed portion 30 that extends away from the upper edge of the rim 14. In addition, the recessed portion 30 also has a further deformed or dished portion 32 adjacent the handle end 28 of the tab 20 so that the user can readily insert his fingers between the tab and the adjacent surface of the end panel.

The main body 12 also has a further weakened line or area 34 adjacent the rivet 22. The weakened area 34 circumscribes substantially one-half of the area around the rivet and allows for pivotal movement of the nose portion downwardly during the initial rupture of the weakened line 16.

As best can be seen from FIG. 3, the entire main body which surrounds the dished portion 30 is substantially spherical in cross-sectional configuration and the center of the radius for the spherical configuration is located generally on a line that extends through the center of the end and the container.

As was indicated above, with arrangements of this type, it has been found that the application of any substantial amount of pressure to the inner surface of the end panel after it has been attached to a container body will result in having the main body bulge outwardly or upwardly as viewed in FIGS. 2 and 3. The major portion of such bulging will occur adjacent the center of the end panel and it has been found that such bulging will cause the handle portion of the tab 28 to extend above the upper edge of the rim 14 to produce the "rockers" discussed above.

This problem is eliminated by forming a specifically located bend in the end panel prior to its insertion onto a container body.

As shown in FIGS. 1 and 2, the main body 12 of the panel is bent along a bend line generally indicated by the reference numeral L. This bend is located in close proximity to the connection between the tear strip and the tab and extends transversely across the tab between opposite ends thereof. Also, the tab 20 is likewise bent along the bend line that is coincident with the bend L in the container body and tear strip. The result is that the transverse bend in the main body will result in a ri-

gidifying effect for the entire end panel and preclude any substantial additional bulging during the pressurization of the container end panel after it has been sealed to a container body.

As is most clearly shown in FIG. 2, the portions of the main body and tab on opposite sides of the bend L are substantially flat or planar and both portions extend downwardly, i.e., away from the top periphery of the rim, on opposite sides of the bend. It will also be noted that the recessed portion or trough 30 is substantially flat when viewed transversely, as shown in FIG. 3. The end result is that the tab is in contacting engagement with the body portion on opposite sides of the bend throughout substantially its entire length. This will locate the handle portion 28 a substantial distance below the upper edge of the rim 14.

Referring to FIG. 2, it will also be noted that the two portions of the main body on opposite sides of bend L define angles ( $i$  and  $b$ ). It has been found that the size and relationship of these angles to each other is important in producing an end panel that is capable of withstanding substantial pressures without bulging sufficiently to have any portion of the tab located above the periphery of the rim. For example, in the illustrated embodiment, the angle  $a$  is greater than  $5^\circ$  while the angle  $b$  is less than  $5^\circ$  and more specifically, the angle  $a$  is preferably on the order of  $11\frac{1}{2}^\circ$  while the angle  $b$  is preferably on the order of  $2\frac{1}{2}^\circ$ . The result is that the included angle between the two portions on opposite sides of the bend define an angle greater than  $150^\circ$ .

Deforming the end panel as described above will result in having the excess metal that may develop during the formation of the weakened lines 16 and 34 absorbed to produce a substantially rigid panel and any pressures that are developed inside the container after the end panel has been attached to the container will be concentrated generally along the bend L. Because of the rigidifying nature of the sharp bend, it will prevent any substantial outward movement of the main body of the panel that is located inside the rim. Actual tests have shown that such an arrangement allows for an increase in pressure inside the container at least 25 percent greater than was heretofore possible with containers of the same metal gauge.

To further insure that the panel does not bulge sufficiently to have any portion of the tab located above the upper edge of the rim 14, the major portion of the end panel, outside of the recess or trough 30 is generally spherical in cross-section and has a spherical radius of approximately  $6\frac{1}{8}$  inches. The center of this radius is located generally along the vertical center line extending through the center of the end panel as well as the center of the container to which the panel is ultimately attached.

The unique end panel described above, can readily be formed in present commercial machinery with a minimum amount of change in tooling. In addition, the end panel can readily be processed on present day existing machinery that is normally utilized in automatic filling and subsequent handling operations which is an important feature in developing a commercially acceptable end.

What is claimed is:

1. In an easy open panel having a weakened line defining an elongated tear strip, said panel having a rim located around the periphery thereof and said rim extending above a main body of said panel, said tear strip

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having opposite ends with one end located adjacent the periphery of said main body, an elongated tab having opposite ends with a connection between said tab and tear strip adjacent said one end of said tear strip, said main body and tab having a bend extending transversely of said tab and tear strip between said connection and the opposite end of said tab to produce a bulge in said main body extending toward a plane that is defined by the upper end of said rim.

2. An easy open end as defined in claim 1, in which said main body has panel portions on opposite sides of said bend and said panel portions define an included angle greater than 150°.

3. An easy open end panel as defined in claim 1, in which the portions of said tab and said tear strip having said connection are substantially planar between said bend and said one end and define an angle greater than 10° with respect to said plane extending along said rim.

4. An easy open container as defined in claim 3, in which portions of said tab and tear strip are substantially planar on the opposite side of said bend and define an angle less than 5° with respect to said plane extending along said rim.

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5. An easy open end panel as defined in claim 4, in which said main body has a depression extending away from said rim and said tear strip and tab are located in said depression.

6. An easy open end panel as defined in claim 1, in which said panel is circular and said bend is located between the center of said panel and said one end of said tear strip.

7. An easy open end panel as defined in claim 6, in which said tear strip and tab are substantially planar on opposite sides of said bend and in which (1) said tear strip and tab define an angle greater than 5° with respect to said plane extending along the upper end of said rim between said bend and the periphery of said panel and (2) said tear strip and tab define an angle less than 5° with respect to said plane extending along the upper end of said rim on the opposite side of said bend.

8. An easy open end panel as defined in claim 7, in which said main body defines a substantially spherical surface on the bottom of said main body adjacent the periphery along at least a portion of said main body.

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