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C. J. MALM ET AL

2,403,734

BOTTLE CAP

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FIG. 1.

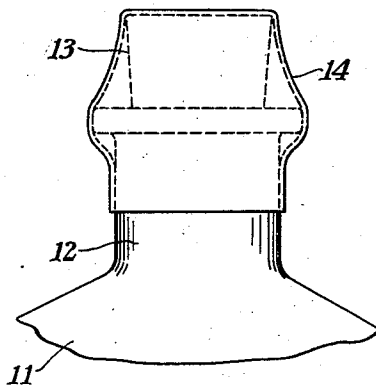
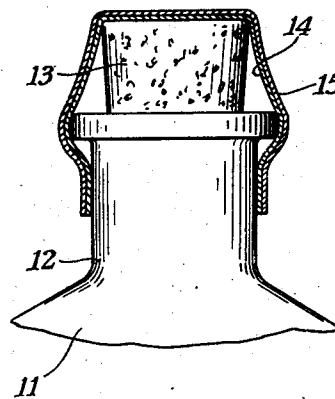


FIG. 2.



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BOTTLE CAP

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3 Claims. (Cl. 215—38)

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The present invention relates to bottle caps or closures for containers. More specifically, the invention relates to a bottle seal formed with inner and outer shrunk coatings or caps.

The customary way of sealing bottles, and similar containers, is by the use of a shrinkable cap manufactured from viscose, or gelatin, as is well known to those skilled in the art. Such caps, however, have the disadvantage of being brittle at low relative humidities and low temperatures so that they may crack and break, and thus fail to provide the desired seal for the container. Furthermore, such caps may be re-hydrated when subjected or exposed to water, and will swell so as no longer to tightly grip the bottle to seal the latter, as is well known.

One way of providing an effective seal is to dip the stoppered end of the bottle directly into a bath of gel lacquer of the type which is a fluid above 50° C. and sets between 10 and 50° C. to provide a self-supporting gel. Such gel type lacquers are described in the application to Fordyce & Clarke No. 370,853, filed December 19, 1940, now U. S. Patent 2,350,742, issued June 6, 1944, to which reference may be had for detailed description thereof. Caps or coatings formed from these gel lacquers are unaffected by water or high relative humidity, and remain flexible even at low temperatures and low relative humidities, and thus provide a seal which will not swell or crack after shrinking into position. One disadvantage, however, of a seal of this type is that whenever the bottle is stoppered with a material which is susceptible to the solvent or solvents in the gel lacquer solution, there is danger of the solvent or solvents of the lacquer getting through the stopper and contaminating the contents of the bottle, the disadvantage of which will be readily obvious.

It has been found that the danger of such contamination can be effectively avoided by first applying to the exposed part of the stopper, an initial or inner coating which is unaffected by the solvent or solvents of the lacquer. After the application of the initial protective coating, the stoppered end of the bottle may be then dipped into a bath of the gel lacquer. Upon withdrawal of the bottle from the bath, the lacquer sets to a gel to provide a second or outer coating which overlies the first or inner coating, and which, upon shrinkage, provides a tough excellent seal, while the inner coating effectively prevents the solvent or solvents of the gel lacquer from penetrating the stopper and contaminating the contents of the bottle. This protection of the bottle

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contents against such contamination is of primary importance, as will be apparent. An additional feature is that in view of the fact that the outer coating is of a gel type lacquer it is unaffected by water or high relative humidities and will thus effectively seal the bottle against leakage of any of the contents which may find its way past or through the inner coating.

The invention has, therefore, as its primary object, to provide a seal which not only effectively seals the bottle, but also protects the contents thereof from contamination by any detrimental or undesirable solvent or solvents used in the seal.

A further object of the invention is the provision of a bottle seal comprising an outer coating which is unaffected by water or high relative humidities and which remains flexible even at low temperatures and low relative humidities, and an inner coating which is impermeable to the solvent or solvents of the outer coating so as to effectively protect the contents of the bottle against contamination by such solvents.

Another object of the invention is a seal of the class described which is tough, durable, flexible and highly effective in use.

To these and other ends, the invention resides in certain improvements and combination of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing:

Fig. 1 is a view of a portion of a bottle showing the inner or initial protective coating applied thereto, and

Fig. 2 is a view similar to Fig. 1 showing the relation of the two coatings which seal the bottle and effectively protect the contents thereof against contamination, the coatings being in sections.

Similar reference numerals throughout the various views indicate the same part.

The drawing shows a portion of a bottle 11 having a neck 12 and a closure member in the form of a cork or rubber stopper 13. The inner sealing coating 14 is first applied to the exposed part of the stopper 13, and, if desired, to the adjacent portion of the neck 12, as shown in the drawing. After the initial coating has been applied, it will shrink, in a manner well known in the art, to effectively seal the stopper and the top of the bottle, as clearly shown in Fig. 1. This initial coating 14 is of a material which is unaffected by the solvent or solvent combinations of the gel lacquer coating to be later described. Water solutions of polyvinyl alcohol or gelatin or a water-

alcohol solution of far hydrolized cellulose acetate, such as one having an acetyl content of less than 30% have been found to be admirably suited for use for the inner or initial coating 14. In order that this inner coating 14 may withstand low temperatures without making the coating brittle, it is advisable to plasticize the inner or sub-coating with a water soluble plasticizer such as glycerine or a glycol.

After the inner coating 14 has been dried or set, the stoppered end of the bottle is then dipped into a solution of a gel lacquer to provide an outer protective coating 15. Such a gel lacquer comprises a cellulose mixed organic acid ester dissolved in a suitable organic solvent or solvent combination, and may be one of the lacquers described in the above-mentioned applications and shown in the following list. These gel lacquer solutions are fluid above 50° C., but between 10 and 50° C. set to form a self-supporting gel containing most, or at least a large part, of the original solvent or solvents. As these solvents evaporate, the gel shrinks so that the coating 15 formed therefrom will tightly grip and seal the inner coating 14, as clearly shown in Fig. 2. Coatings made from such gel lacquers are unaffected by water or high relative humidities and remain flexible even at low temperatures and low relative humidities and thus overcome the brittle feature of prior caps or coatings. While any of the gel lacquer solutions listed below are suitable for the coating 15, an outstandingly satisfactory solution is that composed of cellulose acetate butyrate containing about 37% butyryl and about 13% acetyl dissolved in a solvent composed of 20 to 30% isopropyl alcohol and 70 to 80% xylene.

tents of the bottle. The material of the inner coating 14 is selected from the previously mentioned group to provide a sub-layer which is unaffected by the solvents of the outer coating, and will thus seal out or prevent the passage of such solvents through the stopper and to the bottle contents. This inner coating thus protects the stopper and the bottle contents against such contamination. This feature is of primary and paramount importance, as will be readily appreciated. The outer coating 15 will, on the other hand, remain flexible, as mentioned above, and will not crack or chip off and will thus effectively protect the inner more brittle coating 14. Of secondary importance, the outer coating, due to the fact that it is unaffected by water, will seal the bottle against any leakage which might get past or through the inner coating 14. The two coatings thus cooperate to provide a structure which both seals the bottle, and also protects the contents thereof against contamination of the solvents or the outer coating 15.

While coatings 14 and 15 have been described as being applied by dipping the stoppered end of the bottle in an appropriate solution, it is apparent that these coatings may be formed of separate pre-shaped caps which are applied to the bottle, and which, on drying, shrink to provide the desired seal. The method of forming caps from viscose or gelatine are well known to those in the art. An improved type of separate pre-shaped cap composed of a gel lacquer to provide the outer coating 15 may be formed in the manner shown and described in applicant's copending application Number 507,352 filed October 23, 1943.

While certain embodiments of the invention

Acetyl	Propionyl	Butyryl	Solvent	Ratio of solvents to solids	Plasticizer
Per cent	Per cent	Per cent			
20	26		70% toluene.	4:1	
			30% iso-propyl alcohol.		
16		29	85% toluene.	5:1	
			15% iso-propyl alcohol.		
13.5		36	80% toluene.	4:1	10% dioctyl phthalate.
			20% iso-propyl alcohol.		
16	33		70% toluene.	7:1	
			30% iso-propyl alcohol.		
30		16.5	70% toluene.	6:1	10% triphenyl phosphate.
			30% tert-butyl alcohol.		
16		36	50% trichlorethylene.	5:1	
			50% tert-amyl alcohol.		
16		36	90% trichloroethylene.	5:1	
13		36	10% ethylene dichloride.		
			85% xylene.	5:1	
13		36	15% iso-propyl alcohol.		
			85% xylene.		
20.5		27.6	15% iso-propyl alcohol.		
			60% xylene.	7:1	
13		37	40% iso-propyl alcohol.		
			75% Solvesso #2 ¹ .	5:1	
			25% iso-propyl alcohol.		
		51	85% xylene.	5:1	
			5% iso-propyl alcohol.		
13		36	85% xylene.	5:1	
			15% alcohol mixture of 3-5 carbon atoms.		
	48		70% xylene.	5:1	
			30% iso-propyl alcohol.		
13		36	60% Solvesso #2 ¹ .	5:1	
			40% butyl acetate.		

¹ Solvesso #2 is a mixture of 90% xylenes and 10% other hydrocarbons.

The percentages of acetyl, propionyl and butyryl in the above table are the percentages of these substances in the esters. The heading "ratio of solvents to solids" represents the ratio of the solvents to the solids in the mixture.

While such an outer coating 15 provides a tough, flexible protective cover for the inner coating 14, the solvents of the coating 15 are unable to penetrate the inner coating and work their way through the stopper 13 to contaminate, the con-

have been disclosed it is to be understood that the inventive idea may be carried out in a number of ways. This application is, therefore, not to be limited to the precise details described but is intended to cover all variations and modifications thereof falling within the scope of the appended claims.

We claim:

1. A container closure cap of the type adapted to shrink by loss of solvents comprising an inner

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layer of polyvinyl alcohol, and an outer layer composed of cellulose acetate butyrate.

2. A container closure cap of the type adapted to shrink by loss of solvents comprising an inner layer of polyvinyl alcohol, and an outer layer composed of cellulose acetate butyrate dissolved in a solvent to form a solution which is adapted to set to a gel upon cooling.

3. A container closure cap of the type adapted

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to shrink by loss of solvents comprising an inner layer of a polyvinyl alcohol, and an outer layer composed of cellulose acetate butyrate containing approximately 37% butyryl and approximately 13% acetyl dissolved in a solvent composed of 20 to 30% iso-propyl alcohol and 70 to 80% xylene.

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