Dec. 20, 1966 E. GOLDE 3,292,807

TAMPER-PROOF CLOSURE

Filed March 18, 1965

FIG.2

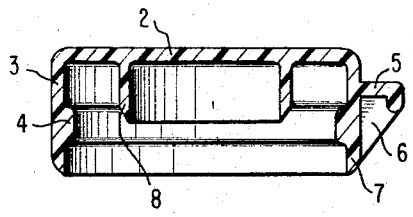
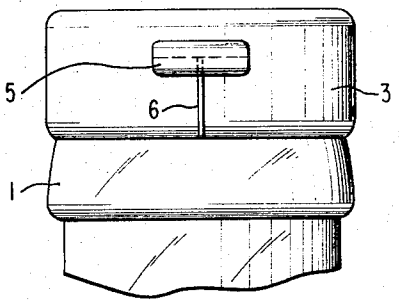


FIG.3



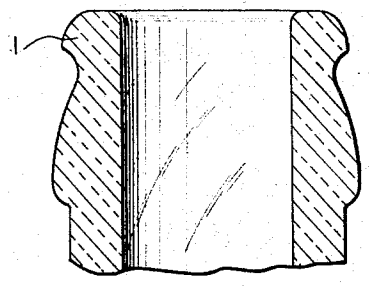
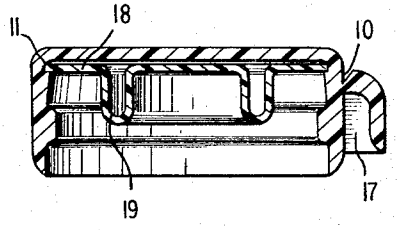


FIG.1

FIG.4



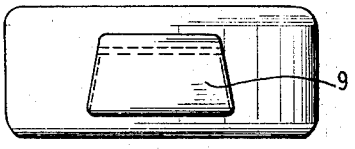
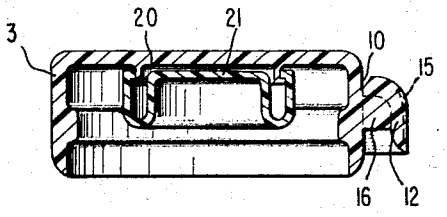


FIG.5

FIG.6



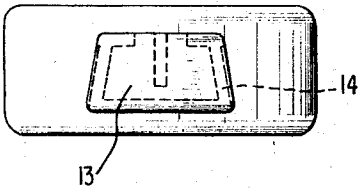


FIG.7

INVENTOR
ERICH GOLDE

BY Burns, Doane, Benedict, Hoecker & Mathis

ATTORNEYS

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TAMPER-PROOF CLOSURE

Erich Golde, 4 Tattenkofener Strasse, 8192 Geretsried, Upper Bavaria, Germany

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This invention relates to an improved closure or cap for bottles and like vessels having at their upper edge or lip an outwardly projecting bead or beading which serves as an anchor for such closure. Closures of this kind made of sheet aluminum or sheet steel are known as crown caps.

Many attempts have been made to make such caps from plastics in order to avoid the disadvantages of corrosion. Accordingly, caps made of thermoplastic resins are known which are provided with a skirt that is adapted to extend over the aforementioned annular bead on the mouth of the bottle and to reach under the bead of the bottle by means of an inwardly directed annular projection formed on the inside of the skirt of the cap. It is also known to provide a projection or tab member on the outside of the skirt which facilitates lifting the closure off a bottle, i.e., it facilitates opening the bottle. In order to insure the genuineness of the bottled contents it has also heretofore been proposed to make the skirt of the closure either entirely or partially tearable so that the remaining visible damage of the closure makes it apparent that the bottle has previously been opened. However, the mechanical capping of bottles with such closures has proved to be difficult in that the capping operation itself easily results in prematurely tearing the closures. Moreover, the weak tear portions of such closures make it difficult to remove the closures from molds used in their fabrication and consequently increase their production cost. Finally, the manipulation required in tearing the closure to open the bottle often is found unduly intricate by the ultimate consumer.

The present invention avoids all of the these disadvantages. It solves in a completely new manner the objects of insuring the genuineness of the bottled contents while providing a re-usable plastic bottle closure. According to this invention the aforementioned lift tab member or lever which serves as a means for prying off the closure, is connected to the skirt of the closure by means of one or more linking members or connecting webs, at least one of which becomes torn as soon as a filled and capped bottle is opened for the first time. As a result, the closure then shows permanent visible damage while, nevertheless, the cap itself remains re-usable for subsequent and repeated capping of the bottle if such is desired.

In order to preclude opening of the bottle without damage to the said linking members which connect the lift tab and the skirt it is preferred to make the lower edge of the skirt thin or to make it downwardly tapered so that it will cling to the neck of the bottle and thus leave the lift tab as the only point of attack which a bottle opener can seize.

According to one particular modification the tab member is shaped such that the closure can be pried off either by means of a mechanical bottle opener or by hand. In this case the tab consists of a downwardly open pocket the side walls of which are substantially thinner than its front wall. Thus, when a finger or a bottle opener is inserted into the pocket or under its front wall the thin side walls of the pocket become necessarily torn as the cap is pried off, before its front wall can exert its full leverage. This effect can be further improved by making a notch at the juncture between the front wall of the pocket and the skirt of the closure to which the tab is

attached, whereby the notched surfaces can come in contact with each other only after the side walls of the pocket are torn.

It is further possible to make the front wall of the pocket with tearable weak portions. In such a case the front wall can consist of a frame with thick-walled edge members while the surface within this frame is made thin and is connected at its middle portion to the skirt by means of a connecting bridge member. When a finger or bottle opener is inserted under the front wall into the pocket and starts lifting the cap, this then causes not only the weak side walls but also the weak portions of the front wall to tear until full leverage takes place to lift the closure off the bottle.

In order to permit subsequent use of the closure for re-capping the partially emptied bottle, and to provide an airtight closure in doing so, it is desirable, in an otherwise known manner to provide the cap on its underside with a cylindrical, pot-shaped, or hollow annular projecting seal adapted to extend inside the mouth of the bottle and to cling in a compressed state to the inside of the bottle.

Bottled gas-containing beverages such as beer or carbonated water tend to develop considerable pressure, especially when being transported or at increased temperatures. In such cases, it is necessary to make the closure from a relatively stiff thermoplastic resin which does not become unduly deformed by the developed pressure and temperature, as otherwise it would spring off the bottle. For instance, it is desirable to use high-density polyethylene, e.g., polyethylene having a density of about 0.93 gram/cm.^{3}. On the other hand, as one must allow for the normal tolerance or minor variations in bottle wall thickness it can be an advantage to make the sealing member of the closure from a softer material, that is, from an elastic or resilient thermoplastic resin, e.g., polyethylene having a density of only about 0.916 gram/cm.^{3}, i.e., to provide the cap with a separate sealing insert made of this material. In doing this it is again advantageous to provide such an insert with a cylindrical, pot-shaped or hollow annular sealing projection adapted to extend into the mouth of the bottle as described earlier herein.

For the fabrication of the closure it is advisable, as mentioned eariler herein, to use polyethylene resin because of its elastic properties and its easy fabrication by injection molding. However, this material is substantially permeable by gases such as carbon dioxide, especially at higher temperatures. This disadvantage can be overcome in the case of the present invention by coating the underside of the cap with a film having only a small permeability for carbon dioxide. Alternatively, one can coat the upper surface of the aforementioned special sealing insert with such a relatively impermeable film or to interpose a sheet or foil of such an impermeable material between the sealing insert and the cap proper, e.g., a sheet of polyvinyl chloride.

Referring to the accompanying drawing wherein the invention is further illustrated,

FIGURE 1 is a vertical section of the neck of a bottle in section;

FIGURE 2 is a vertical section of the novel cap in section;

FIGURE 3 is a view in elevation of the closure illustrated in FIGURE 2, placed on the bottle shown in FIGURE 1, except, however, that the closure is shown rotated through an angle of ninety degrees with reference to the closure shown in FIGURE 2;

FIGURE 4 is a vertical section of the closure with a somewhat different tab member;

FIGURE 5 is a view in elevation of the closure illustrated in FIGURE 4, rotated through an angle of ninety degrees;

FIGURE 6 is a vertical section of still another embodiment of the closure; and

FIGURE 7 is a view in elevation of the closure illustrated in FIGURE 6, rotated through an angle of ninety degrees.

The bottle shown in FIGURE 1 has at the edge of its mouth an outwardly projecting circular bead **1** which serves to retain a so-called crown closure.

FIGURE 2 represents a closure **2** made from a thermoplastic resin. Skirt **3** of this closure has an inwardly projecting bead **4** which is adapted to reach under the outer bead of the bottle after being snapped on and thereby to hold the cap in closed position. A tab **5** which projects laterally from the skirt in an otherwise known manner serves for pulling off the closure. Its special form, as it is variously shown in FIGURES 2–7, represents the essence of the invention. As can be seen from FIGURES 2 and 3, the tab **5** is connected to skirt **3** by means of a connecting web **6** which is considerably thinner than the skirt of the closure or the back of the tab. When the bottle is being opened the finger or bottle opener first bends the flexible back of the tab somewhat upward before the actual prying action takes place. In doing this the thin connecting web **6** is torn and becomes a permanent indication that the bottle has been opened. In this manner the closure is made reusable while the genuineness of the bottled contents is safeguarded as long as the closure remains intact. The lower edge **7** of the skirt is thin and clings to the neck of the bottle in order to preclude a bottle opener from finding a point of attack other than tab **5**.

Especially for bottles with carbonated beverages it is advisable to use a cylindrical sealing member **8** which is adapted to extend into the mouth of the bottle and which is shown in FIGURE 2, as this reduces by about one-half the pressure area on which the free gas can act and thereby reduces the likelihood of the closure being popped off by the internal pressure.

A somewhat different embodiment of tab is illustrated in FIGURES 4 and 5. Here tab **9** is in the form of a downwardly open pocket having side walls **17** which are considerably thinner than the front wall. At the juncture between the front wall of the pocket and skirt **3** of the closure a V-shaped notch **10** is provided. When the closure is to be removed from the bottle a finger or bottle opener is inserted under the front wall of the pocket whereupon lifting of the cap necessarily tears the thin side walls **17** of the pocket before the front wall can effect its full lifting action. The surfaces which define notch **10** come into contact and thereby become capable of transmitting force only when the back of the tab is bent back through an angle corresponding to the width of the notch.

FIGURE 4 further shows a separate, otherwise well-known sealing insert **18** which contains a hollow annular ring or sealing extension **19** adapted to protrude into the mouth of the bottle. The edge of this sealing member rests in a circular recess **11** inside skirt **3** whereby the insert is anchored in the closure.

Another variation of the invention is shown in FIGURES 6 and 7. The front wall **12** forming the back of tab **13** is composed of a frame of thick edge members **14** whereas the tab portion **15** within the frame is a relatively thin membrane. In a center portion this membrane is connected to skirt **3** by means of a thick walled bridge member **16** or baffle which extends only

about halfway down the pocket. When a finger or bottle opener is inserted under the bottom of front wall **12** both the thin side walls of the pocket as well as the membrane portion of the front wall become torn before the full leverage of the tab can be exerted and the closure thus removed from the bottle. The sealing insert **21** which is provided here as shown in FIGURE 6 is anchored in the cap in a manner such that a special sheet or film **20** having a low permeability for carbon dioxide is placed between the sealing insert and the underside of the cap.

Closures, of which several embodiments have been described above, can be placed on bottles by means of known and conventional automatic bottle capping machines without damaging the thin connecting webs or tear portions which forms the "seal." Any subsequent opening of the capped bottle is, however, impossible without damaging this "seal," regardless of whether the cap is pried off by hand or by means of a bottle opener. After partial emptying the bottle can be tightly but easily re-closed by hand.

The invention for which protection is desired is particularly pointed out in the appended claims.

What is claimed is:

1. A resilient cap adapted for closing a bottle having an outwardly projecting bead at the lip thereof, said cap comprising a skirt adapted to extend over and to reach under said bead, an outwardly projecting tab member in the form of a downwardly open pocket attached to said skirt, said tab member having a front wall and a side wall which is substantially thinner than said front wall.

2. A closure according to claim **1** wherein a notch is provided at the place where the tab member is connected to the skirt.

3. A closure according to claim **1** wherein said front wall of the tab comprises a frame composed of thick walled frame members containing a thin surface, said thin surface having a center portion connected by a bridge member to the skirt.

4. A closure according to claim **1** wherein said skirt has a thin tapered lower edge adapted to cling to the neck of a bottle.

5. A closure according to claim **1** which comprises cylindrical sealing member composed of a soft flexible thermoplastic resin and adapted to protrude into and tightly abut the inner wall of the mouth of a bottle.

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JOSEPH R. LECLAIR, *Primary Examiner.*

D. F. NORTON, *Assistant Examiner.*