

[54] **SHIELDED CONTAINER WALL
OPENING**

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

[58] Field of Search..... **220/54, 90.6, 53,
220/48, 27**

[56] **References Cited**

UNITED STATES PATENTS

3,510,022	5/1970	Heller.....	220/90.6
3,610,462	10/1971	Saunders.....	220/90.6
3,632,461	4/1972	Gayher.....	220/53 X

Primary Examiner—George T. Hall

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[57] **ABSTRACT**

A method of establishing a shielded container wall opening including providing a metal container wall panel having an adhesively bonded protective layer selected from the group consisting of polyolefin, copolymers of polyolefin-ethylene and ionomers of polyolefin. Providing a score line defined removable sector within the metal panel and an operating pull tab secured thereto. Thermally treating the container wall having the integral opening device at about 275° to 375°F for about 0.2 second to 4 minutes and preferably about 300° to 350°F for about 0.5 to 3 minutes. Operating the pull tab to initiate fracture of the score line and establish an opening in the container wall. Simultaneously elongating portions of the protective layer disposed in a generally underlying position with respect to the score line and severing the same to provide a shielding edge which is disposed protectively against the opening defining wall of the metal container wall panel. Feathering preferably including an average projection of about 0.002 to 0.010 inch beyond the metal opening defining wall.

2 Claims, 5 Drawing Figures

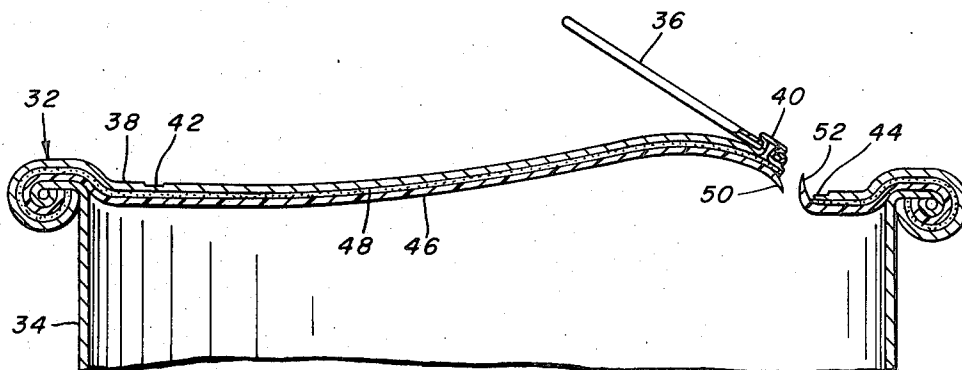


FIG. 1.

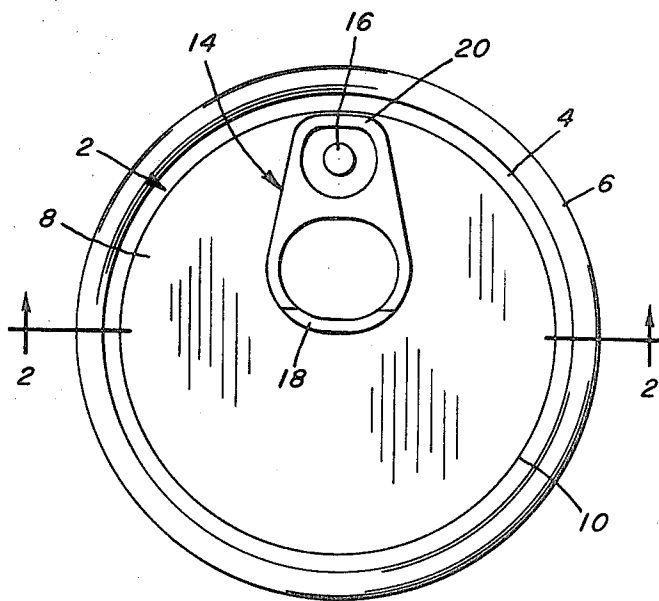


FIG. 2.

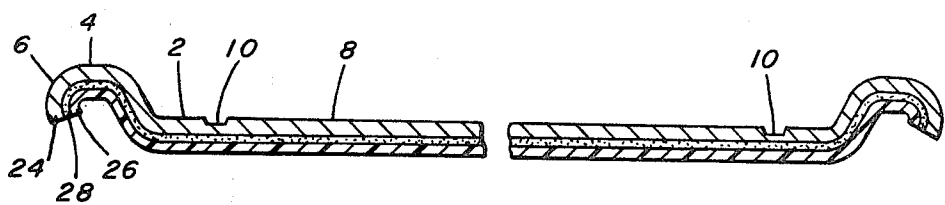


FIG. 3.

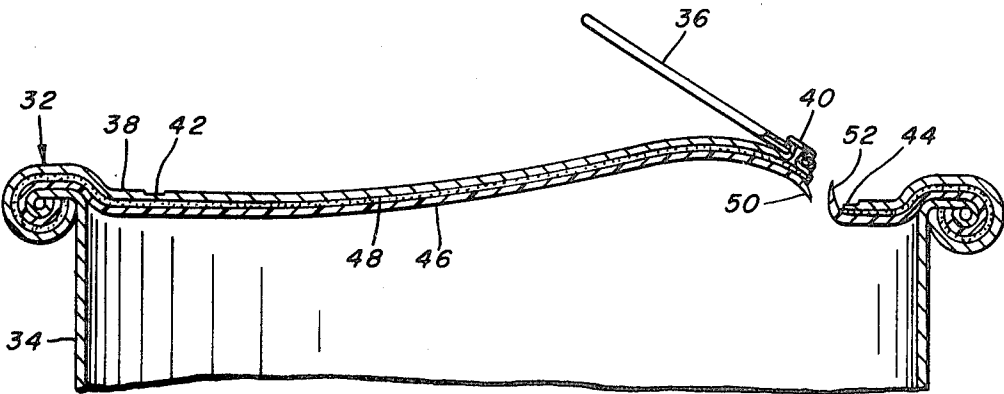


FIG. 4.

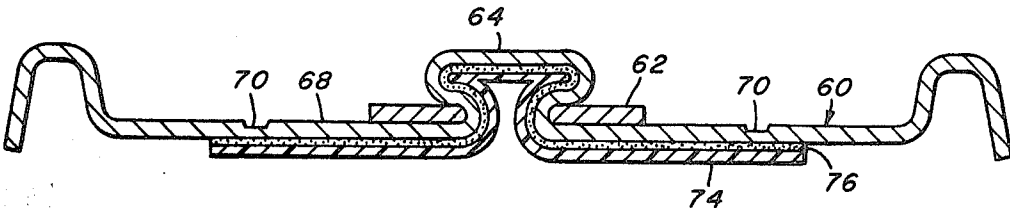
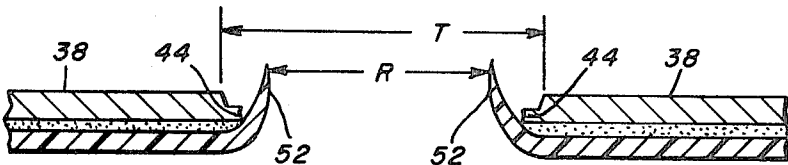


FIG. 5.



SHIELDED CONTAINER WALL OPENING

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is directed toward a method of establishing a shielded opening defining container wall automatically with the operation of an integral opening device to establish a container wall opening. More specifically, this invention relates to such a method wherein a protective layer is elongated and severed to provide a feathered shielded projection around the container wall opening.

Description of the Prior Art

The advantages of providing a container wall such as a can end or closure, for example, with integral opening devices which permit the consumer to gain access to the container contents without the need for a separate opening instrument have been known. One of the more popular conventional devices of this type employs a metal container wall having a scored or weakened line defining a removable sector which is adapted to be either completely separated from the remainder of the container wall or partially separated in order to provide an opening therein. It has been known to make advantageous use of a lever pull tab secured within the removable sector. Operation of the lever pull tab provides a mechanical advantage in initiating fracture of the scored or weakened line and in providing for subsequent continued severance of the line.

One of the difficulties which has been encountered in connection with such opening devices is that complete or partial removal of the score line defined sector results in the remaining portion of the container wall having an irregular, rather sharp opening defining wall which represents a hazard to the consumer. Not only is there a risk that the consumer will inadvertently suffer injury through direct contact with the exposed ragged edge, but also there is the additional disadvantage that the product might be damaged during removal from the container as a result of such contact.

A number of means of attempting to provide shielding structures which resist such undesired results have been known. U.S. Pat. No. 3,303,962 provides a preformed inwardly projecting radial bead in the container body which is adapted to reduce the likelihood of undesired contact with the raw edge on the container wall. In addition to preforming portions of the container wall in an effort to obtain shielding, it has also been known to provide independent shielding elements which are adapted to serve the same function. U. S. Pats. Nos. 3,447,713 and 3,527,377 provide preformed annular elements which are positioned underlying the periphery of the end wall in such a position as to be closely adjacent to the ragged metal edge and provide shielding after opening of the container has been effected. It has also been known to provide shielding of the tear strip element edges, as opposed to the container opening edges, by means of a preformed, separate oversized web of material secured to the undersurface of the tear strip. U. S. Pat. No. 3,442,416 provides such a structure wherein a preformed rectangular web which is oversized with respect to the tear strip, remains attached to the tear strip upon opening and projects beyond the tear strip edges.

There remains, therefore, a need for a method of establishing a shielded container opening which method

does not involve the use of independent preformed shielding elements and results in creation of the desired shielding structure during opening of the container wall.

SUMMARY OF THE INVENTION

The above-described need has been met by the method of this invention. The method of this invention involves providing a metal container wall panel having an adhesively bonded protective layer selected from the group consisting of polyolefins, copolymers of polyolefins and ethylene and ionomers of polyolefin. A score line defining removable sector is provided within the metal panel and an operating pull tab is secured thereto, preferably by means of an integrally formed rivet. After establishment of the integral opening device and prior to operation of the same, the composite container wall is subjected to thermal treatment at about 275° to 375°F for about 0.2 second to 4 minutes and preferably at about 300° to 350°F for about 0.5 to 3 minutes.

In operating the structure of the present invention, the pull tab is employed to initiate fracture of the score line in the metal panel. Simultaneously with such severance, the underlying protective layer is subjected to thinning elongation in regions generally underlying the score line and is severed in order to establish a projection which extends generally upwardly and inwardly so as to shield the raw edge of the remaining portion of the container wall after the removable sector has been withdrawn. The projection, which is preferably feathered, will define an opening of smaller dimension than will the metal panel opening defining wall. The feathered projection preferably extends beyond the metal opening defining wall by an average of about 0.002 to 0.010 inch.

It is an object of this invention to provide an integral opening device container wall adapted to establish shielding of the container wall raw edge simultaneously with the establishment of the opening through operation of the opening device.

It is another object of this invention to provide such a construction wherein such shielding is effected through elongation and severance of a protective layer underlying and adhesively secured to the metal panel.

It is an additional object of this invention to provide such a method which is adapted to be readily employed in connection with conventional container wall manufacturing equipment and container sealing equipment, as well as preserving conventional consumer practices in opening such containers.

These and other objects of this invention will be more fully understood and appreciated from the following detailed description of the invention on reference to the illustrations appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a plan view of one form of container wall contemplated by this invention;

FIG. 2 is an elevational cross sectional illustration, partially broken away, taken through 2—2 of FIG. 1;

FIG. 3 is a cross sectional illustration of a portion of a container assembly of this invention shown after score line severance has been initiated;

FIG. 4 is an elevational cross sectional illustration of a modified form of construction of this invention showing a different form of protective layer;

FIG. 5 is a fragmentary illustration of the container wall of FIG. 4 taken after severance of the removable sector.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As used herein the term "container wall" shall refer to a portion of a container which is provided with an integral opening device and serves as a structural part of the container and shall include can ends and jar and bottle closures as well as other container portions falling within this description.

Referring now to FIGS. 1 and 2, there is shown a container wall in the form of a can end. The container wall has a top panel 2 and a flange portion 4 which terminates in a generally downwardly directed flange extension 6. The can end has a removable sector 8 defined within the top panel 2 by means of score line 10. As used herein, the term "removable sector" shall refer to container wall portions which are adapted to be partially or totally severed in order to establish an opening through which access may be had to the contents of the container. For convenience of reference, the term "score line" shall refer to various types of weakened lines which are so provided as to define a removable sector and yet maintain some residual metal within the score line regions. Score line shall be used to refer to lines created by indentation tools as well as other panel weakening means and the singular shall be deemed to refer to either the singular or plural. As is shown in FIG. 1, a lever pull tab 14 is secured within the removable sector 8 by means of a rivet 16, which may conveniently be established within the panel 2 as an integrally formed rivet.

In effecting opening of the container wall, the lifting portion 18 of the pull tab 14 is raised upwardly so as to cause the attaching end 20 to initiate severance of score line 10. After score line severance has been initiated in this fashion, the lever tab 10 may be employed to continue severance of the score line 10 until such time as the removable sector 8 is completely detached from the remainder of top panel 2.

Referring now to FIG. 2, there is shown a can end of the type shown in FIG. 1, with the pull tab 14 and attaching rivet 16 not shown. The metal panel portion 24 of the composite container wall shown in FIG. 2 may be composed of any material having the desired properties. Aluminum, steel, and alloys of the same are particularly suited for use with such ends. The term "aluminum" as used herein shall refer to any grade of aluminum and aluminum base alloys wherein aluminum consists of not less than 80 percent by weight of the total composition.

A protective layer 26 is secured, preferably continuously, to the metal panel 24 by means of adhesive layer 28. The protective layer 26 is selected from the group consisting of polyolefin, copolymers of polyolefin and ethylene and ionomers of polyolefin. Among the specifically preferred materials are polypropylene and a copolymer of polypropylene and ethylene. With respect to the latter material, a preferred range of ethylene constituent is about 2 to 10 percent, by weight, with about 2 to 5 percent by weight being the preferred ethylene content. The protective layer 26 preferably may have a thickness of about 1 to 4 mils, with about 2.5 to 3.5 mils being preferred. The protective layer 26 preferably is provided in the form of a film in order to facili-

tate handling and joinder, but a coating may be employed should this be desired.

The adhesive 28 preferably is selected from the group consisting of epoxy, polyester and polyurethane. It will be appreciated that various additives which have a modifying influence on the properties of these adhesives may be employed. For example, an epoxy modified polyurethane has proved to be an effective adhesive material. In addition, conventional catalysts and other additive materials may be employed with the adhesives. The adhesives are preferably provided as a coating in amounts of about 1.0 to 5.0 milligrams per square inch with about 1.0 to 3.0 milligrams per square inch being the preferred weight.

It has been found that such composite container walls have exceptional corrosion resistant properties, as well as resistance to destruction during forming of integral opening devices in such container walls.

Referring now to FIG. 3, there is shown a cross sectional representation of a container wall 32 of this invention. The container wall has been secured to a can body 34 by means of an interlocking seam. Protective layer 46 is secured to the panel 38 by means of adhesive 48. In the position shown, the pull tab 36, which is secured to panel 38 by means of rivet 40, has been employed to initiate severance of the score line 42 in the portion shown toward the right of this figure. It will be noted that the panel 38 in the region of severance has an inwardly projecting sharp edge 44 defining the opening in panel 38. In initiating fracture of the score line, portions of the protective layer 46 have been stretched, thinned and subsequently severed to establish feathered edges 50, 52. Edge 52 projects generally radially inwardly and upwardly and provides a shield against sharp edge 44 of panel 38 within the opening defining regions thereof. The term "feathering" as used herein shall refer to the extent to which an edge 52 extends radially inwardly beyond sharp edge 44. While for convenience of illustration the edges 50, 52 have been shown as extending upwardly and inwardly, it will be appreciated that the shielding action may be provided by an edge 52 which extends substantially completely inwardly with little or no upward extension or by a projection which extends substantially completely in an upwardly direction with only little inward extension. In those instances where the amount of stretching and thinning prior to fracture of protective layer 46 is slight the amount of taper in the "feathered" edge may be less than that illustrated in FIGS. 3 and 5.

In the preferred practice of this invention, a feathered edge 52 which has such a projection of about 0.002 to 0.010 inch will be established. This establishes a restricted opening in protective layer 26 which is of smaller dimension than the opening defined by the sharp edge 44 of panel 38. Referring now to FIG. 5, there is shown, somewhat symmetrically, a cross section of an end having a pour type opening wherein there is seen that the panel edges 44 define an opening T, while the feathered edges 52 define an opening R which is less than T. It is noted that the feathered edge 52 will preferably provide a shield against sharp edge 44 substantially continuously around the opening in panel 38 in order to effect a complete shield.

Referring to FIG. 4, there is shown a modified form of the invention wherein a composite container wall 60 has a pull tab 62 secured thereto by means of an integrally formed rivet 64. A removable sector 68 is de-

finished by score line 70 and is of the pour type variety. In this form of the invention, rather than providing a protective layer which is substantially coextensive with the container wall 60, as was the case in connection with the forms shown in the previous drawings, the protective layer 74 completely covers only the removable sector 68 and the region immediately beyond the removable sector. The protective layer 74 is secured to the undersurface of the container wall 60 by means of adhesive 76. This embodiment of the invention functions automatically to establish a shield during container opening in the same fashion as that described above.

It has been found that the method of this invention not only produces the desired feathered effect for shielding purposes, but also separation of portions of the protective layer from the container wall due to release of the adhesive bonds securing the same to the panel (herein referred to as "diaphragming") is also eliminated. Substantially continuous bonding between the protective layer and removable sector not only eliminates diaphragming but also provides automatic thinning and severance of the protective layer portion when the removable sector is severed.

In preparation of the container wall of this invention, the container wall is thermally treated after establishment of the integral opening device in order to establish the desired strength characteristics in the protective layer. It is preferred that the composite container wall be heated to about 275° to 375°F for about 0.2 second to 4 minutes with the preferred form involving heating of the container wall to a temperature of about 300° to about 350°F for about 0.5 to 3 minutes. As a result of this thermal treatment, diaphragming is effectively eliminated. Also, the difference between the strength of adhesive bond between the metal panel and the protective layer and the tensile strength of the protective layer is such that severance of the removable sector results in thinning of the protective layer and establishment of a feathered shielding projection having an average radial inward extension of about 0.002 to 0.010 inch.

EXAMPLE

In order to further describe the features of this invention an example will be provided. An aluminum blank composed of 5052-H19 alloy was provided with an adhesively bonded polypropylene-ethylene copolymer film having a copolymer constituent of about 4 percent by weight. The blank was provided with an integral easy opening device by establishing a score defined removable sector and securing a lever pull tab there-within by means of an integral rivet. The end was heated at 325°F for 2 minutes. Upon opening of the end by severing the score line, the underlying protective polypropylene-ethylene copolymer layer was fractured generally in the region underlying the score line after having been elongated. This established the feathered edge which provided a shield. The feathered edge projected an average of about 0.004 inch into the opening defined by the metal panel.

It will, therefore, be appreciated that the method of this invention permits the use of conventional equip-

ment in establishing a container wall structure which will automatically establish a shield by severance of a protective layer composed of a specifically selected material. Rather than requiring the manufacture and securement of a separate preformed annular shield, the present invention provides for automatic establishment of a feathered shield during normal opening of the container wall in a conventional fashion. In addition, this invention results in custom tailoring the shield proportions and structural configuration in accordance with the dimensions and configurations of the removable sector without the need to provide separate shields having varying shapes corresponding to the removable sector. Also, there need be no concern with variations in tolerance with respect to size and position of the removable sector within the metal panel.

Various modifications may be made in the invention without departing from the spirit thereof or the scope of the claims, and therefore, the exact form shown is to be taken as illustrative only and not in a limiting sense and it is desired that only such limitations shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

We claim

1. A container wall structure comprising a metal panel having a score line defined removable sector, an adhesive layer selected from the group consisting of epoxy, polyester and polyurethane, a protective layer adhesively bonded to said metal panel, said protective layer selected from the group consisting of polyolefins, polyolefinethylene copolymers and ionomers of polyolefin, said protective layer covering said entire removable sector and projecting therebeyond but not being coextensive with said metal panel, each said composite container wall exhibiting thermally treated properties such that the strength of adhesive bond between said metal panel and said protective layer is greater than the tensile strength of said protective layer with the difference between said strength of adhesive bond and said tensile strength being such that said protective layer will upon score line severance elongate in regions disposed under said score line and fracture to produce feathering of about 0.002 to 0.010 inch, whereby severance of said score line will automatically establish a feathered shield continuously about the remaining score line portion raw edge.
2. The structure of claim 1 including said protective layer selected from the group consisting of polypropylene and a polypropylene-ethylene copolymer having an ethylene content of about 2-10 percent by weight, said protective layer being a film having a thickness of about 2.5 to 3.5 mils, and said protective layer is substantially continuous within the region underlying said removable sector and said region immediately outside of said score lines.

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