United States Patent [19]

Botkin

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[54] TAMPER-PROOF CLOSURE ARRANGEMENT

[76] Inventor: **Albert L. Botkin,** 3018 W. Hood Avenue, Chicago, Ill. 60645

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[52] **U.S. Cl.** **215/42,** 215/7, 220/27

[51] **Int. Cl.** **B65d 41/20**

[58] **Field of Search** 215/42, 9, 7, 31; 220/27

[56] **References Cited**

UNITED STATES PATENTS

2,077,977	4/1937	Ahlquist	215/42
3,224,616	12/1965	Fields	215/7

Primary Examiner—George T. Hall
Attorney—MacDressler et al.

[57] **ABSTRACT**

A tamper-proof seal that is located between a container and a cap received on a threaded open end of the container. The tamper-proof seal consists of a flange integral with the container wall adjacent the open end and defining an upwardly opening recess that has a reduced mouth at the upper end. The flange is divided into a fixed portion and a flexible, frangible portion. The cap has an enlarged bead on the lower end thereof that has a dimension greater than the dimension of the mouth to cause outward deflection of the frangible portion when the cap is threaded onto the container and the enlarged bead and frangible portion cooperate to define interlocking elements when the cap is placed in sealing engagement with respect to the open end of the container.

10 Claims, 4 Drawing Figures

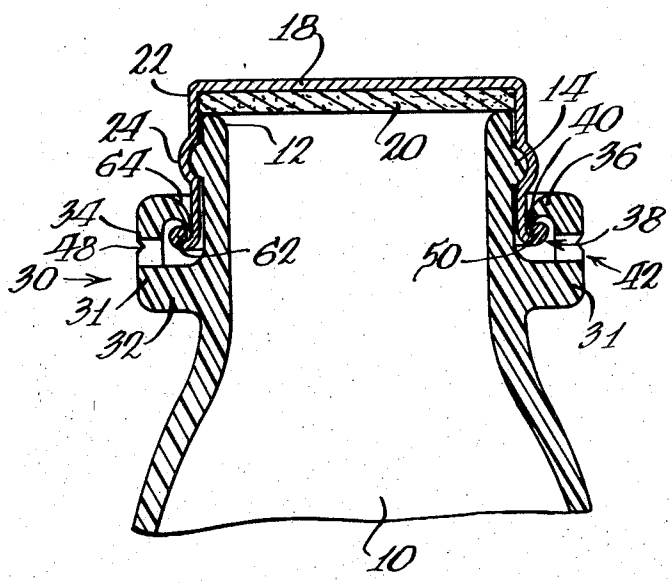


Fig. 1.

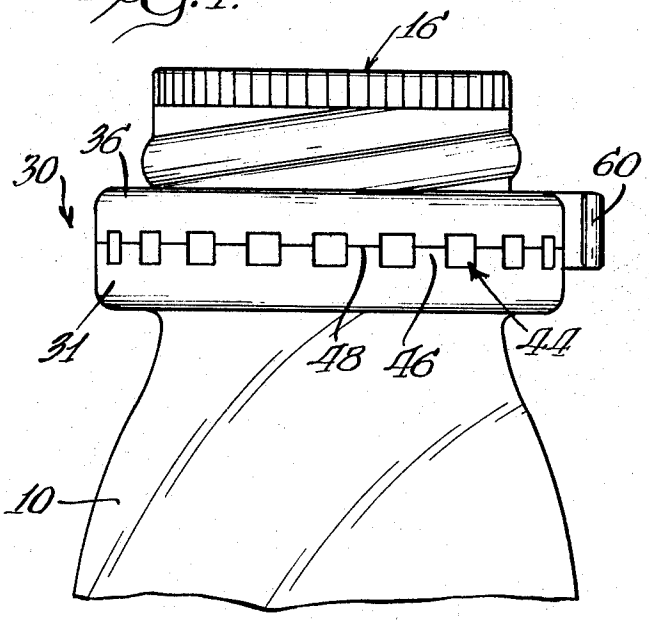


Fig. 2.

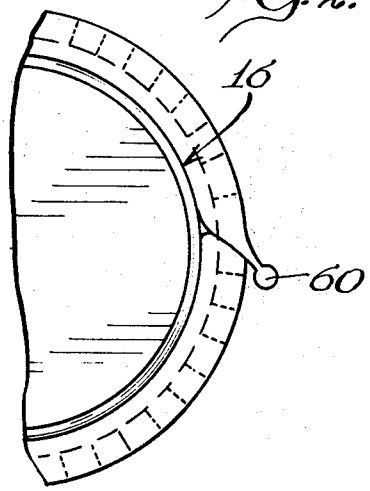


Fig. 3.

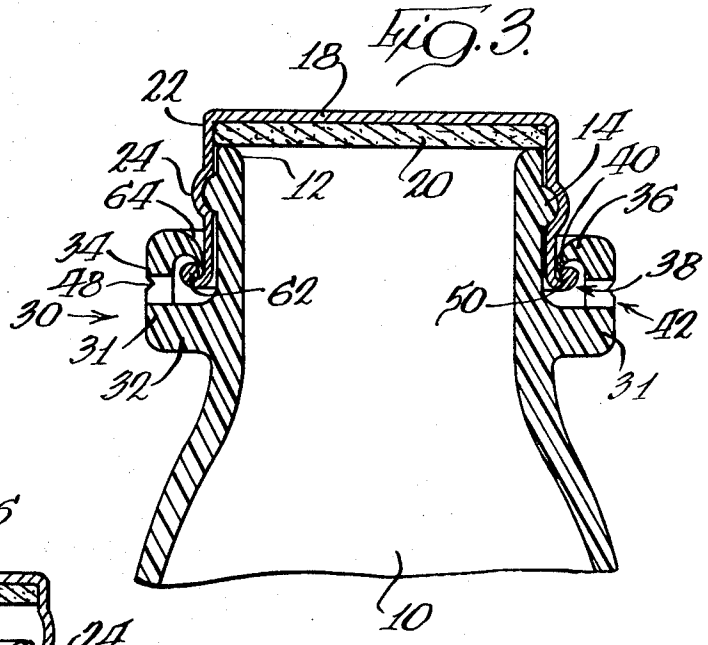
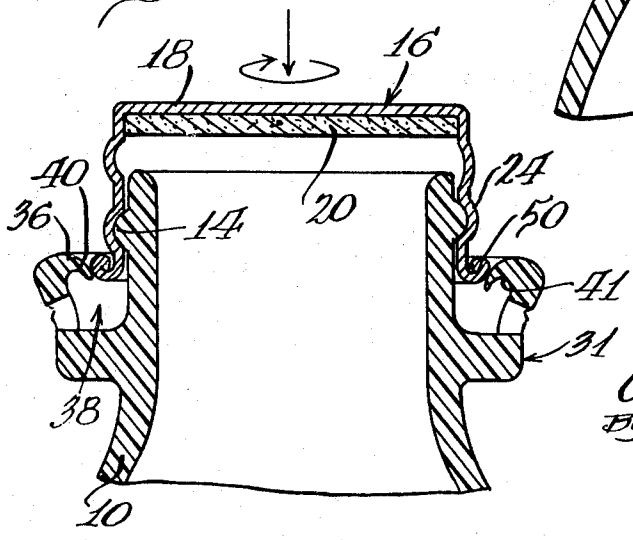


Fig. 4.



Inventor:
Albert L. Botkin
By Dressler, Goldsmith, Clement & Gordon
Atty's

TAMPER-PROOF CLOSURE ARRANGEMENT

BACKGROUND OF THE INVENTION

The use of tamper-proof seals between containers and caps has become increasingly prevalent in numerous industries in recent years because of the substantial losses that have been incurred while products are being displayed for sale. Examples of such devices are shown in Hogg U.S. Pat. No. 1,908,245; Merolle U.S. Pat. No. 2,062,271; and Cheeley U.S. Pat. No. 3,511,402.

Devices of the character disclosed in the above patents, while partially solving the problem of unauthorized removal of the caps on containers, have several serious drawbacks. Tamper-proof seals of this type require a modification of the container and the cap as well as a separate element to provide an interlock between the container and cap. For example, the three patents referred to above, all require a separate band of metal or other material that is applied over enlarged cooperating flanges on the container and the cap to provide the tamper-proof seal. Such an arrangement is not only expensive in the initial manufacture of the container and closure, but also has inherent additional problems that increase the cost of filling the containers and sealing the cap to the container since they require a separate step for placing the tamper-proof band onto the container and cap after the filling and closure operations have been completed.

Another problem encountered with tamper-proof seals of the above type is that the containers and caps can be reused by applying a new tamper-proof band. In many areas, such as the milk industry, sanitation requirements dictate that the container be designed so as to be truly non-refillable. With devices of the above type, the containers can readily be reused any number of times.

While efforts have been directed towards the design of truly non-refillable containers with a tamper-proof seal, as evidenced by U.S. Pat. Nos. 3,088,617; 3,224,616; and 3,504,818, such devices have not found any degree of commercial success because of the manufacturing and assembly problems and/or number of parts that are required.

SUMMARY OF THE INVENTION

The present invention contemplates a tamper-proof seal between a container and a closure that requires only a modification of the container so that a conventional commercially available cap can be utilized with the container and the container can be filled and the closure applied thereto by well known filling and closure operations.

The container modification consists of a flange that is molded integral with the plastic container and has an outwardly directed first portion, an upwardly directed second portion and an inwardly directed third portion adjacent the upper end of the second portion to define an upwardly opening recess having a reduced mouth at its open end. The inwardly directed third portion or wall has an interlocking element defined by a downwardly directed lip that cooperates with an interlocking element in the form of an enlarged bead on the bottom end of the cap so that tamper-proof seal is created as the cap is threaded into sealing engagement with the open end of the container. The upwardly directed second portion of the flange has a weakened section that provides a franglible connection between the first and third portions of the flange.

With this arrangement, the cap can be inserted onto the container with a conventional type of closure machinery and the tamper-proof seal will automatically be provided between the cap and container.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF DRAWINGS

FIG. 1 is a fragmentary plan view of a container and cap in the assembled condition;

FIG. 2 is a fragmentary plan view of the container and cap shown in FIG. 1;

FIG. 3 is a vertical section through the cap and the upper end of the container; and

FIG. 4 is a section similar to FIG. 3 showing the cap as it is being assembled onto the container.

DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

FIG. 3 of the drawings shows a portion of a container **10** having an open upper end **12** with an external thread **14** on the periphery of the container adjacent the open end that receives a cap **16**. The cap or closure **16** has a circular portion **18** with a sealing member **20** secured therein and a depending skirt **22** that has a cooperating thread **24** defined therein.

According to the present invention, the tamper-proof seal **30** is formed integral with the container **10** and cooperates with the closure or cap **16** to automatically interlock the container and cap as the cap is threaded into a sealing engagement with the open end **12** of the container. Furthermore, the cap may be of a conventional, commercially available type that can be assembled onto the container utilizing conventional assembly techniques. The tamper-proof seal **30** consists of a flange **31** that has a first outwardly directed substantially fixed portion **32** that is integral with the wall of the container and a second upwardly directed portion **34** with an integral inwardly directed third portion **36** along the upper end of the second portion. The first, second and third portions of the flange cooperate to define an upwardly opening recess **38** that is adapted to receive the lower end of the skirt **22** of the cap **16**. In addition, the inwardly directed third portion **36** of the flange is of reduced cross-section on the free end thereof to define a downwardly directed lip **40** that terminates adjacent the periphery of the container to define a reduced area opening or mouth for the recess and an undercut portion or groove **41** in the third portion or wall.

The second portion has a weakened area **42** that defines a frangible connection between the first and third portions of the flange. The weakened area **42** also provides a flexing connection between the first and third portions of the flange but has sufficient rigidity to maintain the portions in a predetermined position when no external forces are applied thereto. This is accom-

plished by circumferentially spaced openings **44** that divide the vertical portion or leg **34** into a plurality of spaced segments **46** that are of reduced thickness at **48** to define the point of fracture for the segments.

As was indicated above, the cap **16** is of a conventional, commercially available type that is normally formed of metal and has the free end of the skirt **22** curled outwardly to eliminate any sharp edges. This outwardly directed curl or bead **50** is utilized as one interlocking element that cooperates with the inwardly directed lip **40** to produce interlocking means between the container and the cap as the cap is threaded on the container. As more clearly shown in FIG. **3**, the bead or enlarged portion **50** on the lower end of the cap has a transverse dimension which is greater than the mouth or opening for the recess **38** that is defined by the inwardly directed lip **40**. With this arrangement, the threading of the cap on the container after a filling operation will cause the enlarged portion or curl **50** to be forced into the mouth. Since the mouth or opening on the upper end of the recess is of a dimension substantially less than the transverse dimension of the enlarged portion, the threading action or axial movement of the cap relative to the opening will cause an outward deflection of the free end portion of the flange to the position shown in FIG. **4**. Continued rotation of the cap relative to the container will locate the enlarged bead **50** below the inwardly directed lip and when the cap is in sealing engagement with respect to the open end **12** of the container **10**, the elastic memory of the plastic flange will return the second and third portions of the flange to their initial position shown in FIG. **3**. An inspection of FIG. **3** reveals that in this position the inwardly and downwardly directed lip **40** is positioned above the enlarged bead and the bead is received in the groove **41** and cooperates therewith to prevent removal of the cap without destroying the frangible seal.

When the purchaser desires to remove the cap, the tab **60** integral with the third portion **36** of the flange is utilized for severing the frangible connection incorporated into the flange. Thereafter, it is impossible to reposition the frangible portion onto the remainder of the container which insures that the container will not be reused.

To insure that the bead or enlarged portion **50** enters the recess **38** with a minimum of force applied thereto, it is also desirable to have cooperating camming surfaces on the wall or third portion **36** and the bead **50**. These surfaces are identified as arcuate surfaces **62** and **64**.

It is to be noted that the arcuate surface **64** is shaped to produce an expansion of the opening or mouth for recess **38** as the cap is screwed into position on the container. In contrast, lip **40** is shaped to prevent expansion of the opening or mouth when the cap is unscrewed or moved upwardly and thus rupture of the seal is required to remove the cap.

While the invention has been described in connection with a threaded cap, the invention is equally applicable to non-threaded cap such as a press-fit or push-on cap. Also, the manner of weakening the vertical portion **34** could readily be in the form of a continuous thinned area in the vertical portion or leg rather than the segmented arrangement produced by the openings **44**. The material for the container may be any flexible plastic but polyethylene is preferred.

The tamper-proof seal provides a simple and inexpensive expedient for sealing the cap to the closure and gives an indication of whether the cap has been removed since the filling operation has taken place. All of this is accomplished with only a small additional amount of plastic material and a redesign of the plastic container without the need for separate additional elements. Also, the container having the tamper-proof seal can be used on existing filling lines for non-tamper-proof containers without modification of the filling line.

I claim:

1. In a container having an open upper end; tamper-proof means integral with the periphery of said container below said open end and defining a recess open toward said upper end, said tamper-proof means having a frangible portion; and a cap received on the open end of said container to seal said open upper end, said cap and tamper-proof means having interlocking elements that engage each other when said cap is placed in sealing engagement with said open upper end to prevent removal of said cap without separating said frangible portion from said container.

2. The combination as defined in claim **1**, in which said frangible portion has an upwardly and outwardly directed camming surface along the upper portion to guide the interlocking element on said cap into said recess.

3. The combination as defined in claim **1**, in which said interlocking elements include an inwardly directed wall adjacent the upper end of said frangible portion defining a reduced area opening for said recess and an enlarged portion on the lower end of said cap having a dimension greater than the dimension of said opening, said frangible portion being temporarily deflected during threading of said cap onto said container to allow said enlarged portion to be received into said recess below said wall.

4. The combination as defined in claim **3**, further including cooperating camming surfaces on said wall and said enlarged portion to cause outward deflection of said frangible portion when said cap is threaded on said container.

5. In combination with a plastic container having an open end with an externally threaded portion adjacent the open end and a cap having a cooperating thread defined on a depending portion; a tamper-proof seal between said container and cap including a flange integral with the periphery of said container below said threaded portion, said flange having a first outwardly directed fixed portion, a second upwardly directed frangible portion and a third inwardly directed portion on the upper end of said second portion, said portions cooperating to define an upwardly open recess having a reduced mouth in the open end thereof; and an enlarged bead on said cap and having a dimension greater than the dimension of said mouth so as to cause said inwardly directed third portion to be temporarily deflected outwardly upon threading of said cap into sealing engagement with the open end of said container and position said bead below said inwardly directed portion.

6. The combination as defined in claim **5**, in which said bead and said inwardly directed portion have cooperating camming surfaces to produce said outward deflection during threading of said cap onto said container.

7. The combination as defined in claim **6**, in which said second portion includes a plurality of spaced segments interconnecting said first and third portions of said flange.

8. The combination as defined in claim **5**, in which said inwardly directed third portion has an undercut groove adjacent the free end for receiving a portion of said bead.

9. A container having an upper open end adapted to receive a cap on a periphery thereof to seal the end, and including an integral flange on the periphery of said container adjacent said open end, said flange having an outwardly directed portion, a frangible upwardly directed portion and an inwardly directed portion on the upper end that cooperate to define a recess having a reduced mouth along the periphery of said container adjacent said open end, said flange being deflectable to enlarge said mouth when a cap is received on said container and cooperating therewith to prevent removal of the cap without separating said frangible portion.

10. A container as defined in claim **9**, in which said inwardly directed portion has a downwardly directed lip that has an arcuate camming surface on the upper surface thereof and a groove on the lower surface thereof.

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