April 24, 1934. C. H. EGAN 1,956,012

METHOD OF MAKING A RECEPTACLE CLOSURE

Original Filed Oct. 10, 1930

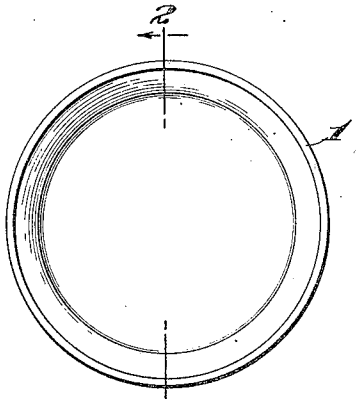


Fig. 1

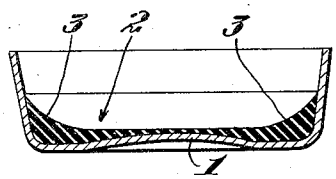


Fig. 2

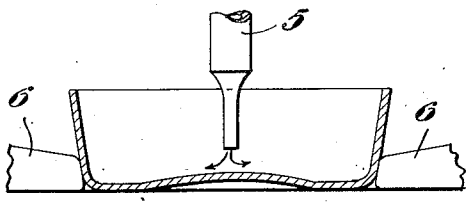


Fig. 3

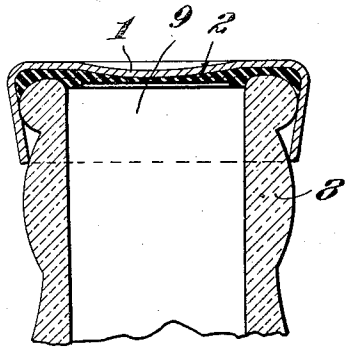


Fig. 4

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1,956,012

METHOD OF MAKING A RECEPTACLE CLOSURE

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Original application October 10, 1930, Serial No. 487,739. Divided and this application April 27, 1932, Serial No. 607,749

10 Claims. (Cl. 113—80)

This invention relates to receptacle closures and particularly to seals for bottle closures of the cap or crown type, and to a method by which the seals may be formed, and is a division of my copending application Serial No. 487,739 filed October 10, 1930.

Cap type bottle closures usually comprise three parts, that is, a crown or metallic cap provided with a flange susceptible of locking engagement with the exterior of the bottle neck, a sealing disc usually of cork or paraffined cardboard and an insoluble binding material joining the sealing disc and the inner top of the crown or cap. Sometimes the sealing disc, whether of cardboard or cork, has been surfaced with rubber compositions; and sometimes there has been substituted for the sealing disc a flat layer of rubber, derived in situ from a fluid solution or dispersion of the same, thereby dispensing with the binding agent mentioned above.

All of the heretofore used or suggested bottle closures of the cap type, known to me, have left something to be desired. Thus those comprising discs of built-up comminuted cork exhibit a marked tendency to become mouldy, which is objectionable. The binding material cementing the cork or other disc to the inside top of the cap is usually a heat-coagulated protein, which, while effective to hold the disc in place, is almost invariably associated with objectionable water solubles, such for instance as the salts of blood serum and egg white remaining in the derived serum and egg albumin. Where an hermetically tight seal is required, as in the vacuum process, neither cardboard nor cork alone suffices. It has heretofore been customary to surface such compressible cushion discs with paraffine or other impervious material to provide an hermetically tight closure as well as to prevent the bottle contents from coming into contaminative contact with the binding agent used and/or the material of the disc. The surfacings are for the most part ineffective for the purpose because of their tendency to rupture, due to a compressive deformation to which the disc is subjected during the bottle-capping operation.

Flat layers of rubber, derived in situ from a solution or dispersion thereof, as heretofore sometimes used, are effective only when sufficiently thick to conform by deformation to the irregularities in bottle tops. This is objectionable not only because of the added expense incident to thick rubber discs but for other practical reasons as well. Thus the removal of the watery vehicle of a dispersion to yield a thick disc involves a long drying operation; and while the usual solvents are somewhat more volatile than water, and therefore more readily removed, the viscosity of rubber solutions increases so rapidly with increments of rubber solids that the production of thick discs therefrom is impracticable. Furthermore, the compressive deformation of a flat, thick, rubber disc at its periphery by the rim of the bottle aperture results in a displacement away from the side walls towards the center. This is objectionable as it diminishes the effective area of sealing contact and tends to increase the percentage of leaky seals.

It is an object of this invention to provide a rubber sealing composition for a receptacle closure of the bottle cap or crown type which shall be free from the objectionable features of bottle cap closures heretofore known, and which shall provide a larger effective area of contact with the receptacle top than may be obtained with the flat sealing discs heretofore used. Another object is to provide a single unit rubber composition seal which will function both as a compressively yielding unit and as an impervious hermetically tight seal. A still further object is to provide a rubber composition seal, for the purpose set forth, which shall be so shaped as to afford full protection to the contents of the receptacle and also provide a thick cushioning layer between the metallic element of the cap and the rim of the receptacle aperture while maintaining the substance of the seal at a minimum weight, thus effecting a material economy. Another object is to provide an improved method by which bottle seals may be produced.

Other advantages will appear from the following specifications taken together with the accompanying drawing in which

Fig. 1 is an inverted plan view of a bottle closure of the cap type;

Fig. 2 is a section taken along the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic view showing the apparatus by which I may produce the bottle closure; and

Fig. 4 is a vertical sectional view showing one of my closures in use.

In the preferred embodiment of this invention an aqueous dispersion of rubber, usually a natural rubber latex, compounded with fillers and other desirable ingredients is admitted to an inverted cap while the same is rotated in a horizontal position and the watery component of the dispersion is thereafter removed by drying.

With reference to the drawing, the closure 1

is represented to be the cap type in which a seal 2 has been inserted. As shown most clearly in Fig. 2, the seal is very thin, substantially a film of material at the center, and gradually becoming thicker toward the rim against which it is banked as at 3, the seal as it approaches the outer edge of the cap tapering to a thin edge.

In Fig. 3 I disclose a means by which the seal may be formed. Material is directed into the closure 1 by means of a nozzle 5, directing the material downwardly into the closure which is held in inverted position by a chuck member 6. This chuck may be mounted in any desired manner to permit rotation thereof, and as the chuck rotates the closure is rotated therewith. Centrifugal force tends to throw the material outwardly and bank it against the vertical portions of the cap, a small portion adhering to the horizontal portion of the cap and covering it with a thin film which protects the cap from the action of the material in the bottle.

A bottle 8 upon which the cap is placed is shown in Fig. 4, the seal being compressed and distorted to form a tight seal over a large area, since the seal is tight on the top of the bottle from the edge of the opening 9 around the top edge and outwardly to approximately the major diameter of the bottle top. It will be seen that due to the adhesion of the seal to the cap and to the arrangement of the seal there is very little flow of the material of the seal toward the center and into the opening in the bottle. Accordingly, no surplus sealing material is placed where no sealing action could be affected, but rather is held in the desired portions of the cap to provide a very satisfactory seal.

In the lining of small circular bottle caps I find it desirable to position the nozzle centrally or approximately centrally of the rotating cap. In the operation of the lining machine a cap is fed into a revolving chuck whereupon a valve, controlling the flow of the sealing composition, is opened to permit the ejection of a predetermined and constant amount of compound. After the closure of the valve the cap is removed from the chuck and conveyed to suitable drying apparatus and the cycle is repeated.

The essence of this invention consists in applying a suitable compound to the interior of a cap in such a manner that after desiccation, the resulting lining, while completely covering the inner top of the cap, is thicker at the periphery than at the center and extends along the side walls for a distance substantially greater than the average thickness of the seal.

While the lining of this invention may be produced by several methods, such for instance as by means of a radially movable nozzle so timed in its motion, outwardly from the center of rotation of the cap, as to yield a thin layer of compound over the central portion of the cap and a thick deposit at the periphery. I prefer, however, to apply the compound through a stationary nozzle disposed centrally or approximately centrally of the cap while the latter is revolved at such a speed that the developed centrifugal force causes the compound to flow outwardly from the center and thus produces a thickened peripheral annulus as well as a thin unitary central lining.

Compounds suitable for the purpose of this invention may contain 30% water, 24% rubber and the remaining 46% of material fillers and protectives. The plasticity of the compound should be so adjusted that it flows freely only in response to pressure. The plasticity and viscosity characteristics desirable in a sealing composition suitable for the purpose of this invention are now known in the art and methods for their control are set forth in U. S. Patent No. 1,765,134 to Dewey and Crocker.

For the purpose of this invention, however, it is essential only that the compound be sufficiently plastic not to flow, after application to the interior of the cap, under the influence of gravity. It is obvious that the speed of rotation of the cap actuating device or chuck may be varied to produce a centrifugal force of a value sufficient to cause the desired flow of a compound of given viscosity and plasticity. Those skilled in the art will encounter no difficulty in obtaining the desired flow and consequent shape of lining by adjusting either the speed of rotation of the cap during application of the lining compound thereto or by adjusting the viscosity and plasticity factors of the compound as taught by Dewey and Crocker in the above mentioned U. S. patent.

In general, it is desirable to use a fairly concentrated compound of about 70% solids, as above stated, and in making thin films it is desirable to avoid such agitation of the compound as would introduce air bubbles because of the tendency of these bubbles to break during drying, whereby a small hole is apt to occur in the resulting lining.

Sometimes, and particularly where there is much variation in the moulding of the glass of bottle tops, it is desirable to interpose a cork or other flat composition disc between the lining compound and the cap. Thus, the usual crown cork and seal closures may be surfaced by the method of this invention whereby not only growth of mould is prevented but the contents of the receptacle are protected from contamination by the reaction products of the cork, tannin, and tin, and a vacuum type seal is obtainable as well. When a lining compound is applied according to this invention over a cork, pasteboard or other inserted disc, it is found desirable to moisten the insert to prevent absorption by the disc of moisture from the compound during application thereof whereby its flow characteristics might be disadvantageously affected.

For a usual compound, a rate of rotation of the cap of about 600 R. P. M. is found sufficient to develop a centrifugal force capable of producing the thickened shoulder 2 (Fig. 3) of this invention. In general, for the usual bottle cap about 650 cubic millimeters of wet compound will yield a satisfactory film. Those skilled in the art will choose a nozzle of such an aperture as to yield the desired amount of compound in the requisite time as governed by the time of the cycle to which the machine has been geared. In general 150 cycles a minute will be found satisfactory.

The term "cap" has been used to include bottle closures of the cap and also the crown type, and is intended to be so interpreted, since the operation of each of these types is the same.

I claim:

1. A method of providing a seal for a bottle cap which comprises introducing into said cap a plastic material and imparting centrifugal force thereto in order to cause said fluid completely to cover the inner top of the cap and to bank against the edges of the cap.

2. A method of providing a seal for a bottle cap which comprises rotating a cap in the plane if its top and introducing into said cap a plastic

fluid to form the seal, centrifugal force carrying said fluid over the inner surface of the top of the cap and against the edges of the cap to provide a thickened annulus at the sides of the cap and a thin integral lining for the central portion.

3. A method of providing a seal for a bottle cap which comprises rotating a cap in the plane of its top and introducing into said cap a plastic material to form the seal, centrifugal force carrying said fluid over the inner surface of the top of the cap and against the edges of the cap to provide a thickened annulus at the sides of the cap and a thin integral lining for the central portion, and then drying the cap and seal.

4. A method of providing a seal for a bottle cap which comprises introduction of a plastic material into a bottle cap and rotation of the cap at such a speed as to cause flow of the sealing fluid over the inner surface of the top of the cap and to cause the greater part of the fluid to bank against the edges of the cap to provide a thickened annulus at the sides of the cap and a thin integral lining for the central portion.

5. A method of providing a seal for a bottle cap which comprises introduction of a plastic material into a bottle cap which is rotated at such a speed as to cause flow of the fluid over the inner surface of the top of the cap and to cause the greater part of the fluid to bank against the edges of the seal to provide a thickened annulus at the sides of the cap and a thin integral lining for the central portion and then drying the cap and seal.

6. A method of producing a seal for a bottle cap which comprises introduction of a plastic material into the center of the cap while the cap is rotated at such a speed that the centrifugal force causes the fluid to flow outwardly, providing a thickened annulus for the sides of the cap and a thin integral lining for the central portion.

7. The method of providing a seal for a cap of the class described which comprises distributing plastic sealing material over the inner surface of the top of the cap by rotating said material to impart centrifugal force thereto, and utilizing this centrifugal force for distributing said material around the cap to provide a thickened annulus at the sides of the cap and a thin integral lining for the central portion.

8. The method of providing a seal for a cap of the class described which comprises concurrently delivering plastic material to form the seal and rotating said material as it is delivered to impart centrifugal force thereto, and utilizing this centrifugal force for distributing said material over the inner surface of the top of the cap and around the cap to provide a thickened annulus at the sides of the cap and a thin integral lining for the central portion.

9. The method of forming a closure of the class described which comprises rotating a cap substantially in the plane of its top and concurrently projecting sealing compound substantially against the inner side of said cap so that the rotary motion of the latter is effective for impelling the compound over the inner surface of the top of the cap and outwardly around the cap to provide a thickened annulus at the sides of the cap and a thin integral lining for the central portion.

10. The method of covering an area with sealing compound which comprises introducing a quantity of said compound within the area to be covered and rotating the compound so introduced to cause said compound to be impelled outwardly over said surface to provide a thickened annulus at the sides of the cap and a thin integral lining for the central portion.

CHARLES H. EGAN.