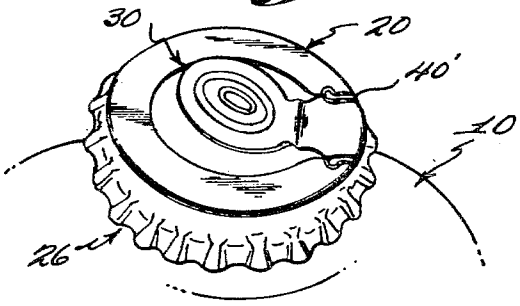
July 20, 1965 J. J. LUVIANO 3,195,756

PULL CROWN CAP

Filed Nov. 18, 1964 2 Sheets-Sheet 1

Fig. 1



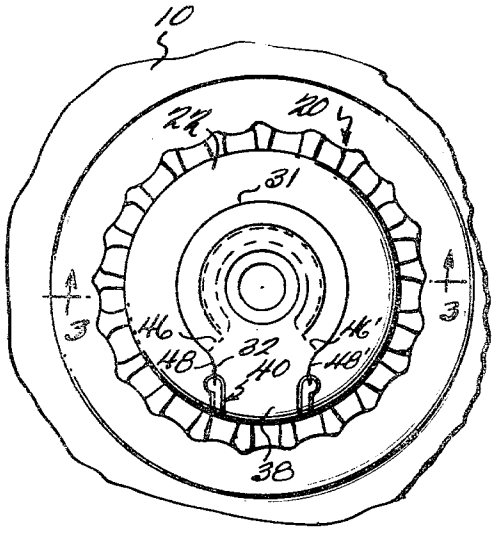


Fig. 2

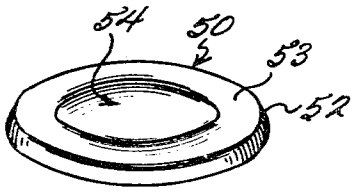


Fig. 4

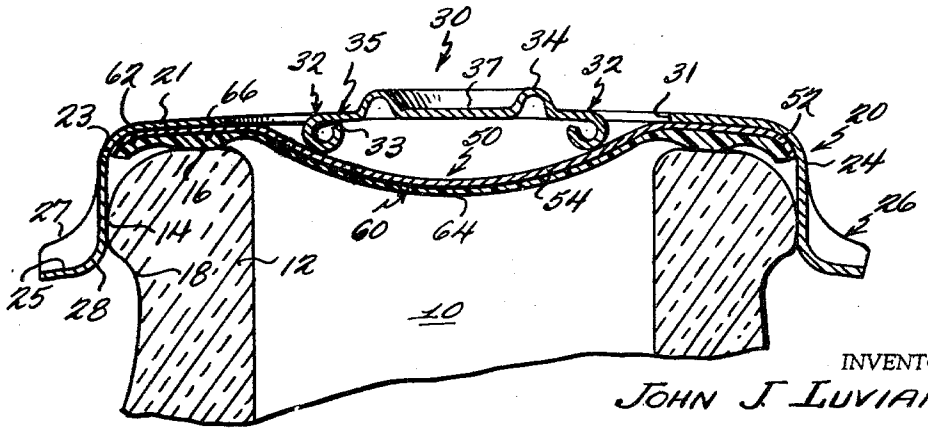


Fig. 3

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PULL CROWN CAP

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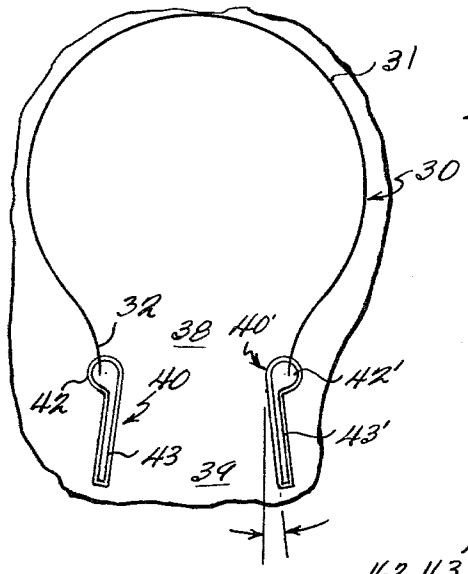


Fig. 5

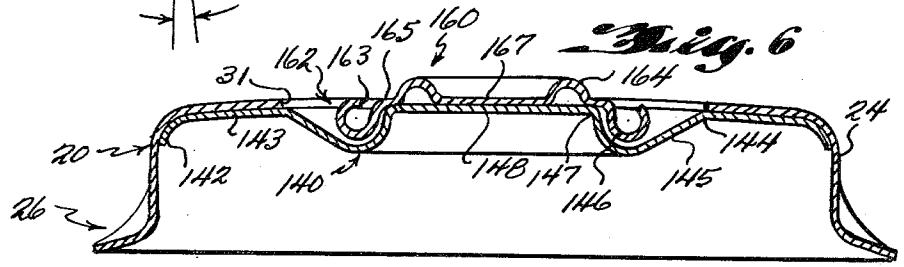


Fig. 6

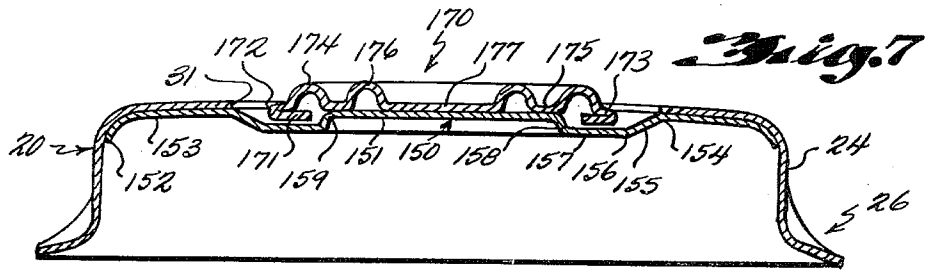


Fig. 7

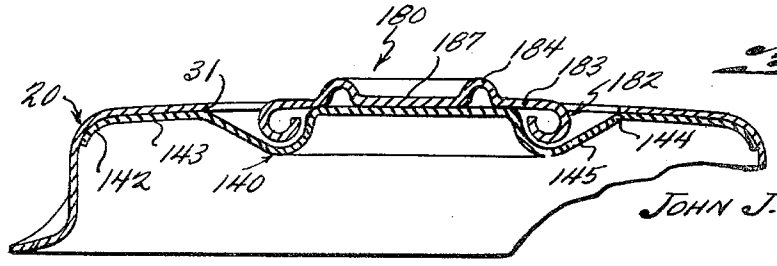


Fig. 8

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United States Patent Office 3,195,756 Patented July 20, 1965

3,195,756

PULL CROWN CAP

John J. Luviano, Jenkintown, Pa., assignor to Crown Cork & Seal Company, Inc., Philadelphia, Pa., a corporation of New York

Filed Nov. 18, 1964, Ser. No. 412,110
14 Claims. (Cl. 215—46)

The present application relates generally to improvements in tear off crown closures, and more particularly to an improved pull cap crown closure for containers wherein the crown closure is provided with a tear-tab having an irregular gripping surface so that the irregular pull cap crown can be safely removed from the container.

Crown closures of the type contemplated in the instant invention and tear off closures for bottles and containers generally, are commonly employed to effect the closure and sealing of glass bottles, narrow-necked jars and other containers, for example, those containing carbonated beverages or other liquids capable of exerting internal pressure. Typically, such containers have a circumferential radially outwardly projecting bead or shoulder having a rounded profile adjacent to and surrounding the opening or mouth of the container. Tear off closures, as known in the art, usually comprise a capsule-shaped shell of sheet metal which can be easily torn and which is adapted to be rigidly connected about the shoulder provided around the mouth of the container and thereby clamp a disc of a sealing material over the opening thereof. Commonly, a metal disc is inserted between the shell and the liner for reinforcement purposes when the tear off closure is to be utilized in sealing carbonated beverages and the like. The top of the capsule is usually flat or substantially flat and by means of shaped score lines or incisions may be provided with an integral tongue-like thumb piece formed or cut therein, hereinafter called a "tear-tab" or "pull tab," which must be raised out of the top portion of the capsule and grasped by the fingers of the container user in order to tear the capsule through score lines that may be provided for this purpose and thereby open the container.

The known tear off closures described above have not found wide commercial success, however, due to difficulty in manufacture and unsatisfactory results in removing the tear-tab. Difficulty in manufacture of tear off crown closures have, however, been overcome by the inventive development of Jerry F. Scharf as is disclosed and claimed in his copending and commonly assigned application Serial No. 372,612 entitled "New Tear Off Crown," filed June 4, 1964, and the pertinent subject matter thereof is incorporated herein by reference.

Prior known tear off closures, including the closure of application, Serial No. 372,612, have, however, been objectionable in the removal process, principally due to difficulty in grasping of the tear tab by the fingers of the user, and in the objectionable cutting edge provided in the metal from which the tear tab is formed by the usual cutting or stamping operation, often bringing about injury to the fingers, hands, etc. of the bottle user, resulting in general discouragement of the public from purchasing containers with such devices. This occurs largely in cases where the tear off crown is made, advantageously and economically, from a single piece of material without perforations or indentations of any kind except those crimpings made on the periphery of the skirt to engage under the crown or beaded flange of a bottle and hold it tight. This form of device requires a special tool to lift it off the bottle, and is objectionable on that account.

It is therefore a principal object of this invention to provide a tear off crown closure with an improved pull tab configuration.

It is another object of this invention to provide a fully effective and appealing pull tab crown closure that will overcome the defects of prior art tear off closures.

It is an additional object of this invention to provide an improved pull tab crown closure which is economical to produce and fully effective in sealing capacity and dependability.

It is still another object of this invention to provide an improved pull tab crown closure which can be applied to existing containers to seal the same by existing production facilities without expensive modification and redesign thereof.

It is a further object of this invention to provide an improved pull tab crown closure for sealing bottles containing carbonated beverages or other liquids capable of exerting internal pressure which is particularly adapted to be easily removed from the bottle without excessive effort by or danger to the fingers of the user.

It is still a further object of this invention to provide an improved pull tab crown closure for glass bottles which is more economical to produce than comparable closures of the prior art and permits not only an effective tight sealing of the bottle but also readily lends itself to an unsealing thereof.

Other objects and the entire scope of the present invention, together with an appreciation for the advantages thereof, will become apparent from the following detailed description and by reference to the accompanying drawings.

Broadly stated, the objects of the invention are accomplished by providing two metal pieces, an outer shell formed from an easily fracturable metal such as aluminum, and a preformed inner metal disc, for example, of steel or stainless steel press fitted to the inside of the crown, with a sealing liner, preferably a molded plastic liner applied over the disc and over a short portion of the inner side wall of the outer crown to seal the disc within the shell in a manner unexpected from the prior art. The new pull tab crown assembly of this invention consists of a basic crown shell of relatively thin aluminum formed with a pull tab in the center of the crown, wherein the tab, like that of application Serial No. 372,612, has a circular segment shape but instead is redirected outward at the junction of its segmented circle into two short straight legs terminating at two short incision lines which extend, as in Serial No. 372,612, into the beginning of the two score configurations especially designed according to said application Serial No. 372,612, and accordingly, all the advantages and appurtenances thereof are incorporated into the present invention.

More specifically, according to the present invention, and in contrast to the prior art and to application Serial No. 372,612, the circular top portion of the present metal crown is provided with an arcuate incision providing a pull tab, but the edge of the incision is separated from the pull tab which is provided with an irregular gripping surface so that the pull tab crown can safely be removed from the container.

Referring now to the accompanying drawings which form a part hereof and wherein the same or similar parts are denoted by the same or similar reference numerals:

FIGURE 1 is a pictorial view of a pull tab crown according to the invention as it would appear on the neck of a suitable container;

FIGURE 2 is a top view, somewhat enlarged showing the tear off crown shell and pull tab configuration;

FIGURE 3 is a side elevation view, in cross section and greatly enlarged, showing the relationship of the crown sheel, a pull tab embodiment, and metal insert of the invention with a resilient liner prior to crimping

of the pull tab crown about the shoulder around the mouth of the container;

FIGURE 4 is a pictorial view of the metal insert disc employed according to the present invention;

FIGURE 5 is a diagrammatic view, greatly simplified and taken from the underside of the crown shell in FIGURE 2 to show the shape of the tab forming incision and the score configuration as employed herein according to application Serial No. 372,612;

FIGURE 6 is a view similar to FIGURE 3, but showing another embodiment of pull tab according to the invention having an upward curled edge, and showing another metal insert embodiment having a centrally raised area;

FIGURE 7 is another view similar to FIGURE 3, but showing still another pull tab embodiment having an undulating curl, and showing still another metal insert embodiment having a recessed disc shape with a central circular dome; and

FIGURE 8 is a further vew similar to FIGURE 3, showing the pull tab embodiment thereof employed with the metal insert embodiment of FIGURE 6.

Referring to FIGURE 1 of the drawings, there is shown a glass bottle or other container generally indicated at 10 that is provided with the pull tab crown assembly indicated generally at 20, the same having a pull tab generally indicated by the reference numeral 30, which pull tab terminates in the score configurations indicated by the reference numeral 40. In the several views, it will be recognized that the uncrimped outer portion of the pull tab crown assembly according to the invention is composed of the usual uncrimped or noninwardly deformed crown 20 having a generally hat-shaped metal shell 21 formed from any relatively easily fracturable metal that may be a relatively soft metal, such as aluminum of for example 0.0115 to 0.0121 inch thickness. The metal shell 21 includes a slightly domed, circular top portion 22 and depending therefrom, a substantially cylindrical skirt indicated generally at 24 having a substantially smooth upper portion and terminating in an annular locking flange indicated at 26 extending radially outward of, and at substantially right angles to the cylindrical skirt 24. While the circular top portion 22 may be slightly domed so as to present slightly convex outer and inner surfaces, it will be apparent that such circular top portion can be substantially flat so as to present substantially plain outer and inner surfaces.

As best seen in FIGURE 3, the smooth upper portion of cylindrical skirt 24 merges with the circular top portion 22 of the metal crown shell in a smooth inwardly flaring annular transition portion 23 which is rounded in radial section so as to define similarly rounded annular outer and inner transition surfaces.

In order to strengthen the relatively weak crown shell 21, and to enable the new pull tab crown closure 20 formed therefrom to be effectively retained in sealing engagement with the container 10 to which it is applied the radially extending annular locking flange 26 is given an undulatory form by being circumferentially provided with a plurality of corrugations of substantially identical form. The corrugations will be seen to comprise downwardly projecting concave flutes or ribs 25 formed by radially extending downwardly converging wall portions which merge in a rounded or slightly flattened radially extending juncture, alternating with similarly shaped upwardly projecting convex ridges 27 formed by upwardly converging wall portions which merge in a rounded or slightly flattened radially extending juncture. The several corrugations shown not only add great strength and rigidity to the annular locking flange 26, but also provide for a certain amount of circumferential compression and expansion of the flange 26 which facilitates the crimping application of the tear off crown closure assembly 20. Normally, about twenty-one such corrugations are employed for the closure 20 but where the metal shell 21 is

formed from lighter materials, it has been found, according to copending application Serial No. 354,050, filed March 23, 1964, that up to forty corrugations or more, that is, forty or more ribs alternating with forty or more ridges, may be employed in order to impart the desired strength and rigidity to the closure 20. As shown, the fluted corrugations 25 each merge with the cylindrical skirt 24 in a relatively sharply rounded juncture or knee having a relatively small radius in radial section, the flutes 25 extending radially outward therefrom to the peripheral edge of the annular locking flange 26. Crimping or camming of the locking flange 26 about the shoulder of a container is facilitated by the sharp radial knee portion 28 provided approximately midway of the downwardly projecting concave flutes 25, which knee portion is adapted to be cammed under the container shoulder 12 in a manner understood in the art.

According to the invention, the crown shell 21, as shown in FIGURE 2, is provided with the pull tab 30 formed by making a circular arc incision 31, preferably of greater than semicircular size, completely through the metal of the crown shell.

The circular segment shape of the arc 31 is redirected outward at the junction of the segmented circle into two short straight legs 46 and 46' which terminate at two short incision lines 48 and 48' which extend within the circular beginning shape of the weakened score portions 40. The straight leg portions also define a tear tab portion 38, while the score configurations 40 define a further tap portion 39 which passes from the top of the shell portion 22, over the portion 23, having a radius of about one-sixteenth inch, and down the cylindrical skirt, terminating in the area of the annular locking flange. In the embodiment shown, both tab portions 38 and 39 are greater in width than the tab radius.

According to the invention, it is desired to provide the circular top portion of the metal crown shell with an arcuate incision, for preparation of a pull tab such that the edge of the incision is separated from the pull tab. More particularly, the pull tab is provided with an irregular gripping surface so that the pull tab crown can safely be removed from the container.

Turning now to FIGURE 3, it will be seen that the pull tab 30 is provided with an inside curl 32, the metal on the edge of the tab being curled down in, around, underneath and inwardly, below the surface of the pull tab, terminating at 33. Inwardly of the curl, there is a relatively planar portion 35, which rises abruptly into the beaded rib or boss 34, defining a relatively planar, circular shaped interior tab portion, and providing both a reinforcement and an additional portion of the irregular surface desired according to the invention. Also according to the embodiment of FIGURE 3, there is provided a preformed inner metal disc which comprises a circular top portion 53, a substantially arcuate skirt 52 depending from the circular top portion, and a circular depressed portion 54 which is located substantially centrally and concentric of the top portion, and is substantially concave with respect thereto.

Turning now to FIGURE 6, it will be seen that in this embodiment, the irregular surface on the edge of the pull tab 160 is provided with an upward curl 162, the metal on the edge of the tab being curled down, out, beneath, around and upwardly, below the surface of the pull tab, terminating at 163. The flat portions 165 and 167, and the bead 164 otherwise correspond to the FIGURE 3 embodiment. However, in this embodiment, the metal insert 140 is provided with a centrally raised portion 143 that is defined by a corner radius 144, a gradually downwardly and inwardly sloping skirt 145, and by an arcuately curved skirt 146 rising from the skirt 145, merging into the central dome at the corner radius 147.

In the embodiment of FIGURE 7, the irregular surface on the edge of the pull tab is provided with an undulating curl comprising the edge curve 172 and bead 174.

As shown, the metal on the edge of the tab is curled up, out, above, around and downwardly, above the surface of the pull tab to provide the bead 174, and then out defining the disc portion 173, and down, around and back below the surface of the pull tab, defining the curve 172 and terminating at 171. The portions 175, 176 and 177 are otherwise similar to central portions of the tab 30. In this embodiment, like the FIGURE 6 embodiment, the metal insert is provided with a centrally raised portion 151, but in this embodiment, the depressed portion 157 is defined by a corner radius 154, a short downwardly and inwardly sloping skirt 155 and another corner radius 156 providing the recessed disc shaped area 157 which extends from the downward edge of the skirt 155 to the corner radius 158. A substantially cylindrical skirt rises therefrom and merges into the corner radius 159 providing the circular central dome 151.

As shown in FIGURE 5, and according to application Serial No. 372,612, the score configurations 40 and 40' are each made in a manner known in the art by using dies having a substantially "key" shape which compress the metal to some extent and may cause it to raise slightly on the outside to provide a circular shaped portion 42. The circle 42, as an example, may have a diameter of about one-sixteenth inch and may be located on the outer area of the top of the crown. The circular portion 42 then immediately narrows into the leg or line score portion 43. The circular portion may lie completely on the top of the crown or may run slightly over the edge thereof. The line score portion 43 is approximately .010 inch wide and extends to and over the corner radius and down the side of the crown, terminating about halfway down the side of the crown shell. It is to be understood that the leg portions may comprise the two lines shown which form the line score 43, or a plurality of substantially parallel score lines or may comprise a single narrow score line. The line scores 43 can also be parallel.

According to a preferred embodiment of application Serial No. 372,612, the score configurations 40 and 40' are oriented with respect to each other at an angle, for example, of about 15° such that each is oriented at about 7½° from a mutual reference line. This has a first advantage of better conforming to the circular shape of the crown. As an added advantage, it is desired that the line score portions 43 should reach down between the points of the ridges or ribs 27 and into the concave flutes 25 on the periphery of the crown locking flange, as this has been found to further reduce incidence of fracture or splitting during crimping for reasons not yet fully understood. It is also preferred that the straight leg portions of the lanced arc 31 should desirably enter the circular portion 42 of the substantialy keyshaped score configurations toward the outer extremity thereof since it has been found that this configuration is far less conducive to fracture during crimping and capping. It has further been found that while the leg portions 32 may be placed in substantially any area of the circle 42, as the position of the leg portions 32 is moved outwardly of the circle 42, it becomes increasingly harder to fracture the score prematurely during crimping and this is preferred in reducing and resisting fracture and offering advantages in alignment. Desirably, the lanced legs should not be in alignment with the line score 43, or score lines thereof, as these locations have been found to be more subject to fracture and splitting, although such location may be employed according to the invention.

According to the present invention, the entire crown may have an uncrimped outer diameter of about 1.264 inch and an inner diameter of about 1.054 inch, while the circular boss 34 will have a diameter of fifteen sixty-fourths inch. The crown height to the edge of the top at 21 will be about .236 inch, while the center height will be about one-quarter inch and the several circular bosses or beads will have heights of about 0.013 inch with a cross sectional radius of 0.020 inch. The diameter of the circle 31 forming the tab will be about 0.656 inch while the radius leading to the straight leg portions will be about one-eighth inch, and the two incision lines will terminate at a distance of about three-eighths inch from a line passing through the axis of the circular tab.

The score configurations are about one-quarter inch long, with one-sixteenths inch diameter circular portions and a one thirty-secondths inch radius leading into the line score portions, the center line of the circular portions of the two score configurations being about 0.344 inch apart. The raised line score portion is about 0.008 inch wide while the sloping sides are each about 0.0075 to 0.0085 inch wide.

The edge 32 of the FIGURES 3, 6 and 8 pull tab embodiment is provided with a one-sixteenth inch outside or inside curl respectively, and when curled, the FIGURES 3, 6 and 8 tabs are each approximately fifteen thirty-secondths inch diameter, while the FIGURE 7 tab is approximately thirty-seven sixty-fourths inch diameter. The underturned straight edge of the FIGURE 7 tab is about one-sixteenth inch length. The two short straight legs form an acute angle below the horizontal of approximately fifty degrees on a side. The beads 34, 164, 176 and 184 each have diameters of about 0.234 inch, while the bead 174 diameter is about 0.422 inch.

As shown in FIGURE 3, the crown shell 21, provided with the incision and score lines shown in FIGURES 2 and 6, is assembled with a preformed metal insert 50 (FIGURE 4) having a concave inwardly domed central area 54 defined by the upturned edges or slightly dished sidewall portions which may have an overall height (FIGURE 3) of about 0.091 inch. The area 54 is approximately five eighths inch in diameter and is formed having a spherical segment shape from a sphere having a five eighths inch radius (1¼ inch diameter). The insert 50, which may be formed from a relatively stiff material such as steel or stainless steel of about 0.0066 inch thickness, or a stiff aluminum is of a size to fit reasonably snugly within the crown shell 20 and may be slightly oversized to promote snug fitting engagement therein by means of press fitting. Each metal insert 50, 140 and 150 has an overall diameter of about 1.058 inch.

The upwardly sloping edge portion 52 is formed from an inside radius of about one sixteenths inch and is about 0.045 inch overall height and each metal insert 50, 140 and 150, less the corner radius portion 52, has a disc shaped top portion 53, 143, 153 of about 0.950 inch outside diameter that rises about 0.064 inch to an imaginary center formed by a sphere having a six and one quarter inch radius. The inner edge of each disc shaped portion has a diameter of about five eighths inch that is defined by a sharply downturned corner having a radius of about one sixty fourths inch. The walls 145 and 155 of insert discs 140 and 150 each slope downwardly at an angle of about thirty degrees with respect to the horizontal. The curves 146 are formed by a three sixty fourths inch inside radius on a center line formed by a circle of about thirteen thirty secondths inch diameter.

The curves 146 then rise on this arc and merge into the corners 147 having approximately a one sixty fourth inside radius to provide the central domed portion which rises approximately five sixty fourths inch in outside dimensions from the bottom of curve 146.

In the FIGURE 7 embodiment, the corners 154, 156, 158 and 159 are each defined by a one sixty fourths inch radius on respective diameters of 0.656 inch, thirty seven sixty-fourths inch, for the 154 and 156 corners, while the 158 and 159 corners merge on a diameter of about twenty-three sixty fourths inch. Overall height of the center portion is about one thirty secondths inch.

The metal insert 50 which forms the interior sealing surface of the new pull tab crown, is adapted to receive a suitable pressure sealing resilient lining material, such as the resilient liner or gasket 60 which preferably is

formed of a suitable synthetic thermoplastic material such as a polyvinyl chloride plastisol or the like. The liner **60** is provided with an outer corner radius that takes the shape of and fits approximately flush with the corner radius **52** of the metal insert. Also provided is a suitably raised pressure sealing portion **66** and a wide central area **64** of very small cross-section which snugly fits the area **54** of the metal insert. As is understood in the art, the liner **60** may be provided as a ring form shape having edge and raised portions **62** and **66**, and no central portion **64** in the interest of conserving material. The liner material is compounded so as to be odorless and tasteless and to be free from effects on, or to be affected by, ordinary foods or liquids which may be stored in the container **10**. Preferably, the liner **60** comprises a vinyl chloride plastisol such as has been illustrated and described in U.S. Patent 3,002,641.

The raised portion **66** of the plastisol liner **60** will be deformed during the capping operation, briefly described hereinafter, so as to conform to, and be in intimate sealing engagement with, the opposed sealing surface of the container or bottle. The cylindrical skirt **24** of the crown shell may thus be relatively shallow, i.e., of relatively short axial extent as compared to prior art closures, since it need accommodate only a relatively thin gasket or liner **60**. As is understood in the art, the metal insert **50** may be provided with a suitable precoating of a lacquer or shellac composition to increase adhesion of the sealing liner to the metal insert but this is by no means necessary as it is known in the art that some synthetic lining materials will adhere sufficiently well to the metal insert for normal purposes.

A process for producing a pull cap crown closure according to this invention may comprise the step of (1) press forming a metal crown shell out of relatively light gauge metal which can be easily torn, such that it will have a circular top portion, a substantially cylindrical skirt depending from the circular top portion and an integral annular locking flange. This may be done by first (a) forming weakened score portions having a substantially circular shape located on the outer area of the top of the crown shell and immediately narrowing into a line score portion extending to and over the corner radius and down the cylindrical skirt, (b) cutting an arcuate incision through the top portion to provide a pull tab and pressing the pull tab to provide a concentric circular reinforcing boss, (c) notching the pull tab inwardly of the arcuate incision to provide two short straight legs and precurling the edges of the pull tab, (d) curling the edge of the pull tab to provide an irregular gripping surface so that the crown can safely be removed from a container mouth, (e) and then cutting and forming the crown shell from the metal to provide the circular top portion, substantially cylindrical skirt and annular locking flange. Thereafter, this is followed by (2) press fitting a preformed metal disc into the inside of the metal crown shell, (3) injecting a resilient liner material substantially onto the center of the metal disc, and (4) molding and curing the liner material such that it is secured to the inner surface of the inner metal disc.

The production sequence may be outlined as follows.

(1) Make shell of crown with a press operation die sequence operation of:

(a) Score
(b) Cut and bead
(c) Notch and precurl
(d) Curl
(e) Cut and form shell

Then:

(2) Make and insert disc into shell.
(3) Inject plastisol into center of disc.
(4) Mould and cure plastisol to correct conformation.

During a typical molding operation, the crown shell **21**, with the metal insert **50** simply placed or press fitted thereinto, is placed upside down into a suitable mold form **64**, which may be heated, followed by insertion of either a substantially preformed liner **60**, or a mass of unformed plastisol composition in a manner known in the art. Thereafter, the die or punch, which may be heated, is pressed against the preform or the plastisol composition, further pressing the metal insert **50** into the crown assembly and forming and plasticizing either the preform or the plastisol composition over the metal insert and into the shape of the liner **60**, securing it to the metal insert. As shown, the liner **60** takes the shape of the metal insert **50** and the bottom of the mold to provide a generally flat central area of about 0.005 inch thickness with a raised pressure sealing portion **66** and a corner radius portion **62**.

Turning to FIGURE 3, the pull tab crown assembly **20** is shown in position prior to being shaped about the shoulder portion **12** of the mouth of the container **10** by the usual capping dies. In the capping and crimping operation, the gasket or liner **60**, by means of a suitable presser foot, is initially compressed between the metal of the insert **50** and the rounded, generally upwardly facing sealing surface **16** at the mouth of the bottle or container **10** to form a seal therebetween. While the seal thus established between the bottle and the crown closure is maintained, a suitable die means such as a tapered sealing throat engages the lower edge of the fluted skirt of the crown closure upon axial displacement relative thereto, so as to radially compress and deform such fluted skirt portion of the closure inwardly to wedge the knee portion **28** and the lower portions of the skirt flutings around the peripheral area **14** and under the radius **18** of the shoulder **12**, shown in cross section for convenience, and thereby retain the crown closure in sealing engagement with the mouth of the container **10**. This action not only provides locking engagement of the tear off crown closure with the shoulder on the container but also generally results in some further compression of the liner or gasket **60**. Thus, the knee portion **28** of the crown will be formed against the lower radius **18** of the shoulder **12**, the shrinkage and stretching of the crown being taken up by the undulations of the locking flange portion **26**. In the sealing and capping step, the portion **66** of the plastisol liner **60** will be pressed against the upper mouth radius **16** of the shoulder **12**, slightly compressing the liner **60** and causing the raised portion **66** to flow inwardly. Also, the corner radius portion **62** will be moved close to and usually into touching engagement with the large peripheral arc **14** defining the main portion of the shoulder **12**. It should be understood that the present tear off crown assembly can be used in conjunction with containers and bottles having other cross-sectional crown cap receiving shoulder or bead shapes. One such important improvement in bead shapes is described and claimed in said copending application, Serial No. 354,050.

In the capping and crimping operation, the pull tab **30** may be raised slightly as the metal of the shell **21** is stretched to some small extent. Thereafter, the pull tab can be gripped by the fingers of a bottle user and by a tearing action, the pull tab will be folded back until the leg portions tear into the circular portion **42** of the score configuration **40**. The advantage of this circular portion is to insure that the leg portions of the tear-tab will coact with at least some portion of the score configuration since poor score tracking has been a disadvantage of earlier constructions. This feature of the invention also offers an advantage in quality control since the positioning of the tear-tab and the score configurations may now be subject to some mutual variation without undesirable consequences. It is to be understood however that other configurations than the circular shape shown may be found suitable for this purpose and the invention should not be precisely limited thereto.

Upon reaching the circular portions or other equivalent shaped portions **42** of the score configuration, a firm pull on the tab acting through the portion **38** will cause the

score configurations to tear down the leg portions of the line score 43, and into the crimped flange portion 26 of the crown shell. If the pull is hard and straight, the tab 30 with portions 38 and 39 may be removed completely from the crown shell 21 such that the crown shell is torn into a C-shaped configuration and no longer retains sealing engagement with the shoulder 12 of the container 10. The remaining portions of the crown, including the shell, the metal insert and the liner, may come off with removal of the pull tab, but if the pull tab is pulled straight down, the shell 21, insert 50 and liner 60 can be simply removed by the fingers of the user.

Alternatively, and in the more usual case, the tab 30 will be given a twisting movement as it is pulled so that, after tearing off the portion 38, the portion 39 will adhere on one side to the crown shell while the other side of portion 39 will track from one of the score portions in an arcing fashion through the annular locking flange 26. With this tearing motion, all portions of the new pull tab crown will be removed, with the tap portion 39, from the mouth of the container.

In accomplishing the objects of the invention, it can be seen that a new pull tab crown cap with irregular pull tab configuration has been provided which greatly facilitates the ease of removal of the pull tab, insures that the pull tab will coact with the score configuration, and permits the closure to be removed safely. It should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by the way of illustration only, since various changes and modifications can be made therein. Accordingly, the invention should only be limited to the scope of the appended claims.

What is claimed is:

1. A pull cap crown closure adapted to be applied to sealingly engage the mouth of a container comprising in combination: a metal crown shell formed from relatively light guage metal which can be easily torn, said metal shell comprising a circular top portion, a substantially cylindrical skirt depending from said circular top portion, and an integral annular locking flange extending radially outward of said cylindrical skirt; the circular top portion of said metal crown being provided with an arcuate incision providing a pull tab; weakened score portions located at the ends of said incision and extending therefrom, said score portions having a substantially circular shape located on the outer area of the top of said crown shell and immediately narrowing into a line score portion extending to and over the corner radius and down the cylindrical skirt; a rigid insert disc fitted into the side of said metal crown shell; a resilient sealing liner secured to the inner surface of said rigid insert disc, said liner being adapted to sealingly engage the container mouth whereby when said crown closure is operatively applied to the container mouth, said locking flange will retain said liner in sealing engagement with the container, the edge of said incision being separated from said pull tab and said pull tab being provided with a curled gripping surface so that the pull cap crown can safely be removed from the container.

2. The structure of claim 1 wherein the gripping surface on the edge of the pull tab is provided with an inside curl, the metal on the edge of the tab being curled down in, around, underneath and inwardly, below the surface of said pull tab.

3. The structure of claim 1 wherein the gripping surface on the edge of the pull tab is provided with an upward curl, the metal on the edge of the tab being curled down, out, beneath, around and upwardly, below the surface of said pull tab.

4. The structure of claim 1 wherein the gripping surface on the edge of the pull tab is provided with an undulating curl, the metal on the edge of the tab being curled up, out, above, around and downwardly, above the surface of said pull tab and then out, down around and back below the surface of said pull tab.

5. The structure of claim 1 wherein said rigid insert disc comprises a circular top portion, a substantially arcuate skirt depending from said circular top portion, and a circular depressed portion, substantially centrally and concentric of said top portion, for receiving an edge portion of the gripping surface of said pull tab.

6. The structure of claim 5 wherein the depressed portion is substantially concave with respect to said circular top portion.

7. The structure of claim 5 wherein the depressed portion is provided with a centrally raised area.

8. The structure of claim 7 wherein said depressed portion is defined by a gradually downwardly and inwardly sloping skirt, and said centrally raised area is defined by an arcuately curved skirt rising from said first mention skirt and providing a circular central dome.

9. The structure of claim 7 wherein said depressed portion is defined by a short downwardly and inwardly sloping skirt, and said centrally raised area is defined by a recessed disc shaped area extending from downward edge of said skirt to a substantially cylindrical skirt rising therefrom and providing a circular central dome.

10. The structure of claim 1 wherein the metal crown shell is formed from aluminum of approximately 0.012 inch thickness.

11. The structure of claim 1 wherein the rigid insert disc is formed from stainless steel of approximately 0.0066 inch thickness.

12. The structure of claim 1 wherein said pull tab has a circular segment shape, said tab being redirected outward at the junction of the segmented circle into two short straight legs terminating at two short incision lines which extend within the circular beginning shape of said weakened score portions.

13. The structure of claim 1 wherein the liner comprises a vinyl chloride plastisol.

14. The structure of claim 1 wherein said pull tab is provided with a central concentric circular raised reinforcing boss.

References Cited by the Examiner

UNITED STATES PATENTS

2,680,531	6/54	Underwood	215—46
2,787,394	4/57	Baumann	215—46

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