(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 April 2013 (11.04.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/052219 A1

(51) International Patent Classification:
B65D 41/32 (2006.01)

(21) International Application Number:
PCT/US2012/053131

(22) International Filing Date:
30 August 2012 (30.08.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
13/267,264 6 October 2011 (06.10.2011) US

(72) Inventor; and
(71) Applicant : **FRISHMAN, Abe** [US/US]; 2924 Cambridgeshire, Carrollton, TX 75007 (US).

(74) Agent: **BURR, Matthew, E.**; Mwr Legal, 620 Congress Avenue, Ste 320, Austin, TX 78701 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: EASY-PULL BOTTLE CAP

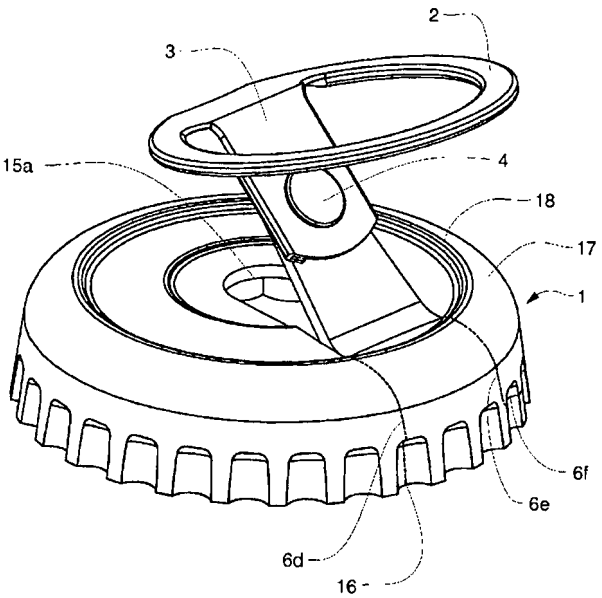


FIG. 13

(57) **Abstract**: A crown for a bottle or other container has a top portion and an annular skirt that descends contiguously from the top portion. An opener assembly and an arrangement of frangible scoring lines on the crown allow for ease of opening the bottle or container. Corrugated embodiments provide material strengthening for a reduced gauge crown.

WO 2013/052219 A1

EASY-PULL BOTTLE CAP

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is related to, claims the benefit of and priority from co-pending United States patent application of the same title Serial Number 13/267,264 filed October 6, 2011 entitled EASY-PULL BOTTLE CAP, by Abe Frishman, the disclosures of which is incorporated herein by reference.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to caps and crowns for beverage bottles and other containers, and in particular, to a manual pull-to-open bottle cap.

BACKGROUND

[0003] A beverage bottle that opens manually with relative ease, without the use of a bottle opener, has been a long-felt need for beverage providers. Bottle caps must be tightly secured to the bottle opening to prevent spillage of the contents, loss of pressure (in the case of pressurized or carbonated beverages) and to maintain the hygienic conditions of the contents. The tight seal makes it difficult to open a bottle by hand.

[0004] Caps, also referred to interchangeably as crowns, are secured to the bottle opening by crimping the crown down over the open of the container in a series of concave arcs around the circumference of the opening. The arcs create sharp convex points between each concave arc. The arcs and points are often referred to by those skilled in art as "angels."

[0005] The advent of the familiar twist-off bottle cap was a significant advance for manual bottle opening, but all too frequently one has to grip the cap so hard to twist the cap free that the points of the cap angels inflict pain on the hands or fingers. To protect the hands from injury, it is a common practice to wrap the bottle cap in the tail of a shirt or in a cloth before twisting the cap.

[0006] Bottle caps adapted with pull tabs, similar to those used for beverage cans, have been known in China and other territories of Asia. See, for example, International Patent Application PCT/CN00/00040 by Liu, priority date March 4, 1999, International Publication No. WO00/51906. Such pull tab bottle caps, however, are notoriously difficult to open because they require the exertion of an uncomfortable amount of force to break the seal and then pull the tab back (tearing the metal) to remove the cap.

[0007] Another pull-tab solution for bottle caps is known as the MaxiCrown® such as is described U.S. Patent 4,768,667 issued September 6, 1988, to Magnusson. The MaxiCrown® provides a pull ring disposed along the side of the neck of the bottle as an extension of the crown and thus is problematic for use with standard angel-crimping bottle capping machines. Indeed, a special capping machine is recommended to cap bottles with the MaxiCrown®.

[0008] There is a need, therefore, for a bottle crown that is easy to open manually yet which may be tightly sealed around the bottle opening using standard bottle capping machines common in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The detailed description that follows, by way of non-limiting examples of embodiments, makes reference to the noted drawings in which reference numerals represent the same parts throughout the several views of the drawings, and in which:

[0010] **Figure 1** is a diagrammatic representation of a top view of a specific exemplary embodiment of a bottle cap of the prior art.

[0011] **Figure 2A** is a diagrammatic representation of a side view vertical cross-section of a specific exemplary embodiment of a bottle cap of the present disclosure.

[0012] **Figure 2B** is a diagrammatic representation of a side view vertical cross-section of an alternative specific exemplary embodiment of the bottle cap of Fig. 2A.

[0013] **Figure 3A** is a diagrammatic representation of a side view vertical cross-section of an alternative specific exemplary embodiment of a bottle cap of the present disclosure.

[0014] **Figure 3B** is a diagrammatic representation of a side view vertical cross-section of an alternative specific exemplary embodiment of the bottle cap of Fig. 3A.

[0015] **Figure 4** is a diagrammatic representation of a side view vertical cross-section of an alternative specific exemplary embodiment of a bottle cap of the present disclosure.

[0016] **Figure 5** is a diagrammatic illustration of a side view cross-section of an alternative embodiment of a crown of the present disclosure.

[0017] **Figure 6** is a diagrammatic illustration of a side view cross-section of yet another alternative embodiment of a crown of the present disclosure.

[0018] **Figure 7** is a diagrammatic illustration of a side view cross-section of an alternative embodiment of a crown of Fig. 6.

[0019] **Figure 8** is a diagrammatic illustration of a side view cross-section of another alternative embodiment of a crown of the present disclosure.

[0020] **Figure 9** is a diagrammatic illustration of a side view cross-section of still another alternative embodiment of a crown of the present disclosure.

[0021] **Figure 10** is a diagrammatic illustration of a top view of a further alternative embodiment of a crown of the present disclosure.

[0022] **Figure 11** is a diagrammatic illustration of an isometric top view of an alternative embodiment of a crown of the present disclosure.

[0023] **Figure 12** is a diagrammatic illustration of an isometric top view of an alternative embodiment of a crown of Fig. 11.

[0024] **Figure 13** is a diagrammatic illustration of an isometric top view of an alternative embodiment of a crown of Fig. 11.

[0025] **Figure 14** is a diagrammatic illustration of a side cross sectional view of an alternative embodiment of a crown of Fig. 13.

[0026] **Figure 15** is a diagrammatic illustration of a side cross sectional view of an alternative embodiment of a crown of Fig. 14.

[0027] **Figure 16** is a diagrammatic illustration of an isometric top view of an alternative embodiment of a crown of Fig. 13.

[0028] **Figure 17** is a diagrammatic illustration of a top view of an alternative embodiment of a crown of Fig. 13.

[0029] **Figure 18A** is a diagrammatic illustration of a side cross section view of an embodiment of a cut line of the present disclosure.

[0030] **Figure 18B** is a diagrammatic illustration of a side cross section view of an alternative embodiment of a cut line of Fig. 18A.

[0031] **Figure 18C** is a diagrammatic illustration of a side cross section view of an alternative embodiment of a cut line of Fig. 18A.

[0032] **Figure 19** is a diagrammatic illustration of an isometric view of the bottom of a crown of the present disclosure.

[0033] **Figures 20A – 20E** are top view schematic illustrations of alternative embodiments of a crown of the present disclosure each embodiment having a curvilinear left score line extending from the center of the top of the crown to the annular edge of the crown.

[0034] **Figure 21** is a top view schematic representation of an alternative embodiment of a crown of the present disclosure illustrating an off-center location for the pull tab.

[0035] **Figure 22** is a top view schematic representation of an alternative embodiment of the crown of Fig. 21 with an alternative score line.

[0036] **Figure 23** is a top view schematic representation of an alternative embodiment of the crown of Fig. 21 with another alternative score line.

[0037] **Figure 24** is an isometric view schematic representation of an alternative embodiment of a crown of the present disclosure having no crimping angels.

[0038] **Figure 25A** is a cross-section schematic illustration of an unbroken score line of a crown of the present disclosure.

[0038] **Figure 25B** is a cross-section schematic illustration of a broken score line of the embodiment of Fig. 24A.

[0039] **Figure 26** is an isometric side view illustration of a reduced gauge crown of the present invention.

[0040] **Figure 27A** is a top view illustration of the crown of Fig. 26.

[0041] **Figure 27B** is a side cross-section view of the crown of Fig. 27A.

[0042] **Figure 28A** is a top view illustration of an alternative embodiment of a crown of the present disclosure.

[0043] **Figure 28B** is a side cross-section view of the crown of Fig. 28A.

[0044] **Figure 29A** is a top view illustration of another alternative embodiment of a crown of the present disclosure.

[0045] **Figure 29B** is a side cross-section view of the crown of Fig. 29A.

DETAILED DESCRIPTION

[0046] In view of the foregoing, through one or more various aspects, embodiments and/or specific features or sub-components, the present disclosure is thus intended to bring out one or more of the advantages that will be evident from the description. The present disclosure makes reference to one or more specific embodiments by way of illustration and example. It is understood, therefore, that the terminology, examples, drawings and embodiments are illustrative and are not intended to limit the scope of the disclosure. The terms "crown" and "cap" may be used interchangeably in the description that follows.

[0047] **Figure 1** is a diagrammatic representation of a top view of a specific exemplary embodiment of a bottle cap of the prior art. The lever-type, easy-opening cap shown in Fig. 1 may have crown 1, pull tab ring 2, pull tab 3, rivet 4, and lever 5. Cutting lines 6 may form a horizontal angle of approximately 30 degrees may be

provided at the back of the crown cap 1. Significantly, cutting lines 6 do not extend all the way to the rim edge of crown 1, but instead terminate at or near ring 2. A plurality of angels 7 may be formed by crimping cap 1 around a circular bottle opening. Not shown in this view is that, in vertical cross section, cutting lines 6 of the prior art maintain substantially the same depth profile along the length of the cut. A consequence of these various features is that undue manual force may be required to open and remove a crown of Fig. 1 from a container opening.

[0048] Crown or cap 1 may be connected to pull tab 3 by lever 5. Lever 5 and pull tab 3 may be joined to make a single unit. Likewise, pull tab 3 and pull tab ring 2 may be a unitary piece. The other end of pull tab 3 may be riveted to the approximate center of the surface on the body of the cap of crown cap 1 by rivet 4.

[0049] **Figure 2A** is a diagrammatic representation of a side view vertical cross-section of a specific exemplary embodiment of a bottle cap of the present disclosure. Pull tab ring 2, pull tab 3 and rivet 4 in combination may be referred to herein from time to time as an opener assembly. Interior threads 8 may be provided for selectively removing crown 1 from a bottle by manually twisting instead of using the opener assembly mechanism.

[0050] Cutting line 6 tapers downward from angel 7 at the rim of cap 1 toward the approximate center of cap 1 to provide a tapered tearing groove. For example, the depth of the tapered groove may graduate from a depth in the range of approximately 0.03 to 0.02mm near the rim of cap 1 to a depth in the range of approximately 0.10 to 0.08 mm by rivet 4 near the center of cap 1.

[0051] **Figure 2B** is a diagrammatic representation of a side view vertical cross-section of an alternative specific exemplary embodiment of the bottle cap of Fig. 2A. The embodiment of Fig. 2B lacks threads 8 and is thus adapted to be opened

manually using the opener assembly as described above. Also shown is rim or rim area 7a, which may be considered the portion of crown 1 that may be crimped over the opening of a bottle, forming the angels, to secure the crown onto the bottle. Rim 7a may be considered to extend from approximately the portion of crown 1 that begins to curve over a bottle opening, or slightly interior to that portion, to the terminus of angel 7.

[0052] While terminus 9 of the tearing groove near the center of cap 1 is depicted in Figures 2A and 2B as being substantially vertical, it will be understood by those skilled in the art that a selected profile or dimensions of the tearing groove employed in a specific embodiment of a bottle cap of the present disclosure are a question of design and engineering choice, and as such the present disclosure should not be read as limiting in such regards. For instance, the present disclosure contemplates that terminus 9 may be curved, slanted, or otherwise shaped consistent with aims of the present disclosure.

[0053] **Figure 3A** is a diagrammatic representation of a side view vertical cross-section of an alternative specific exemplary embodiment of a bottle cap of the present disclosure. In the embodiment of Fig. 3A, cutting line 6 tapers at terminus 9 as well as toward angel 7 at the rim of cap 1 to provide an alternatively tapered tearing groove in contrast to the embodiment depicted in Figs 2A and 2B. By tapering the groove of cutting line 6 such that the thickness of cap 1 increases toward the center and toward the rim, an alternative tearing groove may be provided so that only a reasonable amount of force is called upon to manually tear open cap 1.

[0054] **Figure 3B** is a diagrammatic representation of a side view vertical cross-section of an alternative specific exemplary embodiment of the bottle cap of

Fig. 3A. The embodiment of Fig. 3B lacks threads 8 and is thus adapted to be opened manually using the opener assembly as described above.

[0055] By varying the depth of the groove along cutting line 6, as in either of the embodiments of Figures 2A, 2B, 3A, or 3B, cap 1 provides a tearing groove which makes it more likely that only a reasonable amount of manual force is called upon to tear open crown 1. As will be discussed in more detail below, a recommended range of dimensions and material composition of crown 1 are disclosed to further provide a crown that may be manually opened with only reasonable force.

[0056] In operation, a person grasps ring 2 near tab 3 so as to pivot ring 2 on lever 5 while pulling up and back along cutting line 6. Lever 5 and rivet 4 may act in concert to crack open cap 1 at the center while manual force continues tearing cap 1along lines 6 until cap 1 is substantially split apart so that cap 1 may be easily removed from a bottle. The tearing groove of cutting line 6 facilitates manually tearing cap 1 along line 6.

[0057] Advantageously, the embodiments of Figures 2A and 3A may be provided with mating threads 8 along the interior of angels 7 such that crown 1 is adapted to alternatively be opened by twisting or unscrewing crown 1 from a bottle. Also alternatively, cap 1 may be removed using a bottle opener or other means to pop the cap off of the bottle.

[0058] **Figure 4** is a diagrammatic representation of a side view vertical cross-section of an alternative specific exemplary embodiment of a bottle cap of the present disclosure. Alternatively or additionally to threads 8, crown 1 may be formed, as shown in Fig. 4, having an elongated rim 7b relative to rim 7a of Figure 2. Securing a standard crown over a threaded bottle opening may be problematic because the threads add surface area to the exterior of the bottle opening. A standard crown may

not be big enough to extend over the extra surface area of a threaded bottle. Elongated rim 7b may be an advantageous alternative embodiment that allows crown 1 to be crimped over a threaded bottle opening to provide elongated angel 7c. A further advantage is that a crown of Fig 4 may be twisted off of a threaded bottle without the crown itself being interiorly threaded such as depicted in Figs 2A and 3A.

[0059] Lever 5 is provided for leverage and additional shearing force to rend open the tinplate material of crown 1.

[0060] **Figure 5** is a diagrammatic illustration of a side view cross-section of an alternative embodiment of a crown of the present disclosure. In the embodiment of Fig. 5, lever 5 is omitted such that pull tab ring 2 and pull tab 3 are proximate to the top of crown 1. A crown of the present disclosure may provide divot 10 under pull tab ring 2 to facilitate manual grasping of ring 2. That is, divot 10 may provide a void into which a finger tip or a finger nail may fit to exert upward force on ring 2.

[0061] **Figure 6** is a diagrammatic illustration of a side view cross-section of yet another alternative embodiment of a crown of the present disclosure. Cut line 6 extends into rim area 7a so as to curve downward toward angel 7 to the edge of crown 1.

[0062] **Figure 7** is a diagrammatic illustration of a side view cross-section of an alternative embodiment of a crown of Fig. 6. Cut line 6 into extends into rim 7a, as with Fig. 6, but the depth of cut line 6 is substantially uniform along its length rather than having a variable depth as previously described.

[0063] **Figure 8** is a diagrammatic illustration of a side view cross-section of another alternative embodiment of a crown of the present disclosure. Pull tab ring 2 may be provided with one or more arcuate portions 11 to facilitate manual grasping of ring 2 by providing an uplifted space to accommodate a finger tip or finger nail

underneath. Arcuate portion 11 is shown for illustration purposes only. The amount or angle of uplift or curvature may be a matter of design choice for a specific embodiment.

[0064] **Figure 9** is a diagrammatic illustration of a side view cross-section of still another alternative embodiment of a crown of the present disclosure. Liner 12 is secured under crown 1 with rivet 4. Cushion 13 is disposed under pull tab ring 2 to facilitate manual grasping of ring 2 and further to provide tactile comfort by reducing metal-to-skin contact when ring 2 is grasped by a person. Divot 14, similar to divot 10 in Fig. 5, may be an indented portion of crown 1 such that the indentation extends under pull tab ring 2 so that a finger tip or finger nail may be more easily positioned under pull ring 2 to facilitate manual crown removal.

[0065] **Figure 10** is a diagrammatic illustration of a top view of a further alternative embodiment of a crown of the present disclosure. Pull tab ring 2, pull tab 3 and rivet 4 are not shown. Cut lines 6 typically diverge toward rim 7a from imaginary center line 6a. The present disclosure contemplates alternative degrees of divergence 6b (dashed lines), for example, or that cut lines 6c (dotted lines) may converge toward rim 7a. The lines may even be substantially parallel. Convergence or divergence, and the selected degrees or angle separating the lines, is a matter of design choice, as is the number of cut lines, which may be as few as one or even zero. Accordingly, the present invention contemplates all and every permutation of cut lines which may be selected for the engineering design of a particular crown. Additionally, Fig. 10 illustrates an embodiment of the present crown formed to have 28 angels around the circumference of the crown.

[0066] **Figure 11** is a diagrammatic illustration of an isometric top view of an alternative embodiment of a crown of the present disclosure. The Easy Pull™ pull tab

apparatus is not shown in order to illustrate more plainly the cut lines 6d and 6e. In a preferred embodiment, one of the cut lines 6e provides an S-curve or tail segment 6f that extends along the angel portion 7 of crown 1. Portion 7 may also be referred to herein as skirt 7, which descends contiguously from the top of crown 1. Skirt 7 is described in more detail further below in the disclosure. S-curve 6f may facilitate the removal of crown 1 from a container opening. In operation, a person tears from center 15 along cut lines 6d and 6e. When the tear reaches S-curve 6f, the tearing force follows the S-curve away from cut line 6d and impels the tear along cut line 6d to terminus 16 which breaks open crown 1. Continued tearing force along S-curve 6f pulls angel portion 7 away from the container opening (not shown) and releases crown 1 from the container (not shown). S-curve 6f consists of a scoring line having an upper radial segment extending from the opener assembly to the skirt along a radial axis and a lower annular segment extending circumferentially along the skirt in an annular direction and extending from a terminus of the upper radial segment, the lower annular segment defined in a second horizontal plane equidistant to the first horizontal plane associated with the lower edge of the skirt.

[0067] Another feature illustrated in Fig. 11 is one or more spoilage indicators 17 such as dimples depressed in crown 1 and positioned so as not to be obscured by the pull ring apparatus of the present disclosure. For containers that are vacuum sealed, spoilage indicators 17 pop up in the event that the pressure seal is lost.

[0068] **Figure 12** is a diagrammatic illustration of an isometric top view of an alternative embodiment of a crown of Fig. 11. Again, the Easy Pull™ pull tab apparatus is not shown in order to illustrate more plainly the cut lines. The embodiment of Fig. 12 may provide a single cut line 6 extending outward from center

15. Cut line 6 branches or forks in to cut line 6d which extends to the edge of crown 1 and cut line 6e which curves into S-curve portion 6f as described above for Fig. 11.

[0069] **Figure 13** is a diagrammatic illustration of an isometric top view of an alternative embodiment of a crown of Fig. 11. The crown 1 of Fig. 11 is shown popped open in the center 15a with pull ring 2. Pull tab 3 is connected to crown 1 with rivet 4 and is in position to tear along cut lines 6d and 6e with application of manual force. One or more circular depressions 18 create space in the top 17 of crown 1 to seat pull ring 2 and the rest of the opener apparatus.

[0070] **Figure 14** is a diagrammatic illustration of a side cross sectional view of an alternative embodiment of a crown of Fig. 13. Skirt 7 descends from shoulder 19 which is contiguous with top 17. Seat 18 is of sufficient depth that pull ring 2 is substantially flush with the top 17 of crown 1. Such an embodiment advantageously is suitable for use in conventional bottle capping machines without having to re-tool or – refit the machine. A further advantage of seat 18 is that seat 18 forms a corrugated perimeter around the seat and corrugation is well known to strengthen flat sheets against bending in directions substantially perpendicular to the direction of corrugation. Seat 18, therefore, provides the additional advantage of strengthening crown 1. A further advantage of a strengthened crown as provided by seat 18 is that the thickness of crown may be reduced to a lower gauge (thinner) crown material than would be utilized in a standard crown, thus lowering the costs of manufacturing materials. Although Fig. 14 shows an embodiment of the present crown formed to have 27 angels in circumference around the crown, it will be understood by those skilled in art that the advantages of seat 18 do not depend on the presence or number of angels.

[0071] **Figure 15** is a diagrammatic illustration of a side cross sectional view of an alternative embodiment of a crown of Fig. 14. Seat 18 is shallower than as shown in Fig. 14, so that pull ring 2 is seated slightly or partially above the top 19 of crown 1. Such an embodiment may provide the advantage of having pull ring 2 easily accessible for manual opening. Depending on the acceptable tolerances, such an embodiment may also be suitable for use with a standard bottle capping machine.

[0072] Fig. 15 also illustrates an alternative embodiment in which liner 12 is mounted on the under surface of crown 1 with a suitable adhesive and is disposed so as to cover the bottom of rivet 4. Such embodiment may be distinguished from that illustrated in Fig. 9, in which rivet 4 secures liner 12 in position to the underside of crown 1.

[0073] **Figure 16** is a diagrammatic illustration of an isometric top view of an alternative embodiment of a crown of Fig. 13. Here, crown 1 is broken open at terminus 16 of cut line 6d. Further tearing with pull ring 2 along S-curve 6f will liberate a container (not shown) from angels 7 and detach crown 1 from the container.

[0074] **Figure 17** is a diagrammatic illustration of a top view of an alternative embodiment of a crown of Fig. 13. The embodiment of Fig. 17 provides printed matter such as a bent arrow 20 printed on pull tab 3 to indicate generally how a person should pull ring 2 in order to exploit the cut lines 6 for easy opening. Further instructions may be provided with printed instructions 21, which may read, for example: "LIFT RING PULL DOWN TO REMOVE". Additionally a caution warning 22 may be printed on crown 1.

[0075] **Figure 18A** is a diagrammatic illustration of a side cross section view of an embodiment of a cut line of the present disclosure. To form a tearing groove, cut line 6 may be machined to have any one or more of a variety of cross-sectional

profiles, depending on the engineering choice of a particular manufacturer. For instance, Fig.18A illustrates a square or rectangular cross section profile.

[0076] **Figure 18B** is a diagrammatic illustration of a side cross section view of an alternative embodiment of a cut line of Fig. 18A. Here, a curved cross section profile for cut line 16 is illustrated.

[0077] **Figure 18C** is a diagrammatic illustration of a side cross section view of an alternative embodiment of a cut line of Fig. 18A. A V-shaped cross section profile for cut line 6 is illustrated.

[0078] **Figure 19** is a diagrammatic illustration of an isometric view of the bottom of a crown of the present disclosure. Liner 12 adheres to the top of the underside of the crown and is disposed over the bottom of rivet 4. Additionally, Fig. 19 illustrates an embodiment of the present crown formed to have 21 angels in circumference around the edge of the crown.

[0079] **Figures 20A – 20E** are top view schematic illustrations of alternative embodiments of a crown of the present disclosure each embodiment having a curvilinear left score line extending from the center of the top of the crown to the annular edge of the crown. To reduce the risk of generating sharps from opening a crown of the present disclosure, various alternative embodiments provide score, cut or tear lines that create a gentle curve along the edge of the crown after the pull tab portion has been torn away. Accordingly, alternative cut lines 20, 22, 24, 26, and 28, of Figs 20A through 20E, respectively, arc to the left (as seen looking down on the top of the crown) so that when the pull tab portion is torn and pulled away from the crown it leaves behind a gently curving shape along the edge of the crown rather than a sharp. Each embodiment 20A – 20E, illustrating curvilinear score lines 20, 22, 24, 26, and 28, has a different degree of curvature one from the next and it is a matter of

engineering or design choice as to the amount of curvature selected to obtain the desired performance characteristics. A relatively flat score line 20, for example, yields a smooth edge but might require more force to tear, whereas a relatively more curved score line such as 28, for example, may require less force to tear but yields a differently shaped edge from that of score line 20. Score line 30 arcs to the right and terminates before the edge of the crown so that the crown is preserved as a unitary piece after the crown has been removed from the bottle or whatever container it was sealing.

[0080] **Figure 21** is a top view schematic representation of an alternative embodiment of a crown of the present disclosure illustrating an off-center location for the pull tab. Embodiments of the present crown having an off-center location for rivet 4 and the rest of the opener assembly are advantageous, for example, for non-beverage containers such as containers for canned goods like soup or beans, which familiarly have opener assemblies close to the edge to the container. Tear lines 6G and 6H traverse across top 17 of the crown 1 in a substantially rectilinear fashion to edge 16. Accordingly, the location of rivet hole or rivet 4 or of the crown 1 opener assemble on the top of crown 1 is largely a matter of engineering design choice. A crown of the off-center rivet embodiments is opened as described herein above of the other embodiments.

[0039] **Figure 22** is a top view schematic representation of an alternative embodiment of the crown of Fig. 21 with an alternative score line. Scoring lines 6G and 6H in the embodiment of Fig. 22 descend to skirt 7 directly from rivet 4, in contrast to Fig. 21, but similar to lines 6 in the previously described embodiments. Score line 6G descends to edge 16, whereas line 6H trails in the opposite direction maintaining for its length a substantially equal distance from edge 16 and top 7.

Scoring line 6H consist of a scoring line having an upper radial segment extending from the opener assembly to skirt 7 along a radial axis and a lower annular segment extending circumferentially along skirt 7 in an annular direction and extending from a terminus of the upper radial segment to an end point substantially spaced from the bottom annular edge 16 of the skirt 7. Preferably the lower annular segment defines a longer horizontal plane than that defined in the S-curve of scoring line 6f, described above, extending, for example approximately one quarter of the circumference of skirt 7.

[0040] **Figure 23** is a top view schematic representation of an alternative embodiment of the crown of Fig. 21 with an alternative score line. The score line for tearing crown 1 open circumscribes an almost complete circle around top 17 only to descend into skirt 7 at the end and all the way to crown edge 16. The embodiment of Fig. 23 is advantageous, for example, when employed with containers for products other than a beverage, such as soup or stew, where a large mouth opening provides easy access to the contents.

[0041] **Figure 24** is an isometric view schematic representation of an alternative embodiment of a crown of the present disclosure having no crimping angels. A crown of the embodiment of Fig. 24 is comparable to pressure-sealed crowns for fruit juices and the like which curl over the top of a container without crimping. The embodiment is also advantageous for use with medical containers and vials. The opener assembly with rivet 4 is off-center, but otherwise crown 1 opens as previously described.

[0042] **Figure 25A** is a cross-section schematic illustration of an unbroken score line of a crown of the present disclosure. **Figure 25B** is a cross-section schematic illustration of a broken score line of the embodiment of **Fig. 25A**. An

advantageous safety feature of a crown of the present disclosure is achieved in the manufacture of score lines 6. Describing **Figs 25A** and **25B** together, line 6 is scored on crown 1 in such a way that the moieties on either side of line 6 have curved edges 6M and 6N in cross-section profile. The seal formed by line 6 may be analogized to the seal formed by pressing the fingers of opposing hands together. The tip of each finger is curved and when two fingers are brought together, a seal can be formed. When score line 6 in **Fig. 25A** is torn as one opens crown 1 using the present opener assembly, crown 1 forms two edges 6M and 6N, which are curved or rounded, analogous to pulling the fingers apart. Non-sharp edges 6M and 6N, respectively, are formed upon breaking the frangible scoring line 6.

[0043] The reason score line 6 of Figs **25A** and **25B** is advantageous is that it reduces the sharps produced by tearing open crown 1 with the opener assembly. Round tear edges 6M and 6N render the opened crown dramatically less dangerous from sharps than would otherwise be the case.

[0044] Further regarding score line 6, one consideration of a crown of the present disclosure is the ease with which the material of crown 1 can be torn once opened by the opener assembly. The ease of tearing relates to the amount of pull force that needs to be applied to tear the crown material. Pulling force may be reduced, that is, ease of tearing may be increased, with the use of crown coatings or lacquers known in the art that contain additives which increase the ease of tearing, by reducing the required pull force, of the crown 1 material along line 6. Specific embodiments may also include degradable plastic additives for the liner attached to the underside of the crown to facilitate biodegradation of the liner after a used crown has been disposed of as waste. A variety of commercially available bio-degradable plastic additives are known in the art and the selection of one or more such additives is a matter of design

choice. **[0052]** In addition to the various structures described herein, certain advantages over the prior art are bestowed on the present crown by the recommended specifications shown in Table 1.

TABLE 1

Items	Acceptable Range/Target
1. Appearance	Disc properly adhering
	White, clear or color pigmented liner
	Complete liner
	Clean liner
	Clean crown and ring
	No rust and scratch for crown and ring
	Two cut lines on the downward surface of crown
	Rivet
	Crown
2. Dimensions	Thickness (mm): 0.12- 0.28
	Inside diameter (mm): 32.08 – 32.12
	Outside diameter (mm): 26.60 – 26.90
	Radius of angle (mm): 1.5 – 1.9
	Number of angels: 21 - 32
	Ring
	Diameter (mm): 21.1 – 21.5
	Thickness (mm): 0.28 – 0.32
	Liner

	Diameter (mm): 20.00 – 20.50
3. Rockwell Hardness	T4 on the Rockwell 30T scale
4. Secure Seal	Greater than/equal to 150 PSI for 1 minute
5. Finish Hardness	Should not scratch with "H" pencil
6. Sensory	No significant differences with an identified control after 12 weeks at 20 degrees C
7. Lubricant Migration	No particles or lubricant should be present
8. Simulated Palletizing	CO2 loss should not differ against control caps when stored for 1 week with max weight of 45 Kgs over each bottle
9. Corrosion	Maximum corrosion: slight to moderate
10. Odor	No off odors detected
11. Pulling Force of Ring (kg)	less than or equal to 2.5kg
12. Composition of Material	Tinplate crown and ring; food class non-PVC for liner

13. Package	10000 crowns per box
14. Pressure (kg)	10kg
15. Container 40' Loading	1,247 Master Cartons
16. Printing	Logo/other design may be printed on the Easy Pull™ Cap
17. Crown Anti-Oxidation	Material used is "food grade" PET; clear, with no odor, 1.2 UM (micrometers)

[0053] In particular, a tinplate material which demonstrates an approximate hardness of T-4 on the Rockwell 30T Hardness Scale is preferred for the present cap (see item 3 in table 1), although embodiments of T-3 and T-5 are advantageous for particular products. The preferred soft tinplate material requires less force to open and tear with the opener assembly of the present crown while still providing sufficient sealing of the container contents. For the purposes of this disclosure, tinplate refers the any material, including tin or tin alloys, from which a crown may be fabricated and does not necessarily mean that the crown is made from tin or a tin alloy.

[0054] A pulling force for a pull ring of the present disclosure of approximately 2.5 kg (kilograms) or less is preferred (see item 11 of Table1). A relatively small pull force such as this is recommended so that virtually everyone will have sufficient strength to open a bottle using a crown of the present disclosure. In

contrast, a relatively large pull force has the disadvantage of requiring a great amount of initial force to tear the tinplate material, and once the tinplate is torn open the sudden release of pulling force causes the bottle to jerk away from the user, spilling the contents often in dramatic fashion.

[0055] In addition to the low hardness of the tinplate, the thinness or gauge of the crown may also contribute to achieving a small pull force. For example, a crown of the present invention is recommended to have a thickness of less than 0.28 mm (see item 2 in Table 1). Typical bottle crowns have a thickness of 0.28mm or greater. Embodiments in which the crown material is strengthened by corrugation, such as in seated embodiments, may be thinner than standard crowns, having, for example, a gauge as thin as approximately 0.16mm.

[0056] In addition to the foregoing embodiments described above,, an additional embodiment provides a reduced gauge crown that delivers additional advantages.

[0057] Billions of bottle caps are used worldwide and the cost of the caps is largely determined by the amount of material required for the caps. One way to reduced such costs is to reduce the amount of material used in each crown. The amount of material can be reduced by making the crown thin, or reducing the gauge of the crown. A reduced gauge could be achieved by using less material but this might compromise the integrity of the crown by making the crown weaker. Another approach would be to use less material but use a stronger material. However, stronger materials might be more expensive than standard tin plate typically used in crown manufacture, which would defeat the cost savings purpose. An approach that reduces the amount of material but uses the same material without compromising strength is to corrugate the crown. Such corrugation is described herein in regards to Fig 13, for

example, which describes the present crown having a seat formed in the top to receive the opener assembly. The following is a description of a low gauge embodiment of the present crown in which the advantages of corrugation are exploited.

[0058] Turning now to **Figure 26**, Crown 1 includes top portion 110 contiguous with recess 120 which terminates in seat 18. Skirt 7 downwardly extends from top 110. In some specific embodiments a flange extends obliquely from skirt 7. Alternating flutes 150 and lands 152 are formed on a circumferential portion of skirt 7. Crown 1, and other crowns shown in the figures, is shown as a pry-off type that is opened with a lever. The present invention also encompasses a twist-off type (not shown in the figures) that is opened by twisting, as will be understood by persons familiar with crown cap technology. Finally, crown 1 is suitable for use with pull tab type assemblies mounted to seat 130 with effective score lines embossed on crown 100, as described above.

[0059] Seat 18 is recessed, that is, it is lower than top 110 but is contiguous with top 110 by virtue of transition surface 120, which will be referred to herein for convenience as recess 120. Recess 120 may formed in crown 1 in a variety of suitable ways to provide advantageous shapes. For example, in specific exemplary embodiments concentric tiers, grooves or steps are integrally formed in the crown 1 material until the desired depth of seat 18 is obtained, as illustrated in Fig. 26. In alternative embodiments, recess 120 is formed with a smoothly curved surface from top 110 to seat 18. The form of recess 120 functions as ribs or structural reinforcements that, it is surmised, help to stiffen seat 18 against deflection or deformation.

[0060] Skirt 7 descends from top 110 along the external perimeter of crown 1 and in specific exemplary embodiments smoothly merges into a downwardly and

radially outwardly extending flange. The skirt 7 is preferably adapted to be crimped onto the neck of a bottle for sealing. Specific exemplary embodiments of skirt 7 are divided into undulating, repeating portions that define the flutes 150 and lands 152. Preferably, the repeating portions are circumferentially evenly spaced apart such that each flute 150 is identical to all other flutes 150 around the circumference of the crown cap 1, and each land 152 is identical to all other lands 152 around the circumference of the crown cap 1. It should be understood that the crown cap 1 may include any number of flutes 150 and lands 152.

[0061] Referring to now to Figs 27A and 27B, 28A and 28B and 29A and 29B, the "B" figure of each depicted embodiment is the horizontal cross section of its "A" counterpart through line B-B. Each embodiment, designated 27A/B, 28A/B and 29A/B, is characterized by a particular diameter of its seat 18, as represented by width B 210, 310 and 410 of each embodiment, respectively, and depth A of recess 120 represented by depths 220, 320 and 420, respectively.

[0062] A specific amount of material strengthening from corrugation is achieved by selecting an embodiment with a particular combination of seat diameter 210, 310 or 410, for example, and recess depth 220, 320 or 420, for example. Exemplary embodiment 27A/B, for instance, has seat diameter 210, which is relatively wide, and recess depth 220, which is intermediately deep. Exemplary embodiment 28A/B has seat width 310, which is of intermediate width, and recess depth 320, which is the deepest of the three exemplary embodiments. Exemplary embodiment 29A/B has seat diameter 410, which is the narrowest of the embodiments, and recess depth 420, which is the shallowest depth of the three embodiments. To obtain a desired amount of material strengthening from corrugation, a combination of seat width 210, 310, or 410, for example, and recess depth 220, 320

or 420, for example, is selected to achieve a specific embodiment. [0018] Corrugation strengthens materials. This is particularly true of laminar materials formed into a sheet or plane. A laminar product can use less of a material if the material is corrugated to provide lateral strength. A bottle cap is a laminar product in which the sheet material, often steel or tin plate, is shaped to be affixed to the top of a bottle or other container. A standard pry-off or twist off cap has a thickness of material that is predominantly determined by considerations of leak prevention and the secureness of the attachment of the cap to the container.

[0063] Corrugation allows caps that use less material to have the equivalent strength of a standard thick crown. A corrugated crown is thinner, that is, it has a reduced gauge, in comparison to a standard bottle cap. An advantage of a reduced gauge cap is the money savings obtained by using less material.

[0064] Another advantage of a reduced gauge corrugated cap comes into play with innovated "pull-off" caps, which have a pull tab assembly attached to the crown as described herein above. The pull tab breaks the cap material and the crown is torn off the bottle using the pull tab ring of an opener assembly. A reduced gauge cap facilitates the tear off because the cap material is thin and the tearing action is parallel to the direction of material strengthening provided by the corrugation and therefor the tearing force does not have to overcome the material strengthening of the corrugation. Corrugation affords material strengthening perpendicular to the direction of corrugation.

[0065] In addition to the structures illustrated in the figures herein, it is understood that other structures will imbue a cap of the present disclosure with the advantages of corrugation and provide a reduced gauge crown for a bottle. For instance, concentric rings, which progress from the top of the skirt toward the center

of the seat, and decorative shapes such as stars, brand logos, sports team logos, religious insignia, and the like, formed in the plane of the cap, are embraced in the present disclosure.

[0066] Corrugation forms may be provided to a bottle cap by a variety means, including without limitation, metal stamping, pressing, embossing and so forth. Non-metal crowns of the present disclosure may be formed by injection molding for plastic crowns, or by other suitable means of production.

[0067] Specific embodiments of the corrugated crown caps described herein, such as embodiments for pry-off or twist off, are formed with steel of increased hardness compared with conventional crown caps presently in commercial production. For example, conventional crown caps are often formed of single reduced, T4, tinplate having a thickness of from 0.21 mm to 0.23 mm. Such tinplate has an average hardness (that is, the reported hardness value regardless of +/- variations) of approximately 61 on a 30T hardness scale, in accordance with ASTM 623. Crown caps 1 described herein may be made thinner and lighter weight compared with the prior art, for example, crown caps 1 may be formed of a material having a thickness of about 0.16 mm to 0.18 mm that have the same or roughly equal performance as conventional, thicker caps. These decreases in metal usage are more easily achieved when the structure of crown caps 1 are made with steel having increased hardness. For example, the inventor has demonstrated the effectiveness of low gauge crowns having grooves using DR8 (according to ASTM 623) or DR550 (according to EN 10203). Optionally, the inventor surmises that other materials may be used, such as single reduced tinplate or like material having enhance tempering, tin-free steel having similar properties as those described herein, and the like.

[0068] The crown caps 1 preferably have an average hardness of greater than 62 on the 30T scale (conforming to ASTM 623), more preferably greater than about 65, more preferably greater than about 68, more preferably greater than about 71. The embodiments shown in FIG. 26 and FIG. 28A were demonstrated to be effective using steel having a hardness of 73. The upper limit of hardness is set by the maximum stress acceptable to the glass bottle during the crimping process or the spring back (which may tend to urge the crimped flanges toward an uncrimped state) associated with harder plate.

[0069] The crown caps 1 may be formed with conventional press equipment, with only minor changes to parts of the tooling to form the structure (such as the grooves, crosses, stars, and dimples). And crown caps 1 may be crimped with conventional equipment, only modified to have a smaller throat compared with existing, conventional crimpers.

[0070] Because hardness has a relationship to strength as reflected in the yield point, the aspect of the hardness of the crown may be expressed in yield point on a corresponding scale. For example, DR8 or DR550 tinplate may has a yield point (in a tensile test) of550 MPA.

[0071] However, it will be understood that for pull tab opener embodiments, softer materials, such as softer tinplate than T4 or even aluminum, are advantageous because they facilitate ease of opening and tearing. The strength provided by corrugation permits the use of a relatively soft crown material while preserving the strength required for secure closure of the container. The inventor believes that the most advantageous crown cap embodiment has a combination of strength for secure closure and softness for ease of opening and tearing that is a matter of design and

engineering choice. A crown of the present disclosure encompasses crown caps that do not have all of the structure, materials, and/or advantages in this specification.

[0072] According to this description, commercially acceptable crown caps formed according to the present disclosure can be commercially made with up to 25 percent less material (e.g., steel or tinplate) compared with many conventional crown caps, which has corresponding advantages in carbon emissions. The savings in material weight are approximately proportionate to the reduction in metal thickness. Further, even though energy required to cool an individual crown is tiny, the energy required to cool the total number of crowns produced each year (approximately 45 billion in North America and approximately 300 billion throughout the world), and the corresponding reduction in that energy, is significant.

[0073] The Reduced Gauge Crown has an impact on reducing the cost of the tinplate or steel, and the PVC / PVC free liner material, which is available with an additive, making both the metal crown and PVC or PVC free liner, biodegradable in an "active landfill".

[0074] With the resulting lower production and weight in transportation costs in the RGC, in turn, reduce CO2 emissions.

[0075] Tinplate or steel used to produce crowns for the beer or soda industry varies between 0.21mm – 0.24mm. The present reduced gauge crown may use a thickness of between 0.17mm – 0.19mm. A standard pry-off or twist-off crown, weighs approximately 2.38 grams, whereas the reduced gauge crown weighs approximately 2.14 grams, a 10% reduction in weight yielding a savings in material costs.

[0076] A further benefit of the reduced gauge crown is seen in the transportation costs of crowns. A reduction in weight relates to a savings in

transportation fuel costs, wear and tear on the transportation vehicles, and reduced transportation carbon dioxide emissions. Standard bottle crowns are traditionally packed 10,000 per carton, as indicated in Table 1, but with the reduced gauge crown embodiment of the present crown, a carton holds 11,000 crowns, thus providing reduced energy, transportation, and carbon dioxide emissions.

[0077] Advantages of the reduced gauge crown embodiment include, without limitation, cost savings in production, lower price per crown, lower transportation costs, lower loading costs, as well as reduced carbon dioxide emissions.

[0078] In addition to all of the embodiments described herein above, an additional feature is suitable for use with of each of the embodiments as a matter of engineering, design or marketing choice, which is the employment of temperature-sensitive color-changing ink, so-called thermochromic ink, such as described, for example, in United States Patent No. 6,634,516 to Carballido, which is incorporated herein by reference in its entirety. Such thermochromic inks have the property of changing color so as to be one color at room temperature (approximately 21^0C) and a different color when refrigerated to, for example standard retail refrigeration temperature of 4^0 C. In an exemplary application, the ink is transparent, for example, at room temperature but becomes relatively opaque and visible at chilled temperature, such that a customer has visual confirmation of the approximate temperature without touching the container.

[0079] The illustrations of embodiments described herein are intended to provide a general understanding of the structure of various embodiments, and they are not intended to serve as a complete description of all the elements and features of apparatus and systems that might make use of the structures described herein. Many other embodiments will be apparent to those of skill in the art upon reviewing the

above description. Other embodiments may be utilized and derived therefrom, such that structural, materials, and logical substitutions and changes may be made without departing from the scope of this disclosure. Figures are merely representational and may not be drawn to scale. Certain proportions thereof may be exaggerated, while others may be minimized. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

[0080] Such embodiments of the inventive subject matter may be referred to herein, individually and/or collectively, by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any single invention or inventive concept if more than one is in fact disclosed. Thus, although specific embodiments have been illustrated and described herein, it should be appreciated that any arrangement calculated to achieve the same purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the above description.

[0081] The Abstract of the Disclosure is provided to comply with 37 C.F.R. §1.72(b), requiring an abstract that will allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims. In addition, in the foregoing Detailed Description, it can be seen that various features are grouped together in a single embodiment for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed embodiments require more features than are expressly recited in each claim. Rather, as the claims reflect, inventive subject matter lies in less than all features of a single

disclosed embodiment. Thus the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separate embodiment.

[0082] The description has made reference to several exemplary embodiments. It is understood, however, that the words that have been used are words of description and illustration, rather than words of limitation. Changes may be made within the purview of the appended claims, as presently stated and as amended, without departing from the scope and spirit of the disclosure in all its aspects. Although description makes reference to particular means, materials and embodiments, the disclosure is not intended to be limited to the particulars disclosed; rather, the disclosure extends to all functionally equivalent technologies, structures, methods and uses such as are within the scope of the appended claims.

I claim:

1. A frangible crown for a container opening, the crown comprising:

a top portion having an attachment portion;

an annular skirt descending from the top portion and terminating at a bottom annular edge;

an opener assembly attached to the top at the attachment portion;

a frangible scoring arrangement comprising:

a first scoring line extending in a continuous radial direction from the attachment portion to the bottom edge of the skirt; and

a second curvilinear scoring line comprising:

an upper radial segment extending in a continuous radial direction from the attachment portion of the top to the annular sidewall of the skirt, and

a lower annular segment extending circumferentially along the annular side wall of the skirt from the upper radial segment to an endpoint substantially spaced from the bottom annular edge of the skirt.

2. The crown of claim 1, wherein the opener assembly further comprises

a pull tab ring;

a pull tab attached to the pull tab ring; and

a rivet attached to the pull tab and to the attachment portion of the top.

3. The crown of claim 2, the opener assembly further comprising a lever under the pull tab.

4. The crown of claim 1, wherein the top further comprises a center portion and wherein the attachment portion is at the center portion of the top.

5. The crown of claim 1, wherein the top further comprises a center portion and wherein the attachment portion is off-center from the center portion of the top.

6. The crown of claim 2, where in the top portion further comprises a recessed seat.

7. The crown of claim 1, wherein at least one of the scoring lines is tapered to have greater depth near the annular edge of the skirt than near the attachment portion.

8. The crown of claim 1, comprising a divot on the top portion to facilitate manual crown removal.

9. The crown of claim 1, further comprising an interior under portion opposite of and defined by the top portion and the skirt; a liner fastened to the under portion.

10. The crown of claim 1, further comprising a cushion on the pull tab ring.

11. The crown of claim 1, wherein the top is corrugated.

12. The crown of claim 1, further comprising a crown thickness gauge in the range of 0.12mm to 28mm.

13. The crown of claim 1, wherein the frangible scoring arrangement defines a frangible portion of the frangible crown, the frangible portion extending outward from the attachment portion to the bottom edge of the skirt, the frangible portion having a curved profile shape in cross-section.

14. The crown of claim 1, wherein the frangible scoring arrangement defines a frangible portion of the frangible crown, the frangible portion extending outward from the attachment portion to the bottom edge of the skirt, the frangible portion having a square shape in cross-section.

15. The crown of claim 1, wherein the frangible scoring arrangement defines a frangible portion of the frangible crown, the frangible portion extending outward from the attachment portion to the bottom edge of the skirt, the frangible portion having a V shape in cross-section.

16. The crown of claim 1, wherein at least one of the scoring lines of the frangible scoring arrangement produces a non-sharp edge upon breaking.

17. The crown of claim 1, wherein the skirt comprises a plurality of angels.

18. The crown of claim 1, wherein the skirt comprises no angels.

19. The crown of claim 1, wherein the first scoring line is curvilinear.

20. A frangible crown for a container opening, the crown comprising:

a top portion having an attachment portion;

an annular skirt descending from the top portion and terminating at a bottom annular edge;

an opener assembly attached to the top at the attachment portion;

a frangible scoring arrangement comprising:

a first curvilinear scoring line extending in a continuous radial direction from the attachment portion to the bottom edge of the skirt; and

a second curvilinear scoring line comprising:

an upper radial segment extending in a continuous radial direction from the attachment portion of the top to the annular sidewall of the skirt, and

a lower annular segment extending circumferentially along the annular side wall of the skirt from the upper radial segment to an

endpoint substantially spaced from the bottom annular edge of the skirt.

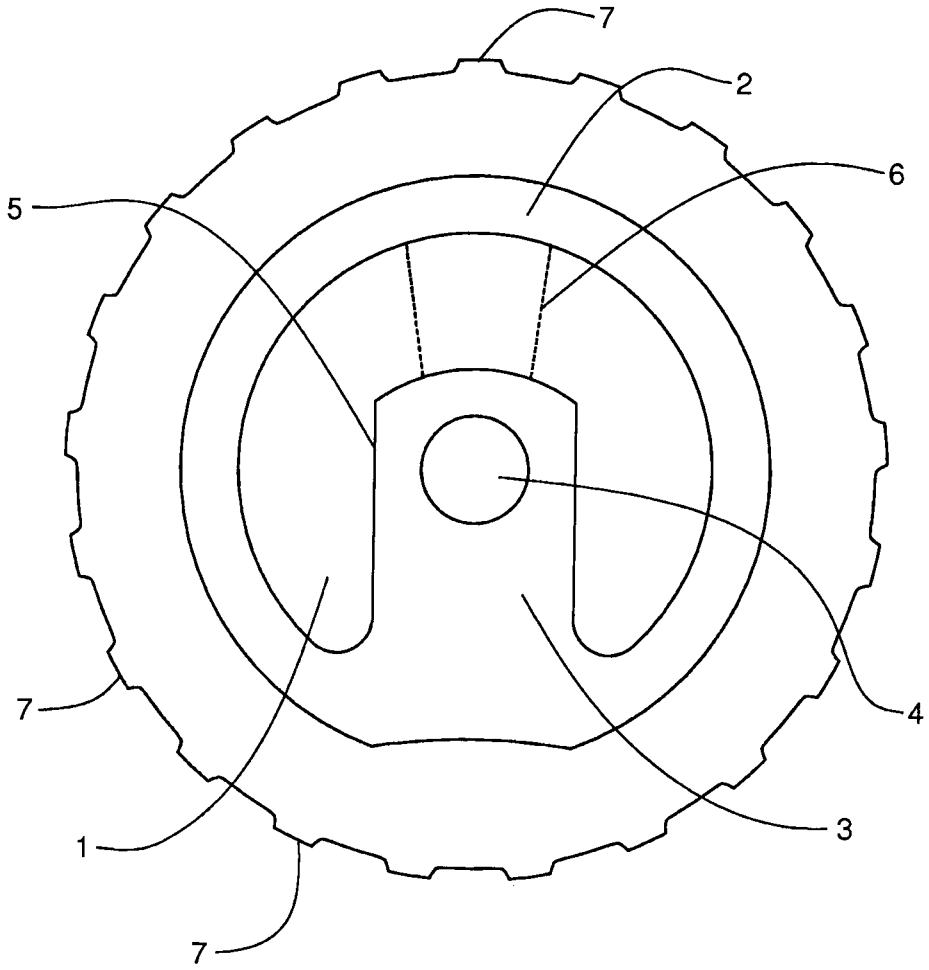


FIG. 1
Prior Art

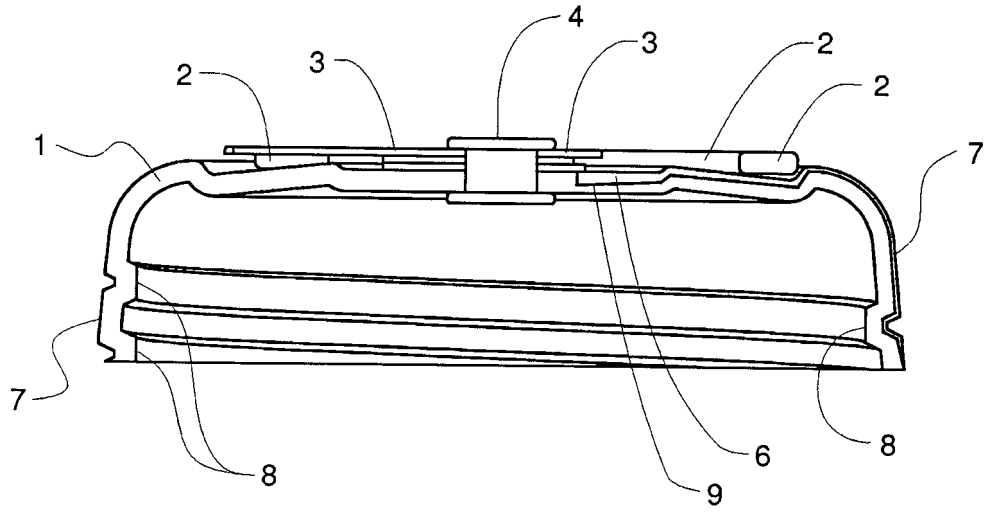


FIG. 2A

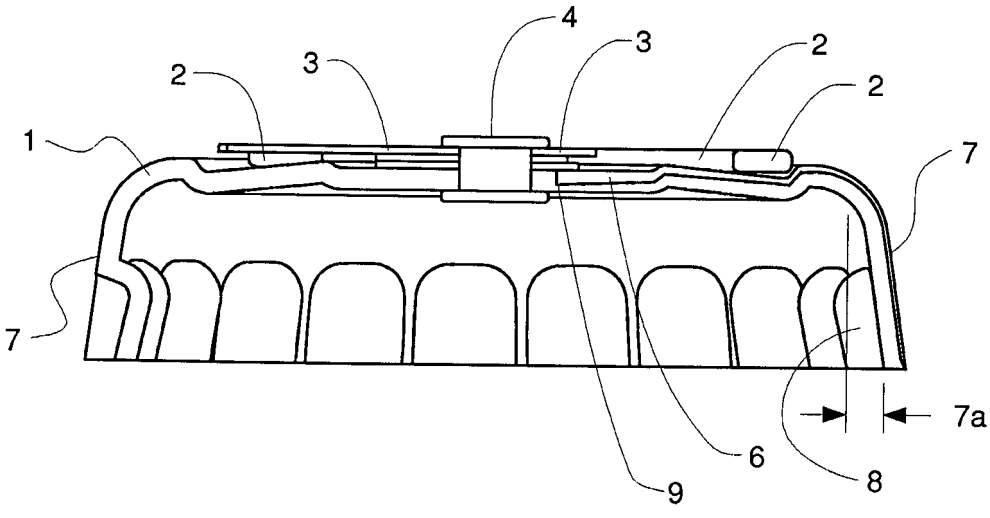


FIG. 2B

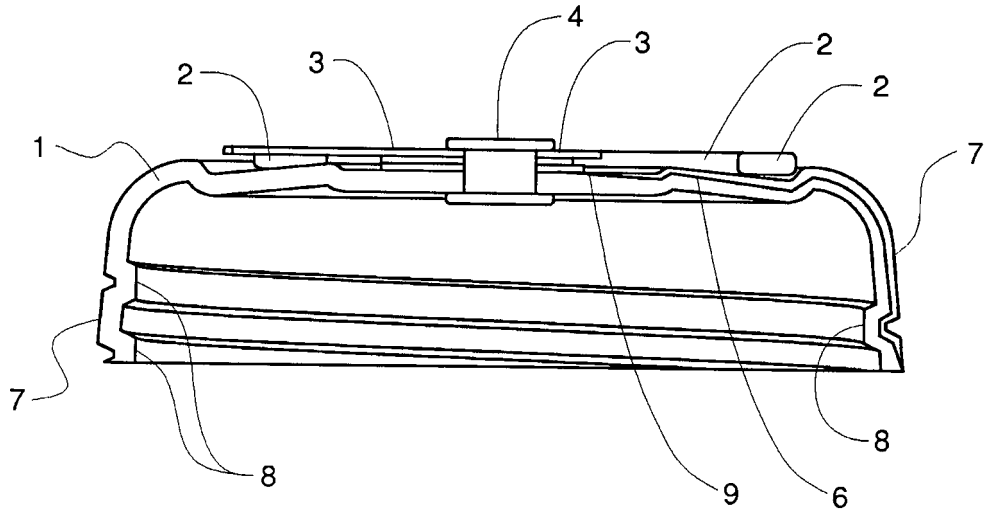


FIG. 3A

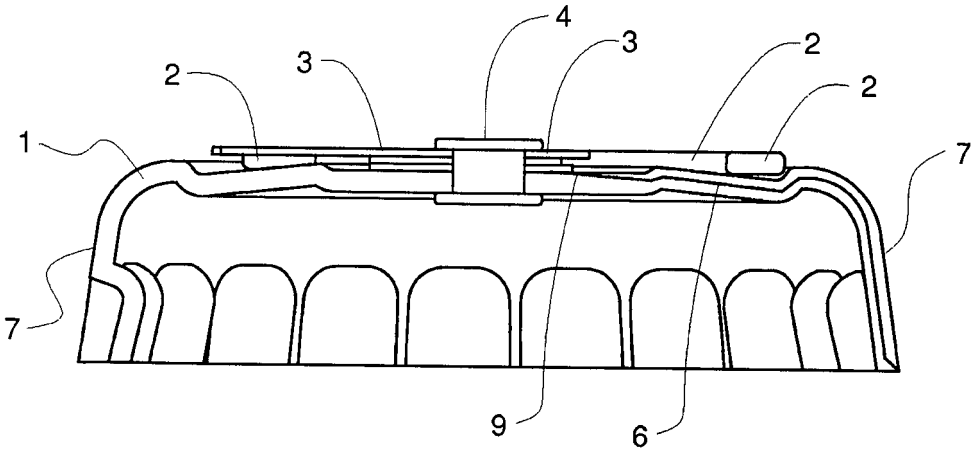


FIG. 3B

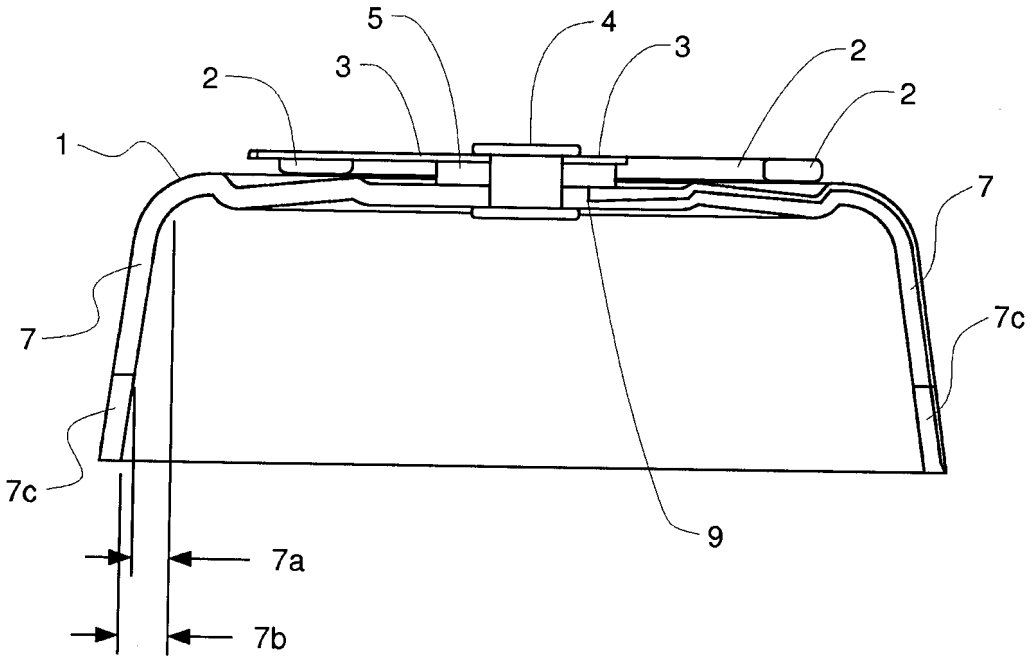


FIG. 4

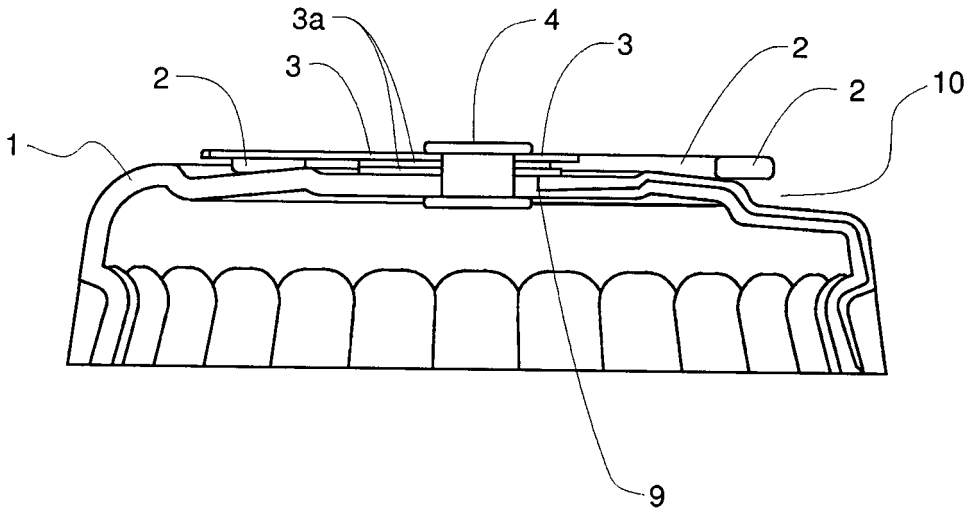


FIG. 5

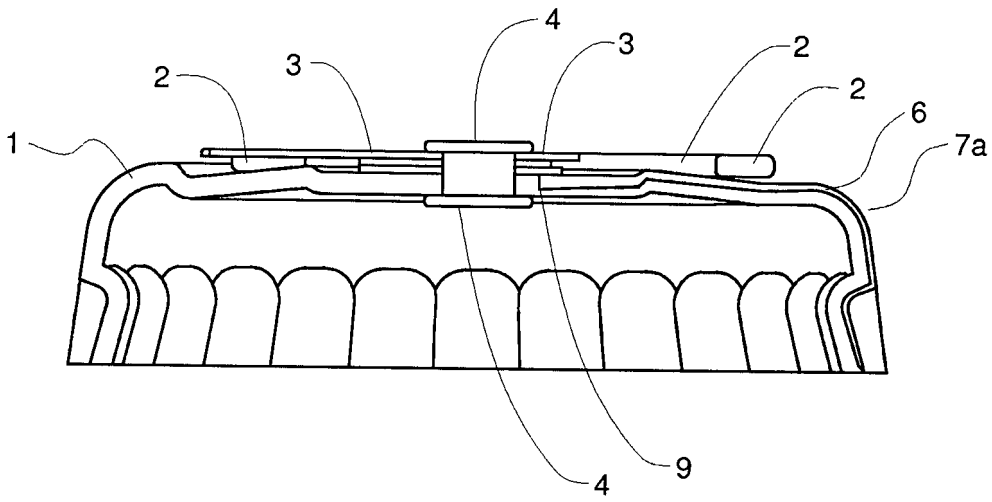


FIG. 6

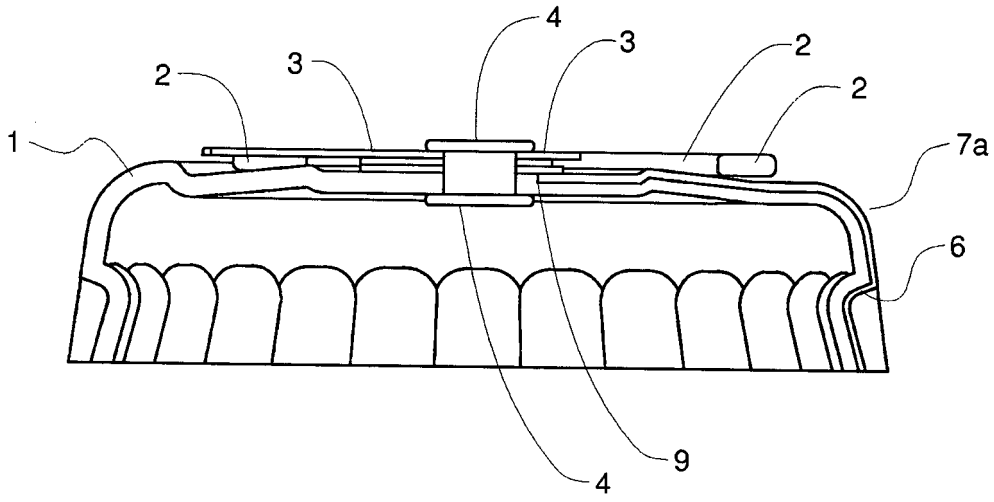


FIG. 7

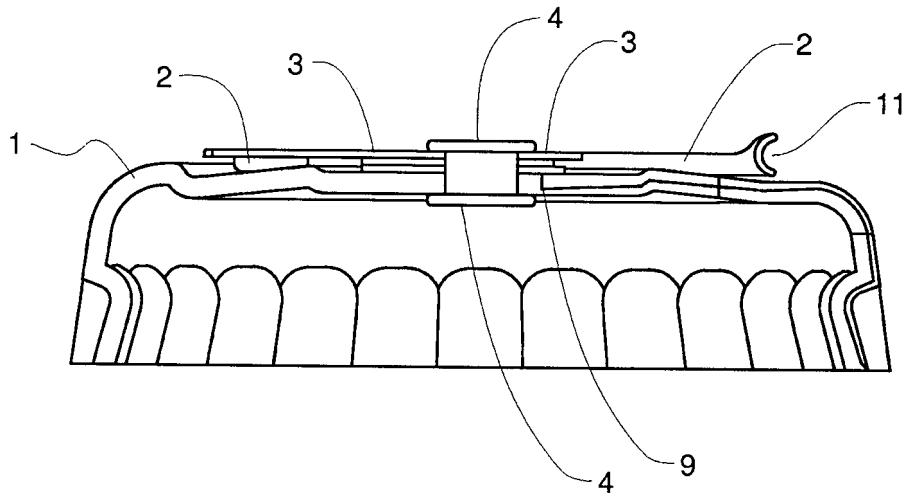


FIG. 8

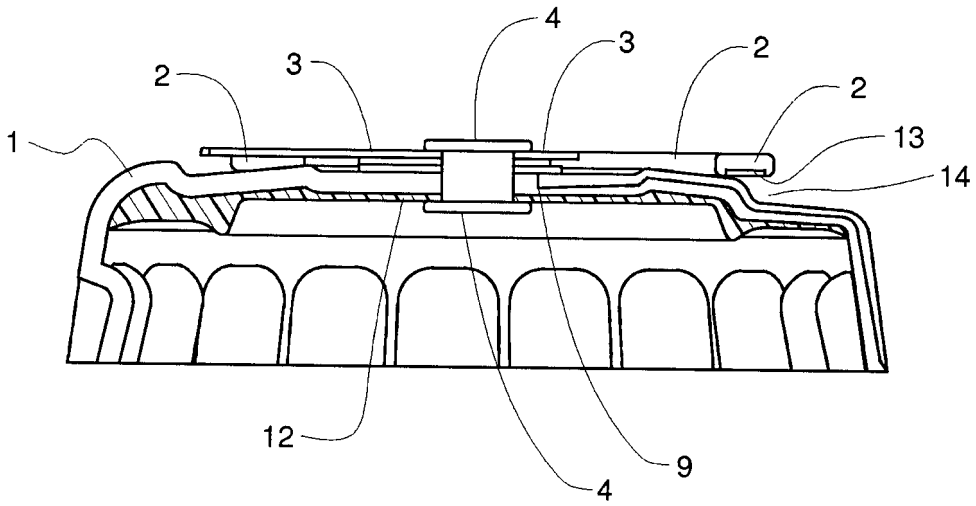


FIG. 9

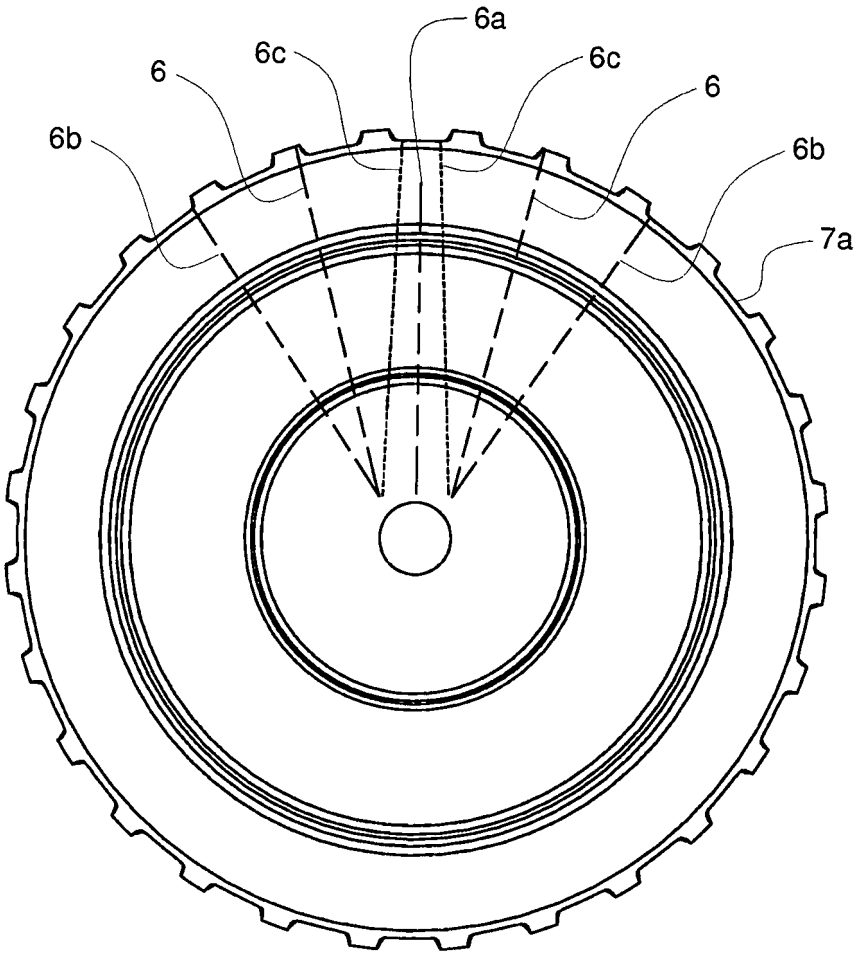


FIG. 10

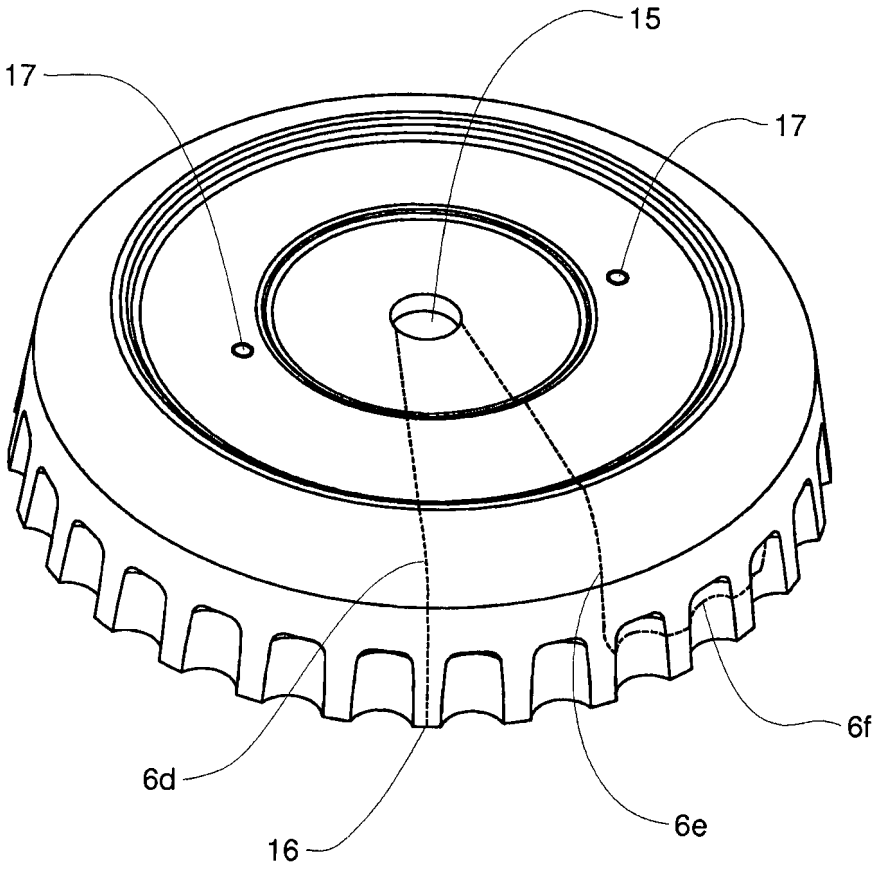


FIG. 11

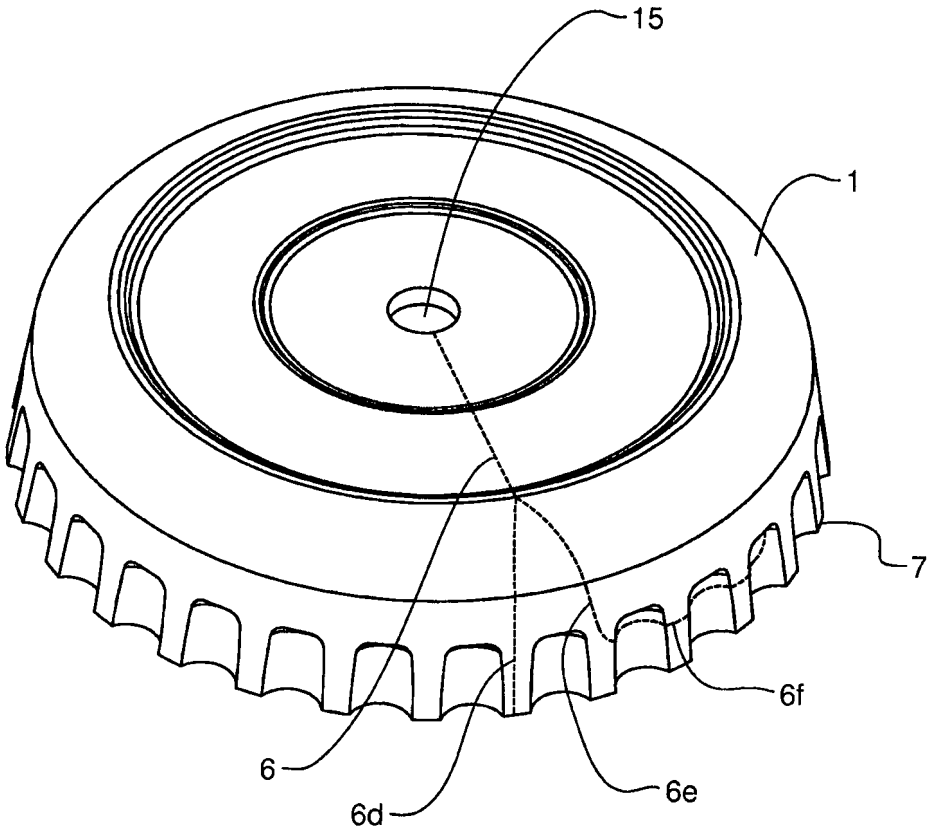


FIG. 12

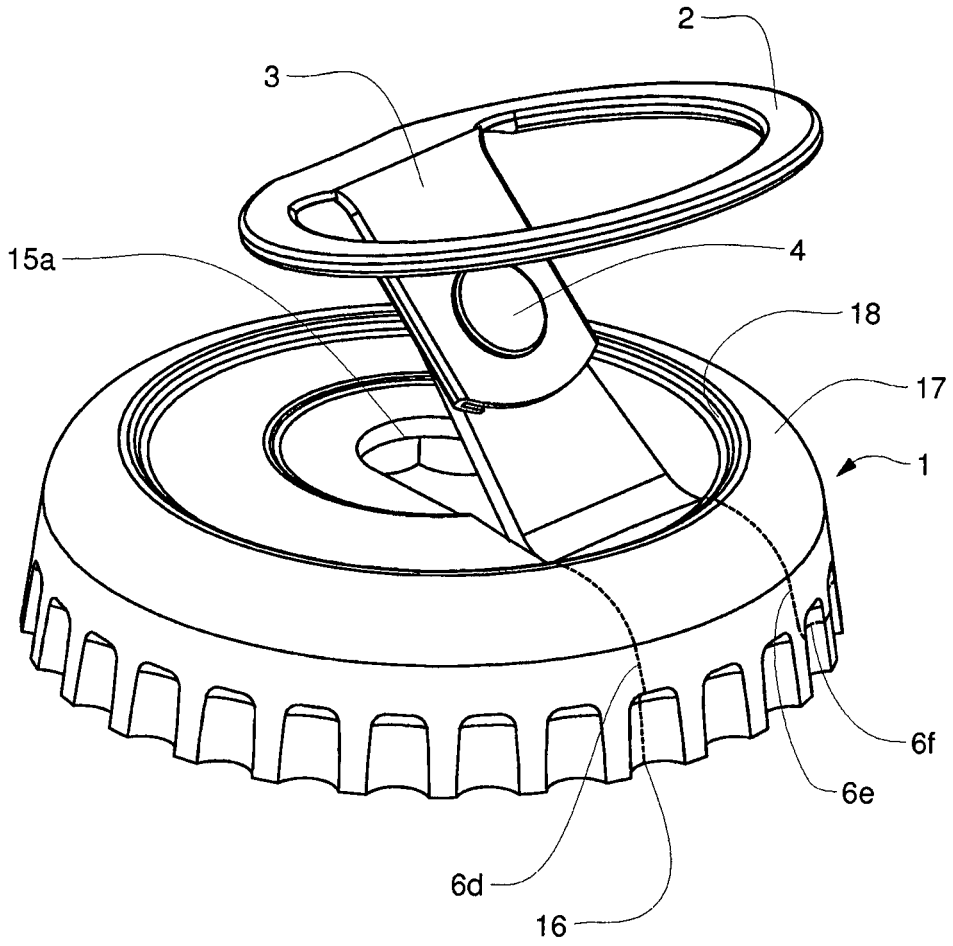


FIG. 13

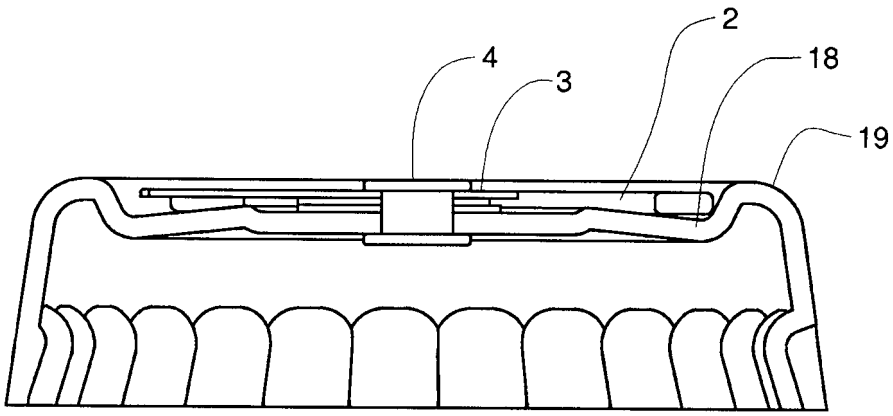


FIG. 14

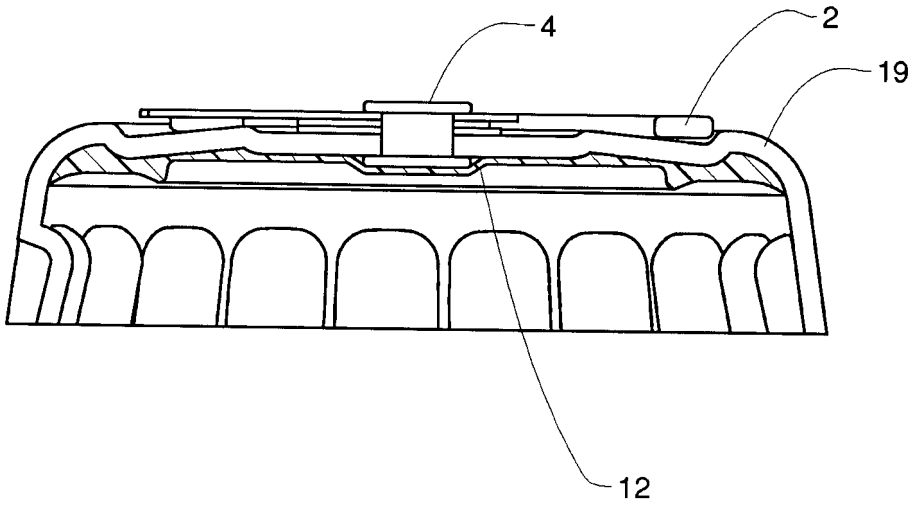


FIG. 15

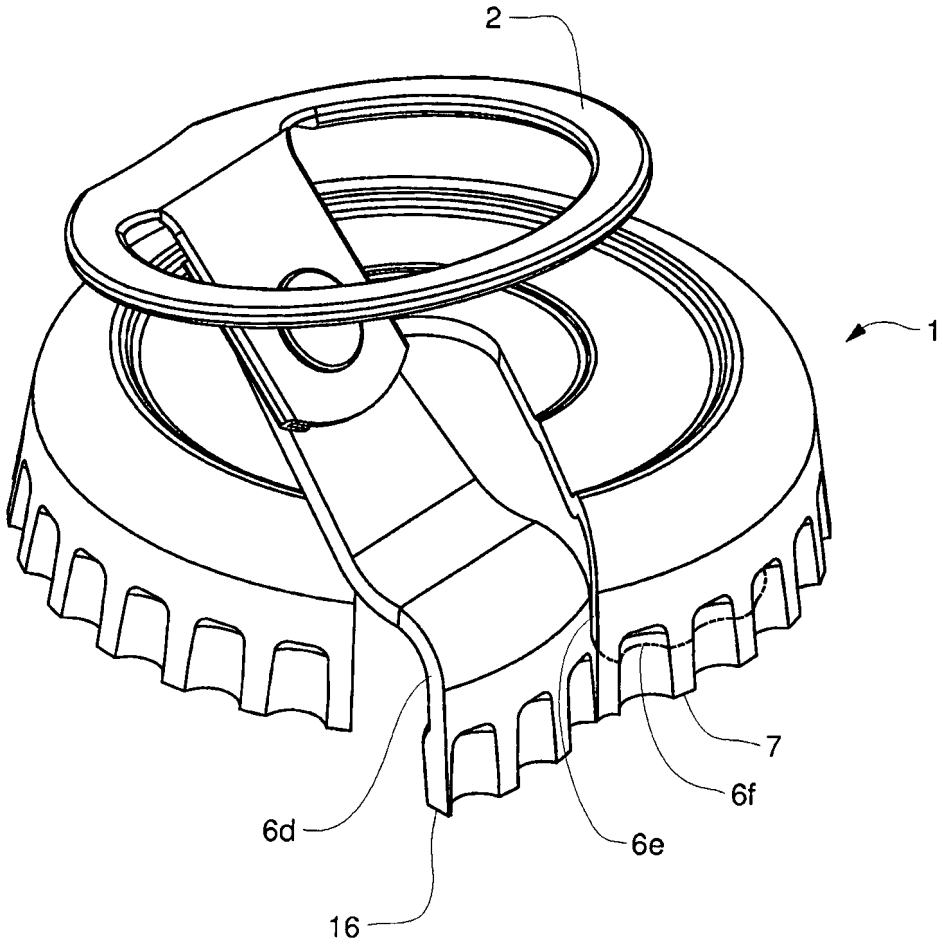


FIG. 16

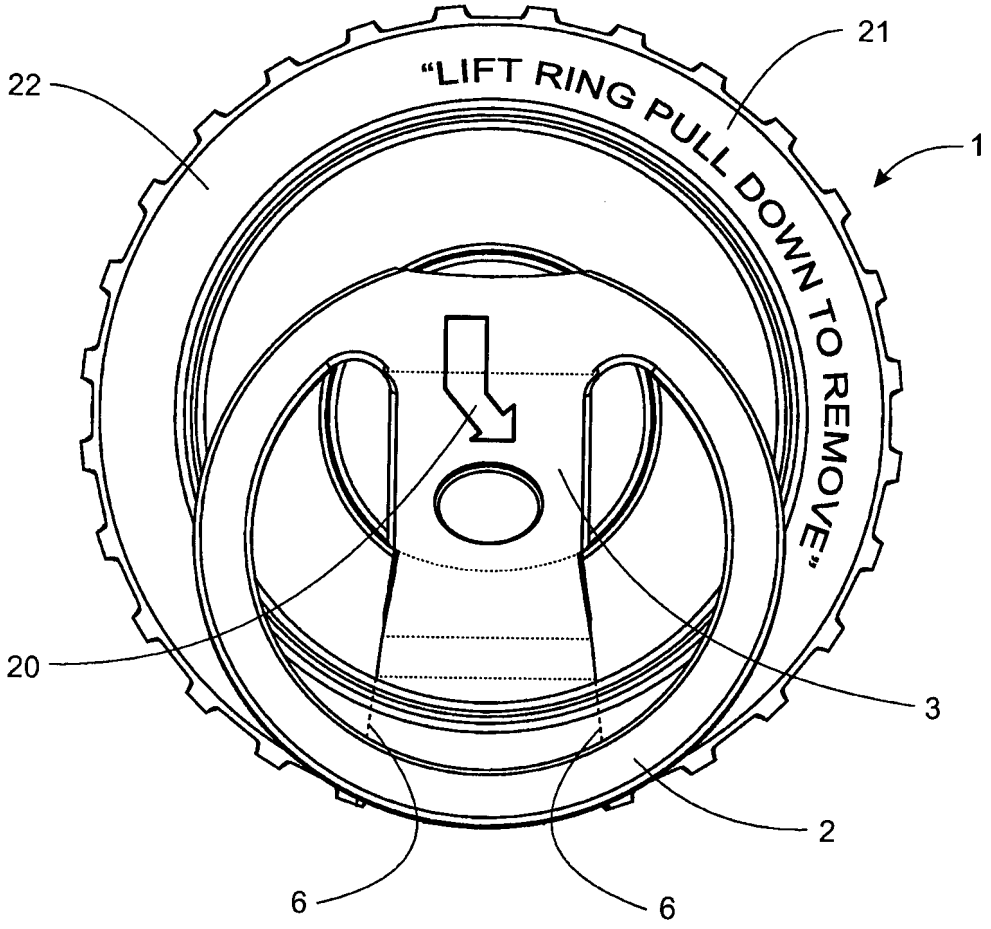


FIG. 17

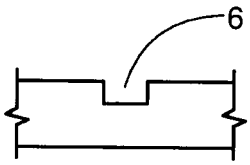


FIG. 18A

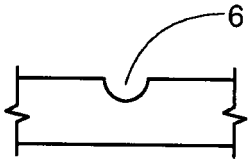


FIG. 18B

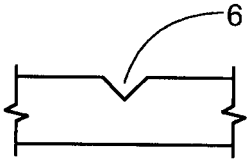


FIG. 18C

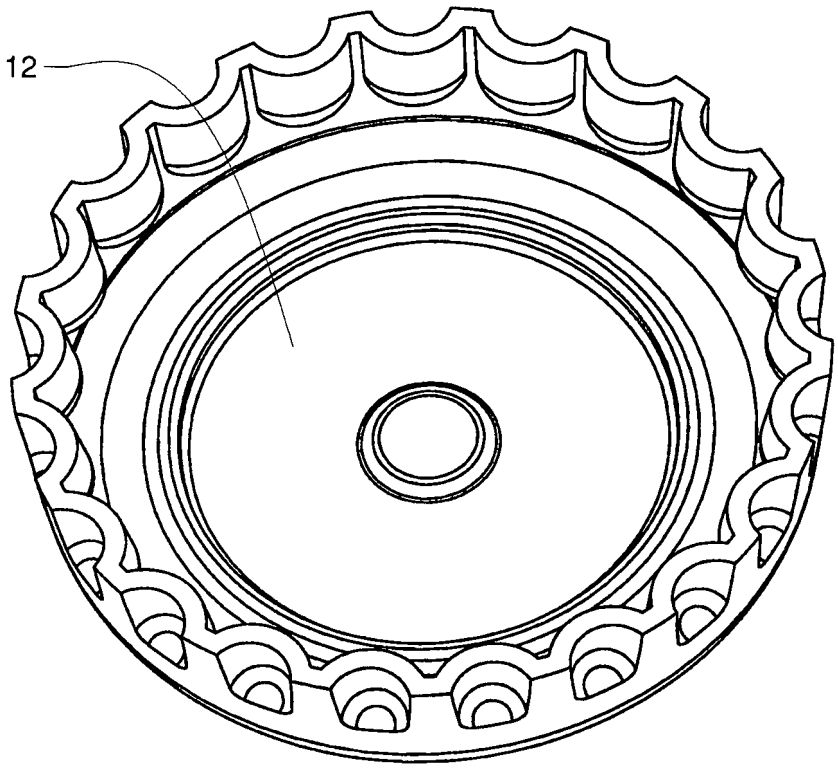


FIG. 19

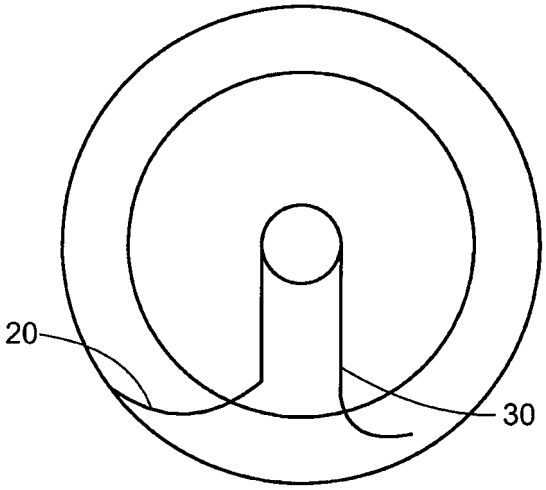


FIG. 20A

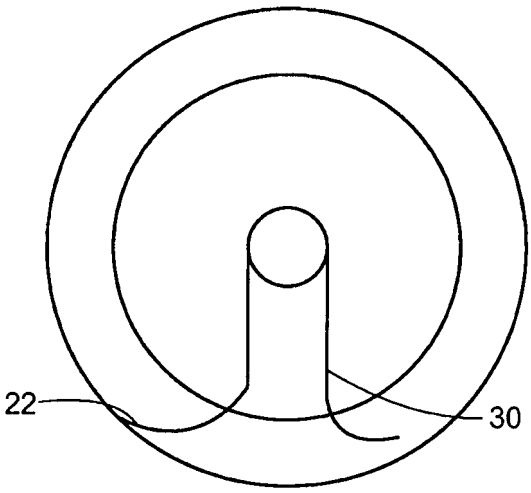


FIG. 20B

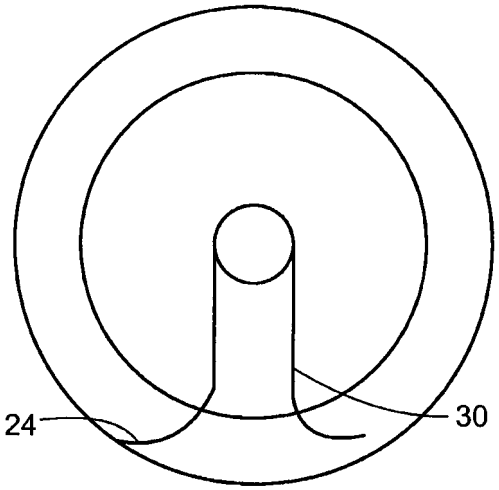


FIG. 20C

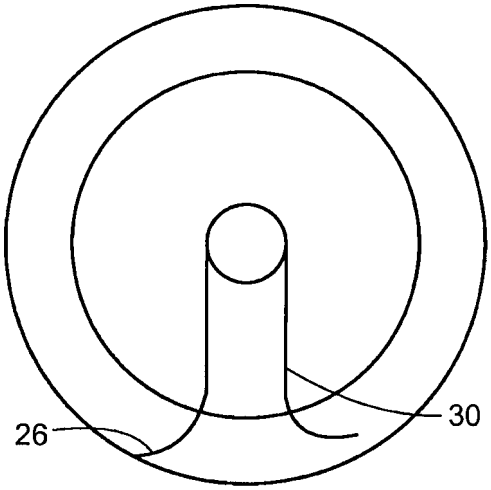


FIG. 20D

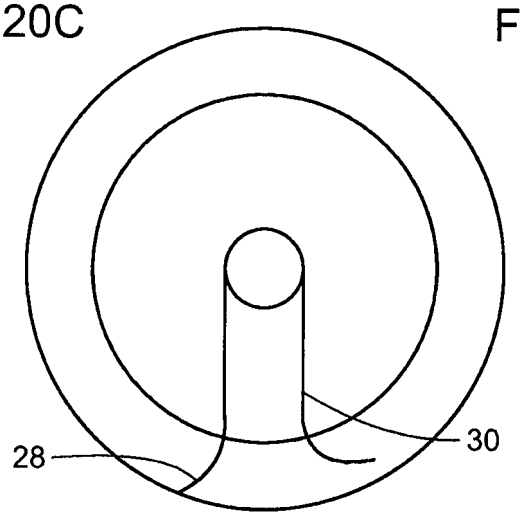


FIG. 20E

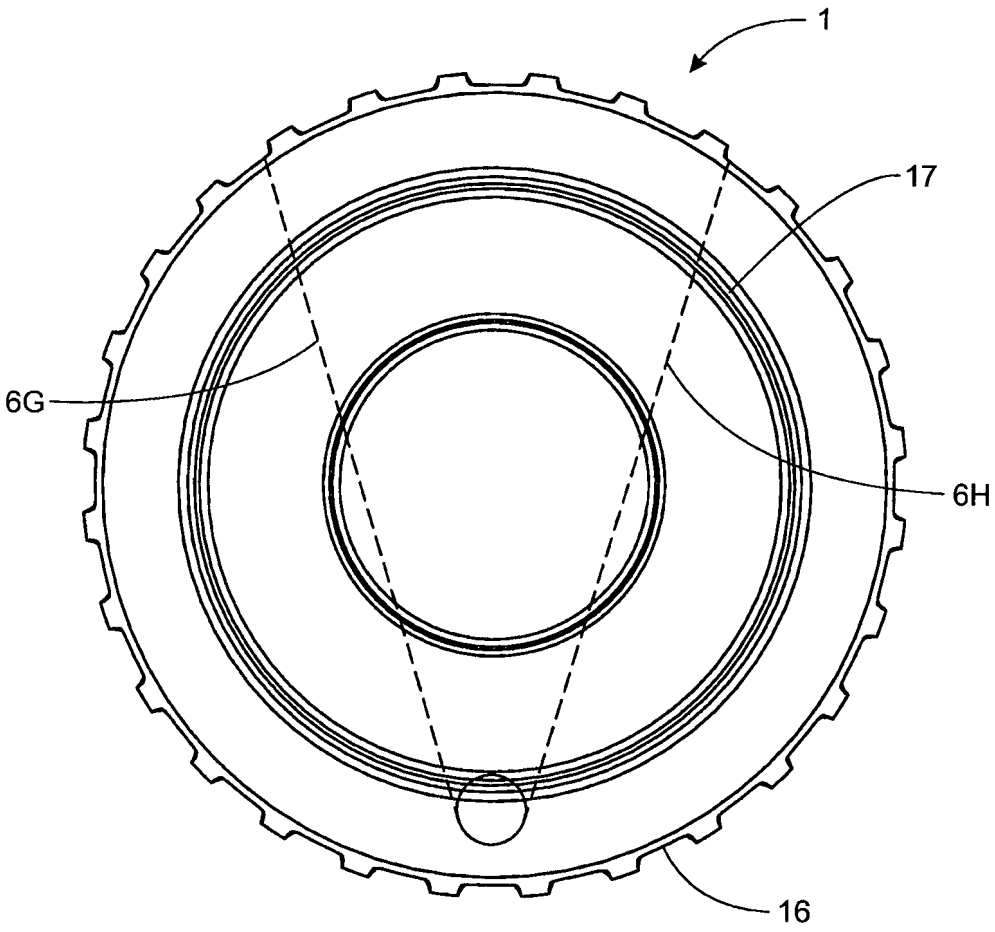


FIG. 21

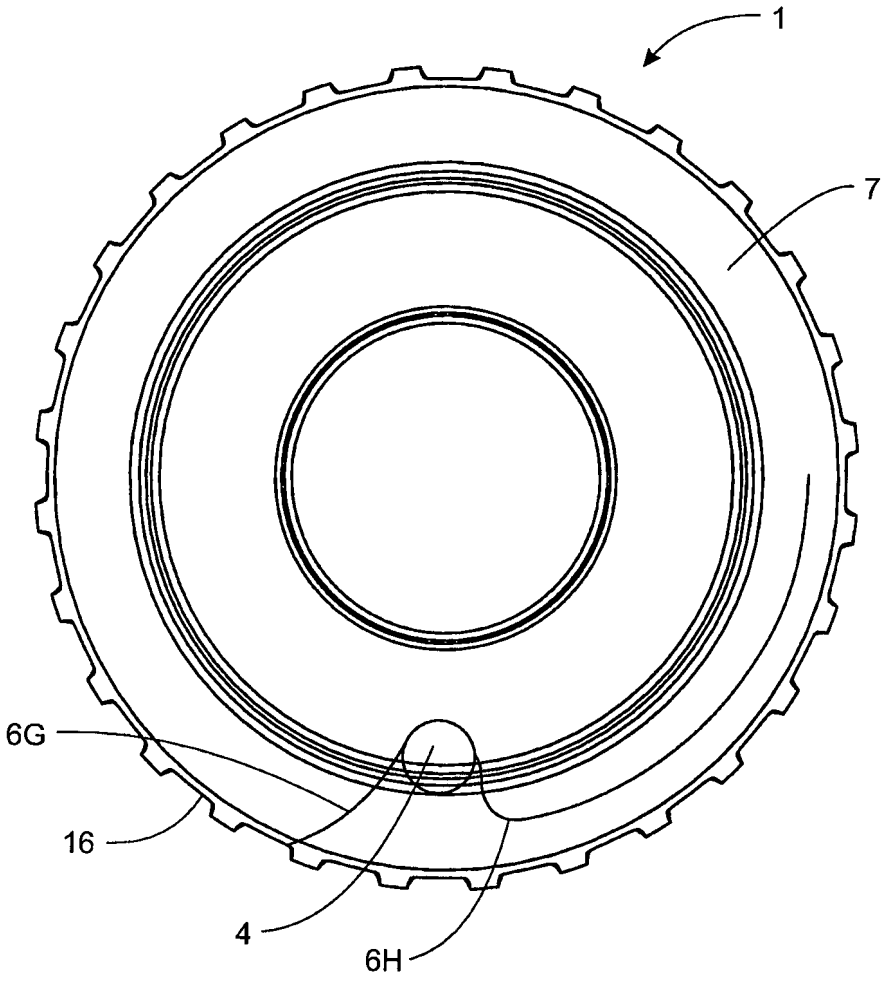


FIG. 22

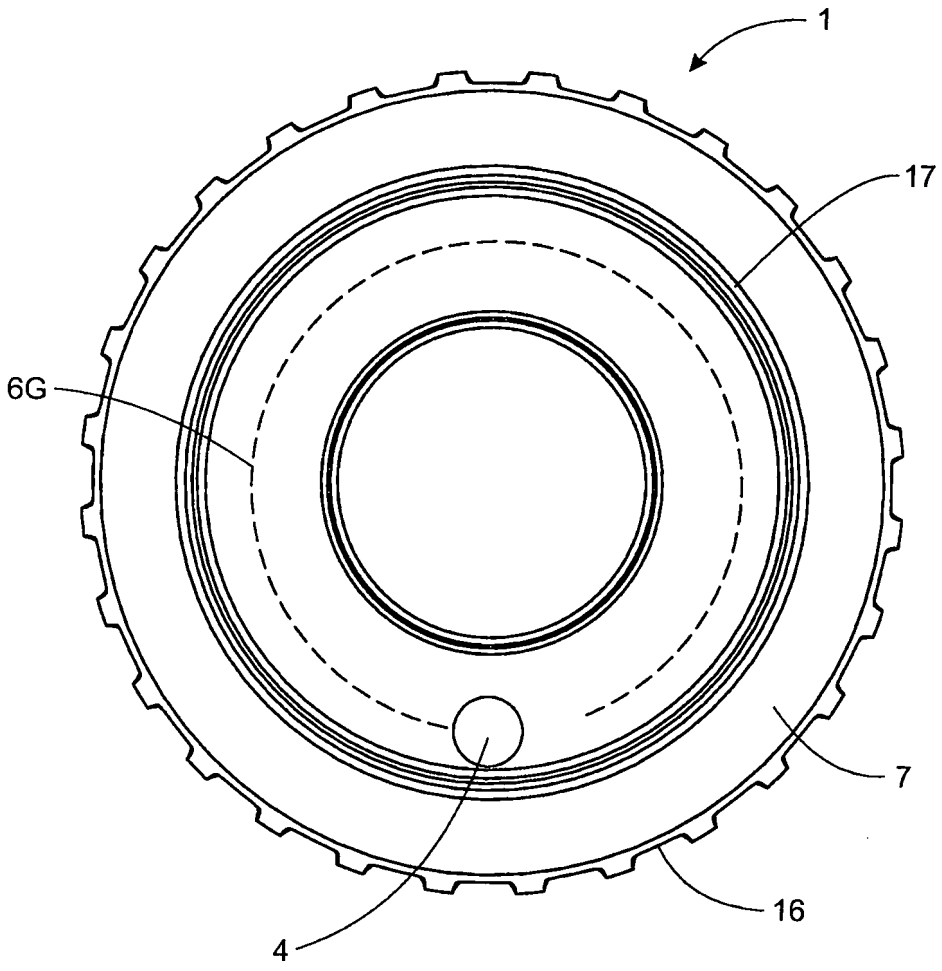


FIG. 23

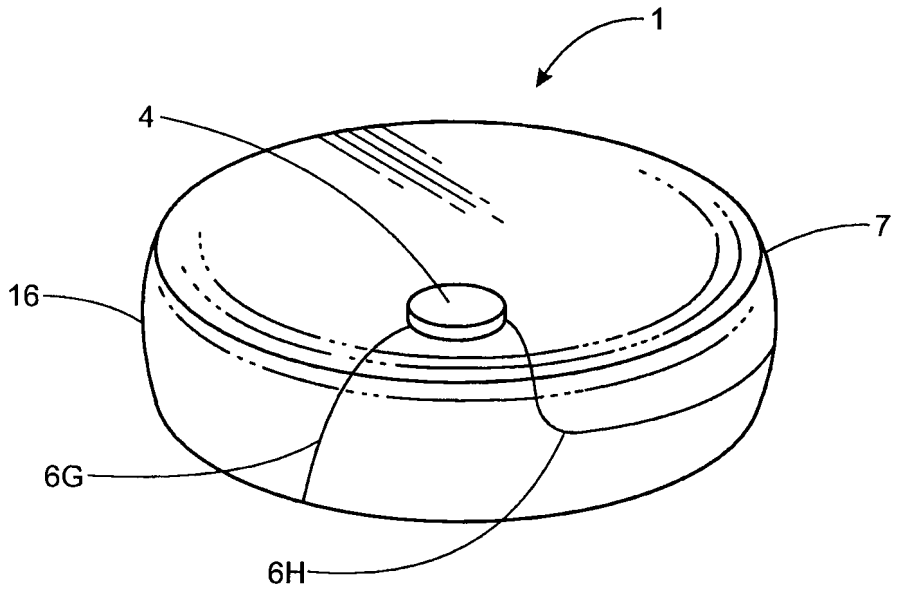


FIG. 24

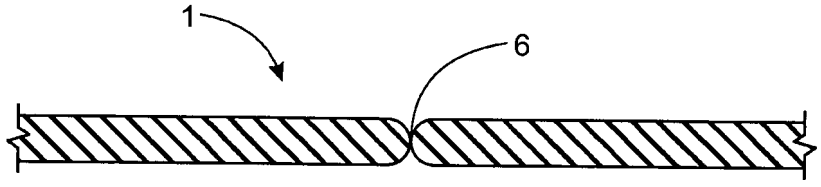


FIG. 25A

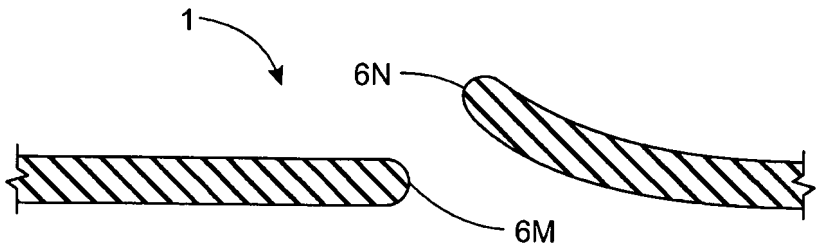


FIG. 25B

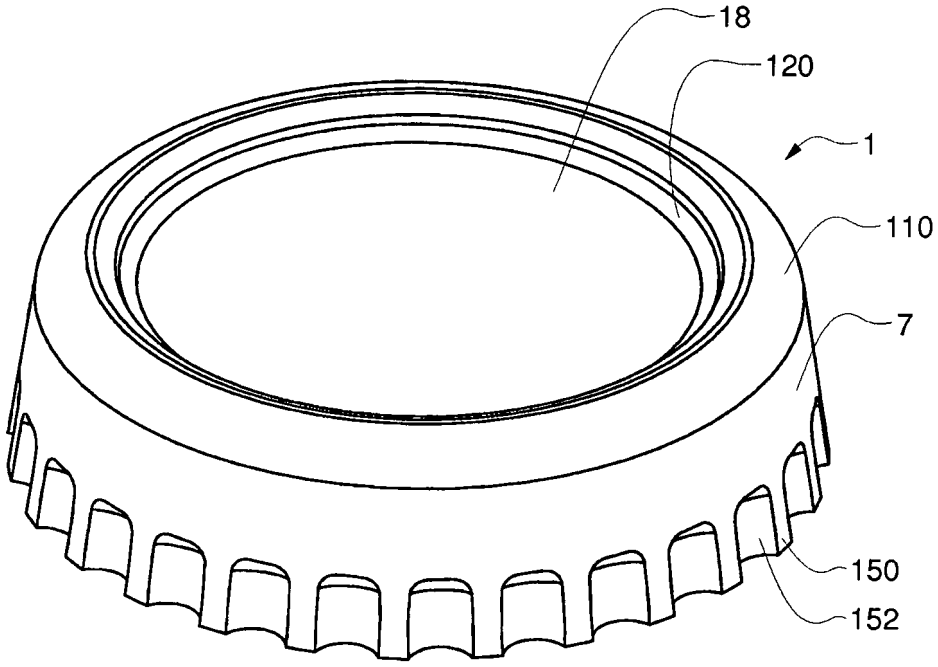


FIG. 26

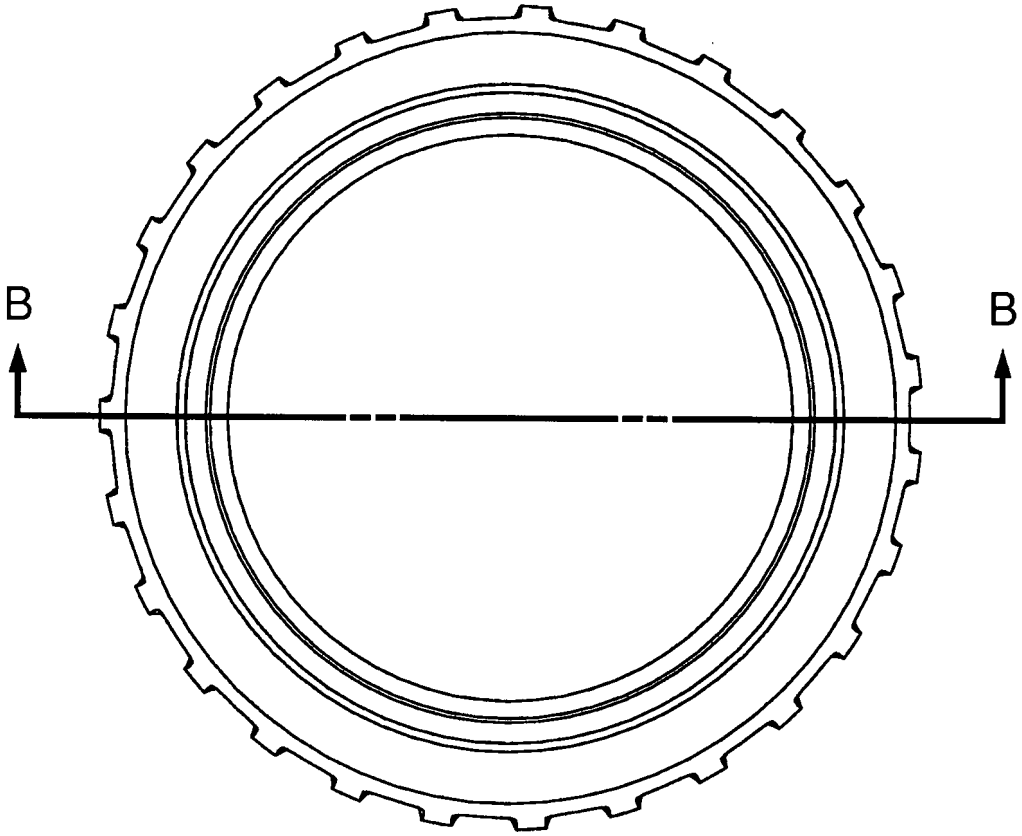


FIG. 27A

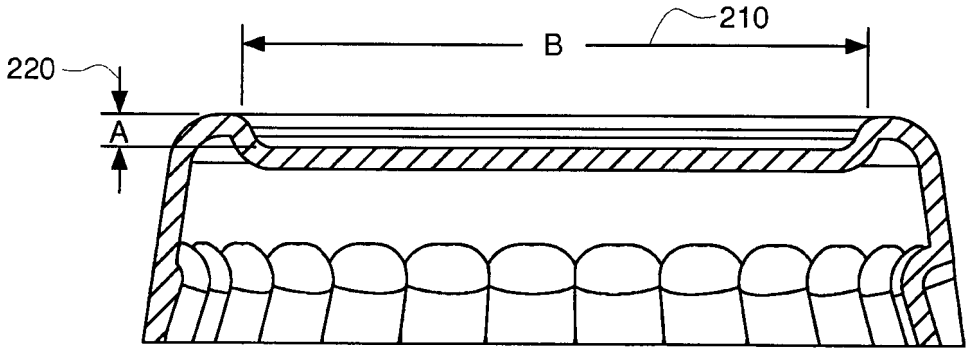


FIG. 27B

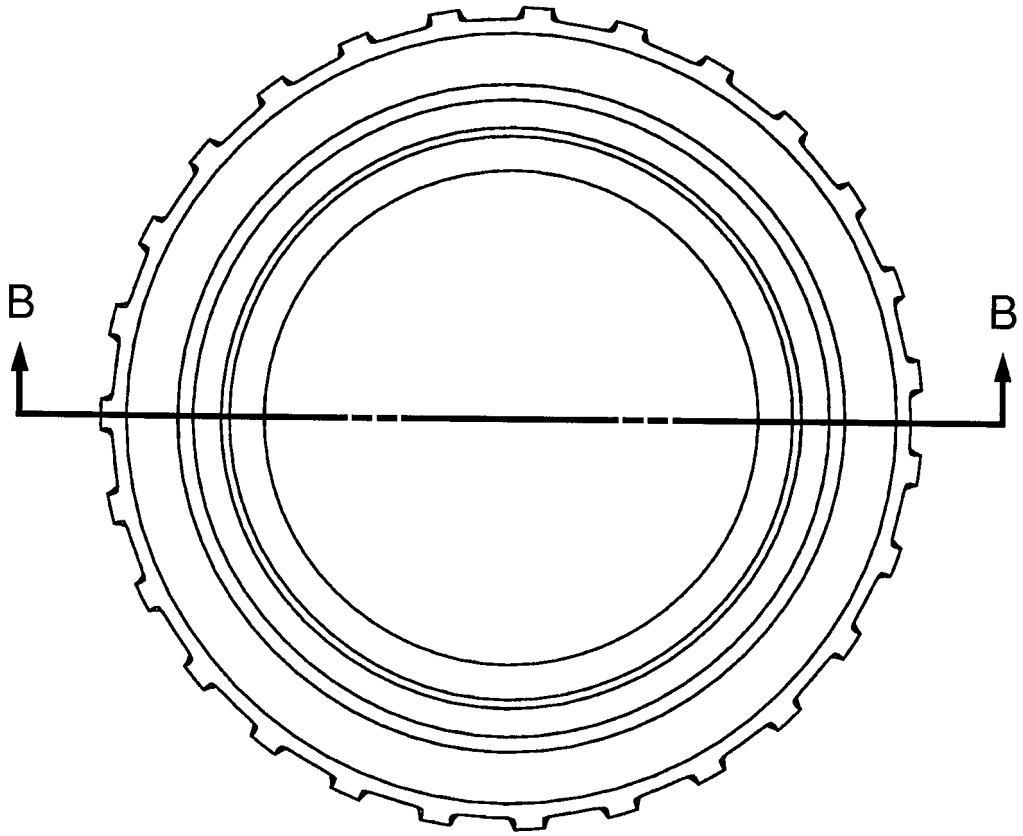


FIG. 28A

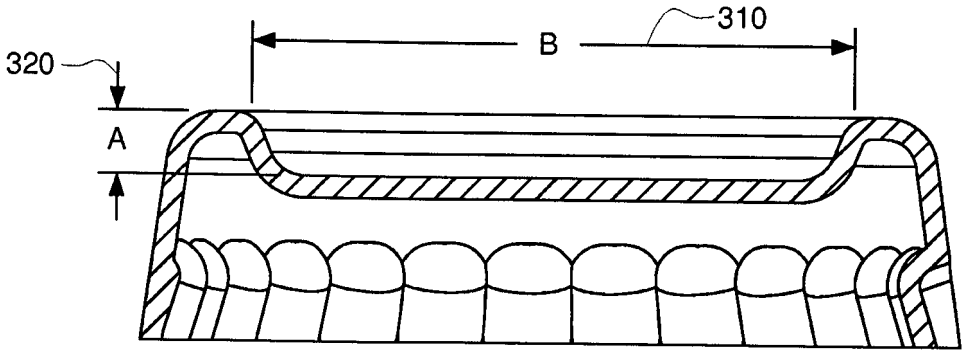


FIG. 28B

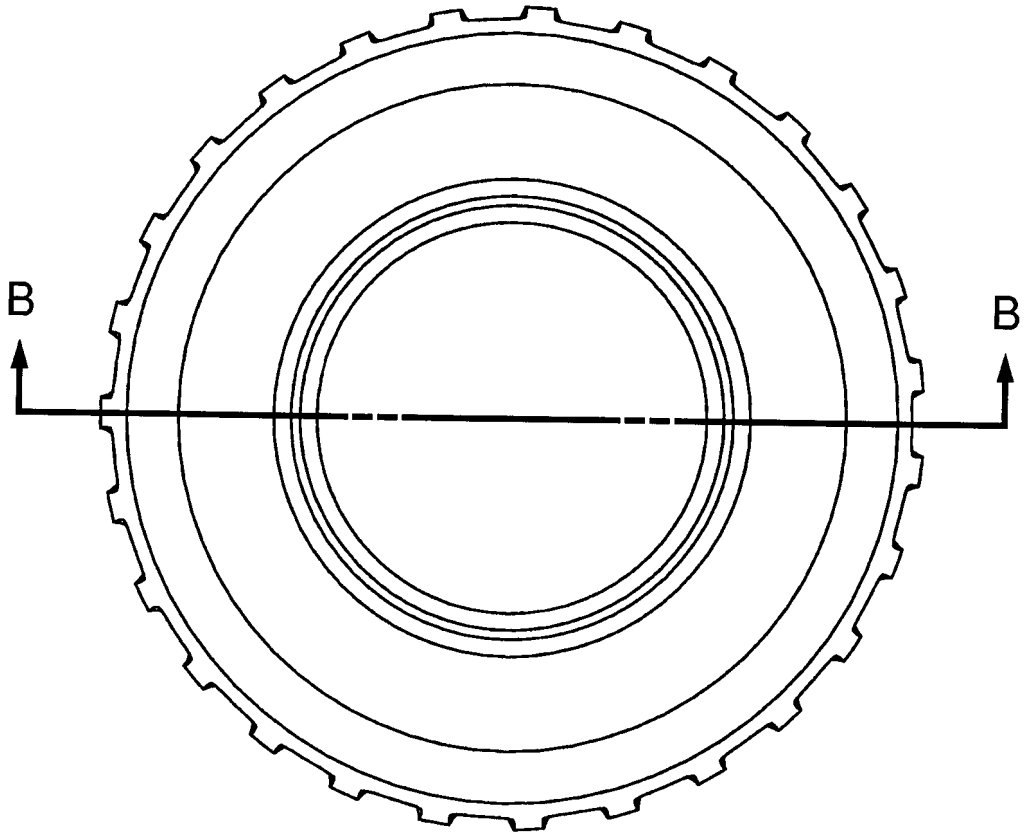


FIG. 29A

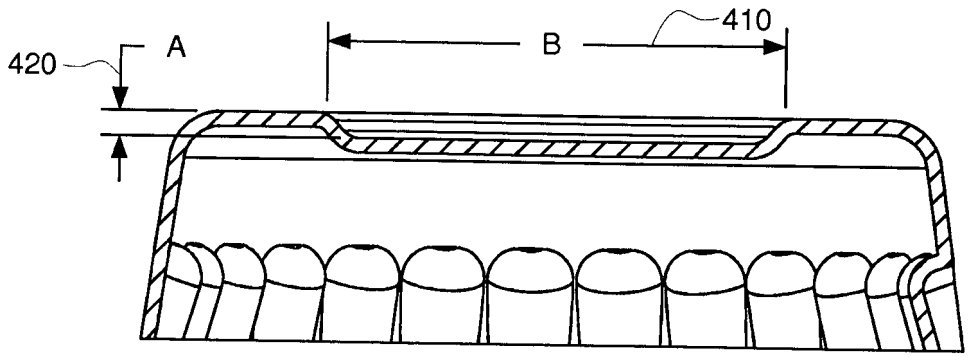


FIG. 29B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 12/53131

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B65D 41/32 (2012.01)
USPC - 215/256 220/260, 265, 266, 270, 272, 273; 215/200, 235, 237, 239, 250, 251, 253, 254, 255, 256,
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC-215/256

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8)-B65D 41/32 (2012.01)
USPC-220/260, 265, 266, 270, 272, 273; 215/200, 235, 237, 239, 250, 251, 253, 254, 255, 256, 295, 305, 316, 323, 328

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase (PGPB, USPT, USOC, EPAB, JPAB, DWPI, TDBD), FreePatentsOnline (US Pat, PgPub, EPO, JPO, WIPO, NPL), GoogleScholar (PL, NPL); search terms: bottle jug beverage drink milk container closure crown cap lid skirt ear*peel*frangible rip*break* scor*perforat*weak*thin*line tab pulltab pull* perimeter circumferen* peripher* around annular* curv*a

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X – Y	US 2011/0024381 A1 (FRISHMAN) 3 February 2011 (03.02.2011) Para 0034]- [0036], [0055]-[0056], fig 2-18	1-17, 19-20 --- 18
Y	US 2002/0195414 A1 (Kim et al.) 26 December 2002 (26.12.2002) Abstract	18
Y	US 2010/0200534 A1 (FRISHMAN) 12 August 2010 (12.08.2010) Abstract, Fig 2-20	1-20
Y	US 2007/0181526 A1 (FRISHMAN) 9 August 2007 (09.08.2007) Abstract	1-20
A	US 3522899 A (Siemonsen et al.) 4 August 1970 (08.04.1970) Abstract, Fig. 11	1-20
A	US 2003/0150834 A1 (Verderber) 14 August 2003 (14.08.2003) Abstract	1-20
A	US 4930656 A (Blanchette) 06 May 1990 (06.05.1990) Abstract	1-20
A	US 2005/0092751 A1 (Alvarez et al.) 5 May 2005 (05.05.2005) Abstract	1-20
A	US 4,066,180 A (Sanchez) 03 January 1978 (03.01.1978) Abstract	1-20

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 December 2012 (01.12.2012)	18 DEC 2012
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

(19)中华人民共和国国家知识产权局

(12)发明专利申请

(10)申请公布号 CN 103998348 A
(43)申请公布日 2014.08.20

(21)申请号 201280055603.0

(22)申请日 2012.08.30

(30)优先权数据
13/267264 2011.10.06 US

(85)PCT国际申请进入国家阶段日
2014.05.13

(86)PCT国际申请的申请数据
PCT/US2012/053131 2012.08.30

(87)PCT国际申请的公布数据
WO2013/052219 EN 2013.04.11

(71)申请人 艾贝·弗里希曼
地址 美国德克萨斯州卡罗敦剑桥郡2924号

(72)发明人 艾贝·弗里希曼

(74)专利代理机构 深圳市启明专利代理事务所（普通合伙） 44270
代理人 郁士吉

(51)Int.Cl.
B65D 41/32(2006.01)

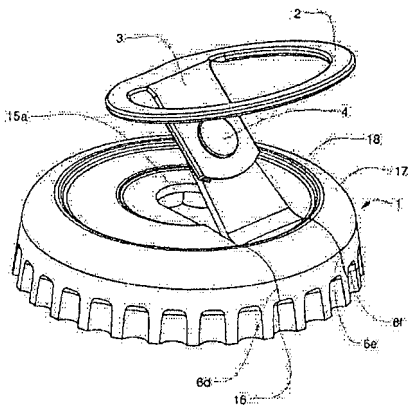
权利要求书2页 说明书12页 附图16页

(54)发明名称

易拉瓶盖

(57)摘要

用于瓶或其它容器的瓶盖具有一顶部以及从顶部连续下降形成的裙部，开启组件和易裂开的撕裂线被设置在瓶盖上，以使其能轻松从瓶口或容器上取下，波折结构强化了结构减少了瓶盖的材料用量。



CN 103998348 A

1. 一种用于容器开口的易开瓶盖，所述瓶盖包括：

具有连接部的顶部；

始于顶部位置终止于环形边缘的环形裙部；

一个连接在顶部连接部上的开启组件；

撕裂线结构包括：从所述连接部沿径向延伸至裙部底边的第一撕裂线；

以及由曲线构成的第二撕裂线，所述第二撕裂线包括：从顶部的连接部沿径向延伸到裙部环形侧壁的上径向段，以及始于上径向段端点，并在裙部的环形侧壁上沿裙部周向延伸的并基本上与裙底环形边缘保持间距的下环形段。

2. 根据权利要求 1 所述的一种用于容器开口的易开瓶盖，其特征在于所述开启组件进一步包括：

拉环；

附于拉环的拉片；

附于拉片的铆钉以及顶部的连接部。

3. 根据权利要求 2 所述的一种用于容器开口的瓶盖，其特征在于所述开启组件进一步包括杠杆，所述杠杆位于拉片之下。

4. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于所述顶部包括中心位置，所述顶部连接部在顶部的中心位置上。

5. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于所述顶部包括中心位置，所述顶部连接部偏离顶部的中心位置。

6. 根据权利要求 2 所述的一种用于容器开口的瓶盖，其特征在于所述顶部包括一凹位座。

7. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于至少有一条锥形的撕裂线，且该撕裂线接近裙边的深度大于接近连接部的深度。

8. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于包括位于顶部便于手动移走瓶盖的凹部。

9. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于进一步包括一个由顶部和裙部所限定的内部，一衬垫固定于内底面。

10. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于进一步包括位于拉环下的缓冲垫。

11. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于所述顶部是波纹状结构。

12. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于瓶盖厚度为 0.12-0.28mm。

13. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于所述撕裂线在瓶盖上形成易裂位，所述易裂位从连接部起向外延伸到裙底边，所述易裂部的横截面具有曲线轮廓形状。

14. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于所述撕裂线在瓶盖上形成易裂位，所述易裂位从连接部起向外延伸到裙底边，所述易裂位的横截面具有方形轮廓形状。

15. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于所述撕裂线在瓶盖上形成易裂位，所述易裂位从连接部起向外延伸到裙底边，所述易裂位的横截面具有 V 形轮廓形状。

16. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于至少所述撕裂线被撕裂后形成一个非尖锐边缘。

17. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于所述裙部包括多个锁齿。

18. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于所述裙部不带锁齿。

19. 根据权利要求 1 所述的一种用于容器开口的瓶盖，其特征在于第一撕裂线为曲线。

20. 一种用于容器开口的易开瓶盖，所述瓶盖包括：

具有连接部的顶部；

始于顶部位置终止于环形边缘的环形裙部；

一个连接在顶部连接部上的开启组件；

撕裂线结构包括：从所述连接部沿径向延伸至裙部底边的第一曲线状撕裂线；

以及由曲线构成的第二撕裂线，所述第二撕裂线包括：从顶部的连接部沿径向延伸到裙部环形侧壁的上径向段，以及始于上径向段端点，并在裙部的环形侧壁上沿裙部周向延伸的并基本上与裙底环形边缘保持间距的下环形段。

易拉瓶盖

相关申请

[0001] 本申请主张 2011 年 10 月 6 日提交的，申请号为 13/267264，名称同为易拉瓶盖，发明人为范思明的美国专利申请的优先权。

技术领域

[0002] 本发明涉及一种用于饮料瓶或类似容器的盖子或皇冠盖，特别涉及能用手拉开的瓶盖。

背景技术

[0003] 瓶盖必须紧紧固定在瓶口，以防止其内的液体溢出或压力损失（在加压或碳酸饮料）的情况下，同时密封对保持瓶内的卫生来说也是必要的。由于密封，也使得瓶盖很难单纯用手打开，提供一种不使用开瓶器具，结构相对简单能手动打开的饮料瓶，一直饮料供应商所期盼的。

[0004] 这里所称的盖亦被称之为皇冠盖，通过皇冠盖开口裙边上的一系列凹弧环绕圆形的瓶口，所述皇冠盖被固定于瓶口。各凹弧之间形成尖凸点，所述的凹弧和尖凸点在本专业领域常被人们称之为“锁口”。

[0005] 众所周知，拧开式瓶盖是手动开瓶技术的显著进步，但也常常会碰到握住瓶盖而拧不开的情况，还使得手被瓶盖的锁口弄得十分疼痛，为了保护手免于损伤，人们在拧瓶盖时常常用衬衣的角边或布包住瓶盖。

[0006] 盖与拉环相组合形成的瓶盖结构，类似于饮料罐上的拉环结构，在中国和亚洲已广泛使用。如由刘先生提出的，优先权日为 1999 年 3 月 4 日，国际申请号为 PCT/CN00/00040，公告号为 WO00/51906 的带拉环的瓶盖，但是这样的瓶盖并非容易打开，需要较大的力量去撕裂金属打破密封，然后除去瓶盖。

[0007] 另一种拉环瓶盖的解决方案为 1988 年 9 月 6 日申请的美国 6,1988 号专利所公开，其对应的产品被称之为 MaxiCrown®，MaxiCrown®产品其拉环位于瓶颈的侧边上，其所存在的问题在于使用这样的瓶盖无法使用常规的瓶口锁口机，而需要使用专用的瓶口锁口设备。

[0008] 综上所述，显然提供一种密封性好，易于手动打开，同时可使用常规锁口机的皇冠盖是十分必要的。

附图说明

[0009] 以下将结合非限制性的实施例及其附图对本发明作进一步说明，特别要指出的是在不同附图中相同的标示数字代表相同的部件，其中。

[0010] 图 1 是现有技术的一种瓶盖的俯视图。

[0011] 图 2A 是本发明实施例的一种瓶盖的剖视图。

[0012] 图 2B 是本发明的一种不同于图 2A 所示实施例的另一实施例的剖视图。

[0013] 图 3A 是本发明又另一种实施例的剖视图。

[0014] 图 3B 是本发明不同于图 3A 所示实施例的另特定一实施例的剖视图。

[0015] 图 4 是本发明又另一种特定的瓶盖实施例的剖视图。

[0016] 图 5 是本发明的瓶盖又另一种实施例的剖视图。

[0017] 图 6 是本发明的又一种瓶盖实施例的剖视图。

[0018] 图 7 是本发明的一种不同于图 6 所示实施例的另一实施例的瓶盖的剖视图。

[0019] 图 8 是本发明实施例提供的另一种瓶盖剖视图。

[0020] 图 9 是本发明的另一实施方案中所涉及的瓶盖的剖视图。

[0021] 图 10 是本发明进一步实施方案中的瓶盖的俯视图。

[0022] 图 11 是本发明的一实施例给出的瓶盖轴测视图。

[0023] 图 12 是不同于图 11 所示瓶盖的一种可替代实施例的轴测视图。

[0024] 图 13 是不同于图 11 所示瓶盖的一种可替代实施例的轴测视图。

[0025] 图 14 是图 13 所示的瓶盖的一种可替代的另一实施例的横截剖视图。

[0026] 图 15 是图 14 所示的瓶盖的一种可替代的另一实施例的横截剖视图。

[0027] 图 16 是图 13 所示的瓶盖的一种可替代的另一实施例的等轴测视图。

[0028] 图 17 是图 13 所示的瓶盖的一种可替代的另一实施例的俯视图。

[0029] 图 18A 是本发明的一个实施例的撕裂线的横断面视图。

[0030] 图 18B 是本发明一种不同于 18A 所示的撕裂线的另一种撕裂线的横断面视图。

[0031] 图 18C 是本发明一种不同于 18A 所示的撕裂线的另一种撕裂线的横断面视图。

[0032] 图 19 是本发明的一种瓶盖的瓶底仰视图。

[0033] 图 20A-20E 是本发明的瓶盖各实施例的俯视图，其展示了各实施例包括的从中心向瓶盖环形区域延伸直至边缘的左切痕曲线。

[0034] 图 21 是本发明的一种瓶盖的另一实施例的俯视图，其展示了一种偏心拉环瓶盖。

[0035] 图 22 是与图 21 所展示的实施例不同另一实施例的俯视图，其带有非标准的撕裂线。

[0036] 图 23 是与图 21 所展示的实施例不同另一实施例的俯视图，其亦带有非标准的撕裂线。

[0037] 图 24 是本发明另一具体实施例的等轴测视图，在该具体实施例中没有锁齿。

[0038] 图 25A 是本发明的一条未破损的撕裂线剖视图。图 25B 是图 25A 所示的撕裂线破损后的剖视图。

[0039] 图 26 是本发明的一种减少了材料规格的瓶盖的等轴测视图。

[0040] 图 27A 是图 26 所示瓶盖的俯视图。

[0041] 图 27B 是图 27A 的剖视图。

[0042] 图 28A 是本发明的一种瓶盖的可替代实施例的俯视图。

[0043] 图 28B 是图 28A 的剖视图。

[0044] 图 29A 是本发明的一种瓶盖的另一可替代实施例的俯视图。

[0045] 图 29B 是图 29A 的剖视图。

详细说明

[0046] 以下将通过一个或多个不同的方面以及多个实施例和 / 或特定的功能构件或子

构件的说明来引导出本发明的一些显然积极效果，对本发明的理解可参考一个或多个实施例中的说明或例子，特别强调的是，术语、例子以及附图的说明并非限制本发明，同时在以下的描述中，“皇冠盖”和“瓶盖”可以交替使用。

[0047] 图 1 是现有技术的一种瓶盖的俯视图。展示的是一种杠杆式易开瓶盖，包括瓶盖 1、拉环 2、拉片 3、铆钉 4，杠杆 5。切割线 6 形成约 30 度的夹角，且可设置在瓶盖 1 的背面上，如图 1 所示，很明显撕裂线 6 不延伸到瓶盖 1 裙部边缘，而是终止于或靠近拉环 2。通过压接在帽 1 上形成的多个锁齿环绕在瓶口上，这在图上没有显示出来，在现有技术中，撕裂线 6 沿其长度方向大致保持着相同的深度，其存在的问题在于现有技术的这种瓶盖存在的问题在于要将这瓶盖从瓶口移开可能需要较大的手动力。

[0048] 皇冠盖或瓶盖 1 通过杠杆 5 联接到拉片 3，当然所述杠杆 5 和拉片 3 可以为一体结构，同样拉片 3 与拉环 2 亦可以是一体结构，所述拉片 3 的另一端通过铆钉 4 被铆接在皇冠盖或瓶盖 1 的盖体的中央位置上。

[0049] 图 2A 展示的是本发明一个特定的实施例的瓶盖的示意图，拉环 2、拉片 3 以及铆钉 4 这样的组合以下我们称之为开启组件。内螺纹 8 供人们选择用手将瓶盖 1 上拧下，而不使用开启组件机构来开启。

[0050] 撕裂线 6 向下逐渐变细。从锁口 7 与瓶盖 1 顶的交界边缘到瓶盖 1 的近中央位置，所述撕裂线 6 为锥形的撕裂槽，所述锥形的撕裂槽的深度可以渐变，接近所述交界边缘位置处的深度可取 0.03-0.02mm，接近瓶盖 1 中央铆钉 4 位置深度可取 0.10-0.08mm。

[0051] 图 2B 是一种与图 2A 所示瓶盖不同的实施例，在图 2B 中没有了内螺纹 8，其是一种适合利用开启组件手动开启的瓶盖，在图 2B 中标示出了环形部或环形区域 7a，瓶盖 1 的这一部份，即所述环形部或环形区域 7a，卷曲成波纹状覆盖在瓶口上，形成以确保瓶盖固定于瓶口上的锁口，所述环形区域 7a 大约为从瓶盖 1 开始弯曲的位置或再稍内一点的位置一直到锁口 7 末端位置的这段区域。

[0052] 而所述撕裂槽靠近瓶盖 1 中心区域的端头 9 如图 2A 和图 2B 所述那样基本呈垂直状，本领域技术人员应能理解，撕裂槽的外形和尺寸只是一个工程选择问题，而不应成为对本发明的限制。例如，端头 9 可以是弯曲的、倾斜的或其它形状的。

[0053] 图 3A 是本发明的瓶盖另一具体实施例的剖视图，在图 3A 所示的实施例中，提供了一种不同于图 2A 和图 2B 所示的锥形撕裂槽，在本实施例中，所述撕裂线 6 沿向着端头 9 的方向以及向着锁口 7 边缘的方向逐渐变细，即向着中心的位置和边缘的位置增加了瓶盖 1 的厚度，这样的结构确保只有在合理的力量作用下才能手动打开瓶盖 1。

[0054] 附图 3B 是本发明的瓶盖的另一具体实施例的剖视图，在图 3B 所示的实施例中，没有了内螺纹 8，因此其使用开启组件手动开启。

[0055] 在图 2A、图 2B、图 3A、图 3B 所示的任一实施例中，瓶盖 1 上均设置了撕裂线，只不过撕裂线 6 的深度有所不同，这使得其可能是唯一的一种能使用合理的手动力而被开启的瓶盖 1，以下我们将进行更为详细地讨论，成为能用合理手动力开启的瓶盖 1 的相关尺寸范围以及制成材料。

[0056] 操作时，一个人手持住拉片 3 侧的拉环 2，上拉使其绕杠杆 5 支点转动，再沿撕裂线 6 拉动，杠杆 5 和铆钉 4 共同作用打开瓶盖 1 的中心并在手动力的作用下继续沿撕裂线 6 撕裂瓶盖 1 直至瓶盖 1 基本上裂开，从而瓶盖 1 很容易从瓶口除去，撕裂线 6 的撕裂槽方

便了沿撕裂线 6 手工撕裂瓶盖 1。

[0057] 图 2A 和图 3A 所示的实施例的积极效果在于可以在锁口 7 内适配内螺纹 8，这样使用者可选择拧开或拉开瓶盖 1，或使用开瓶器或其它的方式打开。

[0058] 图 4 为本发明瓶盖的另一种示例性实施例的剖视图，在本实施例中，其有一个相对图 2 的环形区域 7a 更为细长的细长环形区域 7b，将一个标准的瓶盖固定于带螺纹的瓶口上可能会存在一些问题，因为螺纹的原因增加了瓶口的表面积，一个标准的瓶盖不足以应对这额外增加了表面积的情况，细长环形区域 7b 其积极效果在于其可以提供一个细长的锁口 7c 卷绕在螺纹瓶口上，另一优点在于图 4 所示的瓶盖可以拧开，而不用如图 2A 图 3a 那样在瓶盖内设置内螺纹。

[0059] 杠杆 5 提供的杠杆作用和剪切力以撕裂开瓶盖 1 马口铁材料。

[0060] 图 5 是本发明另一实施例提供的瓶盖剖视图，在本实施例中省略了杠杆 5，拉环 2 和拉片 3 更为靠近瓶盖 1 的顶部，本发明的瓶盖可以在拉环 2 下设置一个凹部 10，以便手抓，所述凹部 10 提供一个适合手指尖或指甲插入的空间，以便向上发力。

[0061] 图 6 是本发明另一实施例提供的瓶盖剖视图，在本实施例中撕裂线 6 进入到环形区域 7a 呈曲线向瓶盖 1 锁口 7 的末端延伸。

[0062] 图 7 是本发明另一实施例提供的瓶盖剖视图，在本实施例中撕裂线 6 进入到环形区域 7a 如图 6 所示，沿其长度方向基本无如前所描述的那样有深度变化。

[0063] 图 8 是本发明另一实施例提供的瓶盖剖视图，在本实施例中拉环 2 上可设置一个或多个弓形部 11，这样提供一个隆起的空间来容纳指尖和指甲以便手抓住拉环 2. 这里对弓形部 11 我们仅作功能性说明，数量或隆起或弯曲的角度只是一个具体的设计选择问题。

[0064] 图 9 是本发明另一实施例提供的瓶盖剖视图，在本实施例中衬垫 12 被铆钉 4 固定于瓶盖 1 内，缓冲垫 13 设置在拉环 2 下，这样通过金属与皮肤的接触进一步提升了手抓拉环 2 时的舒适感。凹区 14 类似图 5 中的凹部 10，可以凹进至拉环 2 下，这样可使手指和指尖更易于把持住拉环 2 从而便于拉扯除去瓶盖 1。

[0065] 图 10 是本发明进一步实施例提供的瓶盖俯视图，图中去掉了拉环 2、拉片 3 以及铆钉 4，撕裂线 6 一般向环形区域 7a 延展，偏离想象的中心线 6a，呈发散状，在本发明中，所述撕裂线 6 的相对中心线 6a 的分布显然是可以多样的，例如，以虚线表达的撕裂线 6c 可能收敛于环形区域 7a，甚至可以是平行线，收敛或发散，收敛或发散的程度以及角度只是工程设计的选择问题，又如撕裂线 6 的数量，显然是不重要的，为此可以为每一个瓶盖 1 选择一特定的设计方案。另外，图 10 展示了一种带有二十八个锁齿的瓶盖。

[0066] 图 11 是本发明的一实施例提供的瓶盖的轴测视图，简单的图不足以清楚表达撕裂线 6d 和 6e 所标示的部份，在本优选的实施例中，其中一撕裂线 6e 带有 S 形段或尾段 6f，所述 S 形段 6f 沿锁口 7 周向延展，锁口 7 亦可称之为裙部 7，由瓶盖 1 的顶部向下形成，对裙部 7 的具体结构，在下文中将有进一步的披露。S 形段 6f 更方便人们从瓶口移走瓶盖 1。在操作时，人为形成的裂痕将从中心区 15 沿撕裂线 6d 和 6e 形成，沿撕裂线 6e 走向的裂痕到达 S 形尾段 6f 时，撕裂力会沿 S 形尾段 6f 的走向而远离撕裂线 6d，同时推动裂痕沿撕裂线 6d 直到末端 16 而使瓶盖 1 裂开，进而继续沿 S 形尾段 6f 撕裂锁口 7 使之与瓶口分离。包括 S 形段 6f 的撕裂线由上方的径向段和下方的环形段所构成，所述径向段沿径向从开启组件向裙边延伸形成，所述环形段顺接径向段的末端，并沿裙边的环形方向延伸形成，环形

段限定一个相对第一水平面的第二水平面，所述第一水平面由更低位置上的裙边所限定。

[0067] 图 11 所示的本发明的瓶盖的另一特点在于设置了一个或多个变质标识，如图 11 所示，在瓶盖 1 上设置的变质标识 17 为压痕，且设置成了不为拉环所遮蔽。容器是真空密封的，一旦变质标识 17 弹出则表明变质了。

[0068] 图 12 是图 11 所示的本发明瓶盖的另一具体实施例的轴测视图，通过本图我们更进一步对撕裂线进行说明，参见附图 12，所述撕裂线 6 可以是从中心 15 向外延伸出来的单一的一条，然后分叉成撕裂线 6d 和撕裂线 6e，撕裂线 6d 继续延伸到瓶盖 1 的裙部边缘，撕裂线 6e 呈曲线状顺接图 11 所示的 S 形段 6f。

[0069] 图 13 是图 11 所示的瓶盖的另一具体实施例的轴测视图，在图 13 中展示了图 11 显示的瓶盖 1 通过位于中心位置 15a 上的拉环 2 被突然打开的情况，所述拉片 3 被铆钉 4 固定于瓶盖 1 上，在手动力作用下撕裂沿撕裂线 6d 和 6e 进行。在所述瓶盖 1 的顶 17 上形成有一个或多个圆形连地限定出一个设置拉环 2 和其它开启装置的空间。

[0070] 图 14 是图 13 所示的本发明瓶盖的另一具体实施例的剖视图，裙 7 从与顶部 17 相连的肩部 19 开始下降，凹位座 18 具有足够的深度，为此拉环 2 放进去与瓶盖 1 的顶 17 基本齐平。这种优选的实施方式适合使用常规的瓶体封口机，而不需要必须对所述瓶体封口机进行改装或者维修。凹位座 18 在其周围形成一种波纹状的边缘，并且所述波纹状结构通常可以是抵抗弯曲平面的加强层，所述弯曲的方向大体上垂直于所述波纹状结构的方向。为此，凹位座 18 提供给加固瓶盖 1 额外的好处。凹位座 18 提供给加固瓶盖的进一步好处是，可以降低瓶盖的厚度，以便采用更低规格（更薄）的瓶盖材料，而不是使用标准的瓶盖。虽然图 14 显示了周围带有 17 个锁齿的瓶盖的一种实施方式，但是对本领域技术人员来说显而易见的是，凹位座 18 的积极效果并不依赖于锁齿的存在以及数量。

[0071] 图 15 是图 14 的瓶盖的另一实施方式的侧向剖视示意图。凹位 18 比图 14 所示的更加浅，所以拉环 2 设置成稍微或者部分的超出瓶盖 1 的肩部 19。这样的一种实施方式提供的益处是，手动开启可以更为轻松的抓住拉环 2。根据可允许的偏差范围，这样的一种实施方式也可以适合采用标准瓶盖封口机。

[0072] 图 15 也展示了一种可选的实施方式，其中衬垫 12 通过合适的粘合剂安装在瓶盖 1 的下表面，并且覆盖在铆钉 4 的底部。这样的实施方式可能有别于图 9 的那些描述，其中铆钉 4 将衬垫 12 固定在瓶盖 1 底部的适当位置。

[0073] 图 16 是图 13 所示瓶盖的一种可替代的实施方式的俯视轴测示意图。在这里，瓶盖 1 在拉裂线 6d 的末端 6 处被撕开。进一步地，用拉环 2 沿着 S 形曲线 6f 撕拉开锁口 7（未示出）并使该容器脱离开瓶盖 1。

[0074] 图 17 是图 13 所示瓶盖的一种可替代的实施方式的俯视示意图。图 17 的实施方式提供了印刷在拉环 3 上的印刷品，例如一种弯曲箭头 20，所述弯曲箭头 20 指示使用者大体上应当如何拉动延伸圈 2，以便利用拉裂线不费力的开启。通过印刷好的操作说明 21 提供进一步的解释，操作说明 21 可以写上例如“提起延伸圈向后拉动，实现开启”的内容。另外。警告 22 可以印刷在瓶盖 1 上。

[0075] 图 18A 为本发明所述拉裂线的一种实施例的侧向剖视示意图。为了形成拉裂槽，拉裂线 6 可以带有任意一个或多个的各式各样的断面结构，并根据工程选择一种具体的制造方式。例如图 18A 展示的方形或者矩形断面结构。

[0076] 图 18B 是图 18A 所示拉裂线的一种可替代的实施方式的侧向剖视示意图。这里展示了适合于拉裂线 16 的一种弧形断面结构。

[0077] 图 18C 是图 18A 所示拉裂线的一种可替代的实施方式的侧向剖视示意图。这里展示了适合于拉裂线 16 的一种 V 字形断面结构。

[0078] 图 19 为本发明所述瓶盖的一种仰视轴测示意图。线 12 依附于瓶盖内侧的顶部，并且设置在铆钉 4 的下端。另外，图 19 展示了所述瓶盖带有位于其边缘周围的 21 个锁齿的一种实施方式。

[0079] 图 20A-20E 为本发明的瓶盖的一些可替代实施方式的俯视轴测视图，各实施例均包括从中心向瓶盖环形区域延伸直至边缘的左切痕曲线，这样的设计减少了瓶盖打开时形成尖锐边的风险，各实施例提供的切痕、切割线或撕裂线均使得拉环被拉开时能形成沿瓶盖边缘的平滑的裂开痕，因此可替代的切割线包括图 20A-20E 中所示的 20，22，24，26 以及 28，各实施例中分别包括弧形左向的左切痕曲线（俯视图方向观看），以至于拉环被拉离瓶盖时，留下沿瓶盖裙部的弯曲形状而不形成尖锐边缘。20A-20E 所示的各实施例中，分别包括曲率不同的左切痕曲线 20，22，24，26 以及 28. 它们有不同程度的向下曲率，显然曲率的选择只是一种工程或设计选择问题，以获得所需的性能特征。例如，选择一个相对平坦的左切痕曲线 20，能产生一个光滑的边缘，但可能需要更多的力量撕裂，选择一个更弯曲的左切痕曲线，如 28，用较少的力量就能撕裂，不同的左切痕曲线 20 将形成不同形状的撕裂边缘。右边的切痕曲线 30，由于其终止于瓶盖的顶边，为此瓶盖被拉裂并从瓶口移开后仍为一整体。

[0080] 图 21 为本发明的一种瓶盖的另一实施例的俯视图，其展示了一种偏心拉环瓶盖。所述偏心拉环瓶盖具有一个偏离中心位置的铆钉 4，这样的结构对开启组件来说是有利的，如非饮料容器，诸如罐装的汤或红豆，常见其开启组件位于容器的边缘，撕裂线 6G 和 6H 基本上沿直线的穿越瓶盖 1 的顶 17 到瓶盖 1 的边 16，本质上铆钉孔或铆钉 4 或开启组件在瓶盖 1 顶部的位置只是一个工程选择的问题，本实施例的偏心拉环瓶盖只是一符合本发明精神的实施例。

[0081] 图 22 是与图 21 所展示的实施例不同另一实施例的俯视图，其带有非标准的撕裂线，在图 22 展示的实施例中，撕裂线 6G 和 6H 直接从铆钉 4 位置处降至裙部 7，在本实施例之前的描述中，所述撕裂线 6 中的撕裂线 6G 均只下降到边缘 16，同时所述撕裂线 6H 沿相反的方向延伸，并大致维持在边缘 16 以及顶部 7 之间。撕裂线 6H 包括一段上方位置上的径向段，该径向段从开启组件沿径向一直延伸到裙部 7，还包括一下方位置上的环绕裙部 7 的环形段，该环形段的起端与径向段末端相接并沿周向延展，其位置大致维持在边缘 16 以及裙部顶 7 之间。

[0082] 图 23 是与图 21 所展示的实施例不同另一实施例的俯视图，其亦带有非标准的撕裂线，用于打开瓶盖 1 的撕裂线呈开口环形，几乎环绕整个瓶盖顶 7，仅末端下降到裙部 7，图 23 展示的实施例的积极效果在于，当其用于非饮料，如汤、炖菜等用的容器上时，能提供一个较大的开口方便里面的东西取出来。

[0083] 图 24 是本发明另一具体实施例的等轴测视图，在该具体实施例中没有锁齿。在图 24 展示的瓶盖相当于一用于果汁类产品的压力密封瓶盖，其卷曲在瓶口上采用的且不是压接的方式，本实施例的瓶盖常见用于医疗用容器瓶上。

[0084] 图 25A 是本发明的一条未破损的撕裂线剖视图。图 25B 是图 25A 所示的撕裂线破损后的剖视图。本发明的瓶盖一项在安全方面的积极效果体现在撕裂线 6 的制造上，如图 25A、25B 共同展示的那样，撕裂线 6 相对的两端具有弯曲轮廓构形的边缘 6M 和 6N，撕裂线 6 这样形成的密封就如人两个左右手的手指相对形成的密封。每个手指的尖端是弯曲的，当两个手指都汇集在一起，可以形成一个密封。当图 25A 所示的撕裂线 6 在使用开启组件打开瓶盖 1 时所述撕裂线 6 将裂开成二个边分别为边 6M 以及边 6N，所述边 6M 和边 6N 是弯曲的或圆形的，这显然类似于将手指分开。

[0085] 图 25A 以及图 25B 所示的撕裂线 6 具有积极的效果的原因在于其减少了使用开启组件开启瓶盖 1 可能形成的尖锐边，圆形的撕裂边 6M 和 6N 使打开瓶盖的危险性较其它情况为小。

[0086] 对于撕裂线 6 的进一步考虑在于本发明的瓶盖 1 其制成材料应是有利于本发明的瓶盖能在使用开启组件的情况下较为容易地被一次性撕裂打开，是否容易轻松撕裂涉及撕裂瓶盖材料所需的力量，在现有技术中我们知道所需的拉扯力可以降低，即可以提升撕裂的容易程度的措施是存在的，如瓶盖使用的涂料或油漆含有以增加撕裂的容易程度添加剂的话，可减少沿撕裂线 6 撕裂瓶盖 1 材料所需的拉扯力。更为具体的实施例也还可以涉及生物降解塑料添加剂，用于瓶盖衬垫以改善瓶盖使用后衬垫的废物处置，在现有技术中有多种市售的生物降解塑料添加剂可供选择，具体如何选择只是一工程问题。

[0087] 此外，本文披露的各种结构用于现有技术的瓶盖均能形成优于现有技术瓶盖的积极效果，推荐的规格如表一所示。

表一

项目	可接受的范围/目标
1、外观	适当地附着的衬垫 白色、干净或者彩色衬垫 完整的衬垫 干净的衬垫 洁净的瓶盖和延伸圈 瓶盖和延伸圈没有生锈和刮伤 瓶盖的下表面有两条切割线 铆钉 瓶盖
2、规格尺寸	厚度（mm）：0.12- 0.28 内径（mm）：32.08 - 32.12 外径（mm）：26.60 - 26.90 圈心角（mm）：1.5 - 1.9 锁齿数目：21 - 32 拉环 直径（mm）：21.1 - 21.5 厚度(mm)：0.28 - 0.32 衬垫 直径（mm）：20.00 - 20.50
3、洛氏硬度	经过 30T 标准洛氏硬度试块测试，硬度为 4T
4、密封牢固程度	大于或等于每分钟 150PSI
5、面漆的硬度	不能被H型号的铅笔刮伤
6、感观	摄氏二十度下放置 12 周后没有明显的不同
7、析出	无颗粒物和絮状物
8、模拟码垛	每一瓶体承载 45kg 并存储一周的时间，CO2 的损失应相同
9、腐蚀性	轻微至中等
10、气味	无异味检出
11、拉环拉力（Kg）	少于或等于 2.5kg
12、材料组成	瓶盖和拉环为马口铁，衬垫为食品级的非 PVC 材料
13、包装	每箱 1000 个瓶盖
14、压力(Kg)	10Kg
15、40 英尺集装箱	1247 的标准纸箱
16、印刷	瓶盖上可印刷商标或其它标志
17、瓶盖抗氧化性	使用的材料是食物登记的 PET，干净、不带有气味，1.2 个单位（千分尺）

[0088] 特别是 30T 标准洛氏硬度试块下，虽然 T3 和 T5 的实施方式有益于特定的产品但是具有 T4 硬度的马口铁优选的用于所述的瓶盖（参见表 1 中的项目 3）。较佳柔软程度的马口铁应当提供给瓶体内置物足够的密封，同时借助所述瓶盖的开启工具总成只需要较小的力气就可以撕开所述马口铁。为了这样一个目的，马口铁掺杂包括锡以及锡合金在内的任何材料，并且瓶盖可以由此焊接而成，然而并不必然意味着瓶盖由锡以及锡合金制成。

[0089] 适用于本发明的延伸圈的拉力优选的为近似 2.5kg 或者更小（参见表 1 的项目 11）。例如前述的推荐值，这种相对较小的拉力使得实际上任何人具有足够的力量通过本发明的瓶盖打开瓶体。相反，采用相对较大的拉力的不利之处在于，需要较大的初始拉力撕开马口铁，并且一旦马口铁被撕开，突然释放的拉力导致所述瓶体在使用者手上剧烈晃动，在戏剧性的场合下经常导致瓶体泄漏。

[0090] 除了马口铁的硬度较低之外，瓶盖的厚度和直径也有助于实现较低的拉力。例如，本发明的瓶盖推荐的厚度低于 0.28mm（参照表 1 的项目 2）。标准的瓶盖的厚度大于或等于 0.28mm。优选的本实施例的瓶盖的厚度小于标准瓶盖，本实施例的瓶盖的厚度例如大约是 0.16mm，其中，起皱结构对本实施例的瓶盖进行加固。

[0091] 另外，除了前述已描述的实施外，还包括降低了瓶盖材料规格的实施例，在前述我们已提及的积极效果之外，进一步提供了进一步的积极效果。

[0092] 在世界范围内瓶盖的产值达数十亿美元，瓶盖的成本很大程序上决定于其所需材料的数量，一个降低成本的方法在于减少每个瓶盖所需要的材料数量，材料的数量可以通过减少瓶盖的厚度或尺寸来达成，通过减少瓶盖的尺寸虽然能实现瓶盖使用材料的减少，但可能会危及瓶盖的完整性，另一种方法是使用更少的材料，但使用更强的材料，然而，更强的材料可能比通常使用的用来制作瓶盖的标准镀锡板更昂贵，从而达不到节约成本的目的。真正可减少材料用量，而不损害强度的是所谓的凹位瓶盖，如图 13 所示，这样的瓶盖顶上有一容纳开启组件的凹位，以下描述的是一降低了材料规格的瓶盖的实施例，其展示了前述的凹位结构的积极效果。

[0093] 参见图 26，瓶盖 1 包括通过凹陷过渡部 120 与凹位座 18 相联接的顶部区域 110，裙部 7 从顶部区域向下延展形成，在一些特定的实施例中，从凸缘起斜向延伸形成裙部 7，交替的裙褶 150 以及凹区 152 形成在裙部 7 的圆周边上，瓶盖 1 以及其它图中所展示的瓶盖，为撬开式，包括一用于开启的杆。本发明还包括扭开式，通过扭打开瓶盖，这对于熟悉瓶盖技术的本行业普通技术人员来说，这是不难理解的，最后本发明的瓶盖 1 使用一个拉环式开启组件安装座以及在盖 100 上设置有效撕裂线是合适的。

[0094] 凹位座 18 是凹陷的，即其低于瓶盖的顶部 110，但其通过过渡面 120 与顶部 110 形成连续，为了便于陈述，我们将前述过渡面称之为凹弧 120，凹弧 120 可以各种方式来形成，以提供有利的形状，例如，在特定的例示性实施例中，在瓶盖 1 中完整地形成同心层、细槽或阶梯，直至凹位座 18 凹陷达到预期深度为止。图 26 则展示了以一个平滑的弯曲表面从顶部 110 到凹位座 18 形成凹弧 120 的情况。据推测，凹弧 120 的形状起到了支撑或结构加固的作用，有助于加固凹位座 18，使其免于弯曲或变形。

[0095] 沿着瓶盖 1 顶部 110 外围向下延伸的裙部 7，在特定的例示性实施例中，裙部 7 会平滑地向下过渡至呈放射状延伸的凸缘。裙部 7 可以较佳地卷绕到瓶颈上，以达到密封目的。在特定的例示性实施例中裙部 7 进一步细分为波状部和循环，所述波状部由裙褶 150 以及凹区 152 所限定。循环以周向均布方式为较佳，以使每个裙褶 150 均与围绕瓶盖 1 的其它所有裙褶 150 相同，且每个凹区 152 均与围绕皇冠盖 100 的其它所有凹区 152 相同。应理解，瓶盖 1 可能包含任何数目的裙褶 150 以及凹区 152。

[0096] 参见图 27A、图 27B、图 28A、图 28B、图 29A 及图 29B，图号中带有“B”的均为其相对应的图号中带有“A”的图的 B-B 剖视图。对应各实施例，分别标示为图 27A 和图 27AB、

图 28A 和图 28B 以及图 29A 和图 29B 的图中，顶盖板 130 的直径各不相同，如，各实施例中顶盖板 130 的宽度 B 分别为 210、310 以及 410，同时凹弧 120 的深度 A 相应分别为 220、320 以及 420。

[0097] 通过选择实施例，所述实施例具有特定的顶盖板直径 210、310 或 410 以及具有特定的凹陷深度 220、320 或 420，可以实现达到凹陷强化金属材料的特定结果，以较佳实施例为例，如图 27A、图 27B 所示，其顶盖板直径 210 相对较宽，凹陷深度 220 为中等深度，以可替换实施例为例，如图 28A、图 28B 所示，其顶盖板直径 310 为中等宽度，凹陷深度 320 为三个实施例中最深的，以另一可替换实施例为例，如图 29A、图 29B 所示，其顶盖板直径 410 为最窄的实施方案，凹陷深度 420 深度为三个实施例中最浅的。为了达到以凹陷方式强化金属材料的特定效果，可以用不同的顶盖板直径如 210、310 以及 410 与不同的凹陷深度如 220、320、420 进行组合，从而得到不同的实施方式。以凹陷的方式强化材料，已在薄片材料制作的薄板件或平板件上得到了验证。一个薄片产品如果其上形成凹陷，则用较少的材料就能提供原要用较多材料才能提供的横向强度，瓶盖就是薄片材料制成的薄片产品，所述薄片材料通常为铁片或镀锡铁片，经塑形而固于瓶子或其他容器顶部。标准的撬开式或拧开式的瓶盖的材料厚度均有一定的要求，厚度确定需考虑的因素包括防泄露性及瓶盖与容器连接的牢固性。

[0098] 凹陷结构的使用使得瓶盖以更少的材料达到等同于标准厚度瓶盖的强度。具有凹陷结构的瓶盖更薄，亦即，与标准瓶盖相比，具有凹陷结构的瓶盖的所用材料规格降低了。降低了材料规格的瓶盖的优势在于通过使用更少的材料实现了节约成本的目的。

[0099] 降低了材料规格的瓶盖的另一优势在于其应用于创新的“拉拔式”瓶盖上，正如相关专利申请中所述，“拉拔式”瓶盖具有一个附着于瓶盖上的拉片配件。该拉片会撕扯瓶盖材料的表面，从而使瓶盖与瓶子分离。降低了材料规格的瓶盖使得瓶盖与瓶子更易分离，因为瓶盖材料很薄，且撕扯动作平行于材料凹陷加固的方向，所以撕扯力无需超过材料经凹陷处理后的加固力。凹陷结构提供的加固垂直于材料的凹陷方向。

[0100] 除附图所说明的结构外，应理解，基于本发明的启示，会延伸出其它具备本发明凹陷结构优点并亦能提供降低了材料规格的瓶盖的其它结构出现，例如，从裙部的顶部向顶盖板中心延展的同心环以及形成于瓶盖顶盖板上的装饰形状，诸如星状、品牌标志状、体育队标志状、宗教徽章状等。

[0101] 凹陷结构可以用多种方式形成于瓶盖，包括（但不限于）金属冲压、模压、压花加工等。可通过塑料皇冠盖注射成型或其他适当的生产手段来制造本发明中的非金属瓶盖。

[0102] 相比于当前工业生产中的常规瓶盖，瓶盖 1 由硬度较高的铁片制成较佳。例如，常规皇冠瓶盖通常由单一的小镀锡铁片 T4（厚度为 0.21mm 到 0.23mm）制成。根据 ASTM623，该镀锡铁片的平均硬度（亦即，报告硬度值，不考虑 +/- 变量）为约 61（由 30T 硬度计测出）。相对于现有技术，本发明所述的皇冠瓶盖 100 会更薄、更轻；例如，瓶盖 1 可由厚度为约 0.16mm 到 0.18mm 的材料制成，但其性能却与常规厚度的瓶盖相当或大致相当。当瓶盖 1 由强度更大的铁片制成时，其更易达成减少金属用量的目的。例如，发明人已经证实使用 DR8（根据 ASTM623）或 DR550（根据 EN10203）制成具有凹槽的降低了材料规格的瓶盖的有效性。视需要，发明人推测还可使用其它材料，如较薄的单面镀锡铁片或回火强化型材料，以及与本发明上述各项具有类似性能的不含锡铁片等等。

[0103] 瓶盖 1 的平均硬度较佳地大于 62(根据 30T 硬度计测出，符合 ASTM623)，硬度大于 65，硬度大于 68，硬度大于 71，硬度越大越佳。图 26 及图 28A 所示的实施例使用硬度为 73 的铁片，其经证实非常有效。硬度上限取决于与金属板硬度有关的在压接工序或回弹（可能致使卷曲法兰变成非卷曲状态）过程中玻璃瓶中所能承受的最大应力。

[0104] 瓶盖 1 可由常规冲压设备制成，其只需对工具部件做出微小改动即可形成所需结构（如细纹状、十字状、星状以及涟漪状）。瓶盖 1 亦可由常规设备卷曲而成，其只需将缩口改得比现有常规卡扣钳更小即可。

[0105] 因硬度与屈服点与强度有关，所以瓶盖的硬度可以在屈服点中得到相应的体现。例如，DR8 或 DR550 镀锡铁片可能具有 550MPA 的屈服点（拉力试验结果）。

[0106] 然而，采用比 T4 软的马口铁或铝材制作瓶盖也可作为一个实施例，其被认为有着积极的效果，因为这样的材料有利于打开或撕裂，而波纹强化结构则允许在确保安全和密封的前提下使用较软的材料来制作瓶盖，本案发明人认为最佳的瓶盖应具备完美的密封性能以及良好地开启撕裂性能，这也是瓶盖设计和工程选择所要考虑的主要问题，但并不限定本发明中的瓶盖一定要具有本说明书中所述的全部结构、材料和 / 或优点。

[0107] 根据实施例，按本发明制成的商业可用瓶盖比许多常规瓶盖少用高达 25％的铁片，且其在碳减排方面也具有相应优势。减轻的铁片重量大致等于减少的金属厚度重量。而且，尽管冷却单一锯瓶盖所需的能量很少，但每年生产的全部瓶盖（北美约 450 亿，全世界约 3000 亿）冷却节约的能量还是非常可观的。

[0108] 瓶盖材料规格的降低影响马口铁或钢薄板以及 PVC 或非 PVC 垫的成本，另现有一种添加剂，其已可使金属瓶盖以及 PVC 或非 PVC 垫成为一种可降解的所谓积极垃圾。

[0109] 由此产生的较低的生产和运输重量成本，反过来，亦减少了二氧化碳的排放量。

[0110] 用薄铁板或薄钢板制造的用于啤酒或苏打水行业的瓶盖，所用薄铁板或薄钢板的厚度在 0.21mm-0.24mm 之间。目前采用本发明的方案所用薄铁板或薄钢板的厚度为 0.17mm-0.19mm。一个标准的撬开或拧开的瓶盖，重约 2.38 克，而本发明的瓶盖重约 2.14 克的重量，材料成本降低 10％。

[0111] 本发明的瓶盖的另一个好处在于瓶盖运输成本降低。在显然瓶盖重量的减少涉及运输燃料成本的节约，运输车辆磨损的下降以及二氧化碳排放量的减少。标准瓶盖是传统的包装，每箱 10000，如表 1 所示，但本发明的瓶盖每纸箱可装 11000 瓶盖，从而减少了能源消耗以及运输和二氧化碳的排放。

[0112] 本发明瓶盖的积极效果包括但不限于生产成本的降低、瓶盖价格的下降、运输和装卸成本的下降以及减少了二氧化碳的排放。

[0113] 除了前述所有的实施例中我们所提及的外，还有另外一个可适用于各实施例的方案，该方案可作为一项工程、设计或营销的选择，这就是温变色油墨，现有技术的温变色油墨为美国专利号 6634516 所公开，在引纳入本案以供参考。这样的温变色油墨的颜色变化可在室温下显示一种颜色（约 21℃），在冷藏，例如标准零售制冷温度为 4℃时显示另一种不同的颜色，例如在室温下是透明的油墨，但在低温下变的比较不透明的，这样的客户可无距离观查到并对容器的温度进行确认。

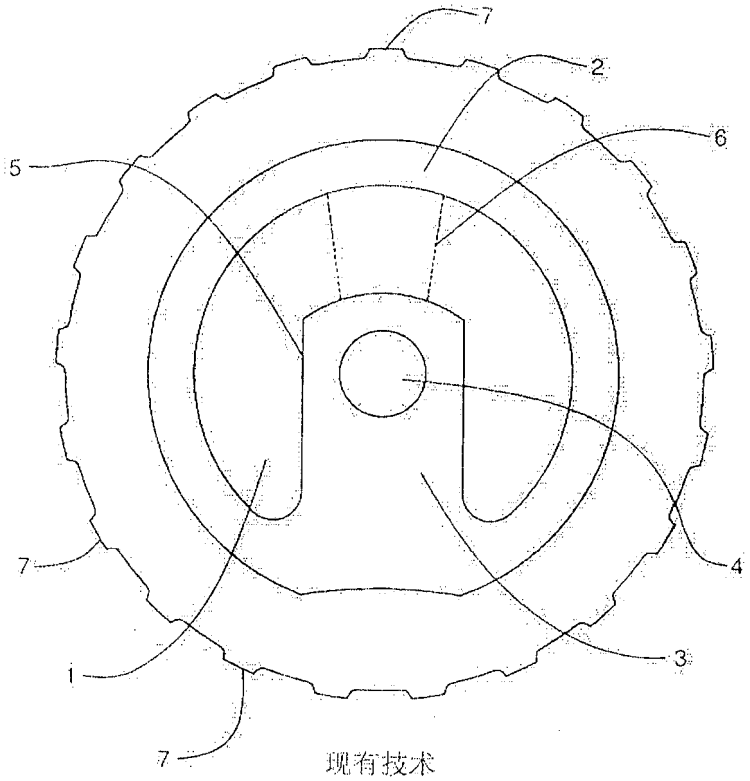
[0114] 在实施例中对附图描述的目的是以提供的对各种实施例的结构有一个大致的了解，并没有打算通过结构描述的方式对所有元件、装置和系统功能作全面的描述。仍可能会

有许多其他的实施例存在，相信那将是本领域技术人员在了解我们对本发明所作的描述后而衍生的，任何结构、材料和逻辑替换以及变化也不会偏离我们披露的范围。数字仅仅是表象，可以不按比例绘制。比例有些人可能加大，而其他人可能会减少。因此，规范和图纸应是说明性而非限制性的。

[0115] 若披露不止一项发明，则为方便起见，可通过“发明”一词单独或共同引用发明主题的实施例，但不得将本发明的范围限于任何单一发明或发明概念。因此，尽管本发明已解释且描述了一些具体实施例，但应注意，为达成同一目的所做的任何安排均可由所示具体实施例代替。本发明旨在涵盖各种实施例的全部修改或变更。以上实施例及本发明未具体描述的其他实施例的组合将便于熟悉本领域的技术人员审视上述实施方式。

[0116] 本发明摘要符合 37C.F.R. § 1.72(b) 的规定，根据该规定，摘要需能够使读者快速读懂技术发明的性质。提交摘要时，应理解，摘要不得用于解释或限制权利要求书的范围或含义。另外，在上述“具体实施方式”中可以看出，为合理解释本发明，单一实施例会综合展示各种特征。这种披露方法不应理解为反映如下意图：即所主张实施例的特征需多于各技术方案中明确叙述的特征。而且，正如权利要求书中所见，发明主题展示的特征少于单一实施例的全部特征。因此，我们特此将权利要求书的内容纳入详细说明中，每一权利要求均作为一单独的实施例。

[0117] 本发明在具体实施方式中引用了若干例示性的实施例。但是，应理解，本发明描述所涉及的术语仅供描述与说明用，而非限制本发明。如当前所述及如所修订，可在所附权利要求书范围内进行修改，但不得背离本发明全部内容的范畴与精神。尽管具体实施方式中提及一些具体方法、材料与实施例，但不得将本发明限于此；而且，本发明应延伸至（诸如）所附权利要求书的全部功能相当技术、结构、方法与用途。



现有技术

图 1

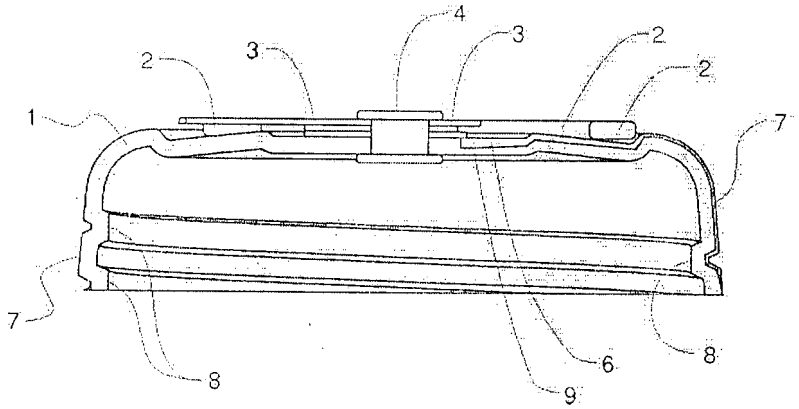


图 2A

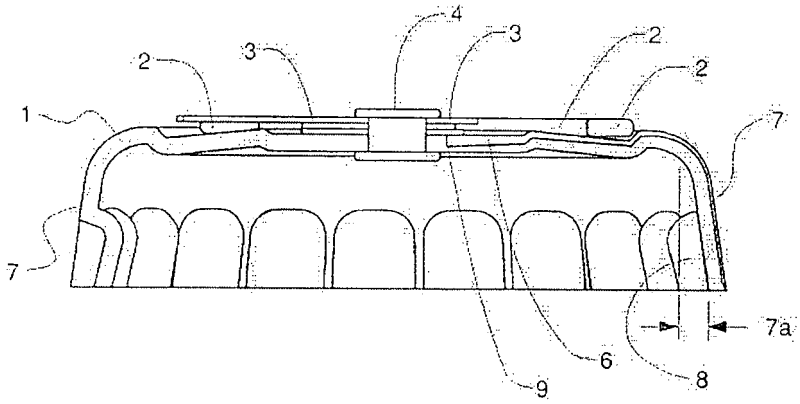


图 2B

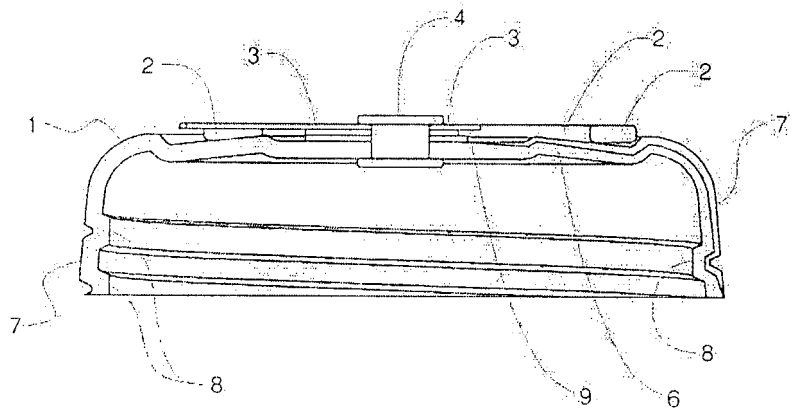


图 3A

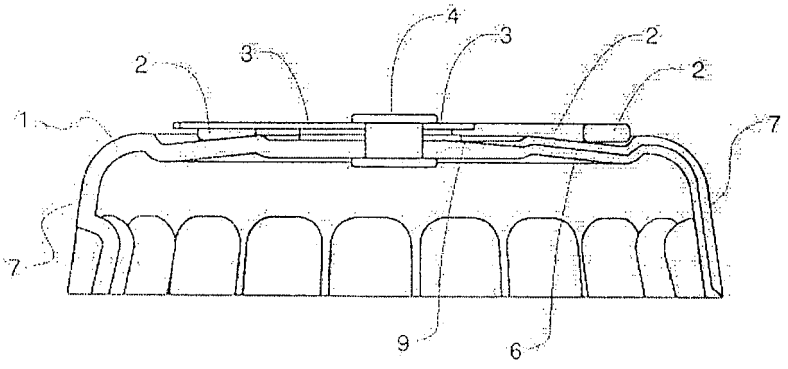


图 3B

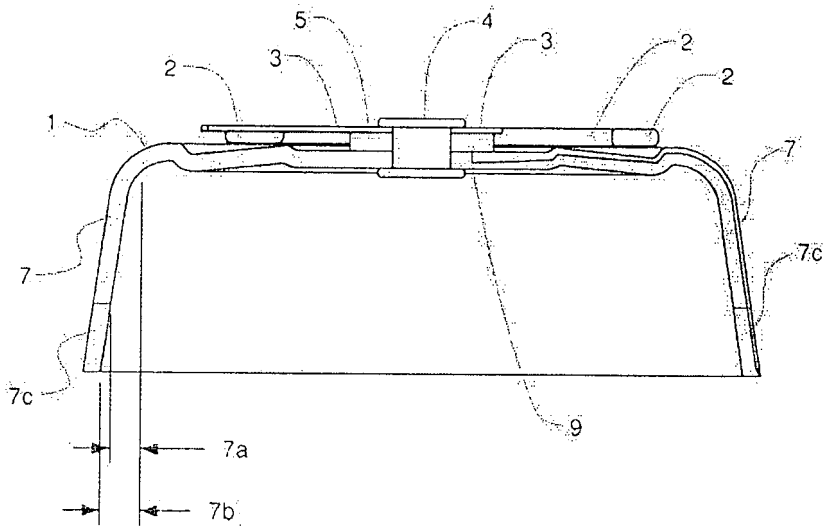


图 4

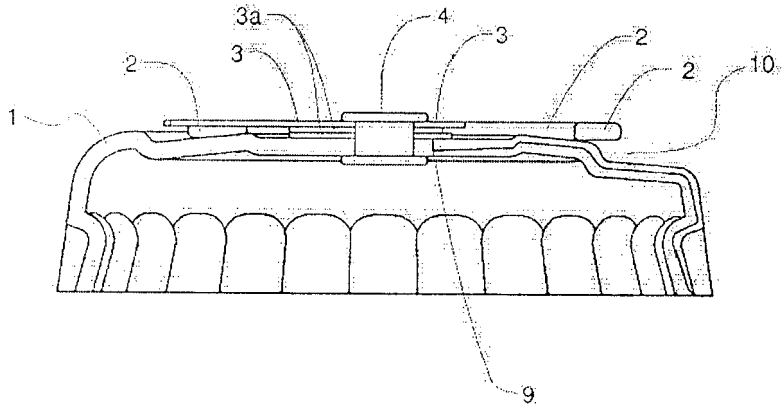


图 5

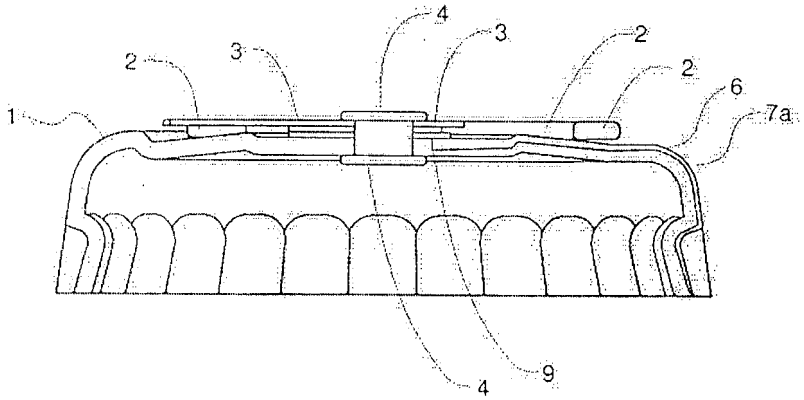


图 6

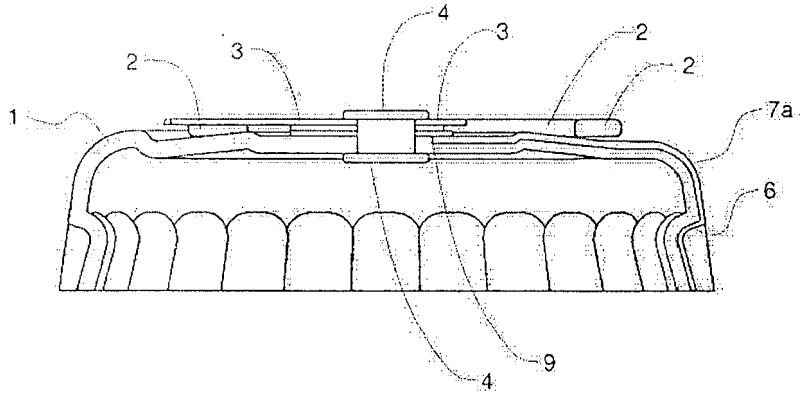


图 7

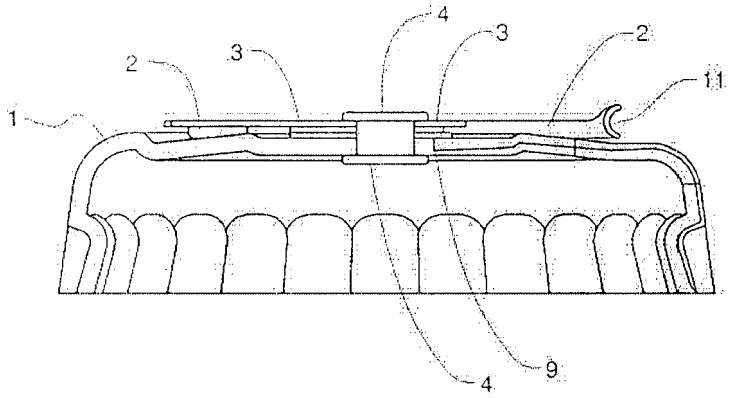


图 8

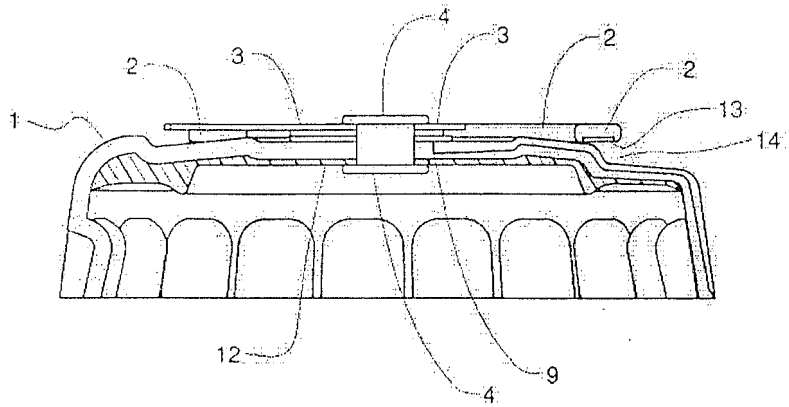


图 9

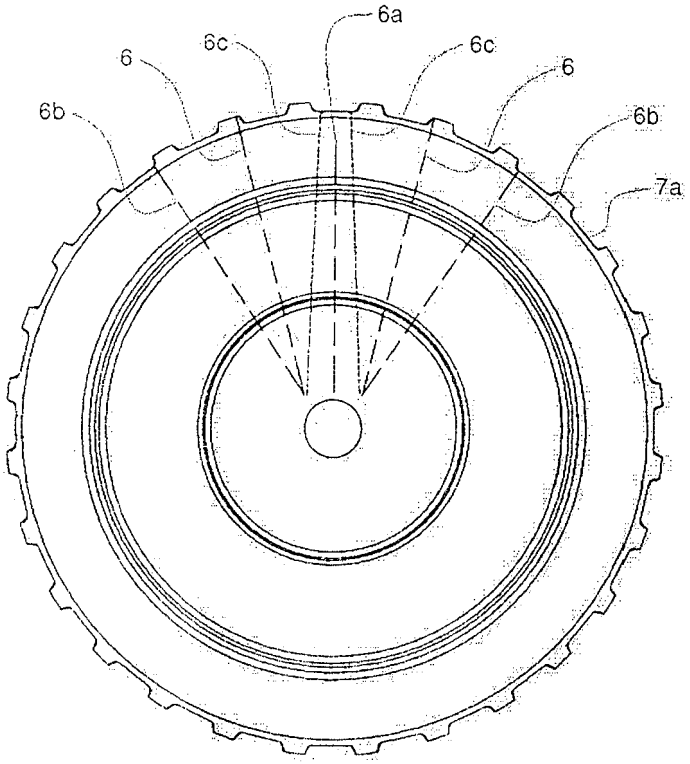


图 10

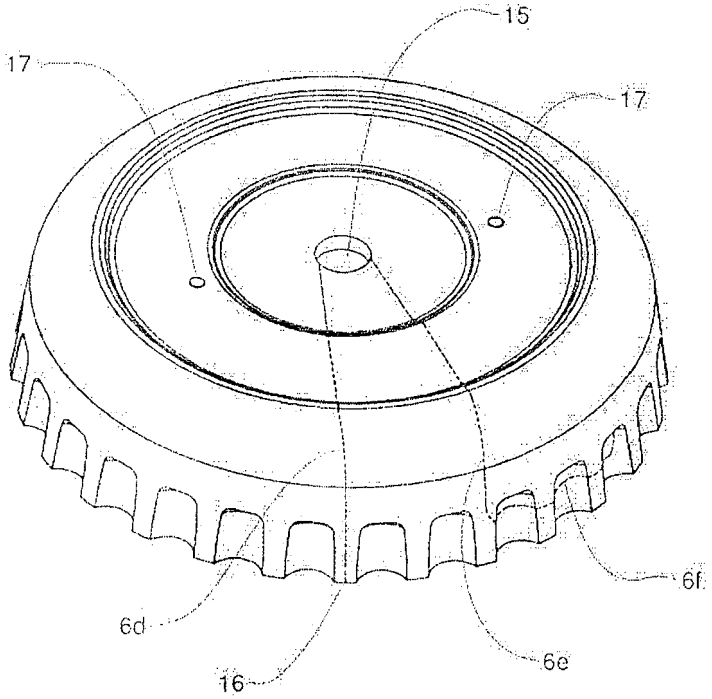


图 11

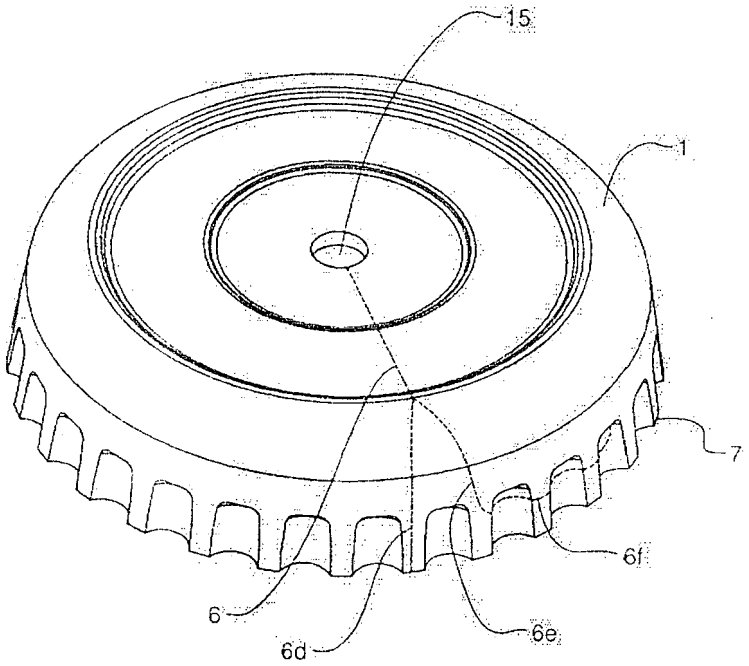


图 12

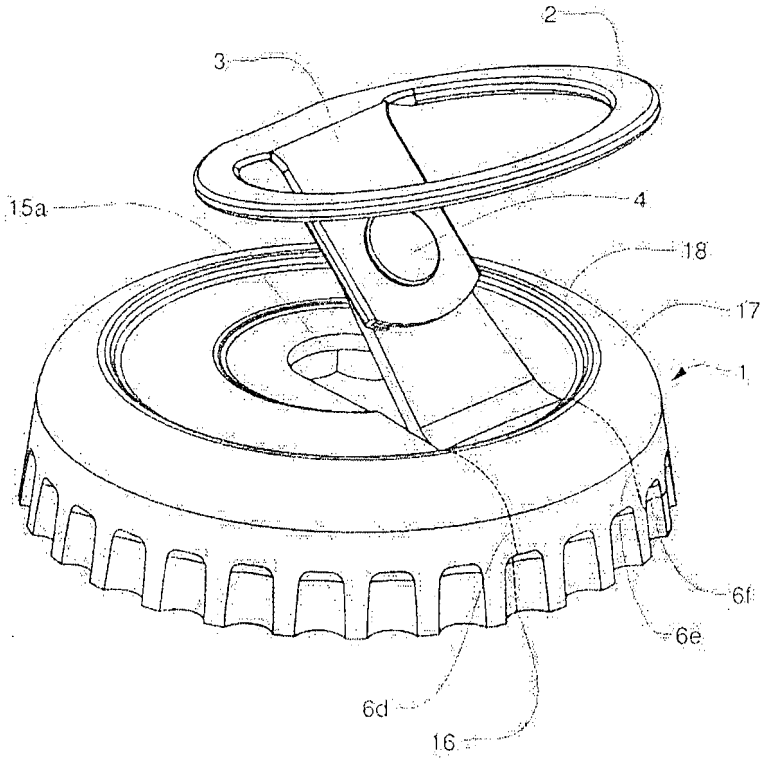


图 13

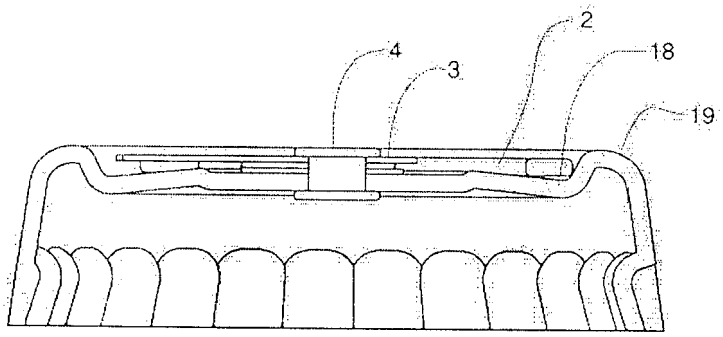


图 14

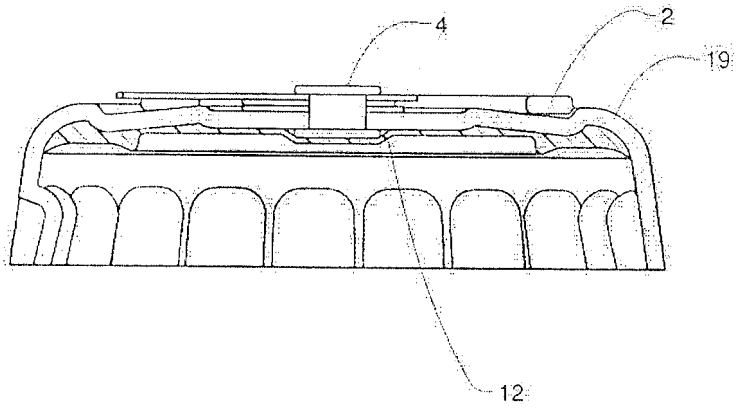


图 15

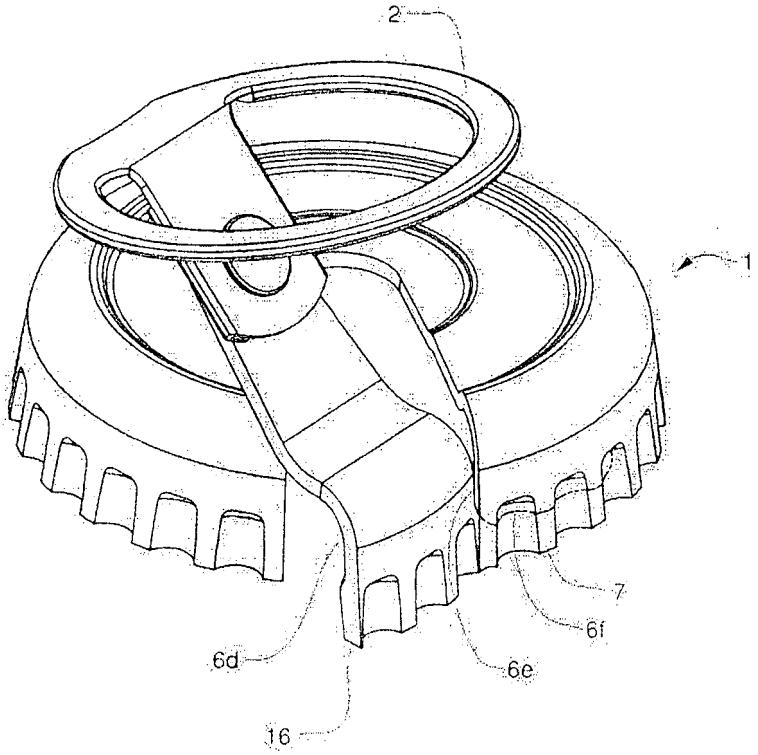


图 16

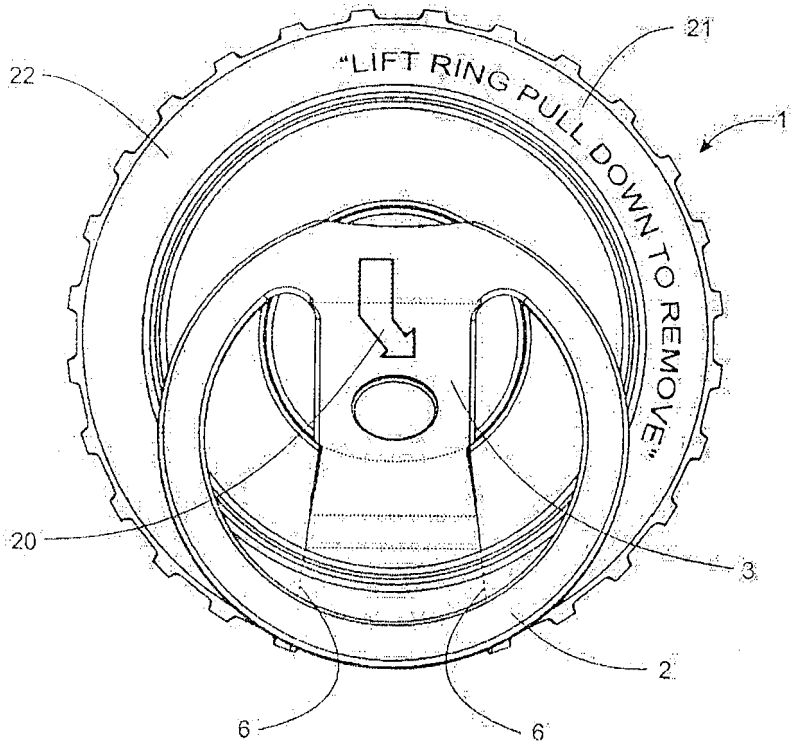


图 17

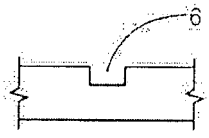


图 18A

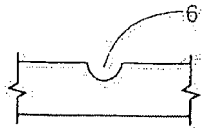


图 18B

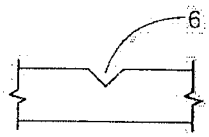


图 18C

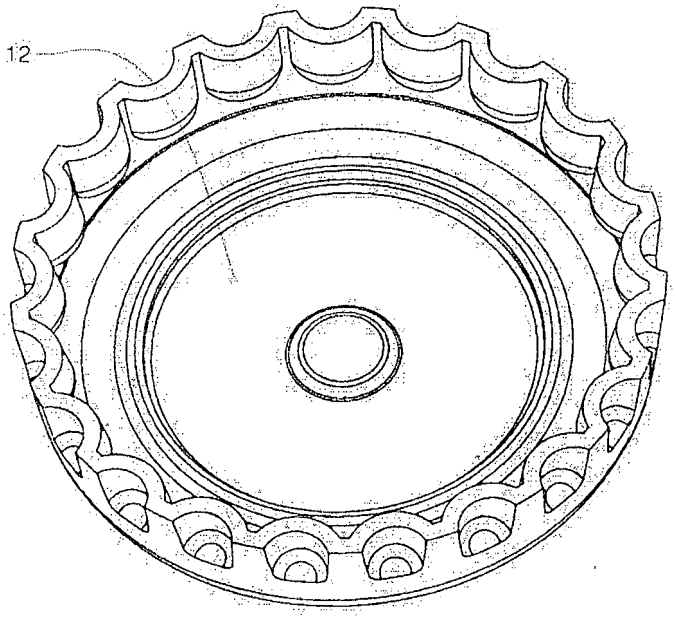


图 19

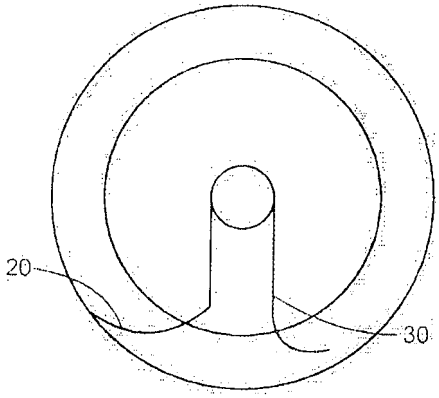


图 20A

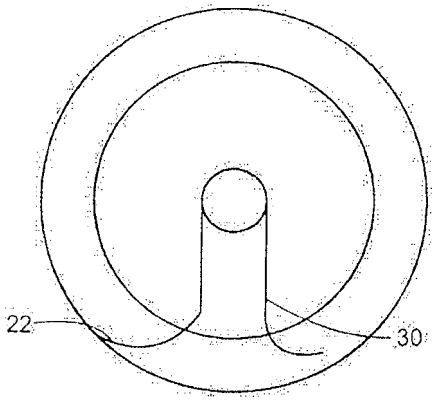


图 20B

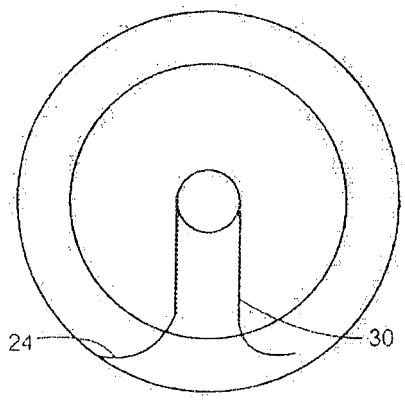


图 20C

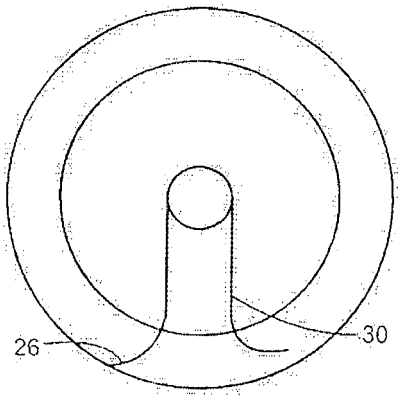


图 20D

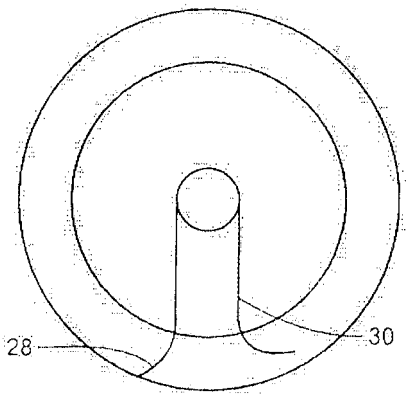


图 20E

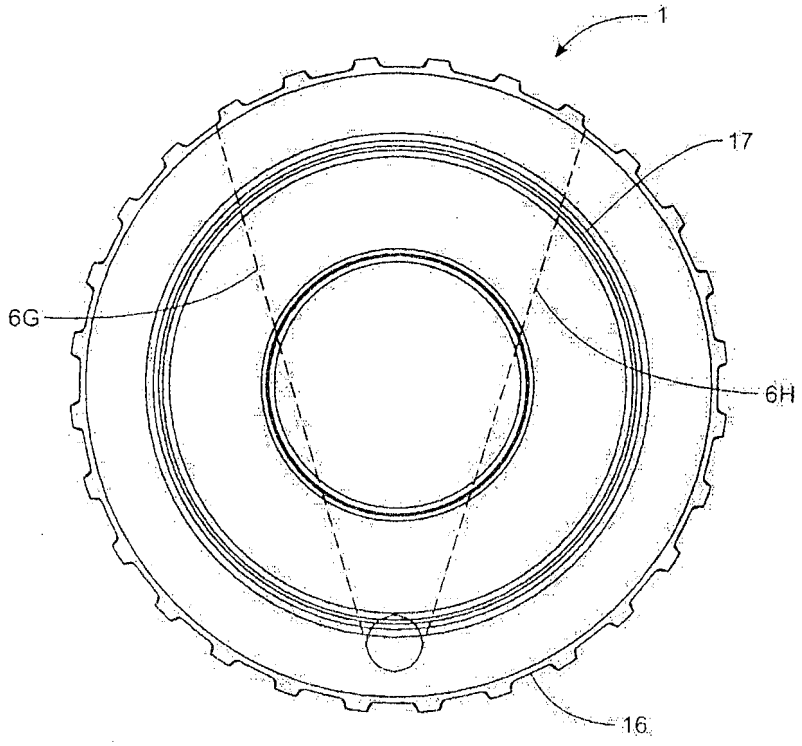


图 21

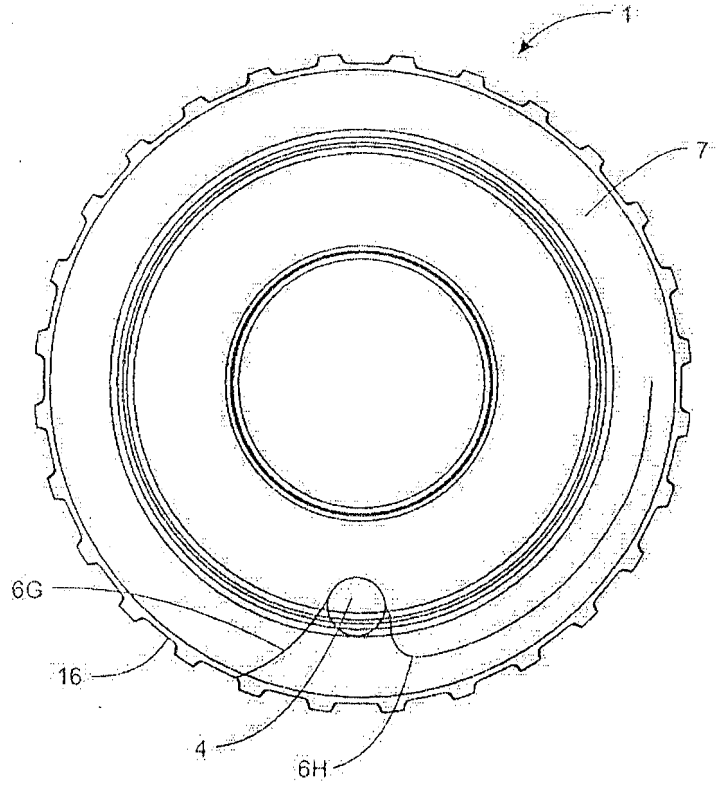


图 22

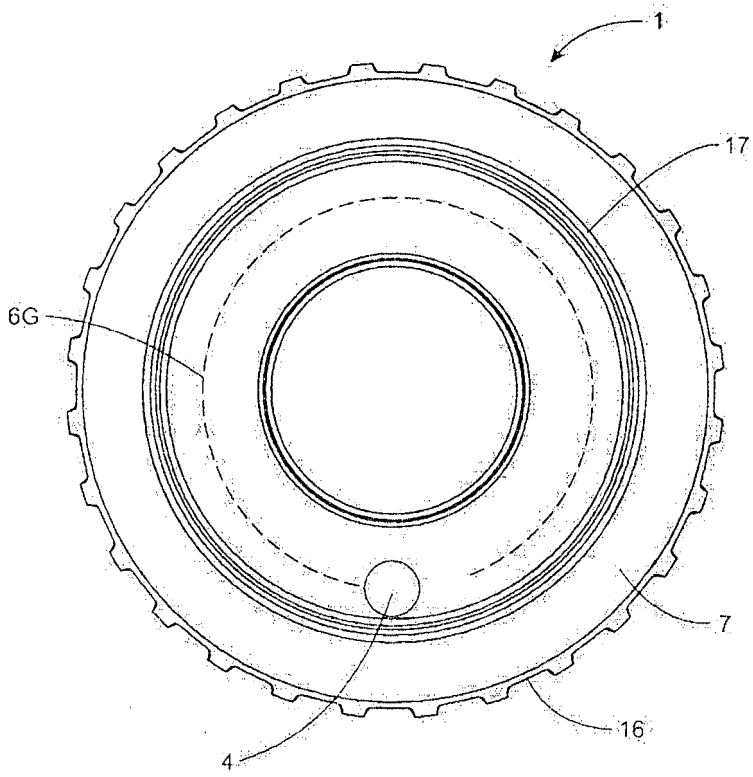


图 23

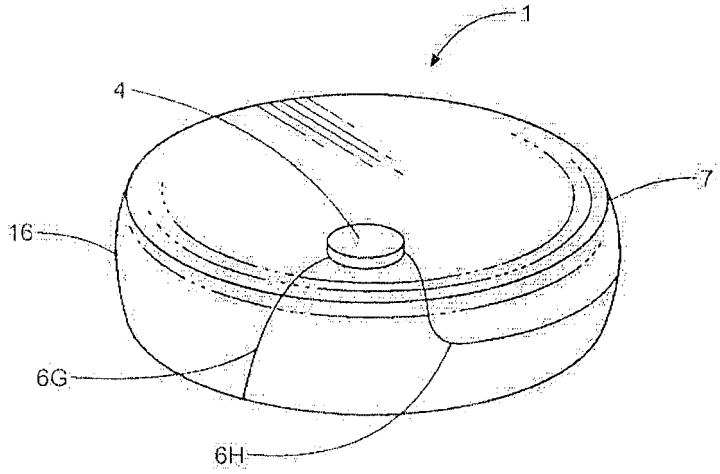


图 24

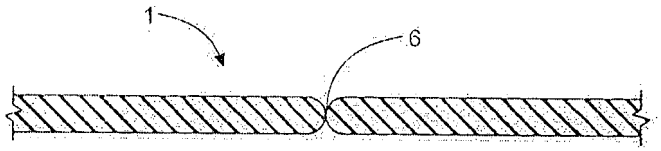


图 25A

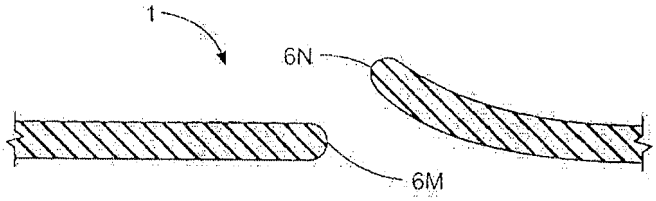


图 25B

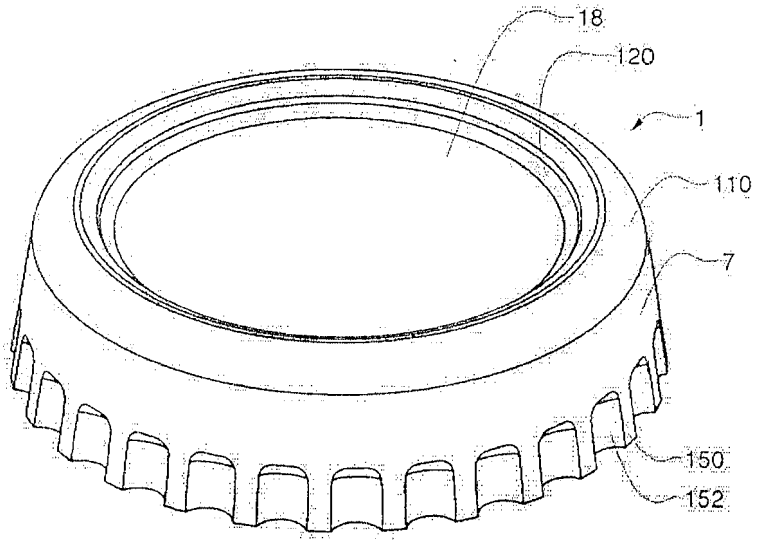


图 26

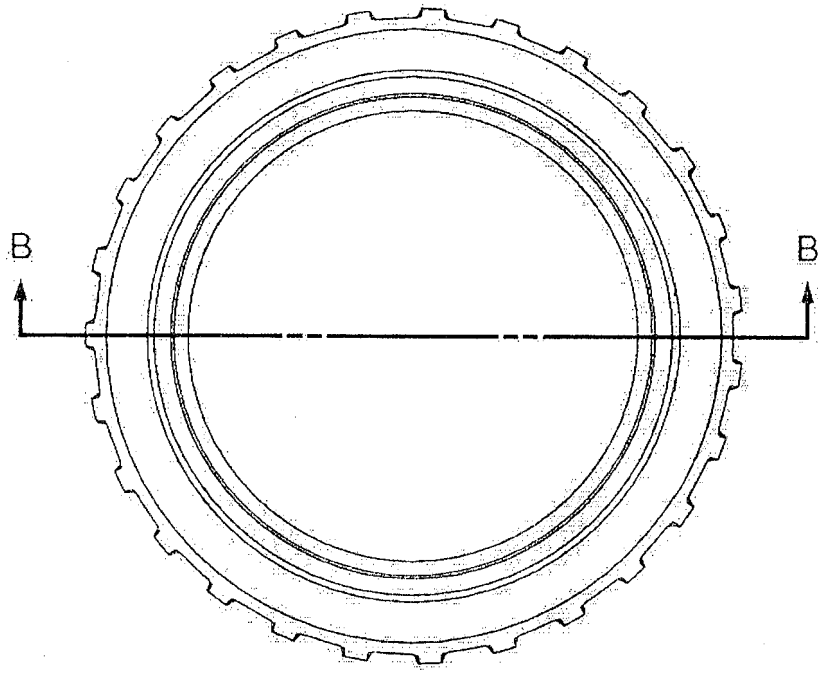


图 27A

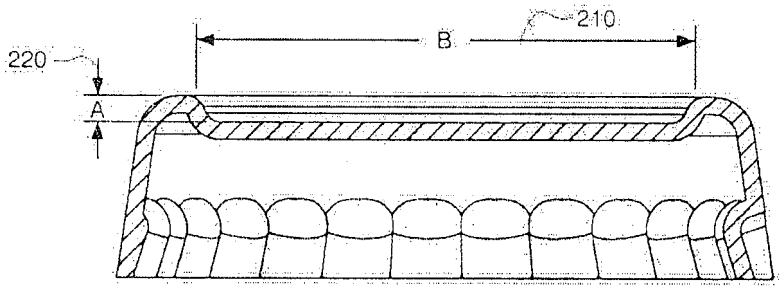


图 27B

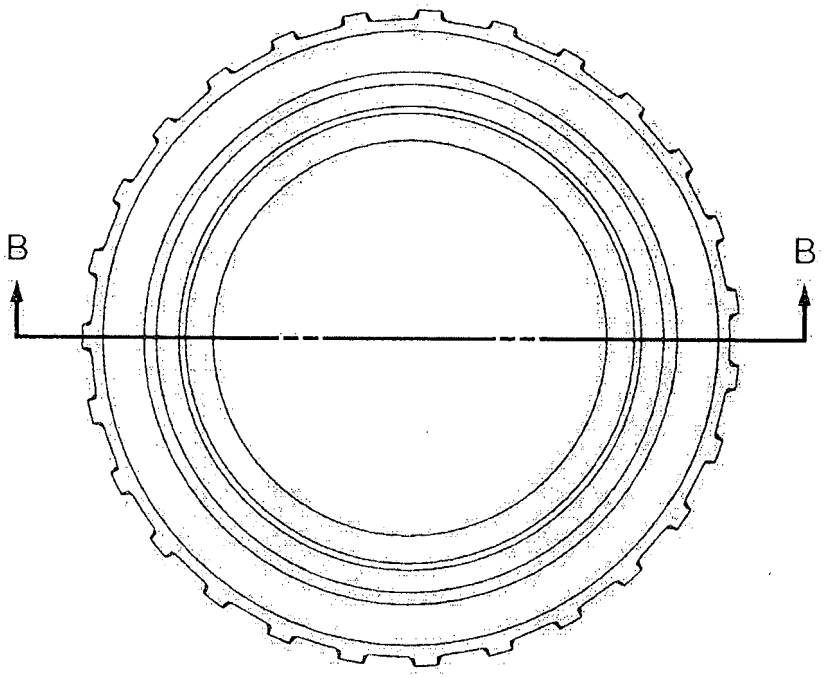


图 28A

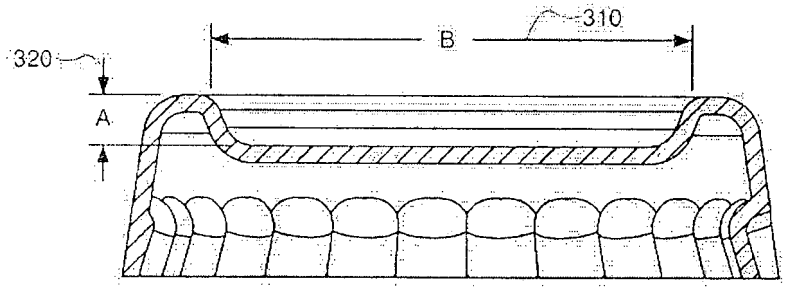


图 28B

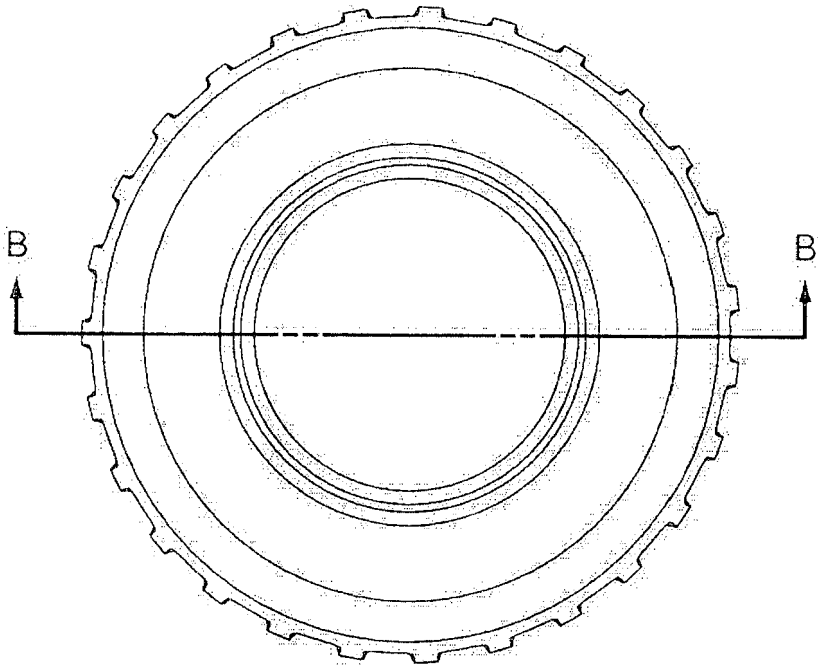


图 29A

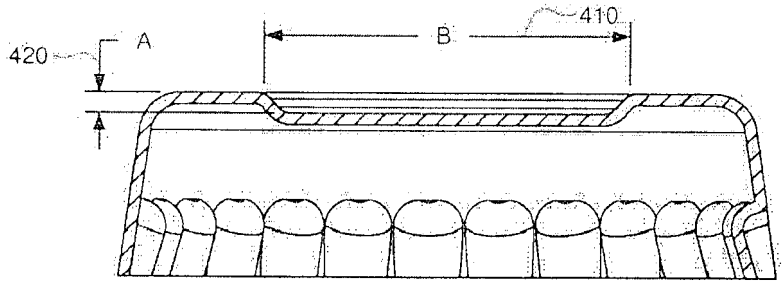


图 29B

Abstract

A crown for a bottle and other container has a top portion and an annular skirt that descends contiguously from the top portion. An opener assembly and an arrangement of frangible scoring lines on the crown allow for ease of opening the bottle or container. Corrugated embodiments provide material strengthening for a reduced gauge crown.