United States Patent [19]

Ostrowsky

[11] **3,853,236**

[45] **Dec. 10, 1974**

[54] **SAFETY CLOSURE UNIT**

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[22] Filed: **Dec. 6, 1973**

[21] Appl. No.: **422,264**

[52] **U.S. Cl.** **215/220**

[51] **Int. Cl.** **B65d 55/02,** A61j 1/00

[58] **Field of Search** 215/219, 220, 9

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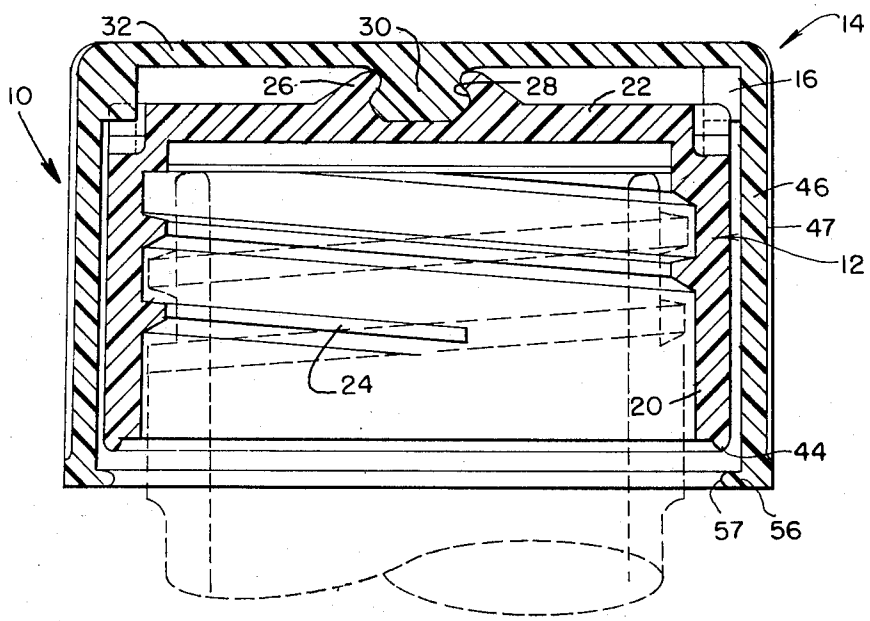
Primary Examiner—George T. Hall

Attorney, Agent, or Firm—Max R. Kraus

[57] **ABSTRACT**

A safety closure unit for containers such as bottles and the like whereby unauthorized removal of the closure from the container is prevented. More particularly, the invention relates to a closure unit comprising an inner or closure cap which is used to close the open end of a container, cooperatively connected with an outer or actuator cap superimposed over the inner cap and connected together at the top wall of each of said caps, the top wall of the outer cap being sufficiently flexible and serving to provide in effect a two-way spring action, and interlocking means between the inner and outer caps to permit the two caps to be rotated in unison to lock the inner cap as a closure for the container, and when the outer cap is rotated in the opposite direction or counterclockwise the interengaging means of the outer cap will override the interengaging means of the inner cap so that no rotation is imparted to the inner cap, and only when a manual downward pressure is applied against the outer cap flexing the top wall of the outer cap axially will the teeth of the outer cap interengage with the teeth of the inner cap to effect an unscrewing of the inner closure cap with respect to the container.

14 Claims, 8 Drawing Figures



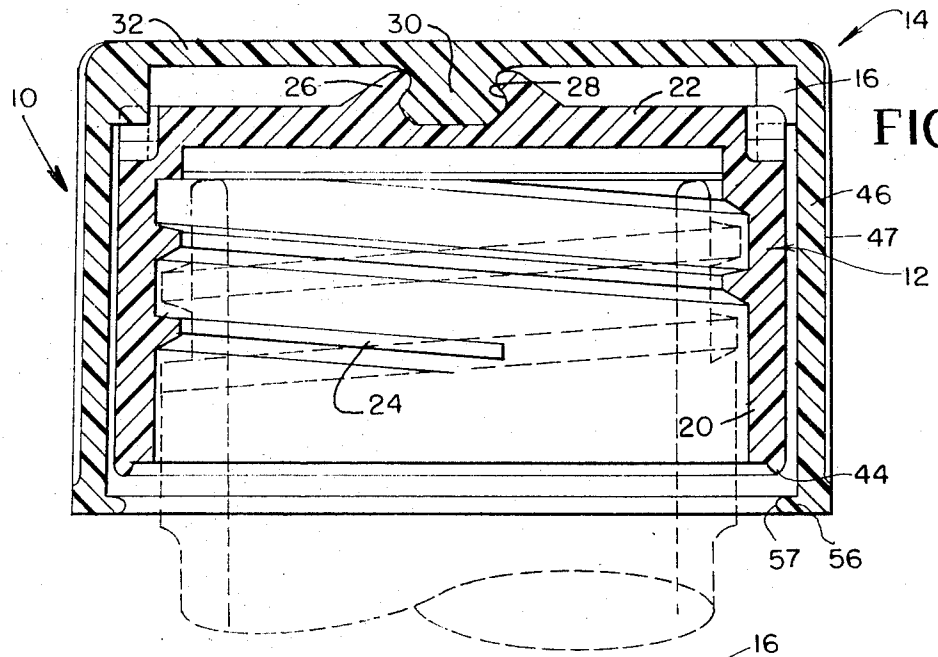


FIG. 2

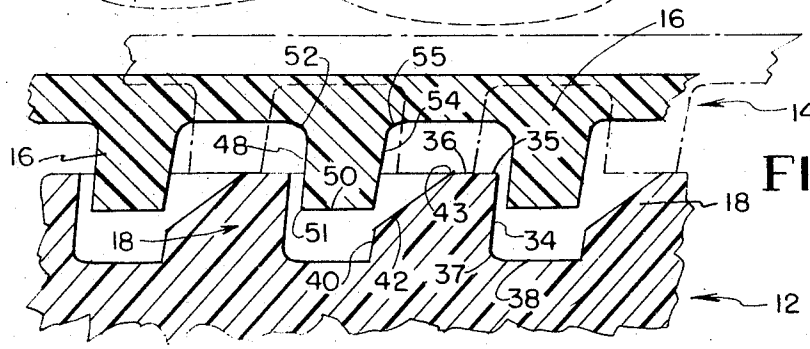


FIG. 3

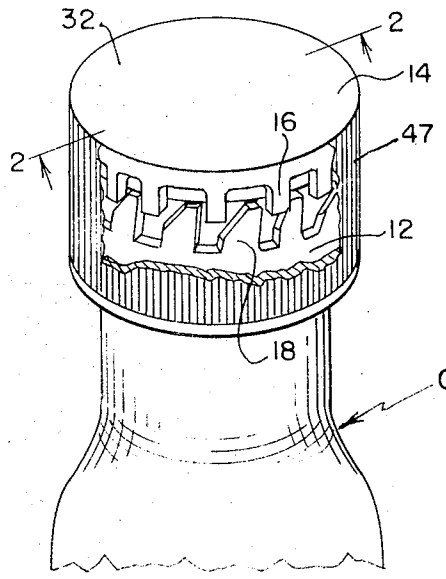


FIG. 1

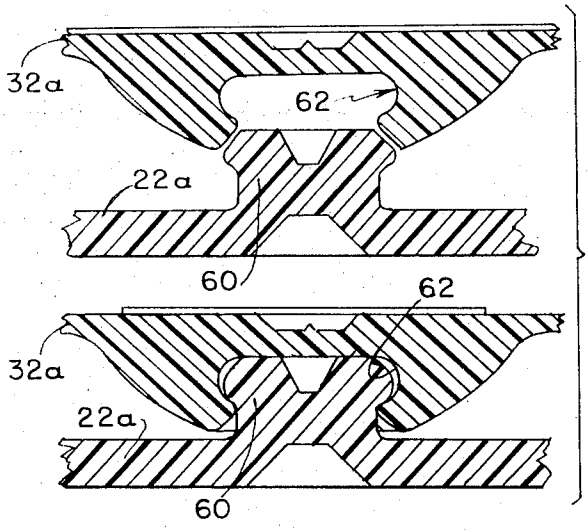


FIG. 6

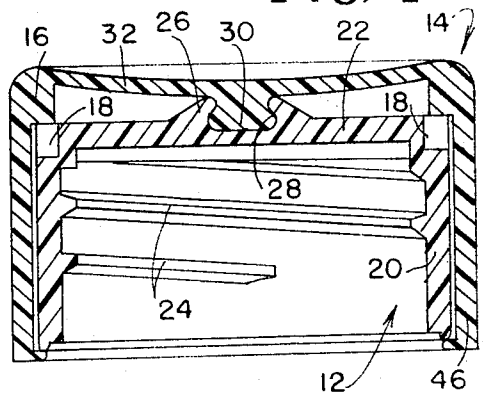


FIG. 4

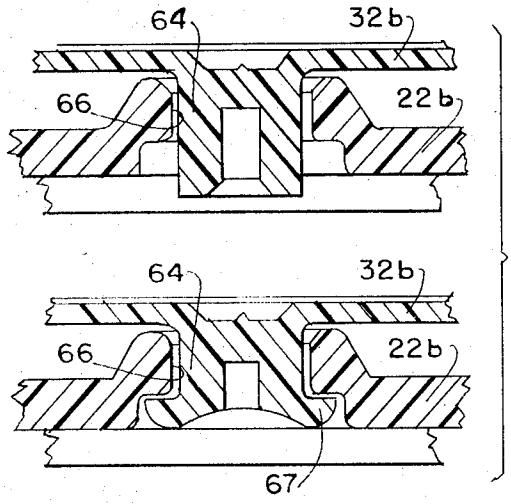


FIG. 7

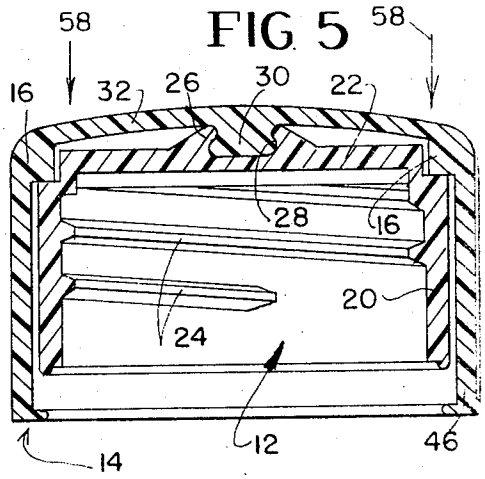
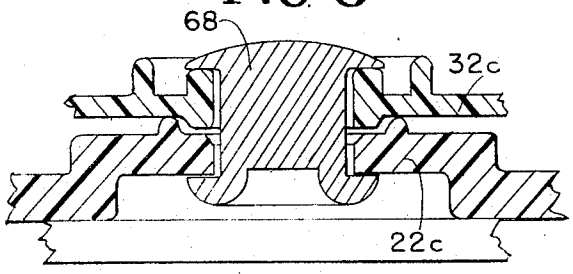


FIG. 5

FIG. 8



SAFETY CLOSURE UNIT

BRIEF SUMMARY OF THE INVENTION

It is well recognized that there is a potential hazzard particularly for young children if they are able to remove the closure cap from a bottle or other container which may contain medicine or a toxic material or the like. It is therefore an object of this invention to provide a safety closure comprising an inner closure cap and an outer cap which may be operated in unison to readily secure the inner cap to the neck of a bottle or container but which inner cap cannot be unthreaded or disengaged from the neck of the bottle or container unless a downward manual pressure or push is applied against the outer cap to produce an interengagement between the engaging means of the inner and outer caps so that they operate in unison to thereby disengage the inner cap from the container. The top wall of the outer cap is sufficiently flexible so as to in effect provide a two-way spring action so that as the outer cap is rotated in the opposite or counterclockwise direction normally without manual pressure applied thereto, the top wall of the outer cap will flex axially upwardly or concavely to permit overriding of the teeth of the outer cap relative to the inner cap, and when a downward manual pressure is applied to the outer cap the top wall of the outer cap will flex axially downwardly or convexly so that the cooperating teeth interengage to simultaneously rotate the inner cap and effect an unscrewing of the inner cap with respect to the container.

Another object of this invention is to provide a safety closure which may be readily and economically manufactured in large quantities and which is substantially foolproof.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a view of the safety closure unit of this invention with a portion broken away to show the interengaging teeth and showing the position of the caps in normal position.

FIG. 2 is an enlarged sectional view taken on line 2—2 of FIG. 1, showing the normal position of the two caps.

FIG. 3 is an enlarged sectional view of the interengaging teeth when the caps are in their normal position of FIG. 1 or FIG. 2.

FIG. 4 is a sectional view similar to FIG. 2 and showing the inward or upward flexing of the top wall of the outer cap, with the teeth positioned as when the outer cap is rotated counterclockwise so as not to impart a simultaneous rotation to the inner cap, that is, when the teeth of the outer cap override the teeth of the inner cap.

FIG. 5 is a sectional view similar to FIG. 2 and showing the downward flexing of the top wall of the outer cap and the interengagement of the teeth when the outer cap is pressed axially toward the inner cap to effect a simultaneous counterclockwise rotation of both caps to unscrew the inner cap from the container.

FIG. 6 is a view showing a modified form of connecting the top walls of both caps.

FIG. 7 is a view of another modification showing the connection of the top walls of both caps; and

FIG. 8 is another modification showing the connection of the top walls of both caps.

The safety closure unit generally indicated at **10** consists essentially of two cap members with interengaging means and with the top wall of the outer cap serving as a two-way spring member which is axially deflectable to permit the interengagement of the interengaging means so that the two caps can be rotated simultaneously to effect an unscrewing of the inner closure cap with respect to the container, such as when a manual downward pressure is applied against the outer cap, and when no manual pressure is applied the outer cap may be rotated relative to the inner cap with the interengaging means of the outer cap overriding the inner cap as a result of the flexing or spring action of the top wall of the outer cap without effecting an unscrewing of the inner cap.

The inner or closure cap is generally indicated at **12.** The outer or actuator cap is generally indicated at **14** and is superimposed over the inner cap. The outer cap **14** is provided with helical or inclined gear teeth indicated at **16** which interengage with helical or inclined teeth indicated at **18,** as will be more specifically described, to effect a screwing on or closing of the inner cap on the container; to also permit an overriding of the outer cap relative to the inner cap without imparting a rotation of the inner cap, and to also permit the outer cap to alternatively rotate the inner cap to unscrew the inner cap from the container. All of the foregoing functions are accomplished by the relationship of the interengaging teeth and the axial deflection of the top wall of the outer cap which serves to provide a two-way spring action.

The inner or closure cap **12** has an annular vertical wall or skirt **20** and a top wall **22** integrally formed therewith. The interior of the annular wall or skirt is provided with a continuous internal thread **24** whereby the inner cap engages the externally threaded neck of a bottle or container C for the purpose of closing the opening of the container. The top wall **22** of the inner cap is provided with a central raised boss **26** having a socket portion **28** which is adapted to receive the centrally positioned downwardly extending projection or stud **30** on the underside of the top flexible wall **32.** The stud or projection **30** is shaped complementary to the shape of the socket so that the two interfit and connect the two caps, to be more fully described hereinafter.

The outer surface of the skirt **20** of the inner cap **12** is provided adjacent the top wall **22** thereof with a plurality of spaced helical or inclined gear teeth **18,** all of which are inclined in the same direction and are shown in greater detail in FIGS. **1** and **3.** Each gear tooth **18** has a front portion and a rear portion. The front portion **34** of the tooth is inclined at an angle of approximately 85° from the horizontal, with the upper corner edge **35** being sharp relative to the top horizontal planar surface **36** of the tooth and with the lower portion having a slight radius **37** which merges with the bottom horizontal planar surface **38** which extends forwardly to the rear of the next adjacent tooth. The rear or trailing portion of the tooth has a lower portion **40** which is inclined at an angle of approximately 80° from the horizontal and extends to the bottom horizontal planar portion **38.** The upper portion **42** of the tooth **18** is inclined at an angle of approximately 35° from the horizontal and extends from the top of the bottom portion **40** to the planar portion **36** at the top of the tooth. Be-

tween the top horizontal planar portion **36** and the inclined portion **42** there is a slight radius as at **43.** The bottom of the skirt **20** of the inner cap has a slight radius **44.**

The outer or actuator cap **14** has an annular skirt portion **46,** the outer surface of which is provided with spaced ribs or serrations **47** for non-slip manual gripping. The outer cap has the integrally formed top wall **32** which is formed with the central depending stud **30** having a shape complementary to the shape of the socket **28** on the top wall of the inner cap so that it may be snapped into engagement with said socket and secured thereto against uncoupling but permitting relative rotation between the outer and inner caps.

Formed on the inside of the skirt **46** of the outer cap **14** adjacent the top wall **32** is a plurality of spaced downwardly extending gear teeth indicated at **16,** all sloping or inclined in the same direction, more specifically shown in greater detail in FIGS. **1** and **3.** The front or lead edge **48** of the upper tooth **16** is inclined at an angle of approximately 85° from the horizontal, with the bottom of said gear tooth being horizontally planar as at **50** and the connecting edge **51** at the front being relatively sharp. The top of said front of the tooth where it merges with the underside of the top wall of the cap has a slight radius as at **52.** The rear **54** of the tooth is inclined at an angle of approximately 80° from the horizontal so that the distance between the front and rear of the tooth **16** is greatest at the top and gradually reduces toward the bottom edge of said tooth. The rear **54** of said gear tooth has a slight radius as at **55** where it merges with the horizontal planar undersurface of the top wall **16.**

The bottom of the skirt **46** of the outer cap **14** is provided with an annular inwardly extending lip **56** having an arcuate shape **57** which is adapted to engage the bottom of skirt **20** of the inner cap to prevent separation of the caps in the event that a person unnecessarily or accidentally applies a strong upward pull on the outer cap which otherwise would dislodge the stud **30** from the socket **28.**

The outer cap **14** is molded preferably of a polypropylene material with the top wall **32** thereof being of a thickness less than the skirt **46** and of a thickness so that said top wall has sufficient flexibility or resiliency or yieldability to provide a two-way spring action, as best seen in FIGS. **4** and **5,** and as will be more fully understood in connection with the operation of the caps. The inner or closure cap may be formed of a plastic having greater rigidity than the outer cap or may be made of metal.

OPERATION

When the two caps **12** and **14** are secured together, as seen in FIGS. **2, 4** and **5,** the central stud **30** of the outer cap **14** is snapped into the socket **28** of the inner cap **12** to connect the two caps relative to each other. In this normal position (FIGS. **1, 2** and **3**) the bottom of the skirt **20** of the inner cap **12** is spaced and positioned upwardly of the inwardly extending lip **56** of the outer cap **14** and the teeth **16** of the outer cap are in partial engagement with the teeth **18** of the inner cap, best seen in FIGS. **1** and **3,** that is, the upper teeth **16** engage the upper portion of the lower teeth **18,** which engagement is sufficient for rotation of the outer and inner cans simultaneously when the outer cap **14** is rotated clockwise to screw the inner closure cap **12** on to the container C. With the caps in this position, if the outer cap **14** is rotated counterclockwise, as seen in FIG. **4,** the upper teeth **16** will ride up on the inclined upper surface **42** of the lower teeth **18** and across and over the lower teeth **18** so that no interengagement is effected therebetween. As this overriding takes place the top wall **32** of the outer cap **14** flexes axially upward, as seen in FIG. **4,** to permit such overriding of the upper teeth on the lower teeth, that is, the top wall of the outer cap is flexed upwardly relative to the top wall of the inner cap and this flexing takes place as the upper teeth override the lower teeth and it is an intermittent flexing as the outer cap is rotated counterclockwise. Thus, as a child or an adult who is unfamiliar with the closure rotates the outer cap counterclockwise there will be no rotation of the inner cap to open the container.

To effect an unscrewing of the inner closure cap **12** from the container it is necessary to exert a downward pressure on the outer cap, as seen in FIG. **5** and indicated by the arrows **58,** in which case the upper teeth **16** move inwardly into full engagement with the lower teeth **18** and engage the lower portion **40** of the teeth **18** to provide positive engagement between the upper teeth **16** and the lower teeth **18.** This is possible by virtue of the downward flexing of the top wall **32** of the outer cap **14,** as seen in FIG. **5,** the downward flexing permitting full interengagement of the teeth.

The downward pressure on the outer cap may be accomplished by manual engagement of the skirt **46** of the outer cap and pushing downwardly, or pushing downwardly on the top wall **32** of the outer cap anywhere except at the axis. With the application of downward pressure on the outer cap as described, the upper teeth **16** move into engagement with the lower portion **40** of the lower teeth effecting a positive interengagement. By rotating the outer cap **14** in this downward position counterclockwise the two caps are interlocked and rotate simultaneously to unscrew the inner cap from the container. After release of the manual pressure the outer cap **14** will assume its normal elevated or raised position, as seen in FIG. **2,** where the top wall **32** of the outer cap is substantially planar. Thus, the top wall **32** of the outer cap has a two-way spring action; it flexes inwardly or downwardly relative to the inner cap in one position, as in FIG. **4,** and flexes upwardly or away from the inner cap in the opposite position for a different function.

It will be understood that the outer or actuator cap while preferably formed of a plastic material may be formed of a suitable metal or like material in which the top wall has flexing properties herein described and that the outer cap may be used with an inner cap either molded of plastic material or made of metal. There is thus provided a safety closure unit, essentially a closure cap and an actuator cap which may be economically produced, which operates effectively, and in which the amount of pressure required to depress the actuator cap relative to the closure cap may be varied and controlled, thereby determinantly controlling the safety factor.

While the coupling of the two caps is accomplished at the top wall of the respective caps, as described, the inwardly extending lip **56** on the outer or actuator cap **14** is provided to prevent separation of the caps should anyone exert an upward pull on the outer cap stronger than is normal. In other words, should anyone attempt

a strong-arm lift off by pulling upwardly on the outer cap sufficient to dislodge the stud from the socket, a separation will be prevented by the lip **56** on the skirt of the outer cap engaging the bottom of the inner cap, limiting the upward motion of the outer cap well within the limits of the spring action of the top wall of the outer cap and thereby preventing separation of the stud **30** from the socket **28.**

If desired, the results achieved by this invention may be accomplished by constructing the top wall **22** of the inner cap **12** of a flexible and yieldable character and constructing the top wall **32** of the outer cap of a substantially rigid material. As long as one or the other of the top walls of either cap is yieldable while the other is rigid, the two-way spring action is attained.

MODIFICATIONS

While the means for connecting the inner and outer caps is shown in the form illustrated in FIGS. **2, 4** and **5,** other methods may be used, for example, the connecting parts may be reversed, as seen in FIG. **6,** in which the top wall **22***a* of the inner cap may be provided with an upwardly extending stud portion **60** and the socket portion **62** for receiving the stud may be formed on the top wall **32***a* of the outer cap.

FIG. **7** shows another modification in which a downwardly extending central stud **64** in the top wall **32***b* of the outer cap is received in an axial opening **66** in the op wall **22***b* of the inner cap, with the stud **64** then being spun over to form an annular flange **67** to interlock the caps against axial separation.

FIG. **8** shows another modification in which the top wall **32***c* of the outer cap and the top wall **22***c* of the inner cap each have axial openings which receive a metal or plastic rivet **68** suitably flanged at its opposite ends to interlock the caps.

While the angle of the teeth **16** on the outer cap is shown inclined at approximately 85°, I have found that the upper teeth **16** may be angled between 45° to 85°; that the upper teeth angled at 45° will operate. However, from a molding standpoint certain molding problems are presented and the inclination of 85° has been found to be the best both from a molding and an operating standpoint. Correspondingly, the lower teeth **18** on the inner closure cap may also be inclined at an angle of 45° in lieu of the two section inclination as shown and previously described.

What is claimed is:

1. A safety closure unit including, an inner or closure cap for application to a container, an outer or actuator cap superimposed on said inner cap, means on the top wall of each of said caps securing said caps against unauthorized axial separation, said outer and inner caps having complementary engaging surfaces on the underside of the top wall of the outer cap adjacent the skirt of said outer cap and on the upper portion of said inner cap adjacent the top wall of the inner cap to cause interengagement therebetween so that in the normal position of the outer cap, rotation of the outer cap will simultaneously rotate the inner cap to secure the inner cap on the container, the top wall of one of said caps being sufficiently yieldable to permit axial deflection relative to the top wall of the outer cap in one direction to permit the outer cap to be rotated in the opposite direction with respect to the inner cap without effecting an unsecurement of said inner cap from the container, said yieldable top wall also being axially deflectable when a downward manual pressure is applied against the outer cap causing interengagement of said engaging surfaces and locking said outer cap with respect to said inner cap to rotate said caps simultaneously to cause unsecurement of said inner cap relative to the container.

2. A safety closure unit as set forth in claim **1** in which the complementary engaging surfaces comprise downwardly extending spaced teeth on the outer cap and upwardly extending spaced teeth on the inner cap.

3. A safety closure unit including an inner or closure cap for application to a container, an outer or actuator cap superimposed on said inner cap, means on the top wall of each of said caps securing said caps against unauthorized axial separation, said outer and inner caps having complementary engaging surfaces on the underside of the top wall of the outer cap adjacent the skirt of said outer cap and on the upper portion of said inner cap adjacent the top wall of the inner cap to cause interengagement therebetween so that in the normal position of the outer cap, rotation of the outer cap will simultaneously rotate the inner cap to secure said inner cap on the container, the top wall of said outer cap being sufficiently yieldable to permit axial deflection thereof in one direction to permit the outer cap to be rotated in the opposite direction with respect to the inner cap without effecting an unsecurement of said inner cap from the container, said top wall being axially deflectable in an opposite direction when a downward manual pressure is applied against the outer cap causing interengagement between said engaging surfaces and locking said outer cap with respect to said inner cap to rotate said caps simultaneously to cause unsecurement of said inner cap relative to the container.

4. A safety closure unit as set forth in claim **3** in which the complementary engaging surfaces comprise downwardly extending spaced teeth on the outer cap and upwardly extending spaced teeth on the inner cap.

5. A safety closure unit as set forth in claim **4** in which when the outer cap is in its normal position and is rotated clockwise the teeth of both caps will be in positive engagement to simultaneously rotate said inner cap to closure position on the container and when the outer cap is rotated counterclockwise the teeth in the outer cap will override the teeth on the inner cap to permit relative rotation between said caps without imparting a corresponding rotation to the inner cap and the top wall of said outer cap will flex upwardly away from the top wall of the inner cap, and when said outer cap is moved downward manually relative to the inner cap said top wall of said outer cap will flex downwardly as long as the manual pressure is applied to said outer cap to cause the teeth in said outer cap to engage the teeth on the inner cap to simultaneously rotate said inner cap with said outer cap to cause unsecurement of said inner cap relative to the container.

6. A safety closure unit as set forth in claim **5** in which the outer cap has a lip adjacent the bottom of the skirt of the outer cap adapted to engage the bottom of the skirt of the inner cap to prevent a manual separation of said caps by any unusual manual pressure.

7. A safety closure unit as set forth in claim **5** in which the top wall of the outer cap provides a two-way spring action to permit a downward axial deflection of said top wall when a downward manual pressure is ap-

plied against the outer cap and said outer cap is rotated counterclockwise to effect an unscrewing of the inner cap, and an upward axial deflection of said top wall when said outer cap is rotated counterclockwise so that the teeth of the outer cap override the teeth of the inner cap.

8. A safety closure unit as set forth in claim **4** in which the spaced teeth in the outer cap are inclined at an angle of between 45° to 85°.

9. A safety closure unit as set forth in claim **4** in which the angle of the teeth on the inner cap is approximately between 45° to 85°.

10. A safety closure unit as set forth in claim **4** in which the teeth on the inner cap are formed to provide a lower section which is inclined at an angle of approximately 80° with an upper inclined section inclined at an angle of approximately 35°, with the top of the tooth being generally horizontal and planar.

11. A safety closure unit as set forth in claim **5** in which the inner and outer caps are formed of a plastic material.

12. A safety closure unit as set forth in claim **11** in which the outer cap is formed of a plastic material having a greater flexibility than the inner cap.

13. A safety closure unit as set forth in claim **4** in which the front or lead edge of the tooth in the outer cap is inclined at an angle of approximately 80° and engages the rear or tail edge of the tooth on the inner cap when rotated in one direction, which tooth in said inner cap is inclined at approximately 80°, and when the outer cap is manually pressed inwardly relative to the inner cap and is rotated in the opposite direction the teeth in the outer cap will be moved inwardly into the spaced recesses between the teeth on the inner cap and will engage each other adjacent the bottom of their respective teeth so that the teeth are interlocked and the two caps will rotate simultaneously when rotated in the opposite direction to unfasten the inner cap from the container.

14. A safety closure unit as set forth in claim **13** in which when the outer cap is rotated in the opposite direction without the application of manual pressure thereto the top wall of the outer cap will flex so as to permit the teeth of the outer cap to override the teeth on the inner cap without imparting a rotation of the inner cap and when downward manual pressure is applied to said outer cap said top wall of the outer cap will flex to permit a positive interengagement of the teeth to cause said outer and inner caps to rotate simultaneously in the opposite direction to effect an unscrewing of the inner cap from the container.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,853,236 Dated December 10, 1974

Inventor(s) EFREM M. OSTROWSKY

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Assignee: Federal Tool & Plastics, a division of VCA Corporation, Chicago, Ill.

Signed and sealed this 18th day of February 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

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