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3,235,115

TAMPERPROOF CLOSURES

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FIG. 1.

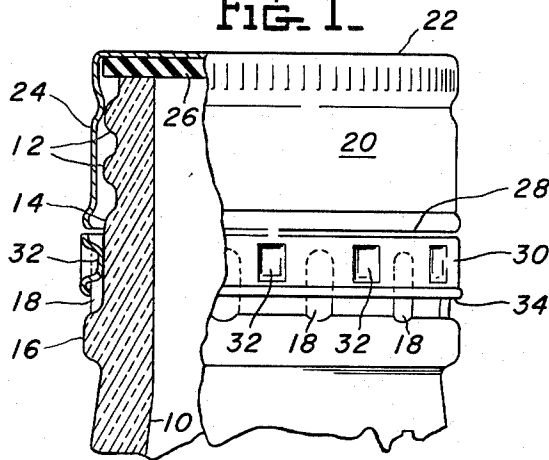


FIG. 2.

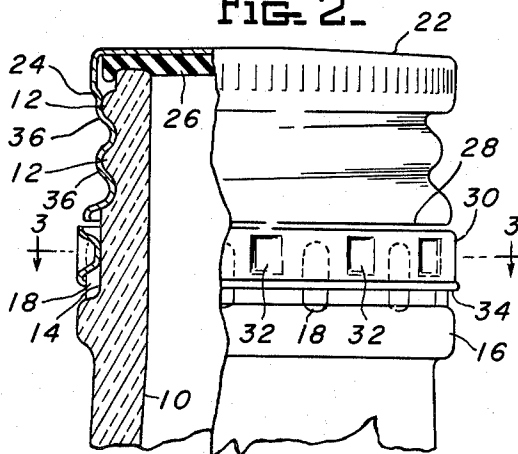
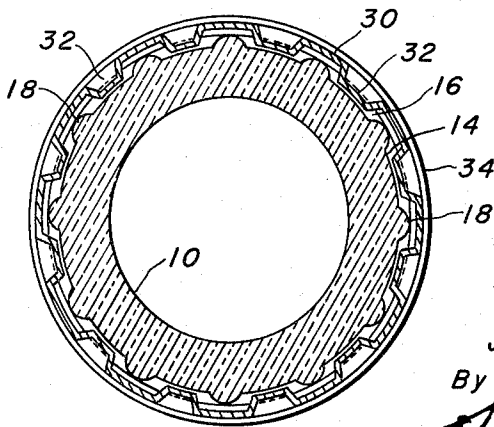


FIG. 3.



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TAMPERPROOF CLOSURES

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3 Claims. (Cl. 215-42)

The invention described hereinbelow is addressed in general to closure and receptacle or container combinations for providing tamperproof packages, exemplary of which are sealed bottles and similar packages. More specifically, the invention is concerned with providing a threaded closure incorporating a cylindrical tamperproof band extension of the cylindrical skirt of the closure, which is severable therefrom on rotational removal of the closure from a container, and the tamperproof band subsequently axially removed or withdrawn from the container in an otherwise intact condition.

A rising demand and commercial interest is being elicited for a sealed package incorporating a tamperproof threaded closure which, following authorized opening of the package by mere rotation of the threaded closure, permits axial removal of an initially integral but severable tamperproof band element separated from the closure proper as a result of the aforesaid rotation thereof. The demand for this type of closure, and packages incorporating the same, is based on an existing need in the closure art for a relatively inexpensive tamperproof closure, and package incorporating the same, the container element of which is capable of manufacture using conventional glass-molding equipment and practices and is readily conditioned for reuse, under circumstances permitting reuse of containers, by mere "pick-off" or gravitational dislodgment of the tamperproof band element from the container. There has also been an expressed desire in the packaging art for tamperproof closure-container combinations of the type herein referred to, regardless of the stated container reuse feature, where retention of a tamperproof band on its container or receptacle, following authorized removal of its threaded closure portion for access to less than the entire contents of the container, has been found objectionable and been a source of digital injury in subsequent reclosing and reopening of a container so equipped.

Closure and closure-receptacle or container combinations incorporating a threaded cylindrical skirt and contiguous tamperproof band in axial extension thereof have been previously proposed. However, the tamperproof band elements in such existing closure structures have always been polygonally shaped, as distinguished from cylindrical, requiring complex and expensive manufacturing techniques and handling operations in the initial fabrication of such closure blanks or shells, as well as requiring specially developed equipment for their bulk hopping, conveying, transferring and subsequent application and affixation in correctly oriented relationship on containers provided with complementary polygonally-shaped surfaces.

Closure blanks or shells, closures produced therefrom, and tamperproof sealed packages incorporating the same, in accordance with the present invention, are of relatively simple construction and design in comparison to the aforesaid proposed polygonally-shaped closures and sealed packages incorporating the same, and because of their exterior cylindrical configuration, can be initially fabricated and subsequently applied on containers to provide tamperproof packages by employing existing conventional equipment without investment at the fabrication and closure-applying levels in complex types of fabricating and handling equipment dictated by a

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polygonally-shaped tamperproof type closure and the problems in orientation introduced thereby.

It is therefore a primary object of the invention to provide a relatively inexpensive closure blank or shell of generally cylindrical exterior configuration incorporating means for restraining it against rotation in respect of a container underlying the closure blank or shell.

Another object of the invention is to provide a closure blank or shell of generally cylindrical exterior configuration incorporating a tamperproof band as an integral but circumferentially severable element thereof confined within a cylindrical exterior configuration of the same, the tamperproof band in turn providing means for restraining the closure blank or shell against unauthorized rotation on an underlying complementary container.

A further object of the invention is to provide a tamperproof closure characterized by an exterior surface composed of cylindrical rolling surfaces over its axial depth, the closure being further characterized by providing a preformed tamperproof locking band adjacent its open end provided with means permitting axial withdrawal of the locking band from a complementary container to which the closure has been applied.

Another object of the invention is to provide a closure-receptacle or container package which is initially sealed against unauthorized opening by a one-piece tamperproof closure having cylindrical exterior surfaces throughout the depth of the closure, the closure being subsequently removable from its container on rotation against non-rotation of its tamperproof band to sever the same from the remaining portion of the closure, and the tamperproof band being thereafter axially withdrawn from the container.

Other objects of the invention will be observed and understood on consideration of the following description and illustrations of the invention, in which:

FIG. 1 represents a fragmentary sectional elevational view of one embodiment of closure and receptacle of the invention illustrating a preformed generally cylindrical closure blank or shell loosely supported on a complementary receptacle finish;

FIG. 2 represents a view similar to FIG. 1, except that the closure blank or shell has been transformed and secured against unauthorized removal from its underlying receptacle; and

FIG. 3 represents a transverse cross-sectional view taken on the plane 3-3 of FIG. 2.

The closures and closure shells to which the invention is directed are generally and preferably characterized as one-piece, cup-shaped articles comprising a top circular panel and an integral depending cylindrical skirt, the skirt being provided with closure-affixing formations, such as threads, over a portion of its axial length, and an integral but readily severable extension of the skirt below the threads serving as a cylindrical tamperproof band for the closure.

It is the tamperproof band feature of the closures of the invention which constitutes the cardinal contribution to the closure art, particularly from the standpoint of its cooperative relationship with the closures and receptacles with which it performs a functional part in providing new and advanced tamperproof packages.

The closures of the invention are preferably initially fabricated as cup-shaped closure shells or blanks, with an unthreaded or unconformed depending cylindrical skirt and an integral but severable preformed cylindrical tamperproof band in the form of an extension of the cylindrical skirt. The closure blanks or shells thus initially fabricated are readily handled in conventional closure equipment, such as bulk hoppers, transfer conveyors from the bulk hoppers to closure-applying devices, where

individual closures are each loosely applied on a complementary receptacle, and closure-sealing heads, where sealed closure-receptacle packages are produced, primarily because of the fact that the skirt and tamperproof extensions thereof present cylindrical rolling surfaces, and because of the further fact that absence of polygonal cross-sectional configuration in the closure shells or blanks eliminates all necessity of precise orientation between a closure blank and its complementary receptacle receiving the same. These features alone permit complete adaptation and use of existing conventional equipment in regular commercial use in the closure art without resorting to complex equipment and slow-down through the provision of special orientation and indexing mechanism required with heretofore disclosed closures incorporating non-cylindrical tamperproof features.

Referring to the closure and receptacle combination or package illustrated in FIGS. 1, 2 and 3, it will be observed that a closure blank 20 (FIG. 1) is fabricated in the form of a cup-shaped article having a top circular panel 22 and depending cylindrical skirt 24 adapted to be loosely supported on the exterior surface adjacent the entrance or mouth of a receptacle or bottle 10. The bottle 10 is preferably provided with a conventional thread formation 12 and a thread-protecting roll or band 16 is usually provided below the thread formation and may extend radially outwardly beyond the maximum exterior crest diameter defined by the thread formation 12.

In addition, the exterior surface of the bottle 10 is provided with a series or plurality of circumferentially equally spaced lugs or protuberances 18 between the lowermost thread formation 12 and the upper ledge surface formed by the roll 16, the outer surfaces of the lugs 18 being preferably inscribed by a circumferential surface, inwardly disposed in respect of the outer periphery of the roll 16, and an inwardly disposed common base circumferential surface 14 of the lugs 18 being of slightly greater diameter than, or at least coincident with, a circumferential surface having a diameter at least equal to the maximum crest diameter of the thread formation 12.

The lower terminal marginal edge of the skirt 24 of the closure blank or shell 20 of FIG. 1 is preferably initially finished with an inwardly curled open circumferential bead 34, which serves to eliminate what could otherwise present an exposed raw-cut edge, and immediately above this bead is a circumferential band 30 forming an integral extension of the skirt 24 partially and circumferentially separated therefrom by at least one discontinuous slotted area 28. The band 30 is cylindrical and is otherwise depressed or indented to provide a series or plurality of circumferentially equally spaced radially inwardly directed lobes 32 for axial entry and withdrawal between the aforementioned lugs 18 on the exposed surface of the receptacle or bottle 10.

The above-described closure blank 20, as initially fabricated with its preformed and configured terminal skirt band 30, provided with a conventional resilient liner or gasket 26 of suitable material compatible with the contents of the receptacle 10, is initially loosely placed upon the rim surrounding the entrance to the receptacle, as illustrated in FIG. 1. In a subsequent closure-sealing operation, and with applied top pressure exerted on the panel 22, the liner 26 is compressed into sealing contact with the receptacle mouth and a thread formation 36 formed in the skirt 24, as by plastic deformation of the same, into conformity with the underlying thread formation 12 on the bottle 10 (FIG. 2).

It will be observed from an inspection of the embodiment of the invention thus far described, in reference to FIGS. 1, 2 and 3, that the preformed and configured band 30 of the closure, with its inwardly projecting lobes 32 disposed between the vertical and parallel disposed lugs 18 on the exposed surface of the bottle 10, provides a tamperproof assembly of closure and receptacle on completion of the complementary thread formation 36

in the skirt 24 (FIG. 2). It is also to be observed that the configured band 30 serves as a tamperproof band for the closure and receptacle associated therewith, and prevents removal of the threaded portion of the closure until rotation thereof breaks through the bridge or bridges in the discontinuous circumferential slot or slots 28, the tamperproof band 30 being otherwise restrained against rotation by its lobes 32 and cooperating receptacle lugs 18.

The upper threaded portion of the closure, on circumferential severance from its tamperproof band 30, is employable as a reclosure, while the tamperproof band is axially removable or withdrawable, without resort to a tool or peripheral severance of the band 30, by merely picking the same off the receptacle to thereby condition the receptacle for subsequent reuse as one element of a similar tamperproof package.

The closure blank or shell 20, is readily and initially fabricated as a drawn cylindrical cup-shaped article from light gauge metal, such as aluminum and its alloys, with a gauge thickness within the range .006 to .01 inch found in practice to be satisfactory for closures within a commercial container finish size or diameter range of 18 to 70 millimeters of the maximum outside thread formation. Cylindrical shells thus drawn in a one-step operation are thereafter completed by a sequence of operations performed on their depending skirts 24 to plastically transform the same to provide the cylindrically-shaped tamperproof band portions 30; the curled and beaded lower terminal edges 34; the indentations or depressions 32; and the circumferentially slotted areas 28, respectively; all of which operations, and steps incidental thereto in transforming the aforesaid closure shells or blanks 20 being radially directed in reference to the cylindrically generated exterior surfaces of revolution of the depending skirts 24. It will also be understood that the circumferential fracture zone provided by the discontinuous slot or slots 28 can be obtained by circumferential scoring, a circumferential row of perforations, or combinations thereof.

A 30° circumferential spacing of the container lugs 18, and similar spacing of the depressions 32 and in the tamperproof bands 30, have been employed and found satisfactory with containers having a threaded finish of 28 millimeters diameter, and coupled with the rounded upper edge surfaces of the parallel lugs 18, has insured axial and circumferential registry of the closure blanks on their complementary underlying container finishes, in the practice of the invention, using conventional gravity placement of the closure blanks on their containers and without resorting to complex indexing and orienting mechanisms. In like manner, a 45° circumferential spacing of the container lugs 18, 46 and 76 in the case of an 18 millimeter thread formation, and a 12° circumferential spacing in the case of a 70 millimeter thread formation, have performed equally satisfactorily with similarly spaced tamperproof band lobes in closures complementary thereto. Manifestly, the number of lugs and lobes in any particular size of container finish will be selected to insure gravitational application of a closure blank of the invention loosely over the exterior finish of its complementary container, with the rounded upper surfaces of the lugs 18 insuring placement of the closure blanks in the absence of positive indexing mechanism. The aforesaid circumferential spacing of the lobes in the tamperproof bands has also been found to impart torsional rigidity to their respective bands against their distortion and rotation thereof during fractureable removal of the threaded reclosure elements of the closures.

Final affixation of a closure blank of the invention on its complementary container has employed a conventional top pressure head and radial thread-rolling tools, the tamperproof bands in no instance being transformed from their initial configured cylindrical form during affixation of a closure. It will also be observed that the

appearance of a closure-container package of the invention, on circumferential severance of the tamperproof band from its integral threaded skirt portion of the closure, will be immediately detectable and thereby provides a guide and guard against acceptance in commerce of inferior merchandise.

Significant and advantageous in respect of the packages of the invention, and particularly where the container element is a glass bottle, is the fact that the thread formation and tamperproof band lug formation therebelow, both being of concentric cylindrical generation, and the further fact that the tamperproof lugs are in all instances disposed vertically and parallel to the longitudinal central axis of the container, has permitted manufacture of glass containers responding to the invention in conventional book or hinge-type molds, arcuate opening of the halves of which, to discharge the containers or ware molded therein, is devoid of interference between the molding surfaces and the ware, which if present, would otherwise distort the tamperproof lug configurations below the thread formations carried by the containers so molded to destroy axial withdrawal of the tamperproof elements of the closures associated therewith.

Having described the invention in terms of a specific embodiment thereof, it is to be understood that the selected embodiment was made for purposes of illustration only, and not as limiting the scope of the invention, except as defined in the appended claims.

What is claimed is:

1. A tamperproof container-closure structure comprising in combination:

- (a) a rigid container having an open entrance end neck portion with at least one spiral thread formation leading axially away from the open entrance end,
- (b) a right cylindrical unthreaded annular band portion axially contiguous with and below the thread formation of a diameter concentric with and at least equal to the maximum trace diameter of the crest of the thread formation,
- (c) a series of identically configured radially outwardly extending lugs carried by and equi-spaced about the periphery of the unthreaded annular band portion in generally axial parallel relationship to the longitudinal axis of the neck portion of the rigid container,
- (d) the radial outward maximum extension of the lugs lying in a circumferential trace concentric with the unthreaded annular band portion in radial outward extension therefrom,
- (e) a light gauge one-piece readily deformable drawn metallic closure shell of cup-shaped generally right cylindrical configuration having the closed end thereof adapted to seat across the open entrance end to the container neck end with the depending skirt axially overlying the maximum crest diameter trace of the thread formation,
- (f) a right cylindrical tamperproof band formed integrally concentric and dependingly coaxially with said depending skirt, stepped outwardly therefrom, and extending in concentric overlying axial disposition to the unthreaded annular band portion and radially in interior circumferential outward clearance relationship to the outwardly extending lugs carried thereby,
- (g) said tamperproof band being circumferentially separable from the skirt of the closure shell in a transverse weakened fracturable severance line located in the tamperproof band adjacent its integral connection to the skirt above the same, and said tamperproof band terminating at its lower edge in an inwardly curled right cylindrical circumferential reinforcing and raw edge protective bead of internal minimum diameter axially and concentrically slidable over the circumferential trace of the radially outwardly extending lugs on the container neck,

(h) the maximum axial length of the skirt of the closure shell and its integral coaxial tamperproof band, on axially slidable application of the closure shell into supporting contact across the open entrance end to the container neck, terminating with the inwardly curled circumferential bead located slightly above the axial depth of the unthreaded annular band portion of the container neck,

(i) a plurality of identical lobes equi-spaced and equal in number to the aforesaid radially outwardly extending lugs carried by the container neck inwardly depressed out of the outwardly facing right cylindrical tamperproof band surface in axial confinement below the transverse weakened fracturable severance line and above the terminal inwardly curled circumferential bead thereof,

(j) said lobes terminating in inward depression in a right cylindrical circumferential trace substantially concentric and coincident with the circumferential trace of the unthreaded annular band portion of the container neck carrying the radially outwardly extending lugs,

(k) said equi-spaced lugs providing uniform right cylindrical arcuate width spaces therebetween of greater circumferential arcuate length than the circumferential width of each of the identical equi-spaced lobes with the lobes axially and loosely receivable within the spaces between the lugs and capable of relative lateral oscillatory movement into interference contact with the lugs against complete rotation of the closure shell on the container neck, and

(l) said skirt portion of the closure shell being adapted to be deformed into conformity with the thread formation on the container neck.

2. A tamperproof container-closure structure comprising in combination:

- (a) a rigid container having an open entrance end neck portion with at least one spiral thread formation of right cylindrical trace leading axially away from the open entrance end,
- (b) a right cylindrical unthreaded annular band portion axially contiguous with and below the thread formation, concentric therewith, and of a diameter at least equal to the maximum trace diameter of the crest of the thread formation,
- (c) a thread-protecting right cylindrical roll portion axially contiguous with and below the unthreaded annular band portion, concentric therewith, and located radially outwardly beyond the unthreaded annular band portion in shouldered relationship thereto,
- (d) a series of identically configured radially outwardly extending lugs carried by and equi-spaced about the periphery of the unthreaded annular band portion in generally axial parallel relationship to the longitudinal axis of the neck portion,
- (e) the radial outward maximum extension of the lugs lying in a circumferential trace concentric with the unthreaded annular band portion and radially inwardly stepped from the concentric circumferential trace of the cylindrical thread-protecting roll portion of the container below said lugs,
- (f) a light gauge one-piece readily deformable drawn metallic closure shell of cup-shaped generally right cylindrical configuration having the closed end thereof adapted to seat across the open entrance end to the container neck end with the depending skirt axially overlying the maximum crest diameter trace of the thread formation,
- (g) a right cylindrical tamperproof band formed integrally concentric and dependingly coaxially with said depending skirt, stepped outwardly therefrom, and extending in concentric overlying axial disposition to the unthreaded annular band portion and radially in interior circumferential outward clear-

ance relationship to the outwardly extending lugs carried thereby,

- (h) said tamperproof band being circumferentially separable from the skirt of the closure shell in a transverse weakened fracturable severance line located in the tamperproof band adjacent its integral connection to the skirt above the same, and said tamperproof band terminating at its lower edge in an inwardly curled right cylindrical circumferential reinforcing and raw edge protective bead of internal minimum diameter axially and concentrically slidable over the circumferential trace of the radially outwardly extending lugs on the container neck,
- (i) the maximum axial length of the skirt of the closure shell and its integral coaxial tamperproof band, on axially slidable application of the closure shell into supporting contact across the open entrance end to the container neck, terminating with the inwardly curled circumferential bead located slightly above the shoulder at the juncture of the unthreaded annular band and thread-protecting roll portions of the container neck,
- (j) a plurality of identical lobes equi-spaced and equal in number to the aforesaid radially outwardly extending lugs carried by the container neck inwardly depressed out of the outwardly facing right cylindrical tamperproof band surface in axial confinement below the transverse weakened fracturable severance line and above the terminal inwardly curled circumferential bead thereof,
- (k) said lobes terminating in inward depression in a right cylindrical circumferential trace substantially concentric and coincident with the circumferential trace of the unthreaded annular band portion of the

container neck carrying the radially outwardly extending lugs,

- (l) said equi-spaced lugs providing uniform right cylindrical arcuate width space therebetween of greater circumferential arcuate length than the circumferential width of each of the identical equi-spaced lobes with the lobes axially and loosely receivable within the spaces between the lugs and capable of relative lateral oscillatory movement into interference contact with the lugs against complete rotation of the closure shell on the container neck, and
- (m) said skirt portion of the closure shell being adapted to be deformed into conformity with the thread formation on the container neck.

3. The tamperproof container-closure structure in accordance with claim 2 in which the light gauge one-piece readily deformable closure shell is drawn from aluminum sheet of .001 to .01 inch gauge thickness.

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