Oct. 24, 1961 W. E. RISCH 3,005,433

CLOSURE CAP AND METHOD OF MAKING SAME

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Fig. 1.

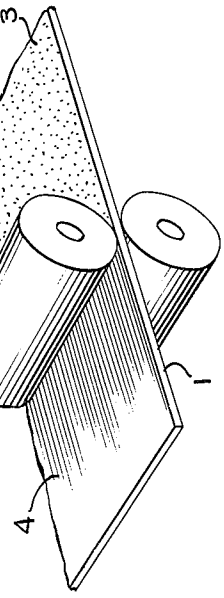


Fig. 2.

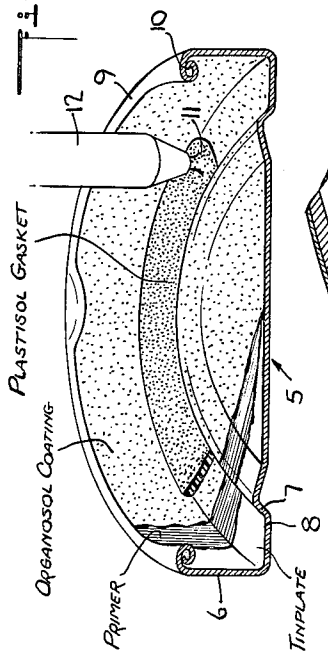
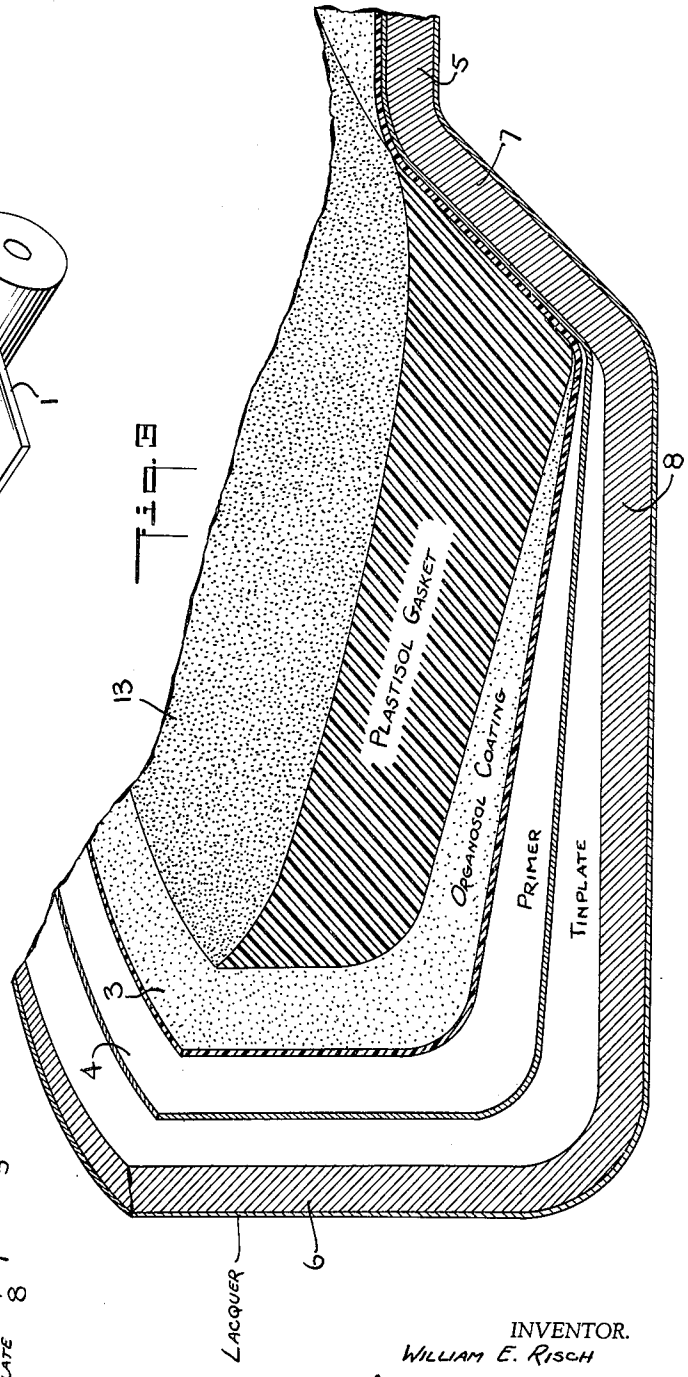


Fig. 3



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CLOSURE CAP AND METHOD OF MAKING SAME

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1 Claim. (Cl. 113—121)

The present invention relates to a closure cap and more particularly to an improved closure cap, method of making, and a sealed package which minimize or prevent chemical and electrolytic attack and the corrosion resulting therefrom and which prevents perforations of the metal due to attacks concentrated on small areas.

Closure caps are utilized in large quantities for sealing containers for various types of products. These closures have coatings applied to the inside to protect the metal, which is ordinarily tin plate. The coatings for such closures are subject to solvation and degradation and frequently fail to protect the sheet metal forming the closure from corrosion attacks. Such failures may occur as a result of loss of adhesion between the material forming the sealing gasket and the coating on the metal. The plasticizer used in the gasket may migrate into the coating and cause degradation. The interface of the metal surface and the primer thereon may also be affected.

The exposure of the base metal is usually occasioned by pockets formed at the inner edge of the sealing gasket. When small portions of the inner edge of the sealing gasket separate or become raised from the corrosion resistant undercoating, they not only tend to form small pockets where corrosion can occur, but they also impair the undercoating by carrying with the raised portion of the gasket small areas of the undercoating or by weakening small areas of the undercoating if they are not carried upward with the raised portion. The corrosion attack is concentrated upon these relatively small areas of uncoated metal and upon small areas of metal with impaired coatings and rapid electrolytic or chemical attack may result. A small area of exposed metal or a small area of a metal with an impaired coating may become anodic and result in a concentrated electrolytic attack. Separation of the inner edge of the sealing gasket from the main coating is dangerous, both because it impairs or removes a small area of undercoating and because the separation forms pockets just under the inner edge of the gasket where oxygen concentration cells tend to collect. Such oxygen concentration cells confined in a small area concentrate corrosion and tend to perforate the closure.

The present invention overcomes the above objections and provides an adhesive inner face bond which will accept a certain degree of migration of a plasticizer and thereby gains excellent adhesion with the compound utilized as the annular gasket engaging and forming a seal on the rim of the container. The adhesive face bond serves as a barrier to any further migration and thereby preserves the inherent character of the corrosion-resistant material.

An object of the present invention is to provide an improved closure which minimizes exposure of small areas of the metal thereon and the resulting corrosion.

Another object of the present invention is to minimize or prevent pinholing of closures of sealed packages resulting from electrolytic and chemical attack on small areas thereof.

Another object of the invention is to prevent the inner edge of the sealing gasket from loosening and forming objectionable pockets or cavities.

Another object of the invention is to provide a thin coating of material bonded to the inside of the closure and a gasket of similar material bonded or fused to the thin coating.

Another object of the invention is to utilize the same general composition for the coating as for the gasket, with the coating material thinned by a solvent so that the two may be fused together by heat.

Another object of the invention is to provide an improved sealed package.

Another object of the invention is to provide an improved method of making the closure.

A further object of the invention is to provide an improved method of making the closure which reduces the cost thereof.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claim, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is a perspective view showing a coating being applied to a sheet of metal, such as tinplate;

FIG. 2 is a perspective sectional view showing a gasket being flowed into a closure cap and also showing the different coatings used to form a secure bond between the metal, the coating, and the gasket; and

FIG. 3 is an exaggerated sectional perspective view showing the relationship between the sealing gasket and the coatings bonded to the metal of the closure cap.

A preferred embodiment of the invention will be described and illustrated in connection with coating materials such as organosols and sealing materials or compounds such as plastisols, it being understood that these are given for illustrative purposes and that this invention is defined in the claim and is not limited to these preferred materials.

Organosols are well known and are utilized as coatings in the textile field. Plastisols are also well known and are utilized for gaskets in closure caps. The general compositions of organosols and plastisols are given in Rubber Age, vol. 67, No. 5, August 1950, at pages 553 to 560.

Generally, a plastisol is made of resin pastes comprising polyvinyl chloride or vinyl copolymers in a plasticizer. Such plastisols will remain in a semi-liquid or pasty condition until they are heated sufficiently to permit the plasticizer to be diffused throughout the resin paste to form a rubber-like compound. This process is called "fluxing."

An organosol is generally of the same composition as a plastisol except that a solvent is added as a thinner to permit the organosol to be easily spread to serve as a coating.

Referring more particularly to FIG. 1 of the drawings, a sheet of metal 1, such as tinplate, is first coated with a primer coating 4 to permit a more secure bond between the tinplate and the organosol coating 3. This primer coating 4 may be the ordinary type of lacquer or enamel used for protecting closures against corrosion. Usually both sides of the tinplate are coated with lacquer to prevent corrosion of the tinplate. One such primer which may be used is a so-called "T-Buff" which comprises an epoxy-phenolic type primer and a modified vinyl type buff coating, however, other primers may also be used if desired. The tinplate with the primer coating is baked in an oven at temperatures of about 310° F. to bond the primer securely to the tinplate.

The tinplate 1 with the primer coating thereon is then passed beneath a roller 2 which is adapted to apply a coating of organosol 3 on the sheet of tinplate 1 over the primer coating. The organosol may be applied to the roller 2 by any well-known or conventional means such

as an offset roller (not shown). The roller **2** applies the organosol **3** to the tinplate **1** and spreads the organosol coating thinly over the primer coating. It has been found that organosol thicknesses of between .0005" and .002" will give a good bond between the organosol and a plastisol gasket to be subsequently applied to protect the sheet metal from attack by the product. Excellent results have been obtained with a coating thickness of .00075" but other thicknesses may be utilized.

After the tinplate is coated with the organosol coating **3**, it is preferably heated to temperatures of between 350° F. and 360° F. for about twelve minutes. Typical oven cycles which give good results are:

350° F.—5 minutes
360° F.—5 minutes
360° F.—2 minutes

This will evaporate the solvent in the organosol coating and will cure the organosol to permit it to become securely bonded to the lacquer coated metal.

The strip of tinplate **1** with its organosol coating is thereafter shaped by suitable machinery into a closure, such as that shown in FIG. 2, comprising a cover portion **5** and a depending skirt portion **6**. The cover portion **5** has a downwardly directed shoulder **7** formed therein in spaced relation to the skirt portion **6** to provide a gasket-receiving channel **8** in the cover. The edge of the skirt portion **6** is curled into the bead **9** from which a plurality of retaining lugs **10** are formed to lock the cap on the container. While the closure illustrated in the drawings is a so-called "hidden lug" screw cap, it will be understood that the present invention may be used in connection with other types of closures, such as a continuous thread type cap, a press-on closure, etc.

After the closure is formed it is placed on a rotating chuck (not shown) and a plastisol **11** flows from a nozzle **12** into the gasket-receiving channel **8** to form a gasket **13**. In order to permit the plastisol **11** to flow freely, it is thoroughly stirred previous to using and maintained at a temperature of between 90° and 100° F. during use which is sufficient to maintain it in a semi-liquid condition but not sufficient to flux the plastisol. The plastisol **11** is applied until it fills the gasket-receiving channel or until a gasket of the desired thickness and width is provided.

After the plastisol has been flowed into the gasket-receiving channel, the closure is conveyed to ovens which heat it to temperatures of between 350° to 390° F. in order to flux the plastisol into a rubber-like sealing gasket and to cause the plastisol gasket to fuse or blend with the organosol coating to form a secure bond between the two. The following oven cycles have been found to give good results:

350° F. for 3.5 minutes
390° F. for 2.0 minutes

However, other oven cycles may also be used.

As shown in FIG. 3, the primer coating, for example the T-Buff coating, is bonded to the tinplate and the organosol coating is securely adhered to the primer coating. The plastisol gasket is fused to the organosol coating which prevents separation between the inner edge of the plastisol gasket and the organosol coating. It is believed that the plastisol gasket and the organosol coating fuse into a securely bonded integral element which is bonded to the sheet metal of the closure to provide a protective coating over the entire underside of the metal. This coating prevents electrolytic or chemical attack on small portions of the sheet metal and also prevents the inner edge of the plastisol gasket from separating from the closure and forming pockets which would serve to harbor oxygen concentration cells tending to corrode and perforate the closure.

The organosol coating will satisfactorily protect the sheet metal against corrosion and perforation even with products such as pickles which have an unusual tendency to react chemically or electro-chemically with the metal of the closure.

While any of the well-known compositions for plastisols and organosols may be used in practicing the present invention, the following are examples of some compositions which have been found to give good results:

ORGANOSOL COMPOSITIONS

Ingredients	Parts by Weight			
	#1	#2	#3	#4
Geon 121	100	100	100	100
Dioctyl Phthalate	80	80	80	80
Paraplex G–62	5	5	5	5
Titanium Dioxide	5		5	5
Paraffin, M.P. 130° F			2	
Silicone Fluid				2
Mineral Spirits	10	10	10	10

PLASTISOL COMPOSITIONS

Geon 121	100	60	60	100
Geon 202		40	40	
Dioctyl Phthalate	80	70		80
Paraplex G–62	5	5	60	5
Dibutyl Sebacate			30	
Titanium Dioxide	5	5	5	5
Paraffin Wax, M.P. 130° F	4			
Stearic Acid				3

Geon is a generic trademark of products sold by B. F. Goodrich Chemical Company and designates a polyvinyl chloride resin composition utilizing a conventional emulsifier. Paraplex G–62 is the trademark of a product sold by Rohm and Haas Company and designates an epoxy type plasticizer. The titanium dioxide is used primarily as a coloring agent.

The silicone fluid may be the one made by Dow Corning Corporation and identified as its Fluid No. 200 and known chemically as dimethyl polysiloxane. The mineral spirits may be the type sold by the Standard Oil Company of New Jersey under the trade name Varsol which is a product of crude petroleum distillation with a boiling range between 300° F. and 400° F. and known as heavy naphtha.

It will be understood that the above formulas and the specific ingredients are given as illustrative and as examples of compositions which have given good results and that other compositions may be used if desired. Also, other types of mineral spirits and silicone fluids may be utilized. Variations of the Geon 121 and the Paraplex G–62 may also be utilized as well as equivalents of other ingredients. Surface coatings forming an adhesive interface bond may be used and sealing gaskets having compositions differing from organosols and plastisols may be used without departing from the spirit and scope of the invention, but organosol and plastisol compositions have been found to be well suited for the purposes, as they fuse together to prevent separation between the inner edge of the sealing gasket and the adhesive interface bond or coating on the inside of the closure.

It will be seen that the present invention provides a closure cap and an improved method of making the cap which has a sealing gasket securely bonded in position by being fused or blended to a thin coating of a similar material bonded to the inside of the closure. In effect, the gasket is in the form of a disc with a very thin center portion and with a thick zone at the outer periphery to engage and form a seal on the rim of the container. The inner edge of the gasket, as well as the remaining width of the gasket, is fused to the innerface coating to prevent the separation of the inner edge of the gasket from the interface coating bond and to preclude the formation of pockets at the inner edge of the gasket, where oxygen concentration cells may collect and provide a point of corrosive attack. The present invention also provides a

closure cap which may be sterilized without separation between the inner edge of the sealing gasket and the interface coating bond.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

The method of making a closure cap which comprises coating one side of a sheet of tinplate with a thin coating of organosol having an easily evaporatable solvent therein, heating said sheet of tinplate to evaporate said solvent and cure said coating composition, fabricating said sheet of tinplate into at least a partially formed closure cap with said coating on the inside, flowing a plastisol gasket material into the inside of said closure in the shape of a ring to form a gasket, and heating said closure cap to cure said plastisol gasket and to fuse said plastisol gasket into said thin coating to form a securely bonded integral element.

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