Feb. 8, 1966 J. J. WATERS 3,233,770

REMOVABLE PLASTISOL LINERS FOR CROWNS

Filed March 5, 1963

Fig. 1

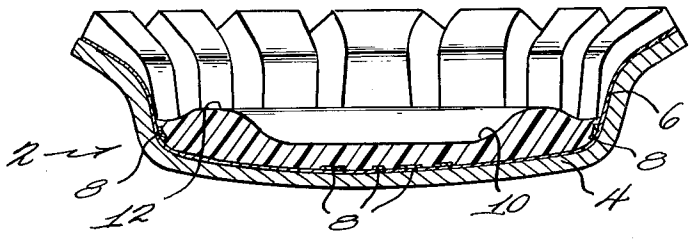



Fig. 2

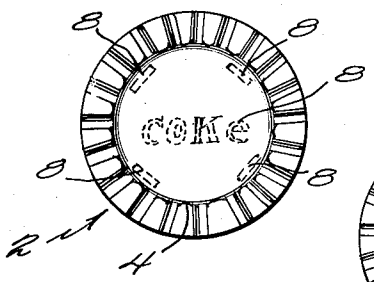
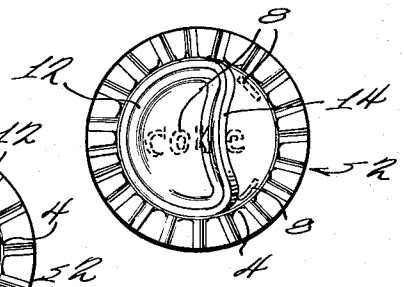



Fig. 4



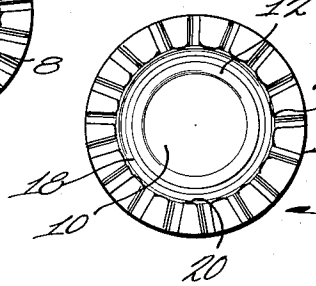
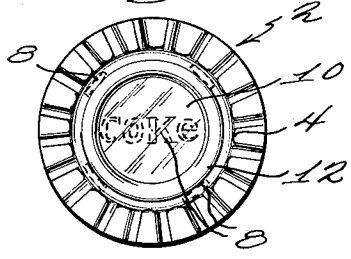




Fig. 6

Fig. 3



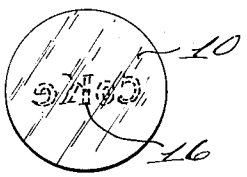




Fig. 5

INVENTOR
JOSEPH J. WATERS

BY
Cushman, Darby & Cushman
ATTORNEYS

United States Patent Office

3,233,770

Patented Feb. 8, 1966



3,233,770

# REMOVABLE PLASTISOL LINERS FOR CROWNS

Joseph J. Waters, Abington, Pa., assignor to Crown Cork & Seal Company, Inc., Philadelphia, Pa., a corporation of New York

Filed Mar. 5, 1963, Ser. No. 262,961
13 Claims. (Cl. 215—40)

This invention relates to closures containing clear plastic liners.

In the promotion of various soft drinks, it has been proposed to mail the crown closure from the bottle back to the manufacturer. The Post Office Department has objected to the sending of crowns through the mail since the automatic cancelling machines are frequently damaged thereby.

It has not been possible in the past to prepare an over-all crown closure liner of the plastisol type which would effectively seal a bottle but still be readily removable, e.g., to be suitable for mailing.

It is an object of the present invention to make a closure having a plastic liner which is readily removable.

Another object is to prepare a closure having a liner which is readily removable but which prior to removal acts as an effective sealant to prevent leaks in bottles closed by said closure.

Another object is to devise a simple way of removing a clear plastic liner having printing on the under portion thereof from a crown closure.

Still further objects and the entire scope of applicability of the present invention will become apparent from he detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

It has now been found that these objects can be attained by adhering a plastic liner to a closure shell in such a fashion that the liner adheres to the closure shell only in certain areas and does not adhere in other areas. While the invention is of primary utility with liners for crown closures, it is also useful in connection with liners for other types of closures such as a lug, screw on and press on caps.

The present invention will be best understood in connection with the attached drawings wherein:

FIGURE 1 is a sectional view of a crown closure cap with a formed plastisol liner;

FIGURE 2 is a bottom view of the cap prior to formation of the plastisol liner therein;

FIGURE 3 is a bottom view of the cap after the formation of the plastisol liner;

FIGURE 4 is a view of the cap showing the liner partially removed;

FIGURE 5 is a view of the liner after removal of the liner; and

FIGURE 6 is a bottom view of a crown closure illustrating an alternative form of the invention.

Referring more specifically to the drawing the numeral 2 indicates a metal, e.g. tin-plated steel, crown shell having a fluted skirt 4 and an overall vinyl resin lacquer protective coating 6. The lacquer is of conventional character and in the specific example was a mixture of 80% of a vinyl chloride-vinyl acetate copolymer (87% vinyl chloride) together with 20% of an oleoresinous modifier, specifically tung oil modified phenylphenolformaldehyde resin dissolved in an organic solvent, specifically 70% xylene and 30% isophorone. The solvents were removed by volatilization after the lacquer was applied to the cap and prior to application of any



superimposed layer. Other suitable vinyl resin lacquers are those disclosed in Patent No. 2,380,456.

In the central portion of the cap on top of the lacquer 6 there is printed indicia 8 made of a lithographic printing ink. In the specific example there was used General Printing Ink No. 3504 red. The lithographic ink can be of any other color, e.g. black, blue, brown, green or white. The lithographic printing ink can also be transparent and this is frequently desired. A suitable transparent lithographic printing ink is General Printing Ink No. 95836. Superimposed on the lacquer coating and the printed indicia is a vinyl chloride plastisol liner 10 formed so as to include a sealing ring 12. In the specific example, the plastisol was unfoamed clear and colorless (water white) so that the indicia could be seen therethrough. However, if it is desired, the plastisol can be colored with an appropriate dye to make a clear colored liner or a pigment, e.g. carbon black, calcium carbonate, titanium dioxide, ochre, iron oxide or the like, can be added to render the plastisol opaque so that the indicia cannot be seen until removal of the liner. This is frequently desirable in promotion of the product packaged.

As stated, however, in the specific example, the plastisol was clear and colorless. It was made up of the following formulation with the parts being by weight:

| | Parts |
|---|---|
| Exon 654 (70 poise) | 46.3 |
| Geon 202 | 18.0 |
| Dioctyl phthalate | 35.5 |
| Dibutyl p-cresol (antioxidant) | 0.2 |

Geon 202 is a copolymer of 94% vinyl chloride and 6% vinylidene chloride and Exon 654 is a copolymer of vinyl chloride with a small amount and not over 5% of trichloroethylene.

The plastisol is applied to the center of the crown cap 2 as a blob. It can then be spread to form the liner in any conventional fashion, e.g. by spinning as in Foye patent, No. 2,489,407 or by use of a plunger as in Gora patent, No. 2,548,306 or Normandy patent, No. 3,002,-641. For convenience a heated stepped plunger was used as set forth in the Normandy patent in making the closure liners shown in the drawings.

The plastisol adhered to the vinyl resin lacquer coating 6 but did not adhere to the printed indicia 8. In order to have adequate sealing, it is critical that there be good adhesion to the cap in the area of the sealing ring and in the immediately adjacent inner area. If this area is left unprinted, the plastisol will adhere to it tenaciously and prevent undesired removal of the liner under the capping pressure. Generally in a crown cap having an inner diameter of about 1 inch, the center ½ inch of the liner need not be adhered tenaciously to the cap and also the area of the liner outside the sealing ring 12 need not adhere to the cap. Consequently, these areas can be printed to prevent adhesion and then subsequently after the crown is removed from the bottle, can or other container, the liner is pulled out.

FIGURE 2 shows the crown 2 bottom surface having printed indicia 8 thereon prior to application of the plastisol. FIGURE 3 is a view similar to FIGURE 2 after the plastisol has been applied and spread to form a liner 10 having a sealing ring 12. Since the liner is made of clear, water white plastic, the indicia are visible therethrough. FIGURE 4 is a view showing the manner of removing the liner 10 from the cap. The portion of the liner indicated at 14 has been separated from the cap. FIGURE 5 shows the liner 10 completely removed from the cap.

If the printing is underbaked prior to aplication of the plastisol, it will offset on the liner. Offset letters 16 are

shown on the liner 10 in FIGURE 5. The liner that has been removed and which contains the offset printing can be sent through the mails, e.g., in a contest, without damaging automatic cancelling machines.

FIGURE 6 shows an alternative form of the invention wherein there is provided a metal crown closure 2. The closure has a coating of a vinyl resin lacquer of the type set forth above. A doughnut shaped lithographic printing ink, overprint 18, is then applied. The ink can be G.P.I. No. 3504 red or can be of other color or can be a transparent ink. There is then applied to the center of the cap a vinyl chloride polymer plastisol of the type previously set forth, and it is formed into an over-all liner having a sealing ring 12 in the manner previously set forth. The doughnut shaped overprint 18 is between the skirt 20 and the sealing ring 12. The liner can be readily removed from the cap since there is no adhesion between the doughnut 18 and the overlying portion of the liner. Sealing of the bottle or other container to which the closure is applied is insured since the outer portion of the liner is securely locked between the cap skirt and the glass surface of the bottle. However, after removal of the cap from the bottle, it is an easy matter to remove the liner by starting the removal at the doughnut which does not adhere to the vinyl resin lacquer. In this species of the invention, there can also be indicia printed over the lacquer in the central portion of the cap but outside of the critical sealing area. Alternatively, the indicia can be applied to the bottom of the cap before applying the vinyl lacquer. In this latter case, since the indicia will not be between the lacquer and the plastisol liner, the indicia will not be removed upon removal of the liner (starting with the doughnut) from the cap.

Unless otherwise indicated, all parts are by weight.

In addition to the above-mentioned plastisol formulation, there can be used numerous other plastisols. Typical preferred examples are given in Table 1.

*Table* 1

| Component | Amount | | | |
|---|---|---|---|---|
| | A | B | C | D |
| Exon 654 | 46 | 46.3 | 46 | 46 |
| Geon 202 | 18.5 | 17.5 | 17 | 17 |
| Dioctyl phthalate (GP-264) | 30.8 | 35.5 | 33 | 36.3 |
| Paraplex G-72 (glycol sebacate-epoxide polymer) | 4 | | 4 | |
| Dibutyl p-cresol (antioxidant) | 0.2 | 0.2 | 0.2 | 0.2 |

Formulation A can be rendered opaque to give an opaque liner by including 0.25 part titanium dioxide and 0.25 part carbon black.

While preferably the plastisol liner is clear and unfoamed, there can also be used foamed plastisol liners made, for example, as disclosed in the aforementioned Normandy patent.

A vinyl chloride plastisol may be described as a mixture of a vinyl chloride resin with a plasticizer in which the resin is essentially insoluble at room temperature, or very slowly soluble at room temperature, but in which it is essentially completely and rapidly soluble at some elevated temperature, or slowly soluble on standing at room temperature. When such a mixture is heated, the resin dissolves in the hot plasticizer and, when the solution cools, a permanent gel is formed. A plastisol has also been defined as a semi-liquid paste composition containing a normally liquid plasticizer and a vinyl chloride resin which is paste forming with the plasticizer at a temperature below the fluxing temperature of the resin-plasticizer components and capable, upon being heated to the fluxing temperature of the resin-plasticizer components, of forming a permanent rubbery gel.

As the vinyl chloride resin, there can be used homopolymers, such as Geon 101 (mol. wt. about 82,000); Vinylite QYNV and Geon 121 (mol. wt. about 89,000).



There can also be used copolymers of vinyl chloride with a minor amount of copolymerizable ethylenically unsaturated material. Generally, the copolymerizable material is used in an amount of 20% or less, and preferably 10% or less, e.g., 5%. As illustrative copolymerizable materials, there can be used vinyl acetate, vinylidene chloride, acrylonitrile, trichloroethylene, maleic anhydride, diethyl maleate, and other alkyl maleates, etc. Specific examples of copolymers are Vinylite VNYV (copolymer of 95% vinyl chloride—5% vinyl acetate); Exon 654 (vinyl chloride copolymerized with not over 5% trichloroethylene); Pliovic AO (vinyl chloride copolymerized with not over 5% of a dialkyl maleate); Vinylite VYHH (copolymer of 87% vinyl chloride with 13% vinyl acetate); Vinylite VMCH (a copolymer containing 86% vinyl chloride, 13% vinyl acetate and 1% maleic anhydride); Geon 202 (copolymer of 94% vinyl chloride and 6% vinylidene chloride).

The preferred plasticizer is dioctyl phthalate (di-2-ethylhexyl phthalate), although other conventional vinyl chloride plastisol plasticizers can be used, such as other alkyl phthalates, e.g., butyl decyl phthalate, octyl decyl phthalate, diisodecyl phthalate, di-isooctyl phthalate, didecyl phthalate, di-dodecyl phthalate, butyl phthalyl butyl glycolate, ethyl phthalyl ethyl glycolate, methyl phthalyl ethyl glycolate, and other alkyl phthalyl alkyl glycolates, acetyl tributyl citrate, diisobutyl adipate, butyl benzyl phthalate, didecyl azelate, dioctyl azelate, dioctyl adipate, dioctyl sebacate, dibutyl sebacate, and other dialkyl esters of alkane dicarboxylic acids, trioctyl phosphate, tricresyl phosphate and other triaryl phosphates, tetrahydrofurfuryl alcohol esters, e.g., tetrahydrofurfuryl adipate, low viscosity polyesters, e.g., polyethylene glycol adipate, polyethylene glycol adipate-maleate, alkyl esters of higher fatty acids, e.g., pelargonic acid and mixtures of two or more of these plasticizers or one or more primary plasticizers with one or more secondary plasticizers can be used.

Preferably, there is present a stabilizer for the vinyl chloride. For each 100 parts of vinyl chloride resin there are used 1 to 10 parts of stabilizer. Good stabilizers are Thermolite 31 (a thio organic tin compound), Stayrite No. 90 (a mixture of metallic soaps, predominantly calcium, aluminum and zinc stearates, with a minor amount of other fatty acid salts), cadmium laurate, barium laurate, calcium stearate, magnesium stearate, aluminum stearate, zinc stearate, and other fatty acid soaps of these metals, alkyl and aryl tin compounds, dibutyl tin oxide, trioctyl, phosphite, cadmium and barium epoxy compounds, diphenyl urea, polyethylene glycol adipate and adipate-maleate, etc.

While it is preferred to use lithographic printing inks to serve as the non-adhesive portion between the lacquer 6 and the plastisol, there can be used any other non-adhesive. Thus, there can be used silicone fluids and greases such as polydimethyl-siloxane.

While plastisols are the preferred plastic liners, there can also be used plastic liners from polyethylene, polypropylene, irradiated polyethylene, polystyrene, polyurethane, e.g., toluene diisocyanate-polypropylene glycol 2025 condensation product; polyethylene terephthalate and other polyesters, polycarbonates, e.g., the condensation product of bisphenol A and diphenyl carbonate.

What is claimed is:

1. A closure shell having an overall plastic liner adhered directly thereto with predetermined portions of the closure shell having a coating which is nonadherent to the liner whereby the liner can be readily removed from the shell.

2. A closure shell according to claim 1 wherein in said predetermined portions there are printing indicia as said nonadherent coating between said shell and said liner.

3. A closure shell according to claim 1 wherein in said predetermined portions there is a polysilixane as said nonadherent coating between said shell and said liner.

4. A closure shell having an inner vinyl resin lacquer coating and an overall vinyl chloride plastisol liner adhered directly to said lacquer coating with predetermined portions of the lacquer having a coating which is nonadherent to the liner whereby the liner can be readily removed from the shell.

5. A closure shell according to claim 4 wherein in said predetermined portions there is lithographic printing ink as said nonadherent coating between said shell and said liner.

6. A closure shell according to claim 5 wherein the printing ink is a transparent printing ink.

7. A crown closure shell having an inner vinyl resin lacquer coating and an overall vinyl chloride plastisol liner, said liner comprising a sealing ring, said liner being strongly and directly adhered to said lacquer in the area of the sealing ring and in the area immediately inside said sealing ring, said lacquer having a coating which is nonadherent to said liner in other portions of the lacquer whereby said liner can be readily removed from said shell.

8. A closure shell according to claim 7 wherein in said other portions there is a lithographic printing ink as said nonadherent coating between said lacquer and said liner.

9. A closure shell according to claim 8 wherein said shell includes a skirt and said other portions of the liner are between said skirt and said sealing ring.

10. A closure shell according to claim 9 wherein said plastisol liner is a clear plastisol.

11. A closure shell according to claim 7 wherein said plastisol liner is a clear plastisol.

12. A closure shell according to claim 11 wherein in said other portions there is a lithographic printing ink as said nonadherent coating between said lacquer and said liner.



13. A process comprising removing a vinyl chloride resin plastisol liner having offset printing thereon from a closure shell having an inner vinyl resin lacquer coating, predetermined areas between said lacquer coating and said liner having a lithographic printing ink therein whereby said areas are less adherent than the remaining portions of said lacquer and said liner, said liner having been formed over said ink before said ink has fully set whereby said offset printing is retained by said liner when it is removed from the shell, said removal commencing at said less adherent portions.


**References Cited by the Examiner**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,711,469 | 4/1929 | Stratford | 215—1 |
| 2,055,625 | 9/1936 | Heckel et al. | 215—39 |
| 2,718,323 | 9/1955 | Kennedy | 215—40 |
| 2,946,471 | 7/1960 | Randlett | 215—405 |
| 3,005,433 | 10/1961 | Risch. | |
| 3,018,911 | 1/1962 | Grumbles et al. | 215—40 |
| 3,021,250 | 2/1962 | La Voie | 156—247 X |
| 3,032,433 | 5/1962 | Lewis et al. | 156—247 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 843,783 | 8/1960 | Great Britain. |


LOUIS G. MANCENE, *Acting Primary Examiner.*

THERON E. CONDON, *Examiner.*