The present invention relates to the sealing art, and more particularly to a sealed package and cap therefor.

In sealing containers with closures, particularly screw closure caps, it is customary to form a seal on the rim of the container by means of a disc of paper, cardboard, felt, cork, or other suitable material. When the cap is applied to the container, the disc is pressed against the rim of the container by the cover portion of the cap and forms an edge seal. Such caps are used quite extensively and may be made of metal or various molding compounds.

One of the difficulties encountered with such caps is the tendency for the liners therein to fall out during shipment of the caps to the packer or during the sealing of the caps to the containers. It is customary to ship caps with the liners in them and, in large factories, to place the caps in hoppers, where they are fed individually and applied to containers. The agitation of the caps, both during shipment and while in the hoppers, tends to dislodge the liners. If the cap is applied to the container without a liner, there is no seal and the product may spoil or leak out of the container, rendering the entire package unsalable and sometimes damaging adjoining packages.

After the cap has been applied to the container, the rim of the container becomes embedded in the relatively pliable sealing material and a certain amount of adhesion exists between the sealing material and the container, irrespective of the product in the container. In many instances, the product is tacky, which increases the adhesion of the liner to the rim of the container. The result is that, when the cap is rotated to open the package, the liner leaves the cap and remains on the rim of the container, making it necessary to pry it off. The consumer ordinarily throws the liner away rather than to continue to pry it off after each removal of the cap. When the liner is thrown away, the cap is no longer adapted to form an effective seal and the product deteriorates rapidly, causing dissatisfaction on the part of the consumer.

Various attempts have been made to eliminate the difficulties noted above, and to provide a liner which will remain in the cap in all cases. In some instances, manufacturers have gone to the extent of gluing the liners in the caps. This is objectionable, due to the fact that it introduces an additional operation in the manufacture of the caps and, because heat is ordinarily desirable for drying the glue, which decreases the rate of production.

A serious difficulty in connection with caps molded of "bakelite", "durez" and the like is breakage during application to containers. Molded screw caps are applied by sealing machines and substantial rotative effort is applied to the cap to obtain a secure seal. Such rotative effort in a horizontal plane resolves itself into an increased force in a vertical direction by reason of the in-line plane action of the screw thread. Hence, if the rotation of the cap is stopped by the vertical sealing pressure, excessive vertical strains result, which break a substantial percentage of the caps. This is objectionable.

The present invention aims to eliminate or minimize the above difficulties by preventing breakage and by providing a cap adapted to retain the liner during shipment and application, and to remove the liner from the container when the cap is removed therefrom. These advantages are achieved without the use of glue or other adhesive materials.

An object of the present invention is to provide an inexpensive closure cap adapted to engage and retain a liner in proper position at all times.

Another object of the invention is to provide a closure cap adapted automatically to break or impair the adhesion between the liner and the rim of the container, when the cap is rotated or removed.

Another object of the invention is to prevent relative rotation between the closure cap and liner therefor, without the use of adhesive material.

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 drawing, forming a part of the specification, wherein

Fig. 1 is a partial sectional view of a closure cap applied to a glass container, illustrating one embodiment of the present invention;

Fig. 2 is a sectional view of a closure cap illustrating another embodiment of the invention;

Fig. 3 is a fragmentary bottom view of a closure cap illustrating a different embodiment of the liner holding means;
Fig. 4 is a sectional view of another embodiment of the invention;

Fig. 5 is a partial sectional view of a slightly different construction;

Fig. 6 is a top plan view of a preferred form of liner;

Fig. 7 is a fragmentary sectional view, on the line 7—7 of Fig. 4, illustrating the liner in Fig. 6 within a cap, and

Fig. 8 is a sectional view, similar to Fig. 7, illustrating a circular liner applied to the closure cap in Fig. 4.

Referring again to the drawing, and more particularly to Fig. 1, there is shown a container, threaded at its upper end and having a screw closure cap 2 sealed thereon. The closure cap may be made of any suitable material, preferably of a molded composition such as phenolic condensation products, the materials known under the trade names of dures, bakelite, and similar products, although many of the features of the invention may be utilized in caps made of metal.

The cap comprises the usual cover portion 4 and depending skirt 5. A suitable thread 6 is formed on the inner wall to co-operate with a corresponding thread 7 on the container 1. A suitable liner 8, which may be made of felt with a sheet of oil paper on the lower surface thereof, is intermediate the under side of the cover of the cap and the rim of the container. When the cap is screwed on the container, this liner is compressed sufficiently to form a seal on the rim of the container and to prevent the contents from escaping.

The cap is provided with a series of projections 9, shown extending downwardly from the lower surface of the cover of the cap in Fig. 1. As illustrated, these projections are inclined slightly to the left in Fig. 1 to assure rotation of the liner with the cap when the cap is turned counterclockwise for removal. It will be understood, of course, that these projections may be substantially vertical, as illustrated in Fig. 2. In any event, as illustrated in Fig. 2, these projections bite into, or engage, the upper surface of the liner material without affecting the seal on the rim of the container. When the cap is unscrewed, these projections forcibly rotate the liner with the cap, thereby breaking any adhesive contact which may exist between the rim of the container and the liner. In this way, the forces tending to hold the liner on the rim of the container are eliminated, so that the liner will come off the bottle with the cap, substantially the entire tendency for the liner to drop out or remain on the container being measured by the weight of the liner. As shown in Fig. 1, the projections 9 are inclined slightly to the left so that they effectively engage the liner on backrotation of the cap.

In this manner, the liner, while not glued to the cover part of the cap, is nevertheless forcibly removed from the rim of the container when the cap is turned backward, so that it will come off the container and remain in the cap. However, the application of the caps, the projections cause the liner to rotate with the cap as soon as the sealing pressure becomes sufficient to imbed the projections in the liner. The rotation of the liner as the cap is screwed home increases the frictional resistance to rotation as soon as an effective seal has been obtained, and thereby minimizes breakage of the caps.

In Fig. 2, the downwardly extending projections in the cover portion of the cap are shown to be substantially vertical. A series of horizontal ribs 10, in the skirt of the cap, are adapted to engage the periphery of the liner to provide a lifting force tending to prevent the liners from dropping out of the caps and tending, also, to pull the liners from the rims of the containers. The horizontal projections 10 co-operate with the vertical projections 9 to prevent relative rotation between the liner and the cap and to raise the liner from the container when the cap is removed.

Fig. 3 illustrates a different form of projection in the cover of the cap adapted to pierce the upper surface of the liner. These projections are sharp, but of substantial length, extending in a radial direction of the cap. They operate in substantially the same manner as the projections 9, illustrated and described with respect to Figs. 1 and 2.

In Fig. 4, a liner recess 14 is provided, by means of the horizontal ribs 15, to receive the periphery of the liner and retain it in position. The liner recess has a series of vertical projections 16 adapted to engage the periphery of the liner to hold it against rotation. The ribs 15 serve the purpose of the ribs 10, in Fig. 1, but the projections 16 tend to prevent the rotation of the liner with respect to the cap.

The closure cap shown in Fig. 5 is similar to that shown in Fig. 4, except that the projections 17 are substantially conical, for engaging and supporting the periphery of the liner. It will be understood that any type of liner may be used in the present cap. A preferred embodiment of the liner, however, is shown in Fig. 6, with an irregular outer contour 18, in the form of saw teeth, adapted to engage the inner side wall of the skirt of the cap. Such a liner is particularly applicable to a construction such as that shown in Figs. 4 and 5, where the saw teeth engage the projections 16 and 17 to prevent rotation of the liner. This is illustrated more particularly in Fig. 7. A circular liner may be effective in the case illustrated in Fig. 8. The projections 16 or 17, as the case may be, will engage and form indentations in the periphery of the liner and hold it securely against rotation.

The closure cap illustrated herein may be made by a collapsible mold of the interior thereof, and the cap is slipped on the mold. The most convenient way of stripping the cap is to remove the cap and pin from the outer mold and thereafter engage the cap to pull it from the inner mold or pin. It has been found that materials such as phenolic condensation products are slightly elastic, particularly in their heated state, and the solid pin forming the interior of the cap may be removed by a stripping action, as distinguished from the usual unscrewing operation. The present caps can also be made in the usual type of mold, where the solid pins are unscrewed from the interior of the cap in the same way that they have been made heretofore. In this use, however, the projections, such as the projections 10 and 11, will be stripped in the unscrewing operation. The resilience of the cap, while in a semi-plastic condition, will prevent these projections from being broken.

In applying the caps to the containers, the projections in the cover portion of the cap will be forced down into the upper surface of the liner to force the liner to rotate with the cap and to prevent its rotation with respect to the cap. The friction between the rotating liner and
the rim of the container provides a force countering the rotative effort utilized in applying the cap, thereby preventing excessive strains in a vertical direction by reason of the thread leverage on the skirt of the cap and minimizing breakage of molded caps. When the cap is unscrewed, the liner will be rotated with the cap and any adhesion between the liner and the rim of the container will be broken, so that the liner may be removed readily. The projections on the inside of the skirt of the cap cooperate with the periphery of the liner to effect the same result. In addition, the liner retaining ledges forming the recess in the upper part of the cap, to support the liner during shipment of the cap and during application thereof, co-operate with the projections to pull the liner off the rim of the container.

It will be seen that the present invention not only prevents the liners from falling out of the caps during shipment and application of the caps to the container, but also prevents relative rotation between the liner and the cap. In the application of such a cap, the frictional resistance between the bottom of the liner and the rim of the container makes the cap harder to rotate, thereby preventing the cap from being screwed on too tight by sealing machines. This minimizes the vertical strains on the cap and the breakage of molded caps resulting therefrom.

Backward rotation of the cap forcibly breaks any adhesion between the liner and the container in the removal operation, thereby permitting the liner to be readily removed from the container. Unsealed packages are eliminated and deterioration of the contents of opened packages is minimized, due to the fact that secure seals may be repeatedly made by the consumer. The cost of the cap is not materially increased because it may be made in substantially the same manner that the present types of molded caps are made. The production of the caps on existing machines simplifies the commercial introduction thereof and minimizes the expense in connection therewith.

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 my invention, I claim:

1. A molded closure cap having a cover portion, a depending skirt, a liner, liner engaging means integral with the upper portion of said skirt adapted to hold the liner within the cap, and downwardly extending means on the under side of the cover portion above the rim of the container adapted to indent the upper surface of said liner when the cap is screwed on a container to hold said liner so that it will subsequently rotate with the cap.

2. A closure cap molded of a phenolic condensation product or the like, comprising a cover portion, a depending skirt, a sealing disc in said cap adjacent to the cover portion thereof, and a plurality of projections molded independently of the contour on the exterior of the cap and being integral with and extending downwardly from the under side of the cover portion of the cap, said projections being adapted to be pressed firmly against the sealing disc when the cap is applied to a container, thereafter to resist rotation of said sealing disc with respect to the cap.

3. A molded closure cap comprising a cover portion, a depending skirt, a disc liner, and a series of tooth-like projections molded on and extending downwardly from the cover portion of said cap, said projections being adapted to indent the upper surface of said liner and being inclined to the vertical so that they will exert greater rotative effort on said liner when the cap is unscrewed from a container than when it is screwed on a container.

4. A screw closure cap molded of a frangible material comprising a cover portion, a depending skirt, a sealing disc in said cap adjacent the cover portion thereof, said sealing disc being sufficiently large normally to remain in the cap, and elongated radially extending ridges molded on the under side of the cover portion of said cap above the rim of the container adapted to engage and indent the upper surface of said sealing disc and press the sealing disc against the rim of the container, whereby said ridges forcefully engage the disc and prevent rotation of the sealing disc thereafter with respect to the cap during application and removal thereof.

5. A screw closure cap molded of a synthetic resin or the like, comprising a cover portion, a depending skirt, screw means for attaching the cap to a container, a liner in the cap, means molded on the interior of the skirt for engaging and supporting the liner in the cap, the under side of the cover portion of said cap having ridges located in the cover portion of the cap above the rim of the container to which it is to be sealed and adapted to be pressed into forceful engagement with the liner and to thereafter resist relative rotation of the cap and liner during application, thereby increasing the resistance to screwing the cap on the container and minimizing the strains on the cap and breakage during application.

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