Aug. 20, 1968 B. B. LIPSKE 3,397,811

TEAR-OUT CAN END WITH ORGANIC INNER SEAL MEMBER

Filed April 17, 1967

FIG. 1

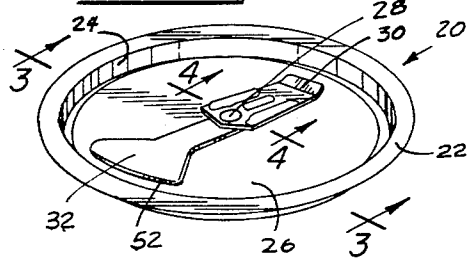


FIG. 2

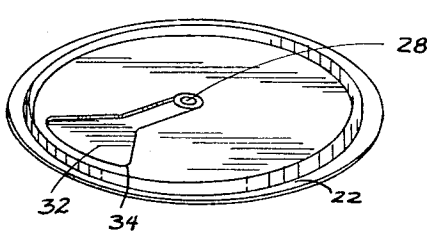


FIG. 3



FIG. 4

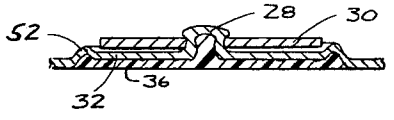


FIG. 5

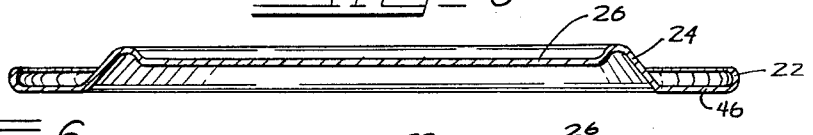


FIG. 6



FIG. 7



FIG. 8

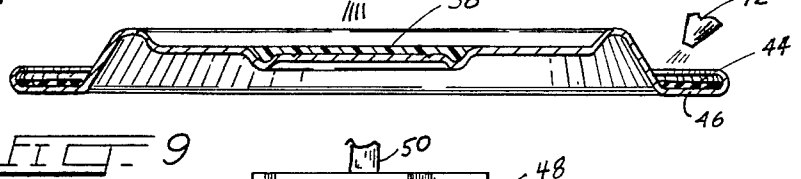
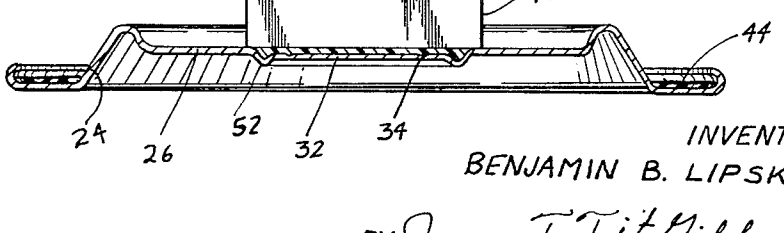


FIG. 9



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TEAR-OUT CAN END WITH ORGANIC INNER SEAL MEMBER

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13 Claims. (Cl. 220—54)

ABSTRACT OF THE DISCLOSURE

An easy opening can end in which a scored tear-out area is joined to a finger tab by means of a rivet which is integrally formed from the material comprising the can end, wherein the scored area is surrounded by a continuous, upwardly extending ridge, and wherein an area inside the ridge is covered with an organic plastic seal member which covers the entire area defined by the score line, including the portion of the end from which the rivet is formed. In the preferred embodiment, the score line is on the inside of the end, which is made from steel, and the entire tear-out area is in a plane slightly raised from the plane of the remainder of the end. A method is described for forming the ridges, metering a given amount of plastisol or like material in to the area, achieving gelation of the seal member, and further curing it if necessary, leaving an end with a smooth interior surface sealed against cracks or imperfections created by scoring and riveting during the manufacturing process.

BACKGROUND OF THE INVENTION

Field of the invention

The field of the present invention is that of easy opening can ends, particularly ends which include a scored tear-out area which is joined to an external tab, so that the user may grasp the tab and manually remove the tear-out area from the can end.

The preferred embodiment is one made from steel, having a score line on the inside, a tab attached to the tear tab by a rivet, and an inside area surrounding the tear-out portion covered with a plastisol seal. This invention is also in the field of methods of manufacturing such ends, namely inverting the end, drawing or embossing a boss from which a tear-out will be formed drawing a rivet from a portion of the tear-out area, attaching a tab to the rivet, filling the embossed area with a plastic sealing material, and curing it in place in the can end.

Thus, the field of the present invention is that of easy opening can ends made from tinplate or tin free steel, which are suitable for use with beer, beverages, and other comestible products.

Description of the prior art

Easy opening can ends made from aluminum are well known in the can art, as are easy opening ends of tinplated steel which include an aluminum tear-out portion crimped in place therein.

Easy opening ends of steel, whether tin plated or not, have been developed to a certain extent, but have not found broad commercial favor, because the scoring operation causes microscopic breaking of the tinplate coating and of the other coatings, typically organic varnish, lacquer or other plastic coatings, and when such cracks or flaws are present, the product reacts with the iron in the steel ends, whereby the beer or beverage contained in such can is rendered unpalatable or unfit for consumption.

When ends are made from aluminum, however, although the scoring damages them to some extent, the aluminum is less brittle and better able to withstand cracking, and furthermore, not only forms a relatively inert oxide but, when, and to the extent, it reacts with beer, does not produce the undesirable flavor and product contamination associated with the reaction between the iron and a beer or beverage product.

Accordingly, it has been known to protect vulnerable areas of aluminum easy opening beer and beverage ends by a so called "post repair" operation consisting of coating the end after manufacture with additional varnishes, waxes or the like.

Easy opening aluminum ends are described and claimed and methods for making them are described in U.S. Patents Nos. 3,191,564, 3,198,155, 3,191,797, all issued to E. C. Fraze.

Likewise, ends are known in which a separate removable foil seal member is attached to the outside of a steel end by means of a suitable adhesive, such structures being described in Henchert et al., Patent No. 3,251,515, and the Balocca Patent No. 3,302,818. These ends have many advantages in use, but production thereof is difficult, because thin tin foil of a type used to cover the opening is not yet commercially available, and is difficult to decorate, and because machinery has not yet been completely developed for high speed handling of such thin, delicate foils.

There has been a demand for a tinplate end which would combine the inherent advantages of steel, namely of economy, magnetic handling, capability, etc., and the reliability of aluminum units, and which could be made without greatly altering existing manufacturing techniques or calling for the adoption of new techniques.

Summary of the invention

In view of the shortcomings of the prior art devices referred to above, an object of the invention is to provide an all steel easy opening can end which is compatible with beer and beverage products.

Another object is to provide an easy opening end in which the regions adjacent the tear-out area are covered by a cured plastisol sealing material.

An additional object of the present invention is to provide a method whereby the cut, notched, or scored line can be impressed, cut, or formed on the inside of the end, for reasons which will be explained in detail hereinafter.

Another object of the present invention is to provide a steel easy opening can end which is acceptable for use in the beer and beverage field, and which has the advantages of being more economical than an aluminum end, which can be handled and recovered by magnetic means, and which possesses other advantages of steel ends referred in my copending application Ser. No. 458,932, filed May 26, 1965 now Patent No. 3,280,939.

An additional object of the invention is to provide a method of manufacturing a can end having the advantages referred to herein, which includes the steps of dispensing, forming, and curing a relatively thick plastisol seal in place on a portion of the inside of the end.

A still further object is to provide a method in which handling of the end during manufacture thereof is simplified.

The present invention overcomes the disadvantages of the prior art by providing an all steel easy opening end in which the score line is on the inside of the end, and in which a plastic seal covers the score and rivet areas, and is confined substantially thereto by ridges which surround the scored area, to protect the area, to serve as a guide member for localizing the seal, to facilitate the calibration of thickness thereof and to protect the user from cutting himself on the edges of the tear-out area.

These and other objects and advantages of the present invention, including those inherent therein, and the man-

ner of their attainment, will become more apparent when considered in conjunction with a description of the preferred embodiment of the invention contained in the following specification and claims, and as shown in the drawings below, in which like reference numerals denote corresponding parts throughout.

FIG. 1 is an isometric view showing the top portion of a can end made in accordance with the present invention.

FIG. 2 is an isometric view of the bottom portion of a can end, shown at an intermediate state of the manufacture thereof.

FIG. 3 is a vertical sectional view of the can end shown in FIG. 1, taken along lines 3—3 thereof.

FIG. 4 is an enlarged fragmentary vertical sectional view of a portion of the end shown in FIG. 1, taken along lines 4—4 thereof.

FIGS. 5 through 9 inclusive are vertical sectional views of an end of the present invention, showing various steps in the manufacture thereof.

Referring now to the drawings in greater detail, there is shown in FIG. 1 a can end **20** including an outer curl **22**, a countersink portion **24** and a principal end panel **26**. A rivet **28** is disposed centrally of the can end **20** and is adapted to hold a finger tab **30** joined to a tear-out portion **32** which is defined by a score line **34** in the principal portion **26** of the end **20**. The score line **34** is covered by a cured plastisol seal **36** (FIGS. 8 and 9), disposed on the bottom surface of the end **20**.

Methods of forming the rivet **28**, and methods for attachment thereto of the finger tab **30**, are well known in the can making art, and are illustrated, for example, in the Fraze Patents Nos. 3,198,155, issued Aug. 3, 1965, 3,191,564 issued June 29, 1965, 3,196,817, issued July 27, 1965, and 3,191,797 issued June 29, 1965. Formation of the rivet is partly shown and described in the Fraze Patent No. 3,191,564, in which, for example FIGS. 17, through 21 illustrate the formation of the rivet, FIG. 9 illustrates the scoring of the tear-out portion, FIGS. 10 and 11 show a typical tab adapted to be placed over the rivet, and FIGS. 26 through 29 show the method of forming a rivet. The resulting joint formed between the tab and rivet is claimed in the Fraze Patent No. 3,191,797, and a typical machine for performing this process and producing this product is shown in the Fraze Patent No. 3,196,817.

Thus, the steps in manufacturing such an easy opening end are known to those skilled in the can making and similar arts.

Although the teachings set forth in the patents just referred to are employed currently with respect to aluminum, they may also be applied to forming steel, subject to the difficulties referred to above, and referred to further herein, which difficulties are overcome by the present invention. The first steps of manufacturing an end according to the present invention are the same as those described in the above patents, with the exceptions specifically noted herein.

In the first embodiment of the invention, a can end **20** is manufactured according to the teachings of the patents referred to above, and, thereafter, the end is placed in the position shown in FIG. 7 hereof. Thereupon a metered mass of a liquid plastisol or like material **38** is deposited from a nozzle **40** on to the can end **20**. This may be done at the same time that a compound lining nozzle **42** deposits sealing compound **44** into the seaming panel **46** of the end **20**. Thereafter, the plastisol material **38** is shaped by the die **48** into the configuration desired, and a permanent set or shape is imparted to the material **38** under the influence of heat supplied thereto from the die holder **50** which is connected to a suitable electrical current or like heating source (not shown). In practice, it has been found that when about 225 milligrams of a plastisol material, of a type described below, is deposited and formed into a seal with a thickness of about 0.010 to 0.020, a time of about 2 seconds is sufficient to impart a "set" or state of gelation to this material when the die is operated at a temperature of about 300–325°

The operation of the nozzles **40** and **42** is well known in the can art, inasmuch as so called compound lining machines of this type have been used in the can industry for many years.

After a "set" has been imparted to the plastisol material **38**, forming it into an integrally bonded seal **36**, the plastisol may be further cured in a so called "Hurricane" dryer or the like, of a type well known in the can industry. A typical "post cure" such as this may approximate 30 to 50 seconds at up to 425° F.

A can end made according to the present invention may be made from a steel end, in view of the novel seal member, will possess good chemical resistance to corrosion, and is compatible with beer and beverage products, since the work damaged areas are completely covered with a thin but product-impermeable seal.

When the can end is opened, the plastisol seal **36** which is adhered equally strongly to the can end and to the tear out portion **32**, but which has relatively considerably less internal cohesive integrity, will separate along the score line **34**, and the plastisol remaining on the end in the areas of the score line **34** will serve to protect, to a certain extent, the raw metal edge thus formed. Thus, the likelihood of being cut by such raw edges is diminished, as compared to an end without such a seal.

In another preferred embodiment of the invention, the scoring line **34** defining the tear-out portion **32** is formed on the inside surface of the end **20**. This method presents two additional advantages over the construction in which the line **34** is on the outside. First the inner seal, which is otherwise still necessary, in view of the cracking of the inside tin and organic coatings which occur when even an outside score line is formed, can cover the damaged area, and second, the outside area needs no seal. When an aluminum end is made, the outside surface is scored. This method is satisfactory since aluminum does not corrode or oxidize objectionably in air, while product contact may be harmful, but the organic inside coatings are adequate in the case of aluminum.

In the case of a tinplated steel end, however, the steel substrate exposed when a score line is formed will rust when exposed to the air, thereby making an outside score line undesirable.

Thus, in the case of beer cans, an aluminum end is not damaged enough internally by exterior score line formation to necessitate a separate interior seal member, and a steel end is not damaged enough externally by inside score line formation to require a separate exterior seal. But since the interior seal is otherwise required in the case of a steel end, placing the score line on the inside eliminates the need for outside protection on this more economical end.

A third embodiment of the can end of the present invention, including the method of making it, is shown in FIGS. 5 through 9 of the drawings.

In this method, the can end to which a countersink **24** and a curl **22** have been imparted, is held by known means in the inverted position shown in FIG. 5.

Thereafter, an embossed or recessed tear-out portion **32** is formed by a suitable die or punch. The tear-out area **32** is defined by a ridge **52** which preferably totally surrounds the tear-out area **32**, including the portion containing the rivet **28**. The plane of the tear-out portion **32** is parallel to, but offset from, the principal end panel portion **26** of the end **20**. The direction of offset is downward as shown in FIG. 6, that is, upwardly extending in position of use, for reasons further set forth herein.

The next step is striking the area **32** defined by the ridge **52** with a scoring punch to form a score line **34**, in a manner known in the art, and described, for example, in the patents enumerated above.

During the tear-out portion- and score line-forming operations, a rivet **28** such as that shown in FIG. 4

may be formed, and a tab **30** attached thereto in the manner described above. Rivet formation and tab attachment are not discussed further herein, since, although these steps or elements are included in some embodiments of this invention, these elements are not novel in and of themselves.

FIG. 8 shows the nozzles **40**, **42** depositing the plastisol material **38** and compound liner **44** in the areas defined respectively by the ridge **52** and the seaming panel **46**. The compound liner **44** may be deposited at an earlier stage of manufacture in a conventional manner if desired. This step does not form a necessary part of the invention, but is described here because of the similarity of function between the liner nozzle **44** and the sealing material nozzle **40**.

After sufficient quantity of the plastisol **38** has been deposited, a vertically movable die support **50** moves a heated die **48** into the position shown in FIG. 9. In this manner, the plastisol is formed with one surface thereof roughly parallel to the principal end panel **26**, and the other surface is strongly adhered to the tear-out portion **32** and to the score line **34** and the ridge **52** defining same.

The distance between the inside surface of the tear-out portion **32** and the principal end panel **26** is about 0.010 to 0.020 inch in the preferred embodiment. The die **48** is suitably shaped to cover and overlap the marginal edges of the tear-out area **32** so as to wipe excess material **38** from the depression within the tear-out area **32** after which the material **38** may be hardened by conventional techniques. As pointed out above, a further oven drying step may be utilized.

It is preferred that the depth or height of the ridge **52** is about 0.020 to 0.050 inch, measured from the plane of the principal end panel **26**. The function of this ridge **52** is not only to help define the tear-out area **32** in the desired manner, but to provide protection for the can user from any sharp edges which may remain when the tear-out portion **32** is removed. A third function is to impart additional bending stiffness in the area of the end surrounding the tear out portion, to minimize the likelihood of accidental opening of the end by undue flexing. In addition, such ridges or bosses provide a residue of extensible metal which simplifies forming the rivet **28**.

The depth of the score line **34** is preferably such that the metal remaining underneath the score or cut is from about 0.0015 to 0.003 inch in thickness. Thus, in the case of an end made from so called 55 to 75 pound metal (.006 to .0085 inch thick), the score line may be anywhere from about 0.0045 to 0.0055 inch deep, depending on the temper, tensile strength and other structural characteristics of the steel from which the end is formed.

Referring now to the materials used for making the inner seal, it is preferred that a plastisol or like resinous material be used. Thus, in the case of a vinyl plastic, such as polyvinyl chloride, the resin may be in a form of a plastisol, that is, a colloidal dispersion of the resin in a plasticizer; in the form of an organosol; or in the form of a vinyl solution.

A typical plastisol material I have found suitable for use in this invention comprises a vinyl chloride resin, or vinyl chloride resin copolymerized with small amounts, say 5% or less, of vinyl acetate and/or vinyl alcohol. These resins are insoluble in, but dispersable in, typical plasticizers, such as dioctyl phthalate, dioctyl sebacate, diphenyl phosphate, tricresyl phosphate and the like. After the resin is dispersed in the plasticizer, it may be cured, as by heating to 350° F. or more, whereupon solvation of the resinous component takes place, and the resulting cured composition is in the form of a solvated plastic, that is, an organic glass, solid solution, or ultra-high viscosity fluid, being somewhat flexible, and having excellent adhesion to the primers or inner coating materials commonly used on such ends. Such typical interior end coating lacquers or enamels include tung oil or linseed oil based materials, epoxy phenolics, epoxy esters, vinyl chlorides, modified vinyls or copolymerized epoxy phenolic type synthetic resin coatings, selected with regard to product compatibility and resistance, and adherence to subsequent or prior coating materials.

It has also been found that a vinyl or other suitable plastics, such as a urethane, an acrylic or an ester or amide type resin may be used in the form of an organosol or, for example in a form of vinyl or other plastic solution. Where a solution is used or where the external phase of a dispersion has a low viscosity, the plastic material is more easily metered and levelled in the desired position, such as that shown in FIGS. 8 and 9, but additoinal curing time may be required because such material is in a lower state of cure. Solvents and diluents may be appropriately selected as desired by those skilled in the art.

In such cases, a longer curing time may be needed, but this is not critical where a turret type machine or the like is used, wherein several seconds of curing time are available.

Likewise, complete cure of the resin is not necessary as long as the seal has enough stiffness to maintain its integrity and remain tack-free during subsequent handling operations.

It will be understood that the exact type of resin or the curing mechanism thereof is not important provided that the material adheres strongly to the metal, and that it is inert with respect to the product. Preferably, its internal cohesive strength should be considerably less than the force of its adhesion to the metal substrate.

Likewise, for reasons of economics, it is desirable to confine the seal only to the area covering the tear-out portion of the end and slightly overlapping the outer edges thereof, but it is not strictly necessary that the tear-out portion **32** of the end **20** be offset from the principal end panel **26**. If the panels **26–32** are coplanar, the die **48**, instead of being flat on the bottom surface thereof, may have a recess of a shape corresponding to that of a tear-out area so as to form a seal of generally uniform thickness in such an area. The construction and operation of so called die liners of this type are well known in the can making art.

It is also possible to pre-form the seal from a vinyl plastisol, a polyethylene material, or the like, and fuse it in place with heat and pressure, but handling solid seal members is generally more difficult than handling the seal member material in the liquid form.

The hollow integral rivet **28**, shown, for example, in FIG. 4 hereof, is preferred for use in the present invention, but a separate rivet may be used, as for example the types of rivets described in my co-pending application Ser. No. 458,932, filed May 20, 1965. Likewise, the finger tab **30** may be attached by other known means if desired, such as by spot welding, soldering, or the like.

Likewise, in the case of an extruded can, the rivet may be integrally formed with the end, but will have a solid shank portion.

It is not essential that the score line **34** be on the inside surface of the can end but this construction is preferred for the reasons of corrosion resistance and the like set forth above.

As used herein, and in the claims the unmodified terms "internally," "externally," and "upwardly," and the like, indicate these directions in position of use of the finished can end when it is attached to the top of a container. Thus, "upwardly" and "externally" means the bottom surfaces of the ends as shown in FIGS. 5 through 9 inclusive, for example.

It will thus be seen, from the above description, and from the appended claims, taken in conjunction with the drawings, that the present invention provides a new and useful tear-out can end with an organic inner seal member having a number of novel advantages and character-

istics, including those hereinbefore pointed out and others which are inherent therein. I contemplate that certain changes and variations may be made by those skilled in the art without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. An easy opening can end, including means on the outside peripheral edge thereof, adapted to be seamed to the end portion of a container body including:
   (a) a principal end panel portion,
   (b) a score line located in said end panel portion, and defining a tear-out portion adapted to be torn from said principal end portion, said tear-out portion having an area substantially less than one half of the area of said principal end portion,
   (c) fastening means located inside said tear-out portion for attaching a finger tab to said tear-out portion,
   (d) a finger tab attached to said fastening means, and
   (e) a seal member on the inner surface of said end panel, said inner seal member comprising a synthetic plastic resinous material, said seal member completely covering said tear-out portion and having its outer edge portions extending slightly outwardly of said score line defining said tear-out portion.

2. An easy opening can end as defined in claim 1 in which said score line is on the inside surface of said can end.

3. An easy opening can end as defined in claim 1 in which said tear-out portion is in a plane which is parallel to, but offset from, the plane of said principal end portion, and extends somewhat outwardly therefrom in position of use.

4. An easy opening can end as defined in claim 1 in which said fastening means comprises a rivet with a hollow shank, integrally formed from the material comprising said can end.

5. An easy opening can end as defined in claim 1 in which said fastening means comprises a rivet with a solid shank integrally formed from the material comprising said can end.

6. An easy opening can end as defined in claim 1 in which said seal member comprises a vinyl plastisol material.

7. An easy opening can end as defined in claim 1 which additionally includes a protective ridge closely adjacent and outside said score line, said ridge extending axially outwardly of the said tear-out area in a normal position of use.

8. An easy opening can end as defined in claim 1 in which said seal has a thickness of about .005 to .030 inch.

9. An easy opening can end as defined in claim 1 in which said seal member is substantially coplanar with the inside surface of said principal end portion.

10. An easy opening can end as defined in claim 3 in which the amount of said offset is from about 0.005 to about 0.030 inch.

11. A method for making an easy opening can end, comprising, in combination,
   (a) forming a can end, including a principal end panel portion and flange means adapted to be seamed to the end of a container body,
   (b) embossing a portion of said principal end portion to form a shallow recessed area therein, said recessed area having a panel parallel to, but spaced apart, from the plane of said principal end portion,
   (c) forming a score line in at least a portion of the recessed area thus formed, said score line defining a tear-out portion which is easily separable from the principal end panel portion of said end,
   (d) attaching finger tab means to a part of said tear-out portion, and
   (e) completely covering and sealing said recessed area, including all of said tear-out portion, with a resinous organic material, thereby forming an easy opening can end with an organic seal member on the inner surface thereof.

12. A method as defined in claim 11 in which the method of covering and sealing said recessed area comprises depositing a liquid resinous material in said recessed area to completely cover said tear-out portion of said end, and curing said resinous material to form a seal member which is strongly adhered to the metal comprising said end.

13. A method for making an easy opening can end as defined in claim 11 in which said score line is formed on the interior surface of said recessed area.

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