

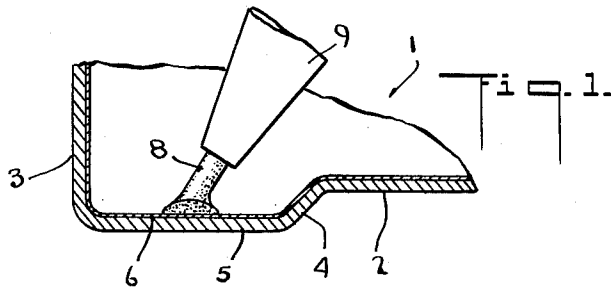
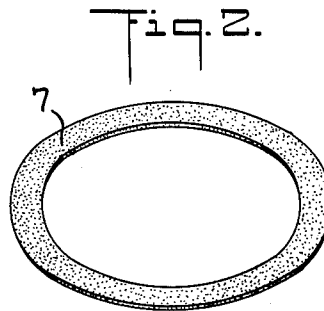
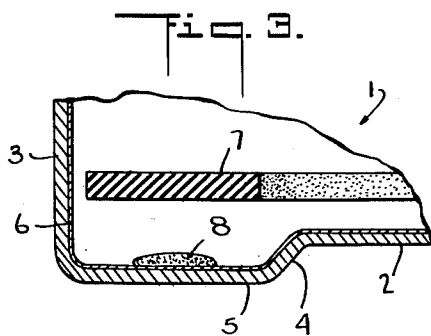
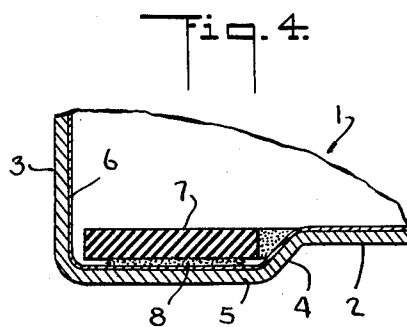
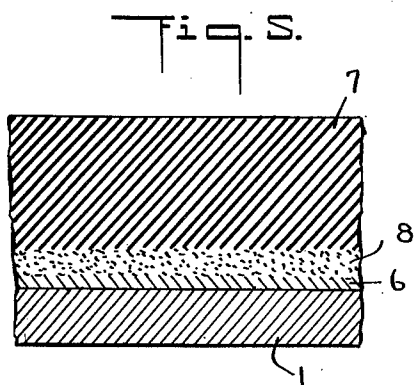
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3,018,911

CLOSURE CAP AND METHOD OF MAKING SAME

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3,018,911
**CLOSURE CAP AND METHOD OF
MAKING SAME**

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The present invention relates to an improved closure cap and more particularly to an improved means of securing gaskets in closure caps.

The present invention is an improvement upon the invention disclosed in the Harry E. Stover co-pending United States patent application Serial No. 763,921, filed September 29, 1958, entitled "Method of Making a Closure Cap and Closure Cap Made Thereby," now Patent No. 2,976,200, granted March 21, 1961.

The increased use of food products which are preferably packaged in hermetically sealed packages has made it desirable to use a closure cap which will form a hermetic seal not only when the package is initially sealed but also when the closure cap is re-applied to protect the unused portion of the contents.

Closure caps have been used for many years for hermetically sealing packages. In order to permit maximum storage time for the contents of the package, it is the practice to provide the closure with a gasket which will co-operate with the rim of a container to form a hermetically sealed package.

In order to form a leak-proof seal, such sealing gaskets must be applied to the closure cap in such a manner as to prevent the entrance of air into the container.

Some of the gaskets which have been used for these containers are the so-called "flowed-in" type gaskets which are formed by flowing a rubber-like gasket material into the closure and curing the gasket material to harden it into a gasket. Such flowed-in type gaskets require the use of well engineered machines with critical operations, since an exact amount of gasket material must be deposited in the closure in order to form an effective gasket.

Another type of gasket which has been used is the so-called "cut ring" type gasket. This gasket is made from a tube of vulcanized rubber, or other suitable material, from which the desired gaskets are cut and applied to the closure cap and adhered therein by a suitable adhesive. Such gaskets are obtainable from suppliers and are extensively used in screw caps, both of the lug and thread types, for forming hermetic seals.

However, any break, crevice or opening in the adhesive between the gasket and the metal of the closure permits air to leak into the container thus impairing the seal and spoiling the product. Difficulty has been encountered with known adhesives and their methods of application in avoiding seepage of air between the upper side of the gasket and the cover of the closure.

In using cut ring gaskets it has also been found that present adhesives do not give a secure bond with the metal of the closure so that at times the pressure used in applying or removing the closures pulls the gasket away from the closure thereby impairing the seal.

Another difficulty encountered in using cut ring gaskets with vacuum sealed packages is that the vacuum within the package exerts a downward pull on the gasket and unless the adhesive securely bonds the gasket to the closure cap, the gasket will tend to be pulled down into the container.

Adhesives presently in use for such gaskets do not provide both initial and long term adhesion of the gaskets to the cap nor do they have the proper viscosity to permit

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them to be used with present day high speed adhesive lining equipment. Also, the present adhesives do not possess the proper drying characteristics to prevent build up of adhesive on the lining nozzle and most adhesives require heat-curing which is an additional and expensive operation.

The present invention overcomes these difficulties and provides an improved closure having a solid bond between the upper side of the gasket and the metal of the closure which will not form cracks or crevices in the adhesive and which will prevent seepage of air between the top of the gasket and the metal of the cap.

One object of the present invention is the provision of an improved closure cap having a cut ring gasket bonded securely therein.

Another object of the present invention is to provide an improved closure cap in which a gasket is adhered thereto by a solid uniform band of adhesive.

A further object of the present invention is to provide a method of applying a cut gasket to a closure cap by an adhesive which will minimize or eliminate the formation of cross channels or crevices in the adhesive.

A still further object of the present invention is to provide an improved method of applying adhesive to a closure for adhering a gasket thereto which is simple and inexpensive.

Another object of the present invention is to provide an adhesive for bonding a gasket to a closure cap which will give both good initial and long term adhesion.

A further object is to provide an adhesive for securing a gasket to a closure which has a low viscosity permitting it to be used with present high speed adhesive lining machines.

Another object of the present invention is to provide an adhesive for adhering a gasket to a closure which possesses such characteristics to prevent build-up of adhesive in the lining nozzle.

Another object of the present invention is to provide an adhesive for bonding a gasket to a closure cap which will eliminate the usual heat-curing operation.

A further object of the present invention is to provide an improved adhesive for adhering a gasket to a closure cap which is economical and does not impart a bad taste or odor to the contents of a package.

Another object of the present invention is to provide an improved gasket securing adhesive for securely bonding the closure cap to the gasket so as to prevent it from being pulled laterally from its seat due to the high vacuum inside and the atmospheric pressure outside.

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 claims, 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 sectional view of a closure cap showing the application of the adhesive for securing the cut gasket to the closure;

FIG. 2 is a perspective view of the cut gasket to be adhered to the closure cap;

FIG. 3 is a sectional view showing the relationship between the cut gasket and the adhesive before the gasket is pressed in position;

FIG. 4 is a sectional view similar to FIG. 3 showing the position of the gasket after it is pressed in position; and

FIG. 5 is an exaggerated fragmentary sectional view showing the relationship between the cut gasket and the closure cap after the gasket has been secured in place.

Referring to the drawings the closure cap 1 is comprised of a cover portion 2 and a depending skirt portion 3. The cover portion 2 has a peripherally extending shoulder 4 forming a gasket-receiving channel 5. The skirt portion 3 may be provided with a plurality of inwardly directed locking lugs (not shown) or any other means adapted to lock the cap to a container.

As is common practice, the metal of the closure cap 1 is first coated with a primer coating 6 to protect the metal and permit a more secure bond between the tin-plate and the cut ring gasket. This primer coating 6 may be the ordinary type of lacquer or enamel used for protecting closures against corrosion. Usually, both sides of the tin-plate are coated with lacquer to prevent corrosion of the tin-plate.

A preferred primer which may be used in practicing the present invention is one having a vinyl or modified vinyl base. One such primer 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 tin-plate with the primer coating thereon is baked in an oven at temperatures of about 310° F. to bond the primer securely to the tin-plate.

The cut gasket 7 adapted to be secured to the closure cap in accordance with the present invention is shown in FIG. 2 and comprises a thin ring of vulcanized rubber or some other suitable material which may be cut from a tube of vulcanized rubber which has previously been heated to cure or vulcanize it.

FIGS. 1, 3 and 4 show the steps of applying the cut ring gasket 7 to the closure. An adhesive 8 is applied to the gasket-receiving channel 5 of the closure by a suitable ejecting nozzle 9 (FIG. 1). The adhesive 8 is applied in the form of a continuous ribbon-like bead around the periphery of the closure and within the gasket-receiving channel 5. The bead of adhesive has a tendency to spread out as shown in FIG. 3. The gasket 7 is then mounted in the cap and pressure is applied to the gasket to bond the gasket to the closure cap. During the application of the gasket, the adhesive is spread uniformly over the gasket-receiving channel 5 to prevent any cross crevices from developing and hence prevent seepage of air. The closure is then left in the open to permit the adhesive to dry and thereby securely bond the gasket to the closure.

In accordance with the present invention, the adhesive 8 which is used to adhere the gasket to the closure cap contains a solvent which is adapted to partially soften the rubber of the gasket 7 and also to partially soften the lacquer coating 6 of the closure cap in order to form a secure bond. The action of softening the gasket and the lacquer coating provides a fusion between the lacquer coating, the adhesive, and the gasket material so that the gasket is bonded securely to the metal closure cap. This is illustrated in FIG. 5 in which the adhesive coating 8 has been fused with both the gasket and the lacquer coating 6 to securely bond the gasket to the closure cap. The resultant bond is so secure that the gasket will withstand the forces exerted in opening and closing the container and it will also prevent the gasket from being sucked into the container by the vacuum therein.

The preferred adhesive used has a resin base. The preferred resin base used is Vinylite Resin VMCH, which is a triopolymer of vinyl chloride, vinyl acetate, and maleic acid in the ratio 86:13:1 and is more popularly referred to as a modified copolymer of vinyl chloride and vinyl acetate. This resin is compatible with both the lacquer coating and the gasket and has good bonding power upon air drying.

However, other resin bases may also be used. For example, other resin bases which have been successfully used are Vinylite Resin VAGH triopolymer of vinyl chloride, vinyl acetate and vinyl alcohol), vinyl alcohol-vinyl acetate resins, and vinyl acetate resins.

To the Vinylite Resin base is added a solvent which is adapted to partially soften the rubber of the gasket and also the lacquer coating so that the lacquer coating and the gasket will fuse with the adhesive to form a secure bond. The preferred solvent used is a ketone, such as acetone, since it dissolves the Vinylite Resin VMCH, produces a low viscosity adhesive, and evaporates rapidly, having a boiling point of about 133° F. (56.1° C.). However, other ketone solvents, such as methyl ethyl ketone and methyl isobutyl ketone may also be used, if desired.

In order to prevent the adhesive from drying before the gasket is applied to the cap, which would adversely affect the bond, an evaporation controlling agent, which may be a second solvent, is added to the adhesive to retard the drying action. The preferred evaporation controlling agent used is a solvent of the aliphatic hydrocarbon class, such as 2-nitropropane which has little odor and a low boiling point of 248° F. (120° C.). However, other solvents, such as hexane, may also be used as evaporation controlling agents, if desired. The 2-nitropropane also decreases the evaporation rate of the volatile components of the adhesive to minimize build up of the adhesive in the nozzle for applying the adhesive.

In order to permit a good initial adhesion a suitable tackifier is incorporated in the adhesive. The tackifier is also used as a plasticizer for the Vinylite Resin. It forms "legs" between the lacquered coating 6 and the rubber gasket 7 to aid in holding the gasket in place and to increase the bond strength. The preferred tackifier used is a glycerol ester of hydrogenated rosin, such as Staybelite Ester 3 (triethylene glycol ester of hydrogenated rosin). However, other tackifiers may also be used. Some such tackifiers which have been successfully used are Staybelite Ester 1 (ethylene glycol ester of hydrogenated rosin); Staybelite Ester 2 (diethylene glycol ester of hydrogenated rosin); Staybelite Esters 5 and 10 (glycerol ester of hydrogenated rosin); Acryloid (acrylic ester resins); and Versamids (polyamide resins produced by the condensation of polycarboxylic acids with polyamines).

The resulting adhesive has a low viscosity of between 30 to 90 centipoises so that it can be easily applied with present adhesive-lining machinery. Because of the low viscosity a smaller amount of adhesive is required to apply a gasket to the closure. Amounts as low as .006 gram of adhesive per cap have given excellent results.

The acetone solvent, in addition to permitting fusion of the gasket and the lacquer, permits the adhesive to be air-dried and eliminates the necessity for heat-curing.

The following are the preferred adhesive formulas which may be used in practicing the present invention:

Ingredients

[Parts by weight]

Formula No.	Vinylite Resin VMCH	Acetone	2-Nitropropane	Staybelite Ester 3	Staybelite Ester 10
1	25	75			
2	10	90			
3	15	85			
4	10.7	33.3	50.0		
5	14.3	14.3	71.4		
6	19.3	27.3	53.2		
7	22.4	31.0	46.6		
8	16.3	65.0	11.7	7.0	
9	15.6	62.3	11.1	11.0	
10	15.4	61.6	16.5	6.5	
11	14.6	58.2	20.8	6.4	
12	16.3	65.0	11.7		7.0
13	15.2	61.0	10.7		13.1

Some of the other formulas which have also been used are as follows:

Ingredients

[Parts by weight]

Formula No.	Vinylite Resin VMCH	Acetone	2-Nitropropane	Acryloid B-72	Acryloid B-82	Vinylite Resin VAGH	Hycar 1001	Geon Polyblend 503-H
1-----	14.8	70.4	7.2	7.4				
2-----	16.7	75.0	4.2	4.1				
3-----	14.8	70.4	7.4		7.4			
4-----	13.3	53.4	26.7			6.6		
5-----	10.0	53.4	26.7			9.9		
6-----	15.6	62.2	11.1				11.1	
7-----	14.0	56.0	10.0				20.0	
8-----	15.6	62.2	11.1					11.1

It will be seen from the above that the present invention provides an improved closure cap in which the gasket is securely bonded to the metal and cannot be pulled off by the normal forces exerted in applying or removing the cap nor be sucked into the container by the vacuum therein. The present invention also provides a solid uniform band of adhesive between the gasket and the metal of the closure which will not form crevices and which will prevent seepage of air.

The invention will provide an improved adhesive which will give a good initial and long term bond and which has a low viscosity permitting it to be used on present machinery and which will eliminate the necessity of heat-curing.

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 our invention, we claim:

1. A closure cap having a cover portion and a skirt portion, said cap having a primer coating thereon, and a gasket adhered to said closure cap by an adhesive, said adhesive being adapted to partially dissolve the primer coating and the said gasket to securely bond the gasket to said closure cap.

2. A closure cap having a cover portion and a skirt portion, said cap having a primer coating thereon, and a gasket adhered to said closure cap by an adhesive, said adhesive having a solvent therein adapted to dissolve the primer and said gasket to fuse the two together and to securely bond the gasket to the closure cap.

3. A closure cap as claimed in claim 2, wherein said solvent is a ketone.

4. A closure cap as claimed in claim 3, wherein said solvent is acetone.

5. A closure cap as claimed in claim 2, in which said adhesive comprises a copolymer of vinyl chloride and vinyl acetate as a base and an acetone solvent.

6. A closure cap having a cover portion and a skirt portion, said cap having a primer coating thereon, a gasket adhered to said closure cap by an adhesive, said adhesive having a solvent adapted to dissolve the primer coating and said gasket to securely bond the gasket to said closure cap and an evaporation controlling agent to prevent quick drying of the adhesive.

7. A closure cap as claimed in claim 6, wherein said solvent is acetone.

8. A closure cap as claimed in claim 6, wherein said adhesive comprises a copolymer of vinyl chloride and vinyl acetate as a base, acetone as a solvent, and an

aliphatic hydrocarbon as the evaporation controlling agent.

9. A closure cap as claimed in claim 8, wherein said evaporation controlling agent is 2-nitropropane.

10. A closure cap having a cover portion and a skirt portion, said cap having a primer coating thereon, a gasket adhered to said closure by an adhesive, said adhesive having a solvent adapted to dissolve the primer coating and said gasket to securely bond the gasket to the closure cap, an evaporation controlling agent to prevent quick-drying of the adhesive and a tackifier to aid in initial adhesion.

11. A closure cap as claimed in claim 10, wherein said primer coating has a vinyl base.

12. A closure cap as claimed in claim 11, wherein said adhesive comprises a copolymer of vinyl chloride, and vinyl acetate as a base and wherein said solvent is acetone.

13. A closure cap as claimed in claim 10, wherein said evaporation controlling agent is an aliphatic hydrocarbon.

14. A closure cap as claimed in claim 13, wherein said evaporation controlling agent is 2-nitropropane.

15. A closure cap as claimed in claim 10, wherein said tackifier is a glycol ester of hydrogenated rosin.

16. A closure cap as claimed in claim 15, wherein said tackifier is triethylene glycol ester of hydrogenated rosin.

17. A closure cap as claimed in claim 10, wherein said tackifier is a glycerol ester of hydrogenated rosin.

18. A closure cap as claimed in claim 10, wherein said adhesive has a viscosity of between 30 and 90 centipoises.

19. A closure cap as claimed in claim 10, wherein .006 gram of adhesive is present in said cap.

20. The method of inserting a gasket in a closure cap which comprises coating the inside of a closure with a primer, applying an adhesive to said primer and applying a gasket thereto, causing the primer coating and the rubber of the gasket to soften to permit the gasket to be securely bonded to the cap.

21. The method as claimed in claim 20, wherein said adhesive is applied to the closure cap in ribbon-like form.

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