Aug. 23, 1966 G. G. KAMM 3,268,344

CONTAINER AND PACKAGE UTILIZING THE SAME

Filed Jan. 19, 1965

Fig. 1.

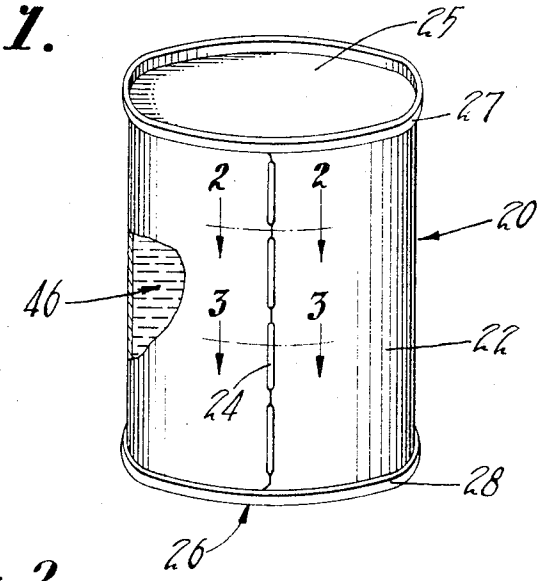


Fig. 2.

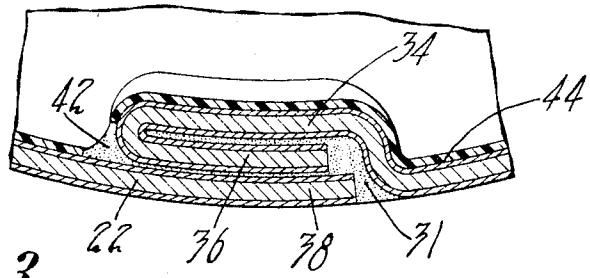
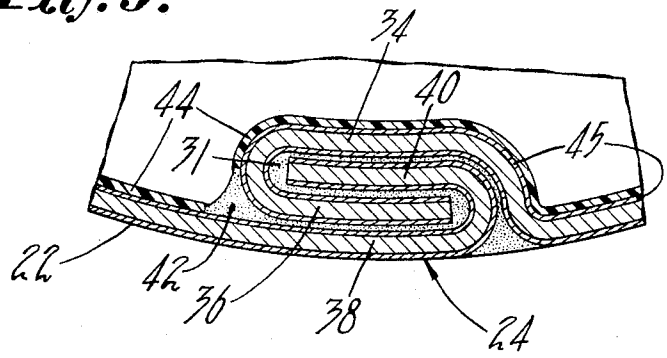


Fig. 3.



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3,268,344 CONTAINER AND PACKAGE UTILIZING THE SAME

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7 Claims. (Cl. 99—181)

This application is a continuation-in-part of my copending application Serial No. 246,908, filed December 26, 1962, now abandoned.

This invention relates to an enameled tinplate container having a particular construction to prevent undesirable redox reaction between the metal of the container and certain relatively corrosive products packed therein, and to a package including this container and these products. More specifically it relates to an enameled tinplate container having a particular soldered side seam to substantially inhibit if not obviate chemical attack upon the steel base metal of the can by the product and the undesirable results of such an attack.

The products for which the can construction of the instant invention has primary utility as a container are those subject to tannate discoloration such as asparagus, green beans, okra, cranberries and the like, and tomato products, particularly tomato paste, and prunes. While the complex chemical composition of each of these products may and very probably does differ, each is considered to have a relatively high degree of corrosivity with respect to a tinplate can in which they are packed. Further, the general nature of the attack on the metal of the can with each of these products is substantially the same. Each of these products is capable of attacking both the tin and steel of the tinplate can directly. When sufficient tin is exposed to the product, it acts as a sacrificial anode and provides cathodic protection to the steel thereby preventing direct attack of the steel by the product. However, concurrently with the cathodic protection of the steel by the tin causing it to go into solution, the product is directly attacking and dissolving the tin exposed. In most instances, the direct attack of the tin overshadows the galvanic corrosion resulting from the tin-steel couple action. This direct attack on the tin proceeds at a rate which is a function of the surface area of tin exposed; and even with the surface tin coating weights commercially available, the rapid detinning of the interior surface of the can takes place in too short a time period to make a plain tinplate can wholly acceptable for the commercial packaging and marketing of these products.

Rapid, uneven detinning exposing areas of tin-iron alloy results in an unsightly appearance, even before all of the tin has been corroded from the plate surface.

By the time the tin is essentially all removed from the steel base metal, the product is attacking the steel itself. Such a direct attack upon the steel leads to an exceedingly unsightly appearance on the interior of the can, and hydrogen swells or perforations of the can side wall if it is allowed to proceed long enough. In the case of products susceptible to tannate discoloration, the ferrous ions released into the product, through a complex chemical reaction, cause a darkening or blackening of the product itself upon exposure to the air after opening. In other words, the package including a plain tinplate can enclosing one of the products enumerated above, in most instances, would be completely unmarketable within the time period needed to pack, warehouse, distribute and retail the package.

It is therefore an object of the instant invention to provide a tinplate can having a novel side seam construction which eliminates the problems set forth above.

Another object is to provide a tinplate can for the packaging of relatively highly corrosive products wherein the resulting package has a commercially acceptable shelf life.

Yet another object is to provide a tinplate can which simply and efficiently inhibits undesirable redox reactions between the metal of the can and the product packed therein.

Still a further object is to provide a package having a long shelf life with no undesirable chemical inter-reaction between a packed product and the metal of the can when the product has a relatively highly corrosive character in relation to the can metal.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

The above objects are accomplished by providing a tinplate can having an organic coating or enamel over substantially the entire interior surface thereof and having its longitudinally extending side seam bonded and hermetically sealed by means of pure tin soft solder wherein the tin solder forms a fillet of appreciable size along the side seam on the inside of the can and is exposed to a relatively highly corrosive product packed in the can.

Referring to the drawings:

FIG. 1 is a perspective view of a sheet metal can with a portion thereof broken away, exposing the interior of the can;

FIG. 2 is an enlarged fragmentary sectional view taken substantially along lines **2**—**2** in FIG. 1; and

FIG. 3 is an enlarged fragmentary sectional view taken substantially along lines **3**—**3** in FIG. 1.

As a preferred or exemplary embodiment of the instant invention, FIG. 1 illustrates a hermetically sealed metal container, generally designated **20**, having a body **22** with a longitudinally extending vented side seam **24**. The body **22** is closed by upper and lower ends **25**, **26**, respectively, which are made integral with the body **22** by any suitable means such as upper and lower double-seams **27**, **28** respectively. U.S. Patent No. 2,064,537, describes a type of container suitable for this invention.

Prior to the attachment of either end **25** or **26**, the side seam **24** of the body **22** is hermetically sealed by being filled with substantially pure tin solder **31**, which is applied from the outside of the container **20**, in a manner well known in the art.

In the three-thickness zone (FIG. 2), the solder flows in between a body wall part **34** and a hook **36** and also in between the outer surface of the latter and the outside body wall **38**. It also flows laterally into the four-thickness zone (see FIG. 3). The three thicknesses of metal are thus firmly united. There is a venting of the side seam, air or gases within the seam escaping ahead of the solder flow and into the interior of the can body by way of the space between the adjacent parts **36**, **38**. This insures a thoroughly sweated side seam in all sections.

In the four-thickness zone of the side seam (FIG. 3), the solder **31** flows in over the can wall which is adjacent to and directly under the hook **36**, this part of the seam being the portion pressed in during formation of the seam **24** and being designated by the numeral **34**. This much of the solder **31** is under the inner or upper face of a hook **40** and joins the adjacent parts **34**, **40**. The solder then flows around the end of the hook **40** and in between the lower wall thereof and the upper face of the longitudinal hook **36**, thus joining the adjacent parts **36**, **40**. Solder also flows in between the outside body wall adjacent its edge (designated by the numerals **38**) and the outer or lower surface of the hook **36**. This solder mostly

enters through the point where the three-thickness and the four-thickness zones meet and spreads in both directions longitudinally of the seam from the opposite edges of the hooks **40** toward the middle of these hooks. Thus all four thicknesses of the metal making up the four-thickness zone of the sides seam are united by solder.

The solder **31** flows inwardly, uniting the parts of the side seam **24** and continues flowing until it forms a relatively large fillet **42**, extending longitudinally along the interior of the container **20** at the juncture of the side seam **24** and the body wall **43**. A coating of resin **44** which has been applied to the sheet metal prior to formation of the body **22**, does not cover the molten solder **31** as it forms the fillet **42**. However, this barrier layer of resin **44** lies over a layer of tin **45** and thereby covers the metallic container body **22** throughout the interior of the container **20**, except for the area covered by the substantially pure tin fillet **42** along the body interior adjacent the side seam **24**.

The solder fillet **42**, which is composed of substantially pure tin, rather than a solder alloy composition of 3% tin and 97% lead usually used in can side seams, is of sufficient size to provide cathodic protection for any base steel exposed to the product such as at the can side seam or through imperfections in the resin coating **44** and underlying tin coating **45**. Further, direct attack on the tin is substantially confined to the fillet **42** which, in comparison to the tin coating **45**, has a very high ratio of thickness to exposed surface area thereby maintaining the rate of direct attack on the tin at an acceptably low level. In order to provide this protection, the fillet **42** has a transverse width of about 0.3 to 1 mm. and a depth or thickness measured in the direction from its exposed surface towards the side seam folds of about 0.3 mm. A larger fillet will not extend the desired protection to warrant the additional material cost, although the larger fillet is not objectionable from a functional standpoint.

The instant construction permits packaging of the relatively highly corrosive products specified herein with a relatively low interior tin coating weight, e.g. the surface tin coating over the substrate steel can be reduced from 1.35 lbs. per base box, i.e. No. 135 tin plate, to as low as 0.25 lb. per base box, i.e. No. 25 tin plate. This is possible because in the subject construction, unlike the prior art, the surface tin coating **45** is not subjected to direct attack by the product nor is it the primary source of cathodic protection for the steel since it is covered substantially completely by the resin coating **44**. The primary source of cathodic protection is, of course, the fillet **42**, and is only relatively slightly attacked directly by the product due to its relatively small exposed surface area.

Within the container **20** is the product **46**. The product **46** is a comestible and, as pointed out previously, is relatively highly corrosive to the metal of the can **20**. Among the comestible products **46** within the purview of the instant invention are tannate-containing products such as asparagus, green beans, okra and cranberries; tomato products such as tomatoes, tomato puree and tomato paste; and prunes. After filling the product **46** into the container comprising the body **22** and one end closure, either **25** or **26**, the opposite end closure is secured to the body **22** by a well-known doubleseaming operation so that the product **46** is then hermetically sealed within the can **20**.

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 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 container for packaging a relatively corrosive comestible which directly attacks both tin and steel comprising:

a tubular tinplate metal body closed at one end and open at its opposite end;

said body having a longitudinally extending side seam substantially filled and hermetically sealed with substantially pure tin solder;

said solder extending inwardly of said side seam to form a fillet having a transverse width of at least about 0.3 mm. and a depth of at least about 0.3 mm. along said side seam on the interior of the body at the juncture of said side seam and the side wall of said body;

the entire interior surface of said body and end closure, except for said fillet, being covered with a resin coating;

said fillet having a substantially larger ratio of thickness to exposed surface area than the interior tinplating on said body prior to the coating thereof with said resin whereby cathodic protection of the substrate steel is provided by said fillet and direct attack on the tin and steel of said container by said comestible is confined essentially to said fillet.

2. The container set forth in claim **1** wherein said fillet has a transverse width of about 0.3 to 1 mm. and a depth of about 0.3 mm.

3. The container set forth in claim **2** wherein said tinplating thickness is less than No. 135 tinplate.

4. The container set forth in claim **3** wherein said tinplating thickness is No. 25 tinplate.

5. A package comprising a container and a relatively corrosive comestible therein which directly attacks both tin and steel;

said container comprising a tubular tinplate body hermetically closed and sealed at each end;

said body having a longitudinally extending side seam substantially filled and hermetically sealed with a substantially pure tin solder;

the entire interior surface of said body and end closures, except for said fillet, being covered with a resin coating;

said fillet having a substantially larger ratio of thickness to exposed surface area than the interior tinplating on said body prior to the coating thereof with said resin whereby cathodic protection of the substrate steel is provided by said fillet and direct attack on the tin and steel of said container by said comestible is confined essentially to said fillet.

6. The package set forth in claim **5** wherein said comestible is selected from the group consisting of okra, cranberries, asparagus, green beans, tomato products and prunes.

7. The package set forth in claim **6** wherein said comestible is tomato paste.

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