Sept. 26, 1967

S. ROBERTS ETAL

3,343,697

SAFETY CLOSURE

Filed Nov. 30, 1966

4 Sheets-Sheet 1

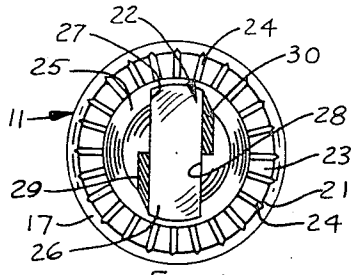


FIG. 3

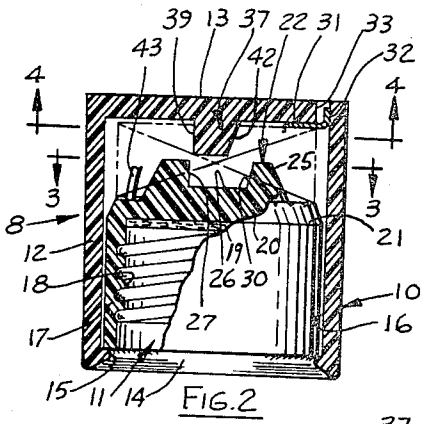
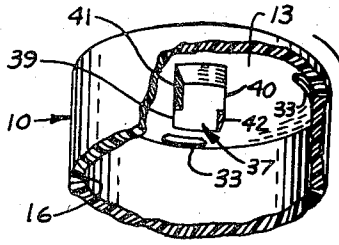


FIG. 2



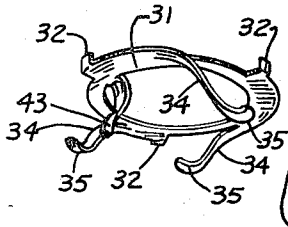


FIG. 5

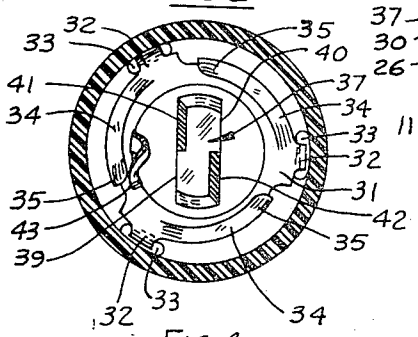


FIG. 4

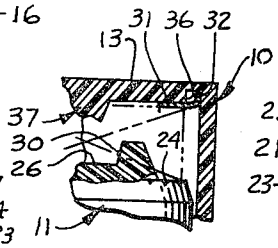
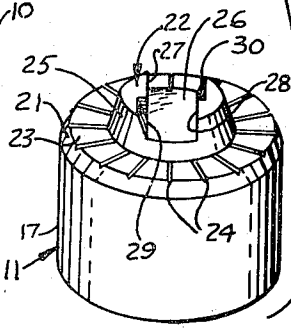


FIG. 8



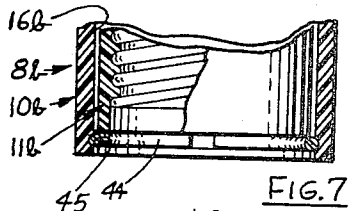


FIG. 7

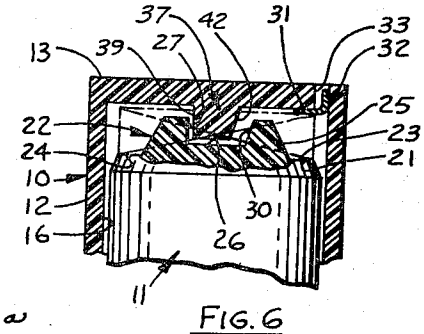


FIG. 6

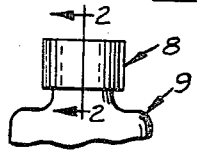


FIG. 1

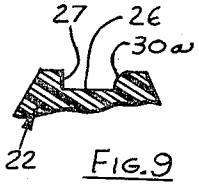


FIG. 9

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SAFETY CLOSURE

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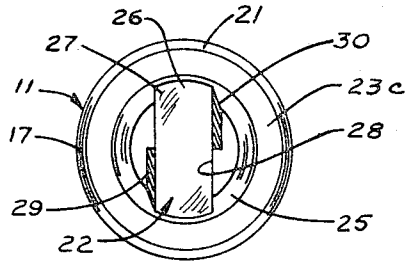


FIG. 11

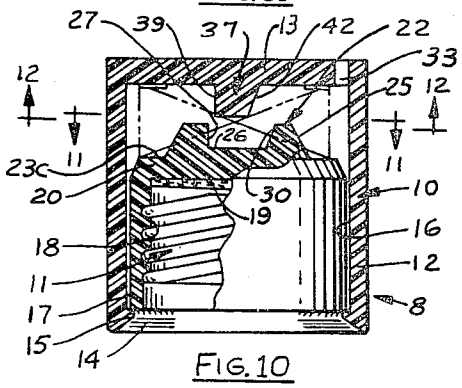


FIG. 10

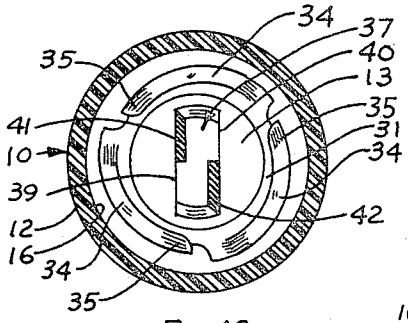
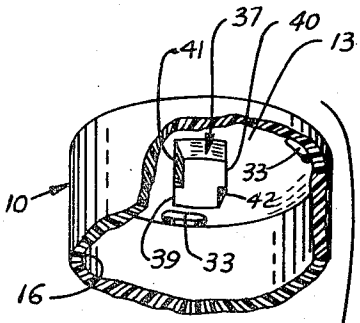
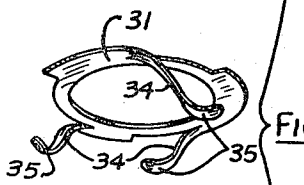


FIG. 12





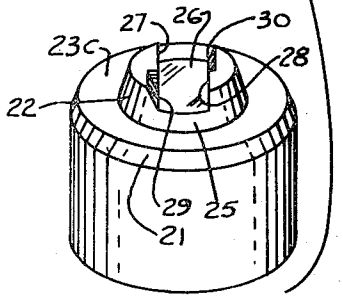


FIG. 13

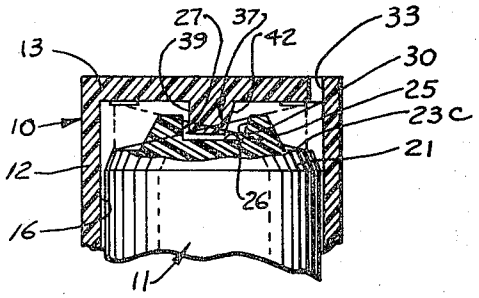


FIG. 14

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SAFETY CLOSURE

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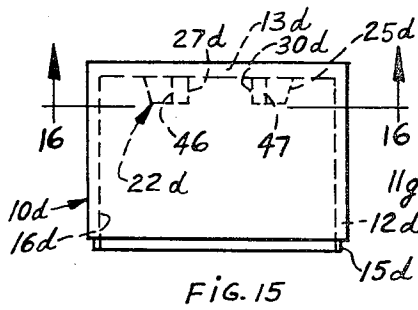

FIG. 15

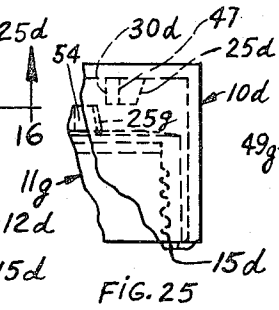

FIG. 25

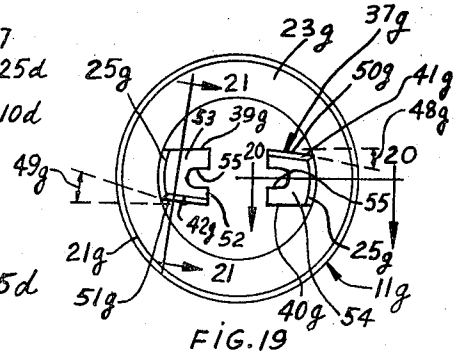

FIG. 19

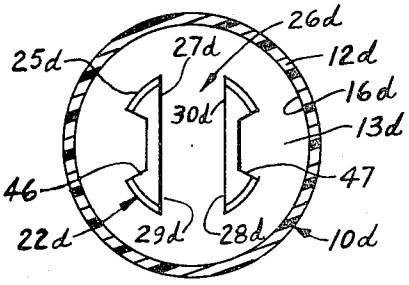

FIG. 16

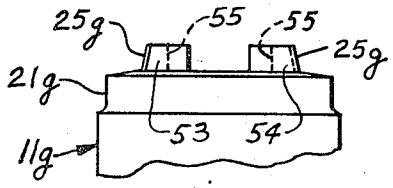

FIG. 22

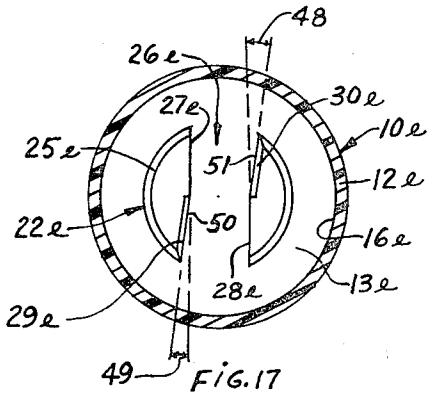

FIG. 17

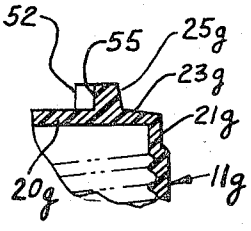

FIG. 20

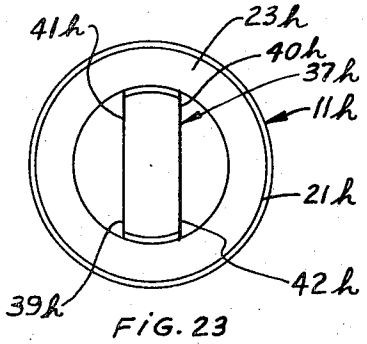

FIG. 23

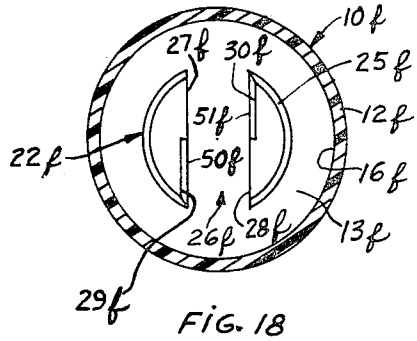

FIG. 18

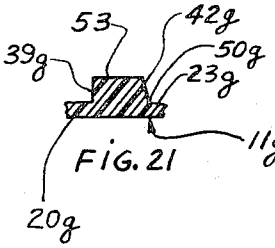

FIG. 21

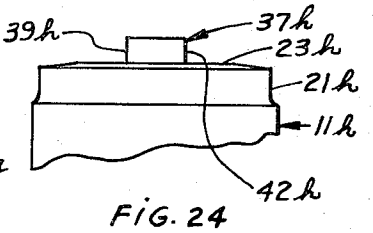

FIG. 24

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SAFETY CLOSURE

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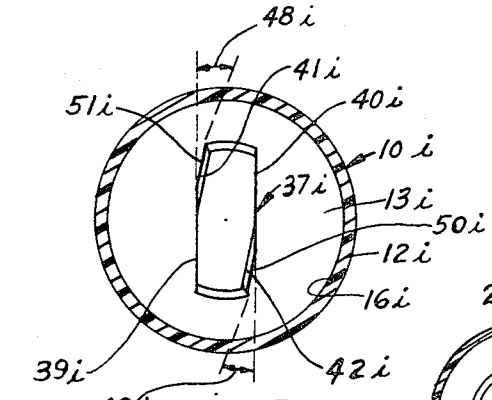

FIG. 27

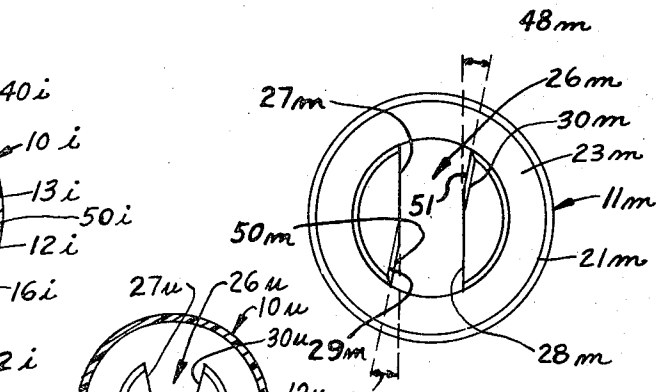

FIG. 26

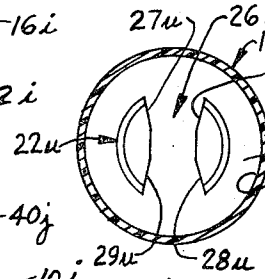

FIG. 36

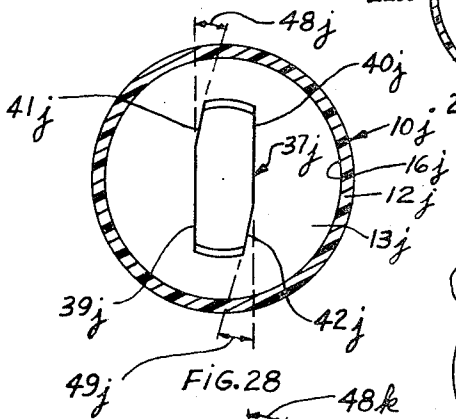

FIG. 28

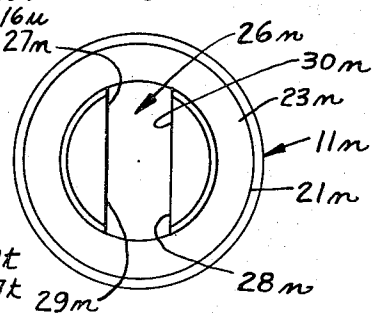

FIG. 30

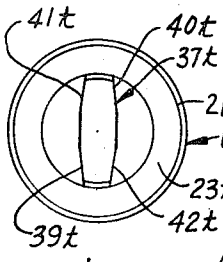

FIG. 35

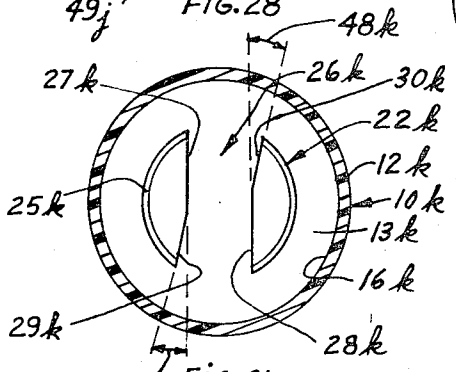

FIG. 31

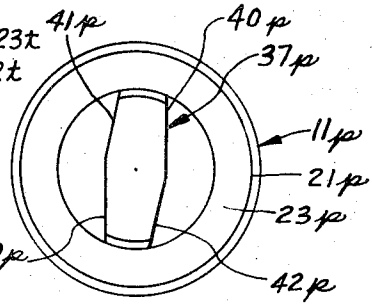

FIG. 32

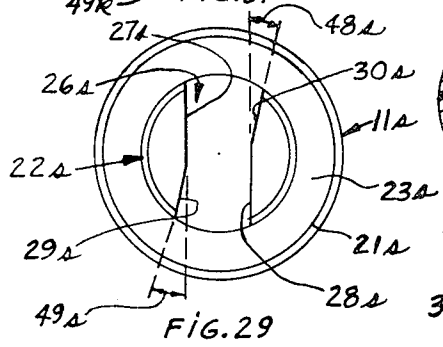

FIG. 29

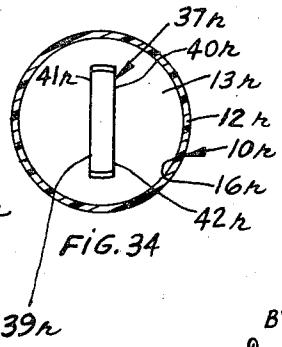

FIG. 34

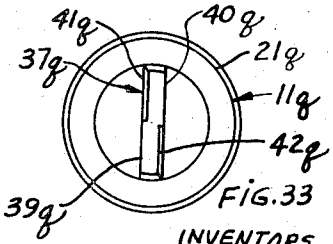

FIG. 33

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United States Patent Office 3,343,697
Patented Sept. 26, 1967

3,343,697

SAFETY CLOSURE

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Filed Nov. 30, 1966, Ser. No. 598,100
28 Claims. (Cl. 215—9)

ABSTRACT OF THE DISCLOSURE

A safety cap for bottles and the like having an inner member and an outer member rotatably mounted on the inner member with clutch drive means on one member and clutch driven means on the other member, and with a spring means between the inner and outer members to normally move the outer member apart from the inner member to release the clutch drive means from the clutch driven means. The clutch drive and driven means includes torque-limiting means to permit the outer member to over-ride the inner member when the inner member is sufficiently tight on the bottle.

This is a continuation-in-part of application Ser. No. 454,556, filed May 10, 1965 and now abandoned.

This invention relates generally to a safety cap for containers such as bottles and the like, and more particularly to a safety cap which is virtually impossible to be opened by children because of its novel structural features.

It is the primary object of the present invention to provide a novel and improved safety cap which is constructed and arranged to prevent children from opening bottles and like containers which contain dangerous or injurious substances.

It is another object of the present invention to provide a novel and improved safety cap which operates in a manner similar to standard caps and may be simply operated by an adult, but wherein a young child would find it virtually impossible to operate to remove the safety cap from a container because he lacks the fully developed reflexes and controls necessary for operating the safety cap.

It is a further object of the present invention to provide a safety cap for a container which is provided with an audible signal means so that when a child plays with a container having the safety cap mounted thereon, a parent will be warned of this fact by a distinctive audible signal.

It is still another object of the present invention to provide a novel and improved safety cap for a container which automatically limits the amount of force which can be applied in tightening the cap so that an adult can open a container which has been closed by another person who is quite strong and who is in the habit of overtightening a container cap in an attempt to make it safe for children.

It is still a further object of the present invention to provide a novel and improved safety cap which is adapted to operate on standard threaded or bayonet type closure containers.

It is still another object of the present invention to provide a novel and improved safety cap which is simple and compact in construction, economical of manufacture, reusable, efficient and sanitary in operation.

It is still a further object of the present invention to provide a novel and improved safety cap for a container which includes an inner cap member provided with means for sealing engagement with a container, an outer cap member telescopically mounted over said inner cap member and normally rotatable independently thereof and

movable longitudinally thereof, clutch drive and driven means for connecting said cap members together for positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from the container, and for torque limiting self-releasable drive action for rotation of the inner cap member when the outer cap is rotated in another direction to attach the safety cap to the container, and spring means mounted between said cap members for normally biasing the clutch drive and driven means apart to inoperative positions to allow independent rotation of the outer cap member relative to the inner cap member.

Other objects, features and advantages of this invention will be apparent from the following detailed description, appended claims, and the accompanying drawings.

In the drawings:

FIG. 1 is a fragmentary, elevational view of the upper end of a container provided with a safety cap made in accordance with the principles of the present invention;

FIG. 2 is an enlarged, elevational view of the safety cap illustrated in FIG. 1, taken along the line 2—2 thereof, looking in the direction of the arrows, showing parts in section and parts broken away, and with noise maker grooves on the top surface of the inner cap member;

FIG. 3 is a plan view of the inner cap member of the structure illustrated in FIG. 2, taken along the line 3—3 thereof, looking in the direction of the arrows, with the outer cap member removed, and with noise maker grooves on the top surface;

FIG. 4 is a horizontal sectional view of the structure illustrated in FIG. 2, taken along the line 4—4 thereof, and looking in the direction of the arrows;

FIG. 5 is an exploded view, partially in section, of the safety cap illustrated in FIG. 2;

FIG. 6 is a fragmentary, elevational section view similar to FIG. 2 and showing the outer cover member moved downwardly to bring the clutch drive key into the clutch drive socket on the upper end of the inner cover member;

FIG. 7 is a fragmentary, elevational section view similar to FIG. 2, and showing a modification wherein the inner cover member is releasably secured in the outer cover member by a snap ring;

FIG. 8 is a fragmentary, elevational section view similar to FIG. 2, and showing a spring tang slot closed on the outer side;

FIG. 9 is a fragmentary, elevational section view of a clutch drive socket means and showing a curved clutch face;

FIG. 10 is an elevational view similar to FIG. 2 and showing a modified safety cap, with parts in section and parts broken away, and with the noise maker grooves removed;

FIG. 11 is a plan view of the inner cap member of the structure illustrated in FIG. 10, taken along the line 11—11 thereof, and looking in the direction of the arrows, with the outer cap member removed, and with the noise maker grooves removed;

FIG. 12 is a horizontal section view of the structure illustrated in FIG. 10 taken along the line 12—12 thereof, and looking in the direction of the arrows;

FIG. 13 is an exploded view, partially in section, of the safety cap illustrated in FIG. 10;

FIG. 14 is a fragmentary, elevational section view similar to FIG. 10, and showing the outer cap member moved downwardly to bring the clutch drive key into the clutch drive socket on the upper end of the inner cap member;

FIG. 15 is a side elevation view of a modified outer cap, showing the clutch socket on the outer cap and operable as the clutch drive means;

FIG. 16 is a horizontal section view of the cap structure illustrated in FIG. 15, taken along the line **16—16** thereof;

FIGS. 17 and 18 are two views similar to FIG. 16, and showing two additional modifications of the clutch drive faces;

FIG. 19 is a top plan view of a modified inner cap, showing the clutch key on the inner cap and operable as the clutch driven means;

FIG. 20 is a fragmentary, elevation section view of the inner cap structure shown in FIG. 19, taken along the line **20—20** thereof;

FIG. 21 is a fragmentary, elevation section view of the inner cap structure shown in FIG. 19, taken along the line **21—21** thereof;

FIG. 22 is a fragmentary, front side elevation view of the inner cap structure illustrated in FIG. 19;

FIG. 23 is a top plan view of a modified inner cap, showing the clutch key on the inner cap and operable as the clutch driven means;

FIG. 24 is a front side elevational view of the inner cap structure illustrated in FIG. 23;

FIG. 25 is a fragmentary, elevation view of the inner cap of FIG. 19 mounted in the outer cap of FIG. 15 with the spring means removed;

FIGS. 26 and 27 are views similar to FIGS. 3 and 4, respectively, showing the embodiment of FIGS. 3 and 4 provided with clutch faces having compound relieved faces;

FIG. 28 is a sectional view, similar to FIG. 4, of an outer cap, and showing the clutch drive key in the outer cap and provided with modified relieved clutch faces;

FIG. 29 is a top plan view of an inner cap provided with a clutch driven socket provided with modified relieved clutch faces;

FIG. 30 is a top plan view of an inner cap provided with a clutch driven socket having straight clutch faces;

FIG. 31 is a sectional view, similar to FIG. 16, of an outer cap, and showing the clutch drive socket provided with modified clutch faces;

FIG. 32 is a top plan view of an inner cap provided with a clutch key having modified relieved clutch faces;

FIG. 33 is a top plan view of an inner cap provided with a modified clutch driven key;

FIG. 34 is a section view, similar to FIG. 4, of a modified outer cap;

FIG. 35 is a top plan view of an inner cap provided with a modified clutch driven key; and,

FIG. 36 is a section view, similar to FIG. 31, of an outer cap, and showing the clutch drive socket provided with modified positive clutch drive faces.

Referring now to the drawings, and in particular to FIG. 1, the reference numeral **8** generally indicates a safety cap made in accordance with the principles of the present invention, and it is shown in an operative sealing position on a container **9**. As shown in FIG. 2, the safety cap **8** comprises an outer cap member, generally indicated by the numeral **10**, in which is telescopically and slidably mounted an inner cap member, generally indicated by the numeral **11**. The outer cap member **10** is provided with the cylindrical side wall **12**, which is formed with a smooth inner surface and which may be provided with a roughened outer surface for frictional engagement with the fingers of a person operating the safety cap. The outer cap member **10** is further provided with an integral top end wall **13**. The lower end of the outer cap member **10** is open and is provided with a beveled or converging entrance lip or surface **14** that terminates in an integral retaining ring **15**. The integral retaining ring **15** is of a slightly smaller diameter than the diameter of the interior **16** of the outer cap so as to provide a ledge on which the inner cap member **11** is seated.

As shown in FIGS. 2, 3 and 5, the inner cap member **11** is provided with a cylindrical side wall **17** which is of a diameter smaller than the inner diameter **16** of the outer cap **10**, and of a size to provide free relative rotation between the two cap members. The inner cap member **11** is open at the lower end thereof and the interior **18** thereof is theaded for threaded engagement with a container as **9**. The inner cap member **11** may be provided with a suitable sealing gasket **19** on the inner side of the integral top end wall **20**. As best seen in FIGS. 2, 3 and 5, the outer peripheral side of the top end wall **20** is beveled, as indicated by the numeral **21**.

As shown in FIGS. 2, 3 and 5, a clutch driven means, generally indicated by the numeral **22**, is integrally formed on the upper end of the inner cap member **11**. The clutch driven means **22** comprises abody which is centrally disposed on the outer side of the top wall **20**, and which is surrounded by a horizontal annular surface **23** in which is formed a plurality of radially disposed grooves or notches **24**. The grooves **24** are circumferentially spaced apart and are part of a noise making mechanism as more fully described in detail hereinafter.

The clutch driven means is provided with a beveled side wall **25**, and a transverse socket **26** is formed therethrough for the reception of a mating clutch drive key, as explained more fully hereinafter. It will be understood, that side wall **25** may be vertical. As best seen in FIGS. 3 and 5, the clutch driven means **22** includes a pair of flat, positive drive clutch driven faces **27** and **28** which are vertically disposed on opposite sides of the slot **26**, and in offset positions relative to each other. The positive drive clutch faces **27** and **28** extend inwardly from the outer edge of the clutch driven means **22** to the center thereof. A second pair of clutch driven faces **29** and **30** are formed on opposite sides of the slot **26** and in offset positions relative to each other. The clutch faces **29** and **30** are relieved faces, and as shown in FIG. 2, are formed at an acute angle relative to the vertical axis of the safety cap **8**. As best seen in FIG. 3, the positive drive clutch face **27** is oppositely disposed relative to the torque limiting clutch driven face **30**, and the same condition is present for the clutch drive and driven faces **28** and **29**, respectively. The torque limiting clutch faces **29** and **30** also extend inwardly from the outer edge of the clutch driven means **22** to the center thereof.

As shown in FIGS. 2, 4 and 5, a flat annular carrier member **31** is disposed inside of the outer cap member **10** and it is made from a suitable spring material, as for example, a suitable spring metal material. The annular carrier member **31** is provided with a plurality of integral, peripherally disposed, circumferentially spaced apart tangs **32** which are disposed at right angles to the plane of the carrier member and are adapted to be slidably received in mating slots **33** formed through the top wall **13** of the outer cap member **10**. It will be seen, that when the outer cap member **10** is rotated the tangs **32** will be engaged by the end walls of the slots **33** and the plate **31** will be carried with the outer cap member **10**. As best seen in FIG. 2, the slots **33** are slightly larger in cross section than the cross section of the tangs **32** so as to provide clearance for passage therethrough of cleansing fluid into the safety cap between the inner and outer cap members for flushing the safety cap. It will be seen that the tangs **32** thus releasably connect the carrier member **31** to the outer cap member **10**.

As best seen in FIGS. 2, 4 and 5, a spring means is integrally formed from the carrier member **31** and comprises a plurality of spring legs **34** struck from said carrier member **31** at circumferentially spaced positions around the same. The spring legs **34** have the upper ends thereof integral with the annular carrier member **31** and the other ends are curved upwardly toward the upper ends of the spring legs so as to provide a rounded lower end **35** which is adapted to slidably engage the upper surface **23** on the inner cap member **11**. It will be seen that the spring means is thus mounted between the cap members and functions to normally bias the hereinafter mentioned clutch driven means and the aforementioned

clutch drive means apart to inoperative positions, to allow independent rotation of the outer cap member **10** relative to the inner cap member **11**. As shown in FIG. 8, the upper end of the slots **33** may be enclosed to form an enclosed tang drive slot **36**.

The drive clutch mechanism employed in the invention further includes a clutch drive means carried by the outer cap member **10** and which is integrally formed on the inner side of the top end wall **13** for selective engagement with the clutch driven means **22** formed on the inner cap member **11**. As best seen in FIG. 5, the clutch drive means comprises a clutch drive key **37** which is integral with wall **13**. The spring arms **34** normally bias the top wall **13** of the outer cap member **10** upwardly to a spaced apart position from the clutch driven means **22** so as to bring the clutch drive key **37** to a position above clutch driven means **22**. Accordingly, it will be seen that with the cap members in such spaced apart positions, the outer cap member **10** may be rotated freely in either the clockwise or counter-clockwise direction without having the clutch drive key **37** engage the clutch driven means **22**.

As shown in FIG. 2, the clutch drive key **37** has a first vertical or flat face **39** on one side thereof and a second vertical or flat face **40** on the other side thereof. The clutch drive key **37** also has a second pair of drive faces **41** and **42** which are on opposite sides of the key. The vertical faces **39** and **40** are offset from each other and the slanting or relieved faces **41** and **42** are also offset from each other. The relieved faces **41** and **42** coact with the slanted or relieved clutch driven faces **29** and **30**, respectively, to provide a torque limiting means for tightening the inner cap member **11** on a container. The clutch drive flat faces **39** and **40** on the clutch drive key **37** function with the vertical or flat faces **27** and **28**, spectively, of the clutch driven means to provide a positive drive for unscrewing or removing the safety cap from a container.

The outer and inner cap members **10** and **11**, respectively, may be made from any suitable material as for example, from a suitable molded plastic. The inner cap member **11** may be mounted in the outer cap member **10** in the following manner. The outer cap member **10** may be disposed in an inverted position and the annular carrier member **31** disposed inside of the outer cap member **10** with the tangs **32** in seated engagement in the slots **33**. The inner cap member **11** may then be forced into the outer cap member **10** with the bevel **21** on the inner cap member **11** functioning to spread the integral retaining ring **15** to permit entry of the inner cap member **11** into the outer cap member **10**. It will be seen, that the integral retaining ring **15** traps the inner cap member **11** in the outer cap member **10** and prevents removal therefrom. The inner cap member **11** is moved into seating engagement on the ledge formed by the retaining ring **15** by the biasing action of the spring legs **34**.

In use, the safety cap **8** may be mounted on the threaded discharge end of a container **9** by grasping the outer surface of the outer cap **10** and positioning the upper end of the container in the leading edge of the inner cap member **11**. Pressure is then exerted downwardly so as to move the outer cap member **10** relative to the inner cap member **11** and to bring the clutch drive key **37** down into the socket **26** of the driven means **22**, as shown in FIG. 6. The outer cap member **10** is then rotated in a clockwise direction to bring the torque limiting clutch drive faces **41** and **42** into driving engagement with the slanted clutch driven surfaces **29** and **30**, respectively. Continued clockwise rotation of the outer cap member **10** will thread the inner cap member **11** down into sealing engagement on the container. When the inner cap member **11** becomes tightly closed on the container **9**, and the clockwise directed force on the outer cap member **10** is continued, the clutch drive key **37** will slip up and over the slanted or relieved surface faces **29** and **30**, thereby preventing damage to the safety cap. The operator will then know that the inner cap member **11** has been tightened securely and he will release the pressure on the outer cap member **10** and permit the spring legs **34** to bias the two cap members apart, to the clutch inoperative position shown in FIG. 2.

It will be seen, that if a child obtains a container with a safety cap of the present invention thereon, he can freely rotate the outer cap member **10** relative to the inner cap member **11** without removing the inner cap member **11**. An adult, on the other hand, can quickly and easily remove the safety cap **8** from the container by pressing downwardly on the outer cap **10** and turning the same until the clutch drive key **37** engages the socket **26**. The inner cap member **11** may be quickly and easily removed from a container by turning the outer cap member **10** in a counter-clockwise direction when the clutch key **37** has been inserted in the socket **26**, so as to bring the inner clutch drive faces **39** and **40** into driving engagement with the clutch driven faces **27** and **28** and with continued rotation of the outer cap member **10** provide a positive drive action by the clutch drive mechanism.

In order to warn persons in the household that a child may have obtained a bottle provided with a safety cap thereon and is playing with the same, the safety cap is equipped with a noise maker which generates an audible signal that may be heard by persons in the house in the vicinity adjacent the child. As shown in FIG. 5, the annular carrier member **31** has a resilient arm **43** struck therefrom or attached thereon and extended downwardly toward the inner cap member **11**. The lower end or free end of the resilient arm **43** is adapted to engage the grooves or notches **24** in the upper surface **23** of the inner cap member **11** and create a noise when the outer cap member **10** is rotated independently of the inner cap member **11**, in the same manner as a stick being run over a picket fence. The resilient noise making arm **43** is provided on the lower end thereof with a curved terminal portion, and this arm **43** is adapted to flex when the outer cap member **10** is moved downwardly into driving engagement with the inner cap member **11**.

It will be obvious that the relative positions on the clutch drive and driven means **37** and **22** and the annular carrier member **31** may be reversed so that the notches **24** and the clutch driven means **22** are carried on the inside of the top wall **13** of the outer cap member **10**, and the carrier member **31** and the clutch drive means **37**, spring legs **34**, and noise making arm **43** carried on the upper side of the inner cap member **11**. This would be merely a reversal of parts.

It will be understood that the mating faces on the clutch drive key and the clutch driven members may vary in angular disposition relative to each other in accordance with the material used in making the mating clutch parts and the load requirements for tightening the inner cap member **11**. The prime requirement is that there be an angular disposition of one or both of the clutch drive faces and clutch driven faces relative to the vertical axis extending upwarly through the lower end of the clutch driven face at the point where it terminates at the surface of the clutch socket **26**.

FIG. 9 shows the clutch driven relieved face **30***a* formed with a curved face. It will be understood that the term "relieved surface," as used in this specification and claims, includes a curved surface as shown in FIG. 9 as well as slanting surfaces as shown in FIGS. 2 through 6, 8 and 10 through 14. This also holds true for the face of the driving member.

FIG. 7 shows a removable inner cap member indicated by the numeral **11***b*. The safety cap of FIG. 7 has been indicated by the numeral **8***b* and the outer cap by number **10***b*. In this embodiment the retainer ring **15** of the first embodiment has been replaced by a removable retainer snap ring **44** which is adapted to be releasably

mounted in the annular recess 45 formed in the inner surface 16*b* of the outer cap member 10*b*. The retainer snap ring 44 abuts the lower end of the inner cap member 11*b*, and retains it in the outer cap member 10*b* during normal use of the safety cap. The inner cap member 11*b* may be removed for cleaning purposes by releasing the retainer snap ring 44. Any suitable retainer snap ring may be used.

FIGS. 11 through 14 illusrtate a slightly modified embodiment of the invention in which the noise maker means has been removed. In this embodiment the parts of the safety cap which are similar to the parts of the safety cap shown in FIGS. 1 through 6 have been marked with the same reference numerals with the exception of the upper surface of the inner cap member 11 which has been marked with the numeral 23*c* to indicate its change. The surface 23*c* is a smooth annular surface without the noise maker notches 24 of the first embodiment. FIG. 13 shows that the noise maker arms 43 and tangs 32 have been deleted. The carrier member 31 does not have to be secured to the outer member 11. The embodiment of FIGS. 11 through 14 would function in the same manner as the first described embodiment with the exception of the removal of the noise maker means.

It will be understood that the mechanically operated noise maker arm 43 may be mounted on any one of the three items including the outer cover 10, the inner cover 11 or the carrier member 31, and coact against suitable grooves or notches formed on one of the remaining two items.

Experience has shown that the safety cap of the present invention is an efficient safety cap which is simple for an adult to operate, while at the same time a young child finds it virtually impossible to open because he has not developed the conditioned reflexes and controls necessary to operate the safety cap in order to remove the inner cap member 11 from the container 9. The safety cap of the present invention limits the amount of force which can be applied in closing the inner cap member 11 so that an adult can open a container that has been closed by one who is quite strong and who is in the habit of overtightening a container cap in an attempt to make it safe for children.

FIGS. 15 through 24 illustrate the aforementioned reversal of parts wherein the clutch driven means 22 is mounted on the inside of the top wall of the outer cap member, and the clutch drive means 37 is mounted on the upper side of the inner cap member. It will be understood that in this reversal of parts, the drive key of the clutch drive means 37 becomes a driven key and the socket means of the clutch driven means 22 becomes a drive socket.

FIGS. 15 and 16 illustrate a first outer cap embodiment of the aforementioned reversal of parts, and the parts of this outer cap and clutch socket embodiment which are the same as the outer cap and clutch socket of the first described embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter *"d."*

The embodiment of FIGS. 15 and 16 illustrates how the torque limiting clutch drive and driven faces for tightening the inner cap member may vary in angular disposition relative to each other in accordance with the material used in making the mating clutch parts and the load requirements, and that the angular disposition may be in one or both of these clutch drive and driven faces relative to the vertical plane extending axially outwardly from the inner or root end of the clutch faces at the point where the clutch faces join with the cap top end wall. FIG. 16 shows a pair of torque limiting offset clutch drive faces 29*d* and 30*d* which are provided with flat, parallel, positive drive faces that are vertically disposed on opposite sides of the slot 26*d* and in offset positions relative to each other and without any relief angle formed on the face thereof. The drive faces 29*d* and 30*d* would coact with relieved clutch driven faces on a driven key on an inner cap, as described hereinafter.

The clutch faces 27*d* and 28*d* are offset, flat, parallel faces with no relief angle since they are adapted to mate with a pair of similar offset, flat, parallel faces on a clutch driven key when the safety cap is to be rotated in a counter-clockwise direction for removing the safety cap from a bottle, as described hereinafter under the discussion of FIG. 19. The numerals 46 and 47 in FIG. 16 illustrate how the two parts of the clutch drive socket means may be provided with the two cut-out areas 46 and 47 for weight reduction purposes.

The numeral 15*d* indicates a reduced end wall portion which is thinned down and adapted to be folded over to the position shown in FIG. 25, for retaining an inner cap member in the outer cap member 10*d*. The integral lip 15*d* may be folded from the position of FIG. 15 to the position of FIG. 25 by any suitable means, as by being heat staked into the position of FIG. 25, or by being spun into such position by means of a metal tool pressed against the lip 15*d* whereby heat is generated and the lip 15*d* can be folded to the position of FIG. 25.

The outer cap embodiment of FIGS. 15 and 16 may be made from a plastic material which has a slippery surface, as for example, polyethylene, polypropylene or nylon. The embodiment of FIGS. 1 through 6 may be made from plastics having a more gripping surface as, for example, an acrylic plastic.

FIG. 17 is another example of the reversal of parts wherein the socket means is made integral with the outer cap and becomes the drive means in the same manner as the embodiment of FIGS. 15 and 16. The parts of the outer cap embodiment of FIG. 17 which are the same as the outer cap illustrated in FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter *"e."* In the embodiment of FIG. 17 the offset clutch drive faces 29*e* and 30*e*, which are employed for rotating the safety cap in a clockwise direction for tightening the cap on a container and with which the self-releasable torque limiting function is to be effected, are provided with a compound relieved clutch face. The self-releasable torque limiting drive clutch faces 29*e* and 30*e* are each relieved or slanted at an outwardly directed compound angle relative to the plane of the adjacent and offset positive clutch drive faces 27*e* and 28*e*, respectively, which are used for removing the safety cap. Each of the compound relieved clutch faces 29*e* and 30*e* is formed on a plane which is rotated first outwardly from the socket 26*e* through an acute angle of approximately ten degrees. However, it will be understood, that the angle may vary depending on the clearances between the socket 26*e* and a mating drive key. That is, if the clearance between said socket and key is at a minimum then the angle would be smaller than ten degrees, and if the clearance is at a maximum the angle would be larger than ten degrees. It will be understood that the initial position of the planes of the relieved clutch faces 29*e* and 30*e* is such that they are offset and parallel to each other, and they are aligned with the plane of the adjacent positive clutch drive faces 27*e* and 28*e*.

The numerals 48 and 49 in FIG. 17 indicate the ten degree angles through which the plane of each relieved clutch face 29*e* and 30*e*, respectively, is first rotated. Said plane of each clutch face 29*e* and 30*e* is then rotated outwardly, about the upper end or root end, as 50 and 51, of the clutch faces 29*e* and 30*e*, respectively, at the point where these faces terminate at the surface of the clutch socket 26*e*, through another acute angle of approximately seven degrees. This second angle will vary with the slipperiness of the plastic or material used to make the cap members. This second angle would be increased from said seven degrees for plastics that tend to be grippy in their contact with other materials or themselves. This second angle would be decreased from said seven degrees to zero

degrees for plastics that are very slippery in their contact with other materials or themselves. Examples of grippy plastics would be acrylic and phenolic plastics. Examples of slippery plastics would be polyethylene, polypropylene and nylon. The final surface or plane of each of these compound relieved clutch faces **29***e* and **30***e* diverges outwardly at its respective end of the socket **26***e* on a compound angle.

The compound relieved clutch faces **29***e* and **30***e* are employed so as to reduce the necessity for close tolerances between the drive and driven parts of the clutch means, that is, between the clutch key and clutch socket. If a close tolerance is not maintained between the clutch key and clutch socket, the contacting parts form substantially point contacts, and the provision of the additional angles **48** and **49** on the torque limiting clutch faces, as **29***c* and **30***c*, provides a wide bearing surface on these clutch faces without the need of close tolerances between the clutch key and clutch socket. The compound relieved clutch faces thus are provided with a greater amount of contact area without the need of close tolerances between the clutch keys and clutch sockets. It will be understood, that a compound relieved clutch face is not required on both faces of a pair of mating torque limiting clutch faces on a clutch key and a clutch socket but that one of these mating faces may be straight. That is, the clutch drive face as **30***e* on the outer cap could be provided with a compound relieved face on the clutch drive face and the mating clutch driven face on the driven key on an inner cap may have a straight clutch face.

FIG. 18 is still another example of the reversal of parts wherein the socket means is made integral with the outer cap and becomes the drive means in the same manner as the embodiment of FIGS. 15 and 16. The parts of the clutch socket and the outer cap embodiment of FIG. 18 which are the same as the clutch socket and outer cap illustrated in FIGS. 1 through 6 have been marked with the same reference numerals, followed by the small letter "*f*." In the embodiment of FIG. 18, the offset clutch drive faces **29***f* and **30***f* which are employed for rotating the safety cap in a clockwise direction for tightening the safety cap on a container and with which the self-releasable torque limiting function is to be effected, are each provided with a relieved clutch face in the same manner as the embodiment of FIGS. 1 through 6. The torque limiting clutch drive faces **29***f* and **30***f* slant outwardly from the socket **26***f* and diverge relative to each other. The slanting relieved face on each of the clutch faces **29***f* and **30***f* are formed by rotating the plane of each of these clutch faces outward about the root ends **50***f* and **51***f*, respectively, in the same manner as when forming the second angle on the compound relieved faces of the torque limiting clutch drive faces **29***e* and **30***e*, of the embodiment of FIG. 17.

The angle of slant of the clutch faces **29***f* and **30***f* depends upon the slipperiness of the plastic material from which the cap is made, in the same manner as the corresponding angular face on the first described embodiments of FIGS. 1 through 6 and the embodiment of FIG. 17, and the same angular relationship set forth under the discussion of these embodiments may be employed. Again, it will be understood that the angular relieved face of the clutch faces **29***f* and **30***f* is not required on the mating clutch faces on the clutch driven key of a mating clutch face on the inner cap, but that one of the mating faces may be straight. The positive clutch drive faces **27***f* and **28***f* function in the same manner as the positive clutch drive faces **27** and **28** of the previously described embodiments.

FIGS. 19, 20, 21 and 22 illustrate another example of the aforementioned reversal of the clutch drive and driven parts, and wherein the clutch key is made integral with the inner cap and becomes the clutch driven means, instead of the clutch drive means as when it is mounted on the outer cap as in the first embodiment of FIGS. 1 through 6. The parts of the clutch key and inner cap of FIG. 19 through 22 which are the same as the clutch key and inner cap of the first described embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*g*." The inner cap **11***g* of FIGS. 19, 20, 21 and 22 is shown in FIG. 25 in fragment in an operative position in a fragmentary illustration of an outer cap **10***d*. The outer cap **10***d* is illustrated in detail in FIGS. 15 and 16. FIG. 25 illustrates the use of the flat clutch drive faces **29***d* and **30***d* on an outer cap for driving the compound relieved clutch driven faces **41***g* and **42***g* on an inner cap.

The outer surface **23***g* of the inner cap top end wall **20***g* is provided with a plain surface, without the noise maker grooves of the first embodiment of FIGS. 1 through 6. The clutch driven key **37***g* is provided with the positive drive vertical clutch faces **39***g* and **40***g* which function in the same manner as the positive clutch drive faces of the previously described embodiments during a safety cap removal operation. The torque limiting clutch driven faces **41***g* and **42***g* are each provided with a compound relieved face which is formed by rotating the plane of these two clutch faces through the first angles **48***g* and **49***g* in the same manner as described for forming the compound relieved faces on the clutch faces **29***e* and **30***e* of the outer cap embodiment of FIG. 17. The plane of the clutch faces **41***g* and **42***g* is then rotated through the second angle about the root ends **50***g* and **51***g* in the same manner as described hereinbefore in the forming of the compound relieved clutch faces of the outer cap embodiment of FIG. 17.

The clutch key **37***g* is provided with a central cut-out portion indicated by the numeral **52** so as to form the two clutch key portions **53** and **54** which are each provided with a cut-out portion on the innerside thereof as indicated by the numeral **55**. The cut-out portions **52** and **55** provide a weight reduction feature to the safety cap. The compound relieved clutch key driven faces **41***g* and **42***g* will function with a straight clutch drive face on an outer cap, or a compound or other type relieved clutch drive face on an outer cap. The upper end of the inner cap **11***g* is provided with a reduced peripheral portion **21***g* instead of the beveled portion **21** on the embodiment of FIGS. 1 through 6. Cut-out portions **52** and **55** also act to give a more constant section thickness to aid in molding operation.

FIGS. 23 and 24 illustrate the aforementioned reversal of parts wherein the clutch key is mounted on the inner cap and serves as a clutch driven key instead of on the outer cap and serving as a clutch drive key. The parts of the embodiment of FIGS. 23 and 24 which are the same as the clutch key and inner cap of the embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*h*." In this embodiment, the positive clutch drive faces **39***h* and **40***h* are provided with the flat faces which are parallel to each other and to a plane passing through the axis of the safety cap and which function in the same manner as the positive drive faces for the previously described embodiments. The torque limiting clutch driven faces **41***h* and **42***h* are also flat faces which are aligned with the positive drive faces **39***h* and **40***h* and which do not have any relief thereon. The torque limiting clutch faces **41***h* and **42***h* may be employed with either compound relieved torque limiting clutch drive faces as **29***e* and **30***e* of the embodiment of FIG. 17, or single relieved clutch faces as **29***f* and **30***f* of FIG. 18, or the round face embodiment **30***a* of FIG. 9.

FIG. 27 illustrates a modified outer cap provided with a clutch drive key having compound relieved torque limiting drive clutch faces. The parts of the embodiment of FIG. 27 that are the same as the embodiments of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*i*." The positive drive clutch faces are indicated by the numerals **39***i* and **40***i*, and the torque limiting clutch drive faces with the

compound relieved faces are indicated by the numerals **41***i* and **42***i*. The compound relieved faces **41***i* and **42***i* are formed in the same manner as described for the compound relieved torque limiting clutch faces of the embodiments of FIGS. 17 and 19, and the same reference numerals have been used, followed by the small letter "*i*." The only difference is the relief angles have been reversed to those on the outer cap of FIG. 17. It will be understood that the outer cap shown in FIG. 27 may be used with an inner cap of the type shown in FIGS. 5, 26, 29 or 30.

FIG. 28 illustrates a further modification of an outer cap wherein the clutch drive key on the outer cap is slightly modified. The parts of the embodiment of FIG. 28 which are the same as the parts of the embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*j*." The clutch drive key **37***j* of the embodiment of FIG. 28 has the same type positive drive clutch faces **39***j* and **40***j* of the first described embodiment. However, the only change is in the torque limiting clutch drive faces **41***j* and **42***j*. These torque limiting clutch faces have been relieved only along the first angle employed in forming the compound relieved torque limiting clutch faces described under the embodiments of FIGS. 17 and 19. That is, the planes of these clutch faces have only been rotated to a first angle and in this case, have been rotated inwardly relative to the clutch key so as to provide torque limiting clutch drive faces which have a straight face disposed on an angular position relative to the positive clutch drive faces. The outer cap of FIG. 28 may be employed with an inner cap as illustrated in FIGS. 5 or 26 to provide the self-releasable torque limiting effect.

FIG. 31 illustrates a modified outer cap which is provided with a clutch drive socket wherein the parts thereof have been marked with the same reference numerals of the embodiment of FIGS. 1 through 6, followed by the small letter "*k*." This embodiment is substantially the same as the embodiment of FIG. 17, but the second relief angle has not been formed on the torque limiting clutch drive faces **29***k* and **30***k*. The outer cap embodiment of FIG. 31 may be employed with inner caps made in accordance with FIGS. 19 or 33 to provide the self-releasable torque limiting effect.

FIG. 29 illustrates a modified inner cap and the parts of this inner cap which are similar to that of the embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*s*." The difference between the embodiment of FIG. 29 and that of FIGS. 1 through 6, is that the torque limiting clutch driven faces **29***s* and **30***s* are provided with only a single relieved face formed in the same manner as the first step described for forming the compound relieved clutch faces of FIG. 17. The inner cap embodiment of FIG. 29 may be used with the outer cap embodiments of FIGS. 5 or 27 to provide the self-releasable torque limiting effect.

FIG. 26 illustrates a modified inner cap and the parts thereof which are the same as the embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*m*." This embodiment is provided with compound relieved torque limiting clutch driven faces **29***m* and **30***m* formed in the same manner as described in the forming of the compound relieved clutch faces of FIG. 17. The embodiment of FIG. 26 may be used with the outer cap embodiments of FIGS. 5, 27, 28 and 34.

FIG. 30 is still another modified inner cap and the parts thereof which are the same as the embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*n*." In this embodiment, the torque limiting clutch drive faces **29***n* and **30***n* are provided with straight clutch faces aligned with the positive drive faces **27***n* and **28***n*. The inner cap embodiment of FIG. 30 may be used with the outer cap embodiments of FIGS. 5 and 27.

FIG. 32 illustrates still another inner cap embodiment and the parts thereof which are similar to the clutch key and the inner cap of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*p*." In this embodiment, the torque limiting clutch drive faces **41***p* and **42***p* have been provided with flat faces disposed at an angle relative to the flat positive driven faces **39***p* and **40***p* and which are formed in the same manner as when forming the first angle of the compound relieved torque limiting clutch faces of FIG. 17. The embodiment of FIG. 32 is adapted to be used with the outer cap embodiments of FIGS. 17 and 18.

FIG. 33 shows a modified inner cap and the parts thereof which are the same as the clutch key and inner cap embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*q*." In this embodiment, the inner cap torque limiting clutch drive faces **41***q* and **42***q* have been provided with the single relieved clutch faces of the type employed in the embodiments of FIGS. 5 and 18. The embodiment of FIG. 33 would function with the outer caps of FIGS. 16, 17, 18 and 31.

FIG. 34 illustrates still another modification of an outer cap, and the parts thereof which are the same as the outer cap of the embodiment of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*r*." In this embodiment, the torque limiting clutch drive faces **41***r* and **42***r* are not relieved and are flat and in alignment with the positive clutch drive faces **39***r* and **40***r*. The outer cap embodiment of FIG. 34 would function with the inner cap embodiments of FIGS. 5 and 26.

FIG. 35 illustrates a further modification of an inner cap, and the parts thereof which are similar to the clutch key and inner cap of FIGS. 1 through 6 have been marked with the same reference numerals followed by the small letter "*t*." In this embodiment, the torque limiting drive faces **41***t* and **42***t* have been provided with flat faces disposed at an angle relative to the perpendicular plane passing longitudinally through the clutch key **37***t*. The positive drive clutch faces **39***t* and **40***t* have also been provided with flat faces disposed at an angle relative to the said last mentioned longitudinal plane. The angularly disposed flat faces at each end of the clutch key **37***t* converge toward each other, and they are formed in the same manner as when forming the first angle of the compound relieved torque limiting clutch faces of FIG. 17. The embodiment of FIG. 35 is adapted to be used with the outer cap embodiments of FIGS. 17 and 18.

FIG. 36 illustrates still another embodiment of an outer cap, and the parts thereof which are the same as the outer cap of the embodiment of FIGS. 1 through 6, and FIG. 31, have been marked with the same reference numerals followed by the small letter "*u*." This embodiment is substantially the same as the embodiment of FIG. 31, but the second relief angle has not been formed on the torque limiting clutch drive faces **29***u* and **30***u* and the positive clutch drive faces **27***u* and **28***u*. The torque limiting clutch drive faces **29***u* and **30***u* and the positive clutch drive faces **27***u* and **28***u* have been formed at an outwardly directed angle relative to a perpendicular plane passing the longitudinal centerline of the socket **26***u*. The clutch drive faces at each end of the socket **26***u* diverge outwardly relative to each other. The outer cap embodiment of FIG. 36 may be employed with the inner caps made in accordance with FIGS. 19 or 33 to provide the self-releasable torque limiting effect.

The various clutch drive and driven faces are axially extended, and centrally disposed on the inner and outer caps on the mating clutch keys and sockets. The various clutch drive and driven faces also extend outward radially from the central portion of the caps and in pairs, with a drive face extending in one direction and an aligned driven face in the opposite direction.

The two clutch faces of each pair of clutch drive and driven faces on the clutch keys and clutch sockets are offset from each other in two radial directions. The central disposition of the clutch drive and driven faces creates a lever arm or moment advantage for tightening and releasing the safety cap. This will be clear when it is noted that the user of the safety cap grips the outer cap at a point spaced radially outward from the clutch faces, whereby the mechanical advantage of a lever is provided. An additional advantage of the centrally disposed, radially extended clutch drive and driven faces is that their contact areas are long and wide so as to provide maximum contact area between a mating clutch key and clutch socket.

While it will be apparent that the preferred embodiments of the invention herein disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What we claim is:

1. A safety cap for a container, comprising:
(a) an inner cap member provided with means for sealing engagement with a container;
(b) an outer cap member telescopically mounted over said inner cap member and normally rotatable independently thereof and movable longitudinally thereof;
(c) self-releasable, torque limiting, drive clutch mechanism for connecting said cap members together for self-releasable positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and for torque limiting, self-releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container, and including:
(1) multiple clutch driven means on one of said cap members, and
(2) multiple clutch drive means on the other of said cap members for selective engagement with said clutch driven means; and,
(d) generally circular spring means mounted between said cap members and located outboard of and surrounding said multiple clutch driven and drive means for normally biasing the clutch drive and driven means apart to inoperative positions to allow independent rotation of the outer cap member relative to the inner cap member.

2. A safety cap for a container as defined in claim 1, wherein:
(a) said outer cap member is provided with at least one opening for the passage therethrough of cleansing fluid into the safety cap between the inner and outer cap members for cleaning the safety cap.

3. A safety cap for a container as defined in claim 1, including:
(a) means fixed on said outer cap member and engaging said inner cap member for retaining the inner cap member in the outer cap member.

4. A safety cap for a container, comprising:
(a) an inner cap member provided with means for sealing engagement with a container;
(b) an outer cap member telescopically mounted over said inner cap member and normally rotatable independently thereof and movable longitudinally thereof;
(c) self-releasable, torque limiting, drive clutch mechanism for connecting said cap members together for self-releasable positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and for torque limiting, self-releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container, and including:
(1) multiple clutch driven means on one of said cap members, and
(2) multiple clutch drive means on the other of said cap members for selective engagement with said clutch driven means;
(d) spring means mounted between said cap members for normally biasing the clutch drive and driven means apart to inoperative positions to allow independent rotation of the outer cap member relative to the inner cap member; and,
(e) means releasably mounted on said outer cap member and engaging said inner cap member for retaining the inner cap member in the outer cap member.

5. A safety cap for a container, comprising:
(a) an inner cap member provided with means for sealing engagement with a container;
(b) an outer cap member telescopically mounted over said inner cap member and normally rotatable independently thereof and movable longitudinally thereof;
(c) self-releasable, torque limiting, drive clutch mechanism for connecting said cap members together for self-releasable positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and for torque limiting, self-releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container, and including:
(1) multiple clutch driven means on one of said cap members, and
(2) multiple clutch drive means on the other of said cap members for selective engagement with said clutch driven means;
(d) spring means mounted between said cap members for normally biasing the clutch drive and driven means apart to inoperative positions to allow independent rotation of the outer cap member relative to the inner cap member; and,
(e) said clutch driven and drive means comprising,
(1) a first pair of clutch driven faces, on one of said cap members, engageable by a first pair of clutch drive faces on the other of said cap members for positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container; and,
(2) a second pair of clutch driven faces, on said one cap member, engageable by a second pair of clutch drive faces on the other of said cap members for torque limiting, releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container.

6. A safety cap for a container, comprising:
(a) an inner cap member provided with means for sealing engagement with a container;
(b) an outer cap member telescopically mounted over said inner cap member and normally rotatable independently thereof and movable longitudinally thereof;
(c) self-releasable, torque limiting, drive clutch mechanism for connecting said cap members together for self-releasable positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and for torque limiting, self-releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container, and including,

(1) multiple clutch driven means on one of said cap members, and

(2) multiple clutch drive means on the other of said cap members for selective engagement with said clutch driven means;

(d) spring means mounted between said cap members for normally biasing the clutch drive and driven means apart to inoperative positions to allow independent rotation of the outer cap member relative to the inner cap member; and,

(e) one of said clutch drive and driven means is mounted on a two-part clutch key.

7. A safety cap for a container as defined in claim 5, wherein:

(a) said second pair of clutch driven faces and said second pair of clutch drive faces are relieved, whereby when a predetermined torque is exerted on the clutch driven faces by the clutch drive faces, the clutch drive faces will slip over the clutch driven faces and the outer cap member will rotate independently of the inner cap member.

8. A safety cap for a container as defined in claim 5, wherein:

(a) said first pair of clutch driven faces and said first pair of clutch drive faces are provided with flat surfaces which seat on each other for positive drive action.

9. A safety cap for a container as defined in claim 5, including:

(a) a carrier member in said outer cap member and made from a spring material;

(b) said spring means comprising a plurality of spring legs struck from said carrier member, and each of said spring legs having one end integral with said carrier member and the other end in slidable engagement with the other of said cap members; and,

(c) said carrier member being releasably connected to one of said cap members.

10. A safety cap for a container, comprising:

(a) an inner cap member provided with means for sealing engagement with a container;

(b) an outer cap member telescopically mounted over said inner cap member and normally rotatable independently thereof and movable longitudinally thereof;

(c) drive clutch mechanism for connecting said cap members together for positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and for torque limiting, releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container, and including:

(1) clutch driven means on one of said cap members, and

(2) clutch drive means on the other of said cap members for selective engagement with said clutch driven means;

(d) spring means mounted between said cap members for normally biasing the clutch drive and driven means apart to inoperative positions to allow independent rotation of the outer cap member relative to the inner cap member; and,

(e) means for generating an audible signal when said outer cap member is rotated independently relative to the inner cap member.

11. A safety cap for a container as defined in claim 10, wherein said means for generating an audible signal comprises:

(a) a resilient arm moved by one of said cap members and having a free end engageable with the other cap member; and,

(b) said other cap member is provided with a plurality of grooves engaged successively by the free end of said resilient arm when said one cap member is rotated independently relative to said other cap member, thereby producing an audible sound.

12. A safety cap for a container as defined in claim 11, including:

(a) a carrier member mounted in said outer cap member; and,

(b) said resilient arm being carried by said carrier member which is releasably connected to one of said cap members.

13. A safety cap for a container as defined in claim 12, wherein:

(a) said carrier member is releasably connected to the outer cap member; and,

(b) said inner cap member is provided with said plurality of grooves.

14. A safety cap for a container as defined in claim 12, wherein:

(a) said carrier member is formed from a spring material and is releasably connected to one of said cap members;

(b) said spring means comprises a plurality of spring legs struck from said carrier member, and each of said spring legs having one end integral with said carrier member and the other end in slidable engagement with the other of said cap members.

15. A safety cap for a container, comprising:

(a) an inner cap member provided with means for sealing engagement with a container;

(b) an outer cap member telescopically mounted over said inner cap member and normally rotatable independently thereof and movable longitudinally thereof;

(c) drive clutch mechanism for connecting said cap members together for positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and for torque limiting, releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container, and including:

(1) clutch driven means on one of said cap members, and

(2) clutch drive means on the other of said cap members for selective engagement with said clutch driven means;

(d) spring means mounted between said cap members for normally biasing the clutch drive and driven means apart to inoperative positions to allow independent rotation of the outer cap member relative to the inner cap member;

(e) said clutch driven and drive means comprising:

(1) a first pair of clutch driven faces, on one of said cap members, engageable by a first pair of clutch drive faces on the other of said cap members for positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and,

(2) a second pair of clutch driven faces, on said one cap member, engageable by a second pair of clutch drive faces on the other of said cap members for torque limiting, releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container;

(f) said one cap member being provided with a socket and said first pair of clutch driven faces being formed on opposite sides of said socket and in positions offset from each other, and said second pair of clutch driven faces being formed on opposite sides of said socket and in positions offset from each other; and,

(g) said other cap member being provided with a clutch

key that is shaped to fit into said socket, and said first pair of clutch drive faces being formed on opposite sides of said clutch key and in positions offset from each other, and said second pair of clutch drive faces being formed on opposite sides of said clutch key and in positions offset from each other.

16. A safety cap for a container, comprising:

(a) an inner cap member provided with means for sealing engagement with a container;

(b) an outer cap member telescopically mounted over said inner cap member and normally rotatable independently thereof and movable longitudinally thereof;

(c) self-releasable, torque limiting drive clutch mechanism for connecting said cap members together for self-releasable positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and for torque limiting, self-releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container, and including,

(1) multiple clutch driven means on one of said cap members, and

(2) multiple clutch drive means on the other of said cap members for selective engagement with said clutch driven means;

(d) spring means mounted between said cap members for normally biasing the clutch drive and driven means apart to inoperative positions to allow independent rotation of the outer cap member relative to the inner cap member;

(e) said clutch driven and drive means comprising:

(1) a first pair of clutch driven faces, on one of said cap members, engageable by a first pair of clutch drive faces on the other of said cap members for positive drive action for rotation of the inner cap member when the outer cap member is rotated in one direction to remove the safety cap from a container, and,

(2) a second pair of clutch driven faces, on said one cap member, engageable by a second pair of clutch drive faces on the other of said cap members for torque limiting, releasable drive action for rotation of the inner cap member when the outer cap member is rotated in another direction to attach the safety cap to the container;

(f) a carrier member in said outer cap member and made from a spring material;

(g) said spring means comprising a plurality of spring legs struck from said carrier member, and each of said spring legs having one end integral with said carrier member and the other end in slidable engagement with the other of said cap members;

(h) said carrier member being releasably connected to one of said cap members; and,

(i) means for generating an audible signal when said outer cap member is rotated independently relative to the inner cap member.

17. A safety cap for a container as defined in claim 16, wherein said means for generating an audible signal comprises:

(a) a resilient arm carried by said carrier member and having one end connected thereto and a free end engageable with the other cap member; and,

(b) said other cap member is provided with a plurality of grooves engaged successively by the free end of said resilient arm when said outer cap member is rotated independently relative to said inner cap member, thereby producing an audible sound.

18. A safety cap for a container as defined in claim 17, wherein:

(a) said carrier member is releasably connected to said outer cap member; and,

(b) said inner cap member is provded with said plurality of grooves.

19. A safety cap for a container as defined in claim 18, wherein:

(a) said carrier member is provided with a plurality of tangs seated in recesses formed on the inner surface of said outer cap member for releasably connecting the carrier member to the outer cap member.

20. A safety cap for a container as defined in claim 19, wherein:

(a) said recesses are extended through said outer cap member to provide openings for the passage therethrough of cleansing fluid into the safety cap between the inner and outer cap members for cleaning the safety cap.

21. A safety cap for a container as defined in claim 18, wherein:

(a) said second pair of clutch driven faces and said second pair of clutch drive faces are relieved, whereby when a predetermined torque is exerted on the clutch driven faces by the clutch drive faces, the clutch drive faces will slip over the clutch driven faces and the outer cap member will rotate independently of the inner cap member; and,

(b) said first pair of clutch driven faces and said first pair of clutch drive faces are provided with flat surfaces which seat on each other for positive drive action.

22. A safety cap for a container as defined in claim 5, wherein:

(a) the clutch faces of at least one pair of said second pairs of clutch drive and clutch driven faces are formed as compound relieved torque limiting clutch faces.

23. A safety cap for a container as defined in claim 5, wherein:

(a) the clutch faces of at least one pair of said second pairs of clutch drive and clutch driven faces are formed as relieved torque limiting clutch faces.

24. A safety cap for a container as defined in claim 5, wherein:

(a) the clutch faces of at least one pair of said second pairs of clutch drive and clutch driven faces are each formed at an angle relative to the face of an adjacent clutch face of said first pairs of clutch driven and clutch drive faces; and,

(b) the clutch faces of the other pair of said second pairs of clutch driven and clutch driven faces are relieved.

25. A safety cap for a container as defined in claim 5, wherein:

(a) the clutch faces of at least one of said second pairs of clutch drive and clutch driven faces are each formed flat and aligned with the face of an adjacent clutch face of said first pairs of clutch driven and clutch drive faces; and,

(b) the clutch faces of the other pair of said second pairs of clutch drive and clutch driven faces are relieved.

26. A safety cap for a container as defined in claim 5, wherein:

(a) the first and second pairs of said clutch drive faces are on a clutch key on the outer cap; and,

(b) the first and second pairs of said clutch driven faces are formed on opposite sides of a socket on the inner cap.

27. A safety cap for a container as defined in claim 5, wherein:

(a) the first and second pairs of clutch drive faces are formed on opposite sides of a socket on the outer cap; and,

(b) the first and second pairs of clutch driven faces are on a clutch key on the inner cap.

28. A safety cap for a container as defined in claim 5, wherein:

(a) the clutch faces of at least one pair of said second pairs of clutch drive and clutch driven faces are each formed at an angle relative to the face of an adjacent clutch face of said first pairs of clutch driven and clutch drive faces;

(b) the clutch faces of the other pair of said second pairs of clutch drive and clutch driven faces are relieved; and,

(c) the clutch faces of at least one pair of said first pairs of clutch drive and clutch driven faces are each formed at an angle relative to the face of an adjacent clutch face of said first pairs of clutch driven and clutch drive faces.

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