Dec. 9, 1952 G. A. WEISGERBER 2,620,939

SEALING CLOSURE FOR CONTAINERS

Filed Sept. 9, 1948

Fig. 1.

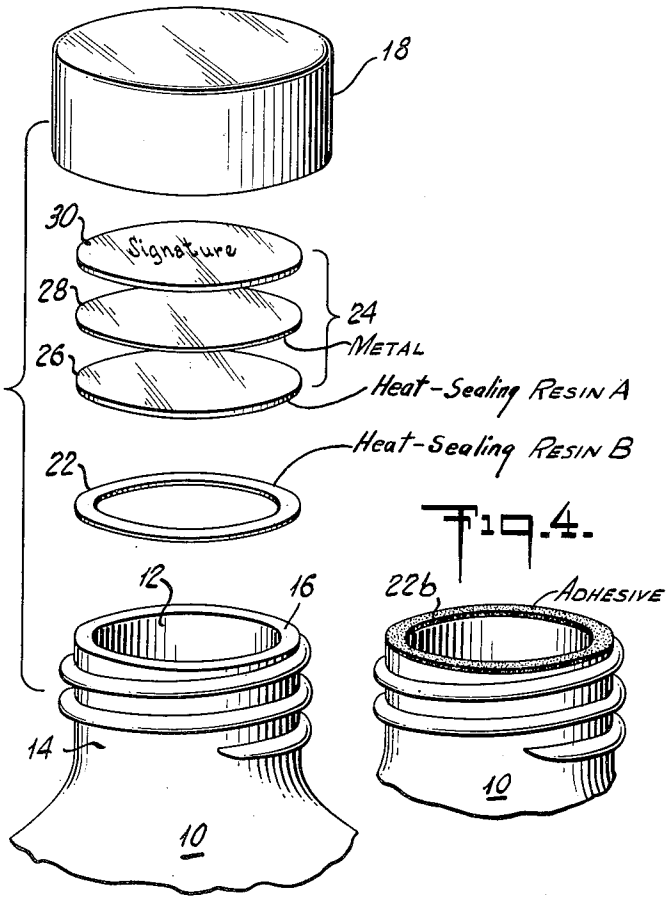


Fig. 3.

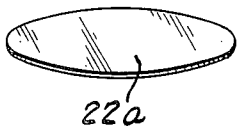


Fig. 4.

Fig. 2.

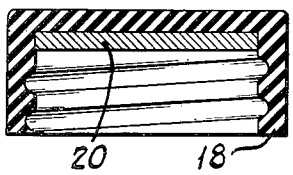
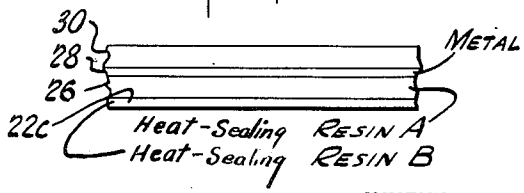


Fig. 5.



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Patented Dec. 9, 1952

2,620,939

UNITED STATES PATENT OFFICE

2,620,939

SEALING CLOSURE FOR CONTAINERS

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Application September 9, 1948, Serial No. 48,346

4 Claims. (Cl. 215—40)

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This invention relates to readily removable sealing closures for containers. It is especially useful for glass bottles containing lotions, medicaments or chemicals where it is important to prevent leakage in transit or to prevent substitution or adulteration. Therefore the invention will be described, for illustration only, as applied to such use.

It is customary to pack liquids in bottles having a screw cap lined with a resilient and impervious disk or gasket which seals the bottle when the cap is screwed on. It has also been proposed to prevent tampering and leakage in transit and the like by sealing the bottle with a diaphragm or membrane adhered to the mouth of the bottle in addition to the cap. When the bottle is first opened the membrane is broken or removed and thereafter the bottle is closed by screwing on the cap, relying on the resilient disk which is then called a re-sealing disk. Such seals that have come to my attention have been unsatisfactory in several respects, particularly in the case of glass bottles containing oils or medicaments for personal use, for example, because the sealing membrane was difficult to remove, or because bits of the membrane or adhesive or both adhered to the bottle, making it unsightly and creating suspicions of uncleanliness.

My invention seeks to overcome these and other disadvantages of known seals by providing an improved seal which can readily and economically be attached, which is secure until it is forcibly removed, but yet is readily removable by the user, and which leaves the container clean when removed. It is particularly an object to provide such a seal which is completely effective with glass containers. Other objects and advantages will be apparent in the description and claims.

In the drawings:

Fig. 1 is an exploded perspective view of a bottle and screw cap embodying one form of my invention;

Fig. 2 is a section of the cap;

Fig. 3 is a perspective of one modified form of a portion of my improved seal;

Fig. 4 is a perspective of a second modified form; and

Fig. 5 is a magnified edge view of a composite seal embodying a third modified form.

A container 10, preferably of dielectric material, especially glass, has the usual opening or mouth 12, in a neck or wall 14 which includes an end surface 16 surrounding the mouth and disposed in a plane. This surface is preferably flat and relatively broad. The usual cap 18 may

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be used. It and the neck may be provided with screw threads, or any other known or suitable means for mechanically holding the cap against the end surface 16. The cap is preferably formed of any suitable dielectric material such as any of a wide variety of molded plastics. Any suitable resilient, impervious sealing disk 20, inert to the material to be put in the container is secured in the cap.

My improved seal includes, for example, a film 22 of material which will adhere to the container, especially to glass and is inert with respect to the contents. It also includes a unitary sealing membrane collectively denoted by 24, inert to the contents and adapted to adhere to the film 22. When the cap is screwed on and the adhesive film is activated the membrane is sealed to the bottle and the cap can become loose or can be removed, leaving the bottle sealed. This prevents leakage in transit, and serves to detect opening of the bottle by unauthorized persons. To facilitate detection the membrane may be provided with the bottler's signature, and an adhesive is used which, when the seal is once removed, cannot be readily resealed to the bottle.

The materials of the container, the film 22 and the membrane 24 are so related to each other that the strength of the adhesive bond between the film and the container is less than the internal strength or internal cohesive bond within the film and less than the strength of the adhesive bond between the film and the membrane. The adhesive bonds within the composite membrane 24 are also greater than the film-to-glass bond. Also the strength of the bond between the film and the glass is such as to permit forcible although easy removal of the membrane with a fingernail. This arrangement assures that when any adequate attempt is made to remove the seal, the film leaves the glass cleanly, and neither the membrane nor the film will split itself. This effectively prevents any bits of membrane or of adhesive film from remaining on the bottle.

When the sealing membrane and film have thus been removed and discarded, the bottle can be capped and closed in the usual way, the reseal liner 20 preventing leakage as long as the cap is tight.

The results described above can be effected in a simple and economical manner which can be performed quickly on a production line.

Preferably all of the materials heretofore described are dielectric, and a disk of metal foil is placed in or on the sealing membrane. The film 22 is of heat-sealing or thermo-adhesive mate-

rial, by which is meant material which becomes adhesive at high temperatures. The film and membrane are placed in position and the cap is screwed on tight. The assembly is then heated in any suitable manner, preferably by placing it in a high frequency dielectric field which rapidly heats the metal disk. This heats the film 22 by conduction until the film becomes adhesive while under the pressure of the cap. The bottle is then removed from the field and upon cooling the film is adhered both to the bottle and to the membrane, as described.

The membrane may be formed of a heat-sealing resin sheet 26 (herein designated Resin A), which may, if desired, have a somewhat higher softening temperature than the softening temperature of the film 22 (herein designated Resin B) and a sheet of metal foil 28, such as thin aluminum. These layers are sealed into a unitary assembly in any suitable known way as by solvent spreading the sheet 26 onto the foil to secure adhesion. The high softening temperature of the sheet 26 prevents loosening the bond between that sheet and the metal foil under the relatively low temperature attained during the sealing operation, but permits the sheet to be adhered to the metal at a higher temperature when the membrane is manufactured. The membrane may be faced on its upper surface by a layer of stiff paper 30 which may be adhered to the foil in any suitable way. This prevents damage to the foil layer when the cap is screwed on. The strengths of the bonds between the foil and both layers of the membrane exceeds the strength of the film-to-glass bond to prevent splitting of the membrane during removal of the seal.

In Fig. 1 the adhesive film is schematically represented. It may be formed and placed in a variety of ways. It may be a washer 22 of cast film, as indicated in Fig. 1, or it may be a disk 22*a* of cast film as indicated in Fig. 3. Preferably it is a dried heat-sealing deposit 22*b* from a solution of the adhesive applied beforehand to the bottle (Fig. 4).

In still another form of the invention as indicated in Fig. 5, I may form a sandwich of the two sheets 26 and 30 and the inner layer 28 of metal foil. To the lower surface of this membrane I apply an adhesive film 22*c* of heat-sealing resin B. This film may be applied by solvent coating, by heating and pressing a cast film or in any suitable way. Preferably the film 22*c* is distinctively colored to facilitate assembly right side up. In any case and especially where the modification of Figs. 1, 3 or 5 is used I may grind the surface 16 is increase the adhesion of the film to the glass.

As materials for Resin A, I may use polyvinyl butyral or any wide variety of known vinyl resins, with or without a suitable plasticizer, the molecular weight of the vinyl polymer and the kind and proportion of the plasticizer being regulated to give the desired thermoplastic and adhesive properties, as known in the art. In particular, I may use a resin designated in the trade as VMCH and manufactured by Carbide and Carbon Chemicals Corporation, New York, New York and said to be a copolymer of vinyl chloride and vinyl acetate having approximately 85% to 88% vinyl chloride and being copolymerized with approximately 1% of maleic acid. I may use a film deposited by evaporating a 10 to 20% solution of VMCH in methyl ethyl ketone or other suitable solvent.

For the heat-sealing film or resin B, I may use as in Fig. 4 a coating solution, which may be applied to the end surface 16 by roller coating with subsequent evaporation of the solvent, such a solution consisting of any of the following:

Example I

	Per cent
VMCH	1.7
VYHH	11.0
Paraplex G–25 (plasticizer)	1.3
Methyl ethyl ketone	86.0

Example II

	Per cent
VMCH	3.0
VYHH	12.0
Dioctyl phthalate (plasticizer)	1.5
Methyl ethyl ketone	83.5

Example III

	Per cent
VMCH	3.0
Saran F–120 (200 centipoises)	8.0
Paraplex G–25	1.2
Methyl ethyl ketone	87.8

Example IV

	Per cent
VYHH	6.0
Saran F–120 (200 centipoises)	6.0
Paraplex G–25	0.5
Methyl ethyl ketone	87.5

Example V

	Per cent
Polyvinyl butyral (high viscosity)	12.0
Dioctyl phthalate	1.5
Ethanol	86.5

In these examples, VMCH is the vinyl resin identified above, VYHH is the trade designation of a vinyl resin manufactured by Carbide and Carbon Chemicals Corporation and said to be a thermoplastic copolymer of vinyl chloride and vinyl acetate having approximately 85 to 88% vinyl chloride and an average molecular weight of 10,000 (Staudinger viscosity method). Paraplex G–25 is a trade name applied by Resinous Products and Chemical Company, Philadelphia, Pennsylvania, to a plasticizer identified by them only as a resinous polyester. Saran is the generic name for a series of polymers and copolymers of vinylidene chloride usually with vinyl chloride with or without acrylonitrile. Saran F–120 is the trade designation applied by Dow Chemical Company, Midland, Michigan, to a copolymer of vinylidene chloride and acrylonitrile having in a 20% solution in methyl ethyl ketone a viscosity of from 40 to 8000 centipoises (Brookfield 25° C.).

The invention claimed is:

1. A container having an opening and comprising in combination an end surface surrounding the opening, a wall surrounding the end surface, a cap, means on the cap and wall adapted to cooperate to urge the cap toward the end surface, and a sealing membrane for closing the opening, the membrane including a heat-sealing adhesive film in contact with the end surface and an electrically conductive layer in thermal contact with the adhesive film.

2. A container having an opening and comprising in combination an end surface surrounding the opening, a wall surrounding the end surface, a cap, means on the cap and wall adapted to cooperate to urge the cap toward the end sur-

face, and a sealing membrane for closing the opening, the membrane including a heat-sealing adhesive film in contact with the end surface and a metal sheet in contact with the adhesive film.

3. A container having an opening and comprising in combination an end surface surrounding the opening, a wall surrounding the end surface, a cap, means on the cap and wall adapted to cooperate to urge the cap toward the end surface, and a sealing membrane for closing the opening, the membrane including a heat sealing adhesive film in contact with the end surface, said adhesive film having a stronger bond to the membrane than to the end surface, and an electrically conductive layer in thermal contact with the adhesive film.

4. A glass container having an opening and comprising in combination an end surface surrounding the opening, a wall surrounding the end surface, a cap, means on the cap and wall adapted to cooperate to urge the cap toward the end surface, a sealing membrane for closing the opening, the membrane including heat sealing adhesive film in contact with the end surface, said adhesive film having internal strength greater than the strength of the adhesive bond between the film and the container, and the adhesive bond between the film and the membrane

being greater than the strength of the adhesive bond between the film and the container, and a metal sheet in thermal contact with the adhesive film.

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