United States Patent

Westfall

[15] **3,685,677**

[45] **Aug. 22, 1972**

[54] **PRESS-ON, TWIST-OFF TAMPER INDICATING CLOSURE CAP**

[72] Inventor: **James E. Westfall,** Western Springs, Ill.

[73] Assignee: **Continental Can Company,** New York, N.Y.

[22] Filed: **Dec. 2, 1970**

[21] Appl. No.: **94,367**

[52] **U.S. Cl.** **215/42**

[51] **Int. Cl.** **B65d 41/02**

[58] **Field of Search** 215/9, 42, 38

[56] **References Cited**

UNITED STATES PATENTS

3,460,703	8/1969	Leftault, Jr.	215/42 X
3,441,161	4/1969	Van Baarn	215/42 X

FOREIGN PATENTS OR APPLICATIONS

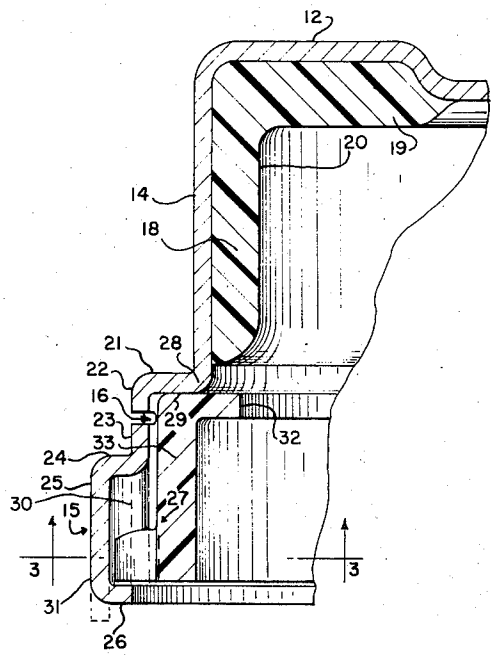
1,188,075	4/1970	Great Britain	215/42

Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Michael Y. Mar
Attorney—Americus Mitchell, Joseph E. Kerwin and William A. Dittmann

[57] **ABSTRACT**

A tamper-indicating closure is provided of a type wherein a closure cap having a side liner is pushed onto a threaded finish so as to form complementary threads in the liner for twistably removing the cap. A resiliently expansible plastic ring is held in the cap skirt against rotation and endwise movement relative thereto. An inturned lip on the ring engages under a collar on the finish below the threads when the cap is pushed on. The edge of the lip also engages serrations around the finish. When the cap is twisted for removal, the engagement of the lip under the collar and with the serrations inhibits rise and rotation of the cap. The applied torque causes rupture of a series of frangible bridges forming a band around the skirt, whereafter the upper portion of the cap twists off.

7 Claims, 6 Drawing Figures

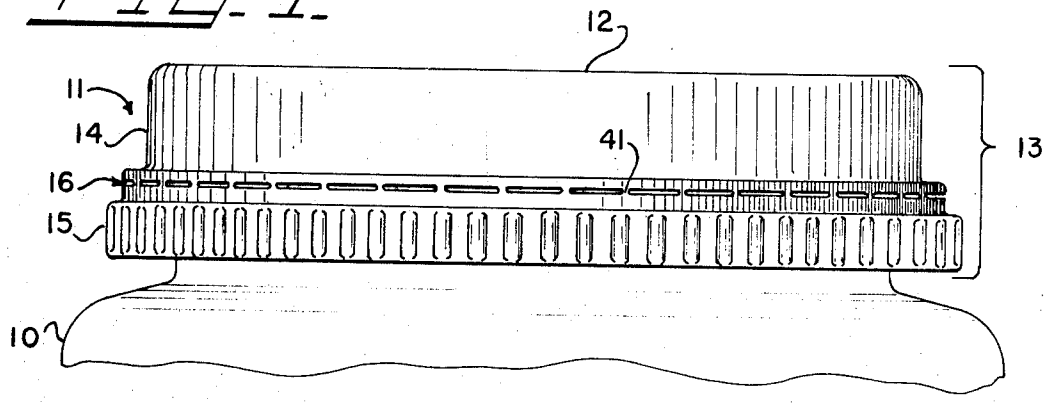


PATENTED AUG 22 1972

3,685,677

SHEET 1 OF 2

FIG. 1.



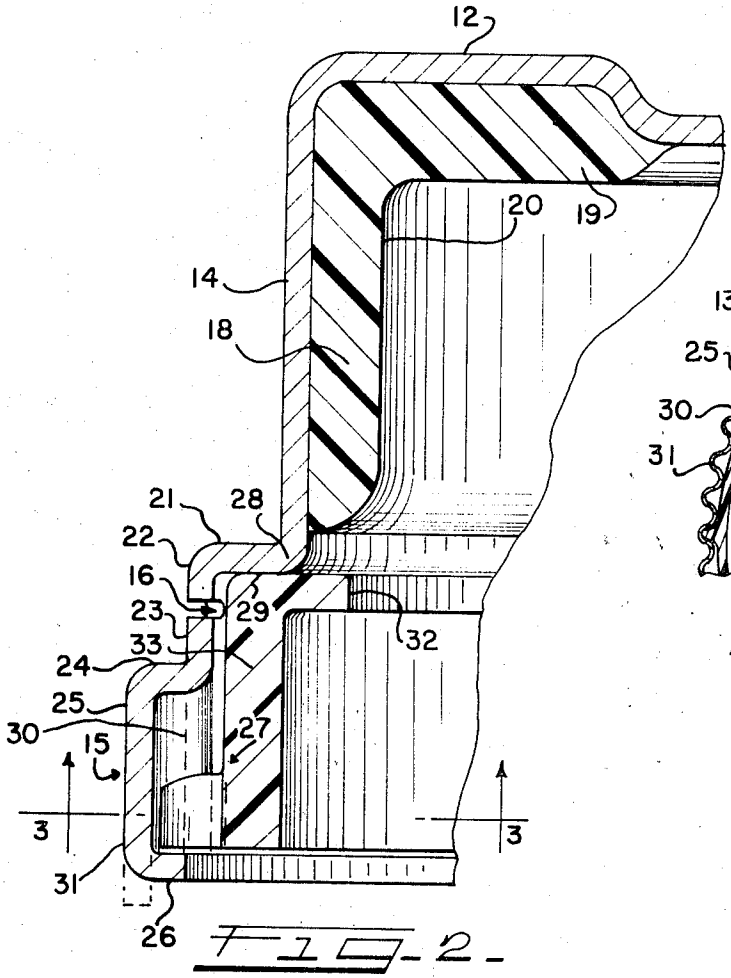


FIG. 2.

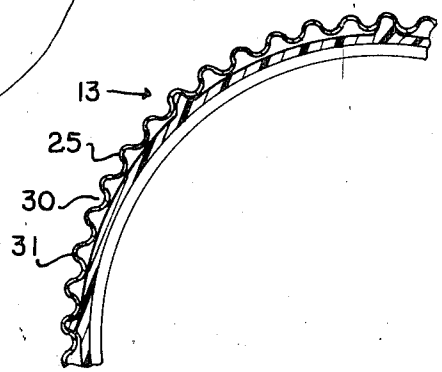


FIG. 3.

INVENTOR
JAMES E. WESTFALL
BY Laurence Whitehead
ATT'Y.

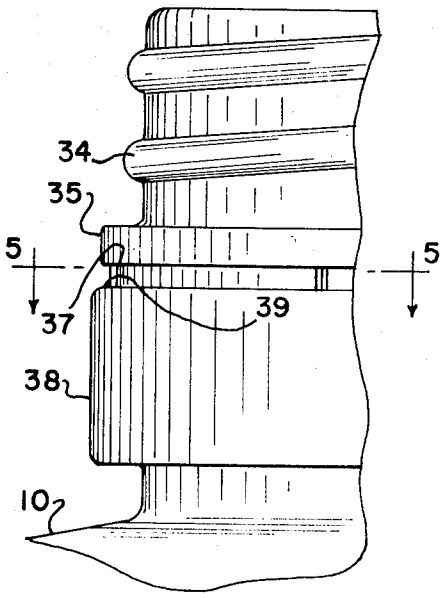


FIG. 4

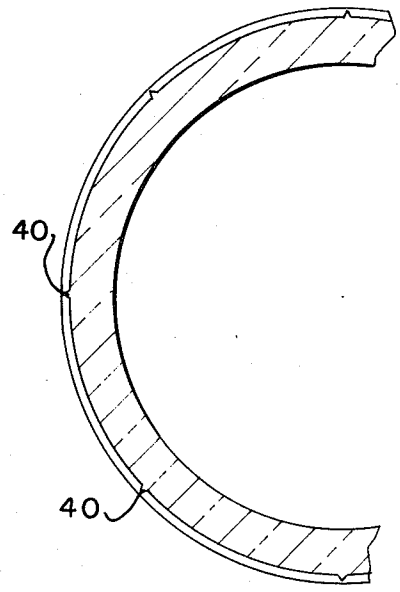


FIG. 5

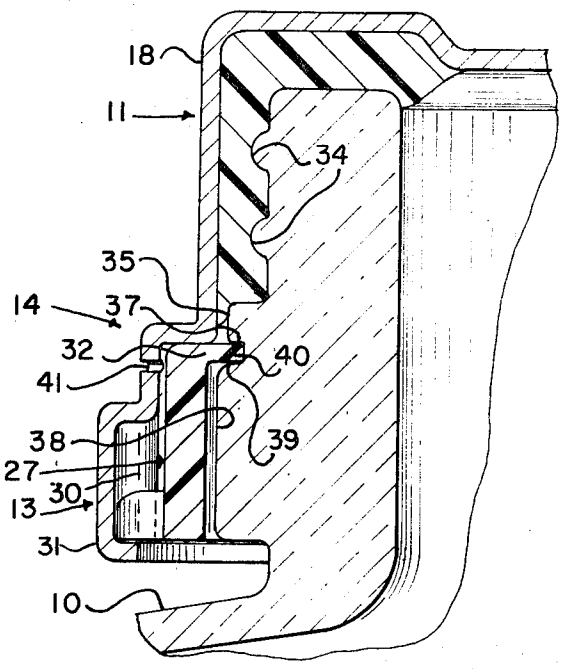


FIG. 6

INVENTOR
JAMES E. WESTFALL
BY
ATT'Y.

PRESS-ON, TWIST-OFF TAMPER INDICATING CLOSURE CAP

This invention relates to closures of a tamper-indicating type, more particularly a closure cap of the push-on, twist-off type for a bottle with a finish having thread formations thereon.

Tamper-resistant caps are popular for beverage bottles, such as used for alcoholic and various carbonated beverages. There is also a demand for tamper-indicating caps on other bottles or containers which are a frequent target of contents pilferage, such as antifreeze jugs or cans.

Supermarket-style, unsupervised shelving of goods greatly increases the incidence of pilferage. Removal of liquids from easily openable and reclosable containers is often difficult to detect. If the container is opaque, neither the ultimate customer nor the sales clerk may be aware that some or all the contents has been removed, there being no evidence of tampering.

A number of designs for "tamper-proof" or tamper-indicating closure caps have been heretofore proposed. Some have met with substantial success. One such is an aluminum cap which can be pushed over a threaded finish to seal against the container lip, the threads being then rolled in the cap skirt in conformity with the finish threads to form a twistably removable closure. The cap is provided with a weakening bank around the skirt below the threads. The marginal portion of the skirt below the weakening band is turned in under a shoulder on the finish, engages with lugs therein, or is otherwise engaged with the neck or shoulder of the bottle to inhibit twist-off. When torque is applied to unscrew the cap, the skirt ruptures at the weakening ban, providing a readily visible telltale of opening or attempt thereat. Such fracture-band telltale is particularly desirable for pressurized or vacuumized containers, as in the case of carbonated beverage bottles, baby food jars, and the like, since tampering is evident even when the cap has been twisted only such slight amount as may disturb the seal and cause spoilage.

While the roll-on-thread tamper-indicating cap above described is generally satisfactory, it is substantially more costly to apply than a crown cap or plain screw cap. Thread rolling in situ involves relatively complicated tooling and is rather slow. Furthermore, materials having the desirable thread-rolling properties are also generally susceptible to creep and warpage, whereby the seal and reclosure qualities may be adversely affected.

Heretofore no fully satisfactory means has been found for providing a cap of the push-on, twist-off type with a tamper-indicating feature. The extra cost of orienting the cap to engage lugs, rolling a lip under a bead, or like application operations largely offset the savings effected by push-on application to form the threads in the skirt.

It is a principal object of this invention to provide a tamper-indicating closure for bottles or the like of the push-on, twist-off type which is highly effective, yet inexpensive, easy opening and having a good reclosure characteristic.

More particularly, it is an object of this invention to provide a tamper-indicating closure cap which can be applied to and fully secured to a container simply by pushing the cap on without special orientation or supplemental operations.

According to this invention, the bottle or jar finish is provided with external threads or equivalent retention means. A collar below the threads defines a downwardly facing shoulder.

The closure cap according to this invention is characterized by a generally cylindrical skirt, the upper portion of which is adapted for formation of thread therein upon the application of an axial force which also effects a seal of the opening and engaging the twist-off inhibition means with co-operating means on the container neck.

The preferred form of the closure cap comprises a shell having a top panel and a skirt depending therefrom. The generally cylindrical upper portion of the skirt has a plastic liner adapted for wedging over the finish threads when the skirt is telescoped over the finish, thereby conforming the liner to the finish threads and effecting a side seal supplementing the top seal effected by liner material inside the cover panel compressed against the container lip. Such means and method of effecting thread engagement and seal are more fully described in U. S. Pat. No. 3,270,940 issued to Charles N. Foster and Robert K. McElroy on Sept. 6, 1966.

The lower portion of the shell skirt is generally bell-shaped and is enlarged relative to the upper portion of the skirt. The skirt terminates downwardly in an inturned lip. A ring of resilient plastic material is inserted in the belled portion of the skirt. The ring has an inwardly projecting annular flange at its upper end, the inside diameter of the flange being normally smaller than the outside diameter of the aforementioned collar. The shell skirt and the outer wall of the ring are provided with closely matched corrugations, obviating relative rotation of the two parts. The ring is also closely held between the inturned lip of the skirt and an opposing shoulder, preventing relative endwise movement. After the ring is inserted into the skirt, then the lip is formed over the ring to hold the ring in place prior to sealing.

Below the downwardly facing shoulder of the container, the neck is provided with a circumferential series of serrations. The ring is so positioned in the cap that the inwardly extending flange rides over the collar on the container as the cap is pushed on and then snaps under the downwardly facing shoulder when the cap in the sealed and thread-engaging position is on the finish. The finish serrations bite into the inner edge of the inturned flange, inhibiting rotation of the ring and the shell.

When torque is applied to twist the cap off the finish, the ring flange engaged under the collar shoulder inhibits rotation and rise of the cap, so that continued application of torque fractures the bridges. The upper portion of the shell with its liner, comprising a complete screw cap, can then be twisted off and can also be used as a reclosure.

When the bridges are fractured, the severed, lowermost portion of the skirt drops, exposing the plastic ring. The ring may be made of a brightly colored plastic, or bear insignia serving to attract attention, improving its visibility as a telltale of the attempted or actual opening of container even through the upper shell has not been removed, or has been replaced.

Other advantages, objectives and details of the invention are set forth in the ensuing description and accompanying drawings.

FIG. 1 is a partial elevation of a jar, showing the neck and finish portion thereof with a closure according to this invention;

FIG. 2 is a partial cross-sectional view of the closure cap shown in FIG. 1, before application of the cap to the finish;

FIG. 3 is a partial horizontal sectional view taken on line 3—3 of FIG. 2, showing the anti-rotation interlock of the ring insert and the shell skirt;

FIG. 4 is a partial elevational view of the neck of the jar shown in FIG. 1, showing details of the finish thereof; and

FIG. 5 is a partial horizontal sectional view taken on line 5—5 of FIG. 4, showing the condition of the closure when sealed;

FIG. 6 is a partial vertical sectional view with the closure added and showing the anti-rotation serrations under the finish collar provided for engagement of the insert ring.

FIG. 1 shows the top of a jar **10** provided with a closure according to this invention. Closure cap **11** includes a shell having a top panel **12** and a skirt **13**. The upper portion **14** of skirt **13** is generally cylindrical. The lower portion **15** is somewhat larger and generally bell-shaped. Skirt portion **15** has a weakening band **16** of the frangible-bridge type, such as that shown in U. S. Pat. No. 3,484,012 issued to Robert P. White and Charles N. Foster on Dec. 16, 1969.

Referring now to FIG. **2**, which shows the internal structure of cap **11** before application to the jar, the top panel **12** and upper skirt portion **14** are provided with a liner **18** having a top seal portion **19** and a side-seal and thread engagement portion **20** extending substantially the full length of skirt portion **14**. Liner **18** is preferably made of plastomeric material, formed substantially in accordance with the description of such liners in the aforesaid patent, serving the same purpose in the closure cap of this invention. While the foregoing is the preferred provision for sealing and skirt thread-formation, it will be understood that other forms may be used if desired, such as for squeeze-on, crimp-on or roll-on thread formation, with any suitable gasket or seal ring, as may be best suited to a particular application, providing same is adapted essentially for push-on application, by and for securement without relative rotation of the cap and the container.

The bell portion of **14** comprises a generally horizontal flange portion **21** defining shoulder **22**, cylindrical portion **23** extending therefrom and including the weakening band **16**. There is another horizontal, outwardly extending flange **24** from which depends the substantial vertical flange portion **25**. Flange portion **25** terminates in the inturned lip **26**.

Bell portion **15** constitutes a cage for retaining the insert ring **27**. As subsequently described, ring **27** serves to inhibit rotation and rise of the cap relative to the finish, after the cap has been secured in sealing position on the container. Accordingly, ring **27** is held in bell portion **15** in such manner that there can be no relative rotation between ring **27** and the skirt **13** while the weakening band **16** remains intact. To obviate relative rotation, ring **27** is splined in skirt portion **15** as best seen in FIGS. **2** and **3**. A number of corrugations **30** are formed in the lowermost vertical flange portion **25** of the skirt, defining alternating axial ridges and flutes. The number of corrugations are selected according to the size and material of the cap, but the corrugations are preferably of such number and flute depth as to provide a general stiffening effect to the lower portion of the cap skirt and most particularly a sufficient resistance to deformation to withstand the torque necessary to fracture the bridges.

The outside diameter of the barrel **33** of ring **27** at its upper end is somewhat less than the inside diameter of the surrounding portion of the cap skirt, so that the flange **32** can be expanded in a manner and for the purpose subsequently shown.

To provide for insertion of ring **27**, the skirt bell portion **15** is formed with its lip portion **26** initially vertical and its inside diameter slightly larger than the outside diameter of ring **27** across the ribs **31**. Ring **27** is pushed into the bell and held with its upper face **28** pressed against the shoulder **29**. The lip **26** can then be crimped, spun, or rolled in tight against the lower face of ring **27**, so that there is no end play between the ring and the shell. In order to obviate rotational slack, it is desirable that the ribs **31** or ring **27** be a close fit in the flutes of corrugations **30**.

FIG. **4** shows the neck and finish of the jar **10** and FIG. **6** shows the cap **11** applied thereto to complete the closure. The finish includes external threading **34**. The thread comprises about two-thirds turn, but it will be understood that compound or partial threads or cam lugs may be used, if desired. Finishes with threading or the like, particularly suitable for wide-mouth jars are shown in the patent to White, mentioned above. Such twist-off arrangements provide desirable quick-removal and reclosure features, yet have good retention characteristics.

A collar **35** is provided immediately below the thread **34**. The outside diameter of collar **35** is about the same as the major diameter of thread **34**, or slightly larger. Collar **35** defines a downwardly facing shoulder **37**. Another collar **38**, slightly larger in diameter than collar **35** and spaced therefrom, defines an upwardly facing shoulder **39** opposing shoulder **37**. A circumferential series of equally spaced serrations or ribs **40** extend between shoulders **37** and **39**, the ribs being quite sharply pointed as best seen in FIG. **5**.

The completed closure, shown in FIG. **6**, is effected by pushing cap **11** over thread **34**, compressing the plastomeric material of the side liner into conformity with the thread **34**. As more fully described in the aforesaid patents, the side liner material has the characteristics of taking a set under the high pressure exerted thereon, whereby the female thread therein becomes permanent within the time elapsing between closing and delivery to the ultimate consumer.

The flange **32** of ring **27** is so positioned as to lie opposite the space between the finish shoulders **37** and **39** when cap **11** is telescoped over the finish the amount required to form the seal and the threading in the liner thereof as above described. Upon pushing the cap over the finish, the expansible flange **32** rides over the threads and collar **35** and then snaps into position snug under shoulder **37**, shoulder **39** serves as a stop to obviate overtravel. The stroke and pressure relief of the

tooling are adjusted accordingly, as well understood by those skilled in the capping tool art.

The diameter across the crests of ribs **40** is larger than the normal inside diameter of flange **32**, so that contractive force of the resilient flange forms complementary grooves therein, seizing the flange to the serration ribs and positively inhibiting rotation of the ring **27** relative to the finish.

As above described, ring **27** is non-rotatably and non-shiftably held in the bell of skirt **13**. Accordingly, twist-off torque applied to the upper shell portion **14** over-stresses the bridges **41**, rupturing them. Thereafter, the upper or prime cap portion **11** can be twisted off. In the weakening band design shown, shearwise elongation of the bridges **41** is negligible, so that rupture occurs substantially without rotation of the cap relative to the finish. Accordingly, the seal cannot be substantially disturbed upon attempting to twist the cap, except by rupturing the bridges. The portion of the bell below the bridges drops, exposing the lower portion of ring **27**. The ring may be made of brightly colored plastic, or have indicia along the lower edge, to provide a telltale supplemental to that of bridge fracture.

The preferred embodiment above described incorporates both anti-rotation and anti-rise features. Thus, even should there be some rotational slack or slight slippage, the cap shell will be severed due to tension imposed on the bridges by inhibition of rise. Generally, ring **27** is more resistant to deformation by twist than by tension imposed by axial restraint, so that the primary rupture forces are shear forces tangential to the weakening band **16**. This is the preferred rupture mode for the type of weakening shown. However, it will be understood that the anti-rise provision alone may be found sufficient in some applications, in which case some modification to the parts may be desirable. The ribs **40** can then be omitted. A somewhat thicker anchor flange **32** than that shown may also be desirable. The barrel of the ring can be made of stiff material, somewhat heavier wall or both, in order to minimize axial elongation, either locally or generally. The style of shell shirt weakening may be employed which will effect rupture with minimal axial elongation, as for example, by sharply scoring or necking the material continuously around the skirt. Use of relatively high temper stock for the cap shell can also serve this purpose.

Aluminum is a preferred material for the shell of cap **11** above shown and described. Such material is preferred because of its good finish, ease of formation by bending, drawing, spinning, or rolling, high corrosion resistance and facility of attractive decoration. Because the threads are formed in the plastic side liner without deformation of the shell, the sometimes unsatisfactory creep and warp characteristics involved with threads formed in thin aluminum are not a factor affecting performance of the preferred form of cap. However, it will be understood that other modes of skirt thread formation may be used, with or without the side liner, for example, roll-on, squeeze or crowning techniques. Various types and styles of top seal liners or gaskets may be used in lieu of the preferred type shown herein.

While an aluminum shell is preferred for the reasons above stated, tin plate or other materials may be used, as may be suitable to particular cap sizes and service conditions. For example, caps according to this invention for beverage bottles can be made of tin plate or other materials in regular use for crown caps. The upper shell, corresponding to skirt portion **14** can be configured for crimp or squeeze application to the threads. This may be done by using equipment similar to crown press tooling in general use for applying a plain cap of the push-on, twist-off variety.

The foregoing description will suggest to those skilled in the art other modifications within the scope of the invention as defined in the appended claims.

What is claimed is:

1. A closure cap for a container finish having an external thread means and a first collar defining a downwardly facing shoulder around the top of the container below said thread;

said cap comprising a top panel and a skirt depending therefrom;

said skirt including a generally cylindrical upper portion adapted for conformation to the finish thread and a lower bell portion of larger diameter than said upper portion;

a second collar connecting the lower part of the cylindrical portion to the upper part of the bell portion;

a ring in said bell portion, said ring being axially and rotationally non-shiftable relative to said bell portion;

said ring having a resiliently expansible inward flange normally of smaller inside diameter than said collar and being positioned in said bell portion for engagement with said lip under the downwardly facing shoulder under the thread when said cap is telescoped over the finish;

a weakening band around said skirt below said second collar;

an inturned lip formed integral with the lower edge of said bell portion; and

an outwardly extending portion of said ring mounted on said ring at a location downwardly of said flange and abutting against the upper surface of said inturned lip whereby said closure cap bell portion is held against upward motion and when torque is applied to said upper portion in a direction to twist said cap off the container then the skirt ruptures at said weakening band.

2. A closure cap for a container finish having an external thread means and a first collar defining a downwardly facing shoulder around the neck of the container below said thread, as set forth in claim **1** said cap further comprising:

lower corrugations in said vertical bell portion defining alternating axial ridges and flutes whereby the exterior of the outwardly extending portion of said ring presses against the ridges and flutes to avoid relative rotation between said portion and ring.

3. A closure cap for a container finish having an external thread and a first collar defining a downwardly facing shoulder around the neck of the container below said thread as set forth in claim **2**, said ring further comprises:

a telltale material whereby when said weakening band fractures, said bell portion falls exposing the telltale material.

4. A tamper-resistant package comprising the combination of:

a container having a finish with external thread formation thereon plus a collar thereon below said thread formations defining a downwardly facing first shoulder with ribs extending parallel to the side of said container under said downwardly facing first shoulder; and

a closure cap having a shell including a top panel and a generally cylindrical skirt depending therefrom;

the upper portion of said skirt telescoping over said thread formations and being conformed to said thread formations;

said skirt including a lower bell portion having corrugations around its lower portion;

a ring insert held fast in said lower portion against endwise movement relative thereto;

said insert including an inward flange engaged under said shoulder and a series of corrugations on the exterior surface of said insert dovetailing with corrugations of said lower bell portion; and

frangible weakening means in said lower portion, said upper portion being free of said insert upon fracture of said weakening means when rotational pressure applied to said upper portion unscrews said upper portion to cause rupture of said weakening means while said ring insert is prevented from rotating by said ribs on said container and said lower portion below said weakening means separates from said upper portion.

5. A tamper proof package as set forth in claim 4 in which said cap further comprises:

an inturned lip formed integral with the lower edge of said bell portion, and

an outwardly extending portion of said ring insert for abutting against the upper surface of said inturned lip whereby said closure cap lower bell portion is held against upward motion.

6. A tamper proof package as set forth in claim 4 in which said lower bell portion further comprises:

a plurality of vertical corrugations in said lower bell portion below said frangible weakening means defining alternating axial ridges and flutes whereby the exterior of the outwardly extending portion of said insert presses against the ridges and flutes to avoid relative rotation between said bell portion and said insert.

7. A tamper proof package as set forth in claim 6 in which said insert further comprises:

a brightly colored material whereby when said weakening band fractures said bell portion falls to expose said brightly colored material.

* * * * *