Nov. 12, 1946. O. J. BRUUN 2,411,024

METHOD OF PRODUCING COLLAPSIBLE TIN COATED METAL TUBE CONTAINERS

Filed Feb. 27, 1943

FIG. 1.

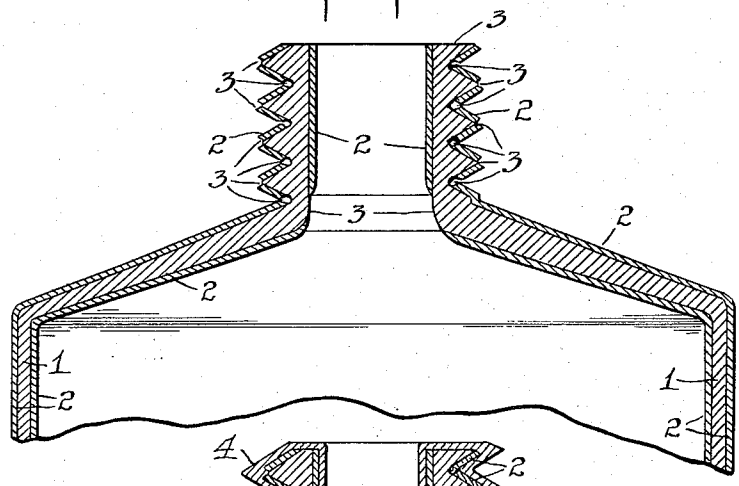


FIG. 2.

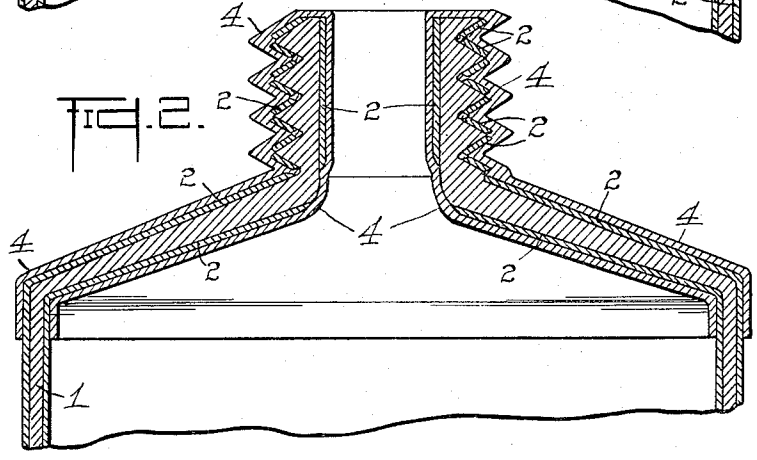
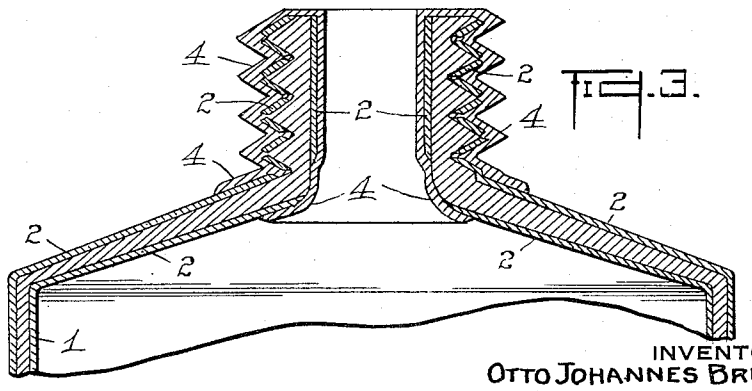


FIG. 3.



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METHOD OF PRODUCING COLLAPSIBLE TIN COATED METAL TUBE CONTAINERS

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Application February 27, 1943, Serial No. 477,429
In Great Britain July 31, 1942

1 Claim. (Cl. 29—148.2)

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This invention relates to a method of producing collapsible tubular metal containers.

Such containers are usually made by rolling a billet of soft metal to a strip of suitable thickness, punching out blanks therefrom and extruding these blanks by one blow in a powerful press into an integral container comprising a tubular skirt, an inturned shoulder at one end thereof and a dispensing spout extending from the middle of said shoulder.

To provide a non-corrodible and non-toxic container for such substances as dentifrice, shaving cream and medicinal ointments the tubes were normally made from substantially pure tin or in some instances aluminium. In order to economise in the use of expensive metals or such as are in short supply it is known to make bi-metallic tubes of a cheaper or more abundant, though in itself less satisfactory, metal with a coating of a second protective metal.

Such bi-metallic tubes are made by plating a first metal with a layer of a second metal by any suitable method prior to the extrusion process either in the state of a cast billet or a blank, and subsequently extruding the plated blank into a container thereby relying on the ability of the layer of second metal to be squirted out in complete unity with the core of the first metal so that it will cover such areas of the container which correspond to the plated portions of the blank.

The best known of such collapsible bi-metallic containers are the tin-coated lead tubes which are used as substitutes for all-tin tubes but which for several reasons have failed to give satisfaction. These tubes are usually made by cladding a billet of lead with a layer of tin foil in the rolling process, punching out blanks from the rolled bi-metallic strip thus formed and extruding these blanks into containers.

The protective coating formed upon a container by these methods has invariably been found to be discontinuous and porous, and attempts to improve the quality by increasing the thickness of the second metal have proved unsuccessful and rather tended to increase the discontinuity, which is probably due to the differences in physical properties of the two metals, so that they fail to completely follow one another during the extreme and rapid deformation in the extrusion process, which takes place in a fraction of a second.

The continuity of the coating is still further impaired subsequently to the extrusion process by the threading, trimming and perforating of the spout, which operations result in the removal

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of portions of the coating and the consequent exposure of core metal.

Furthermore the tin coating is usually damaged at the inside of the nozzle by the mandrel which supports the tube during the threading and trimming process which has a sharp point designed to cut into the tube metal so as to hold the tube in a fixed position.

The presence of pores, cracks and voids in the protective coating may be highly objectionable, as it may give rise to corrosion and electro-chemical attacks leading to contamination of the tube contents.

The exposure of core metal, particularly of lead, is specially harmful at the spout region, due to the accelerated corrosive action in the presence of atmospheric air and to the abrasive effect of the closure cap. Moreover, contamination of the spout region will affect the entire contents of the tube as this is gradually being expelled through the spout.

It is noteworthy that even defects in the protective coating on the outside of the nozzle, which are almost always present in a high degree due to the threading of the nozzle, may affect the contents of the tube due to capillary action and to spreading of substance over these regions during the use of the tube.

It has been found that a tincoated lead tube is an almost perfect substitute for an all tin tube despite any presence of minor defects or porosity of the tincoating on the inside of the tube body provided that only the tin coating of the nozzle portion over its entire surface inside and outside comprising the threaded area is completely homogeneous and free from porosity.

One object of the present invention in its widest aspect is to provide a method of making extruded metal tubular containers with protective metal coatings which are non-porous and free from discontinuity at the spout and—if so desired—adjacent areas of the tube.

The invention comprises first the application of a coating of a second metal to the first metal by any useful method such as dipping, electroplating or cladding at any stage of manufacture prior to the extrusion and subsequently after extrusion, threading, trimming and perforating, superimposing a second layer of metal on the spout and, if desired, adjacent areas of the extruded container by electro-deposition so that it covers the entire inside and outside surface of the spout. This additional layer of metal may be of the same kind as the first coating or it may be of any other suitable metal.

This combination of two plating processes prior to and after extrusion respectively, produces the desired result in a simple, cheap and effective manner. The post extrusion superimposed metal layer at the spout region fills out any pores and cracks in the original coating caused in the extrusion process and covers all areas of core metal exposed in the threading, trimming and perforating processes.

In the case of tin-coated lead tubes I obtain the best results by cladding a lead billet with tinfoil in the rolling process, punching out blanks from the bi-metallic strip thus formed, extruding these blanks into containers, threading, trimming and perforating the spouts of the containers and subsequently superimposing a second layer of tin by electrodeposition at the inside and outside of the spout and adjacent areas.

This combination of tin plating first by the cladding process prior to extrusion and secondly by electrodeposition after extrusion has proved particularly satisfactory as a protective coating on a lead core. I have found that the superimposing of a tin layer of only .0002" thickness, in a sodium stannate plating bath, on the previously tinclad spout produces a completely nonporous and homogeneous cover. As alternative metals for electro-plating the spout of tincoated lead tubes I would mention silver and nickel.

In addition to filling of porosities and covering of exposed areas of core metal the superimposed metal layer has the beneficial effect of increasing the thickness and mechanical strength of the protective coating at the spout area where the tube is exposed to abrasion by the screw closure and other attacks from outside, a result which could not have been achieved by any increase in the thickness of the original coating.

In carrying my invention into effect the post-extrusion electroplating would normally be performed as described after the nozzle has been trimmed and threaded but it may under circumstances be preferred to perform the threading after the electroplating which would be feasible if the threading is done by pressing or rolling without damaging the protective coating.

Contrary to what might be expected I have found that the superimposing of a layer of tin on the spout region of an extruded tincoated lead tube may result in a substantial saving in the total amount of tin required in the manufacture of the tube, because, owing to the improvement in the protection of the spout area it will be possible to reduce the thickness of the tincoating over the interior surface of the tube. Ordinarily the thickness of the layer on the outside surface of the tube is 0.0001 of an inch and that on the inside surface is 0.0002 of an inch. In accordance with my invention it is possible safely to reduce the thickness of the layer on the inside surface to 0.0001 of an inch. The thickness of the superimposed layer on the spout area may be about .0002 of an inch.

Therefore, taking a tube size 1¼ inches by 6 inches as an example, the position would be as follows, one unit of tin being assumed to be 0.0001 of an inch over an area of one square inch:

Outside surface of tube approximately 24 square inches.

Inside surface of tube approximately 24 square inches.

Normal layer of tin on outside surface, 0.0001 of an inch thick=24 units of tin.

Normal layer of tin on inside surface, 0.0002 of an inch thick=48 units of tin.

Total of tin normally required=24+48=72 units of tin.

Spout area on which superimposed layer may be applied, including inside and outside and comprising shoulder and small part of skirt=4 square inches. Layer of tin on outside surface according to present invention may be 0.0001 of an inch thick=24 units of tin.

Layer of tin on inside surface according to present invention may be 0.0001 of an inch=24 units of tin.

Superimposed layer of tin on spout area, according to present embodiment of invention, may be 0.0002 of an inch thick=8 units of tin.

Total of tin which may be required in accordance with invention=24+24+8=56 units of tin.

Saving=72—56=16 units of tin=22.2%.

The reference to any metal does not necessarily refer to such metal in its pure state but may comprise alloys of which the particular metal is the principal constituent.

In order that the invention may be more clearly understood I refer to the accompanying drawings, wherein:

Figure 1 is a sectional elevation of the upper portion of a bimetal extruded tubular container subsequently to the threading, trimming and perforating of the nozzle.

Figure 2 is a similar view of the same after the second layer has been electrodeposited.

Figure 3 is a similar view of Figure 2, the region of the electrodeposition being more restricted.

Referring to Figure 1 the reference 1 designates the core of the container and the reference 2 the protective layer which, in the usual way has been extruded together with the core. The threading, trimming and perforating of the nozzle has been effected in the usual way, and places at 3 are shown where the layer 2 has been removed or cracked, thereby exposing the core metal 1. In addition there would probably be pores in the layer 2 which are too small to be illustrated. It will be seen that the core metal 1 is exposed at the face of the nozzle and in places over the screw threaded portion, and also in places at the lower end of the nozzle orifice, these last bare places being assumed to be caused by the holding tool which supports the tube during the threading and trimming operations.

Figure 2 shows the same container after the second layer 4 has been electrodeposited, thereby covering the places 3 and filling the pores preventing exposure of the core metal. In this figure the layer 4 is shown as extending over the whole of the shoulder and the upper part of the cylindrical skirt.

Figure 3 is the same as Figure 2 except that the layer 4 extends only over the nozzle proper.

The electroplating is effected by immersing the nozzle ends of the containers into the plating solution to the depth required. The containers act as cathodes and the process lends itself well to mass production on a large scale.

What I claim and desire to secure by Letters Patent is:

The method of producing a collapsible tin coated metal tube container with an integral spout, which comprises extruding the container and spout from a tin coated lead blank so that a tin coating is formed on both the inside and the outside, and subsequently superimposing a furtner layer of substantially non-toxic and noncorrodible metal on the inside and outside of only the spout region by electro deposition.

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