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(54) **CAP FOR USE WITH BOTTLE HAVING POSITIVE INTERNAL PRESSURE, AND BOTTLE WITH CAP ATTACHED THERETO**

VERSCHLUSS ZUR VERWENDUNG MIT EINER FLASCHE MIT POSITIVEM INNENDRUCK UND FLASCHE MIT DARAN BEFESTIGTEM VERSCHLUSS

CAPUCHON DESTINÉ À ÊTRE UTILISÉ AVEC UNE BOUTEILLE AYANT UNE PRESSION INTERNE POSITIVE, ET BOUTEILLE AVEC CAPUCHON FIXÉ À CELLE-CI

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**Description**

## TECHNICAL FIELD OF INVENTION

**[0001]** The present invention relates to a cap used for a bottle with a cap, the bottle adapted to have positive inner pressure and a bottle with the cap attached.

## BACKGROUND ART

**[0002]** A typical example of a conventional cap attached to a bottle is disclosed in Japanese Unexamined Patent Application Publication No. 2015-9853.

**[0003]** Referring to Fig. 5 in the current application showing the conventional cap, the cap 100 includes a female screw part 101 engageable with a male screw part formed on an outer circumferential surface of a bottle mouth. The female screw part 101 is formed of a plurality of projections 102 running intermittently in a circumferential direction.

**[0004]** A bottle filled with carbonated drink, for example, has positive inner pressure. If the inner pressure of the bottle increases when stored in a high-temperature atmosphere, for example, a top 103 of the cap 100 may be pushed up and then a side wall 104 also may be pushed up entrained by the action of the top 103 as shown in Fig. 6. Such a condition may break a sealing condition of the bottle mouth established by the cap, which might lead to leakage of the contents.

**[0005]** JP S53 30450 U discloses a container mouth sealed with a cap by screwing a screw thread thereon, which is a female screw formed on the inner periphery of the cap and a male screw formed on the container mouth.

**[0006]** EP 0 009 854 A1 relates to bottles, having screw-threaded necks and to caps for such containers, adapted to release the inner pressure inside the bottle upon its opening by the user, according to the preamble of claim 1.

## SUMMARY OF INVENTION

## TECHNICAL PROBLEM

**[0007]** The cap side wall 104 is pushed up because it has stretched in the circumferential direction and then deformed to bulge outward. The conventional cap 100, which includes the female screw part 101 having the plurality of projections 102 running intermittently in the circumferential direction, cannot satisfactorily prevent the cap side wall 104 from stretching in the circumferential direction and thus cannot effectively prevent leakage of the contents.

**[0008]** To eliminate the above disadvantages, the object of the present invention is to provide a bottle with a cap that effectively prevents leakage of the contents of a bottle.

## SOLUTION TO PROBLEM

**[0009]** The invention is defined by independent claim 1. Further embodiments of the invention are defined by the dependent claims.

**[0010]** The present invention relates to a bottle having positive inner pressure with a cap. The bottle includes a male screw part formed at an outer circumferential surface of a bottle mouth and the male screw part includes a plurality of projections radially protruding from the outer circumferential surface of the bottle mouth and running intermittently in spiral. The cap comprises a female screw part engageable with the male screw part. The female screw part includes a circumferential projection protruding from an inner circumferential surface of a cap side wall and continuously extending in spiral through at least 360 degrees. The circumferential projection is radially cut away in part to form at least one cutaway portion and the cutaway portion is positioned to correspond to each of gaps of the male screw part.

**[0011]** The present invention provides a bottle with a cap, the bottle being adapted to have positive inner pressure, in accordance with appended claim 1.

**[0012]** The above arrangement, in which the female screw part includes a circumferential projection continuously extending in spiral through at least 360 degrees, can effectively prevent the cap side wall from stretching in the circumferential direction and easily bulging outward and thus from being pushed up. Additionally, the cutaway portion formed by radially cutting the circumferential projection in part acts as a gas vent to allow gas to escape when the cap is opened, which ensures safety in opening the cap.

**[0013]** According to one preferable embodiment, the at least one cutaway portion includes a plurality of cutaway portions provided at regular intervals.

**[0014]** Providing the plurality of cutaway portions are provided at regular intervals contributes to weight reduction and providing them at regular intervals contributes to uniform strength of the cap, which can prevent deformation of the cap side wall more effectively.

**[0015]** According to one preferable embodiment, the at least one cutaway portion has an arc edge.

**[0016]** If the cutaway portion has a stepped edge, the male screw part of the bottle mouth would interfere with the cutaway portion when the cap is attached to the bottle mouth, which might hamper smooth attachment of the cap to the bottle. The above arrangement, in which the cutaway portion has the arc edge, effectively prevents the male screw part of the bottle mouth from interfering with the cutaway portion when the cap is attached to the bottle mouth to allow the cap to be smoothly attached to the bottle.

**[0017]** According to one preferable embodiment, the cap further includes an outer seal for sealing the outer circumferential surface of the bottle mouth, and a rib provided between the outer seal and the inner circumferential surface of the cap side wall for connecting them to

each other.

**[0018]** The above arrangement effectively prevents deformation of the seal, the cap top or the side wall, as a result of which leakage of the contents of the bottle can be effectively prevented.

**[0019]** According to one preferable embodiment, the cap is used for a bottle containing carbonated drink.

**[0020]** The cap according to the present invention can effectively prevent leakage of the contents owing to increase in inner pressure of the bottle, and thus is useful for a bottle filled with carbonated drink that would increase inner pressure easily.

**[0021]** According to one preferable embodiment, the cap is used for a bottle having an outer diameter of 25 mm or larger in the bottle mouth.

**[0022]** Typically, the larger the diameter of the cap becomes, the greater an amount deformation becomes, even though a rate of deformation is the same. Although the risk of leakage of the contents due to rise in inner pressure increases in such a condition, the cap having the structure according to the current embodiment is particularly useful for effectively preventing leakage of the contents even if the diameter of the cap increases with the outer diameter of 25 mm or larger in the bottle mouth.

#### BRIEF DESCRIPTION OF DRAWINGS

##### **[0023]**

Fig. 1 is a front view of a bottle mouth;

Fig. 2 is a partially sectional front view of a cap;

Fig. 3 is a sectional view of the cap taken on line III-III in Fig. 2;

Fig. 4 is a sectional view of the cap taken on line IV-IV in Fig. 2;

Fig. 5 is a partially sectional front view of a conventional cap; and

Fig. 6 is an explanatory representation showing a condition with inner pressure increasing.

#### DESCRIPTION OF EMBODIMENTS

**[0024]** A combination of a cap and a bottle according to the present invention will be described in detail hereinafter in reference to the accompanying drawings. In the present invention, the cap 20 prevents breakage of a sealing condition of a bottle mouth 10 established by the cap 20 when inner pressure of the bottle increases and thus prevents leakage of contents of the bottle. The cap is used for a bottle adapted to have positive inner pressure, and in particular, a bottle for containing carbonated drink in the current embodiment.

**[0025]** The bottle mouth 10 according to the present invention is shown in Fig. 1. The bottle mouth 10 includes a male screw part 11 formed in an outer circumferential surface 10A thereof. More particularly, the male screw part 11 includes a plurality of projections 12 radially protruding from the outer circumferential surface 10A of the

bottle mouth 10 and running intermittently in spiral. One or more gaps 13 defined in adjacent projections 12 act as gas vents that allow gas escaped from liquid within the bottle to pass out of the bottle. The bottle mouth 10 has an outer diameter of 35 mm in the current embodiment. The outer diameter of the bottle mouth 10 is not limited to such a size, but is preferably 25 mm or larger, and more preferably 28 mm and larger. Typically, the larger the diameter of the bottle mouth 10 becomes, the more the risk of leakage of the contents due to rise in inner pressure increases. Accordingly, the combination of the cap 20 and the bottle mouth 10 that can effectively prevent leakage of the contents as described herein is particularly useful.

**[0026]** The bottle may be a commercially available bottle that is primarily made of thermoplastic resin such as polyethylene, polypropylene and polyethylene terephthalate and integrally formed by stretch molding such as biaxial stretch blow molding. The capacity of the bottle is not particularly specified, but typically ranging from 200 mL to 2L that are common in the market. The bottle is filled with carbonated drink in the current embodiment, but may be filled with any other liquid that causes positive inner pressure after charged or with nitrogen charged, including drinkables such as drinking water, tea, juice, coffee, cocoa, freshener, alcohol drink, lactic drink and soup as well as liquid seasoning such as sauce and soy sauce.

**[0027]** Referring to Figs. 2 and 3, the cap 20 according to the present invention includes a female screw part 21 engageable with the male screw part 11. The female screw part 21 forms a circumferential projection 22 protruding from an inner circumferential surface 25A of a cap side wall 25 and continuously extending in spiral through at least 360 degrees (680 degrees in the current embodiment). More particularly, while the male screw part 11 of the bottle mouth 10 is formed of the plurality of projections running discontinuously and spaced from each other with the gaps 13, the female screw part 21 is formed of the single circumferential projection 22 running continuously in spiral through at least 360 degrees, i.e., making at least a round of the cap. This arrangement can effectively prevent leakage of the contents of the bottle. The contents or liquid would escape from the bottle when a top 24 of the cap 20 is pushed up with increase in inner pressure of the bottle, and the cap side wall 25 is also pushed up entrained with the action of the top 24. Such a condition would break a sealing condition of the bottle mouth 10 established by the cap 20. In this, the female screw part 21 forming the circumferential projection 22 running continuously in spiral through at least 360 degrees can effectively prevent the cap side wall 25 from stretching in the circumferential direction and easily bulging outward and thus from being pushed up.

**[0028]** Further describing the present invention, to provide a gas vent, the circumferential projection 22 is radially cut away in part (that is, so as not to reach the inner circumferential surface 25A of the cap side wall 25) to

form at least one cutaway portion 23. In the current embodiment, a plurality of cutaway portions are provided at regular intervals. Providing the plurality of cutaway portions contributes to weight reduction and providing them at regular intervals contributes to uniform strength of the cap 20, which can prevent deformation of the cap side wall 25 more effectively. When the cap 20 is attached to the bottle mouth 10, each cutaway portion 23 is positioned to correspond to each of the gaps 13 of the male screw part 11. Additionally, the cutaway portion 23 has a gentle and smooth arc edge 23a. This effectively prevents the male screw part 11 of the bottle mouth 10 from interfering with the cutaway portion 23 when the cap 20 is attached to the bottle mouth 10 to allow the cap 20 to be smoothly attached to the bottle. The cutaway portion 23 may have any desired depth that does not reach the inner circumferential surface 25A of the cap side wall 25, preferably a depth of 20 to 80% of a projecting height of the circumferential projection 22. While a depth of less than 20% of the projecting height would prevent bulging of the cap side wall 25 less easily, a depth of more than 80% of the projecting height would secure the gas vent less easily and hamper weight reduction.

**[0029]** Referring to Figs. 2 and 4, the top 24 of the cap 20 has an inner surface 24A provided with an inner seal 26 for sealing a distal end portion of the bottle mouth 10 from an inner circumferential surface thereof, and an outer seal 27 for sealing the distal end portion of the bottle mouth 10 from the outer circumferential surface 10A thereof. The distal end portion of the bottle mouth 10 is held between the inner seal 26 and the outer seal 27 to seal the bottle mouth 10. A plurality of ribs 28 (fourteen ribs in the current embodiment) are provided between the outer seal 27 and the inner circumferential surface 25A of the cap side wall 25 to connect them to each other, and a plurality of ribs 29 (fourteen ribs in the current embodiment) are provided between the inner seal 26 and the outer seal 27 to connect them to each other. The ribs 28 and 29 are provided at equal intervals in the circumferential direction. More particularly, each rib 28 radially diagonally extends between the outer seal 27 and the inner circumferential surface 25A of the cap side wall 25, and each rib 29 radially extends between the inner seal 26 and the outer seal 27. In the current embodiment, each rib 29 is located in a circumferential intermediate position between adjacent ribs 28, and each rib 28 is located in a circumferential intermediate position between adjacent ribs 29, thereby to effectively prevent deformation of the cap top and leakage of the contents or liquid.

[Alternative Embodiments]

**[0030]** Finally, alternative embodiments of the cap and the bottle according to the present invention will be described hereinafter. The arrangement disclosed in any one of the following embodiments may be combined with any other embodiment if there is no inconsistency.

**[0031]** [1] According to the above first embodiment, the female screw part 21 is formed of the single circumferential projection 22. Instead, the female screw part 21 may include a plurality of projections spaced apart from each other in the same manner as the male screw part 11, in which at least one of the projections may form the circumferential projection 22 extending continuously through at least 360 degrees.

**[0032]** [2] According to the above first embodiment, the plurality of ribs 28 are provided at equal intervals between the outer seal 27 and the inner circumferential surface 25A of the cap side wall 25 to connect them to each other, and the plurality of ribs 29 are provided at equal intervals between the inner seal 26 and the outer seal 27 to connect them to each other. The number of the ribs 28 and 29 may vary at need, and the ribs 28 and 29 may not be necessarily provided at equal intervals. Additionally, both of or one of the outer ribs 28 and the inner ribs 29 are dispensable.

**[0033]** [3] It is noted that the foregoing embodiments have been provided merely for the purpose of explanation and are in no way to be construed as limiting the present invention. Thus, it is understood by a person of ordinary skill in the art that changes and various variations and modifications may be possible without departing from the scope of the appended claims.

#### INDUSTRIAL APPLICABILITY

**[0034]** The present invention is applicable to a bottle with a cap, the bottle being adapted to have positive inner pressure.

#### DESCRIPTION OF REFERENCE SIGNS

##### **[0035]**

10	bottle mouth
10A	outer circumferential surface
11	male screw part
20	cap
21	female screw part
22	circumferential projection
23	cutaway portion
25	cap side wall
25A	inner circumferential surface
26	inner seal
27	outer seal
28	rib

#### Claims

1. A bottle with a cap (20), the bottle being adapted to have positive inner pressure  
 wherein the bottle includes a male screw part (11) formed at an outer circumferential surface

- (10A) of a bottle mouth (10), wherein the male screw part (11) includes a plurality of projections (12) radially protruding from the outer circumferential surface (10A) of the bottle mouth (10) and running intermittently in spiral, wherein at least one gap (13) configured to act as a gas vent is defined in adjacent projections (12), wherein the cap (20) comprises a female screw part (21) engageable with the male screw part (11), wherein the female screw part (21) includes a circumferential projection (22) protruding from an inner circumferential surface (25A) of a cap side wall (25) and continuously extending in spiral through at least 360 degrees, wherein the circumferential projection (22) is radially cut away in part to form at least one cutaway portion (23), **characterized in that** at least one, respectively each, cutaway portion (23) is positioned to correspond to the at least one, respectively each, gap (13) of the male screw part (11).
2. The bottle according to claim 1, wherein the circumferential projection (22) is radially cut away in part to form a plurality of cutaway portions (23), and wherein the plurality of cutaway portions (23) is provided at regular intervals.
3. The bottle according to claim 2, wherein the at least one cutaway portion has an arc edge.
4. The bottle according to any one of claims 1 to 3, further comprising:
- an outer seal (27) for sealing the outer circumferential surface (10A) of the bottle mouth (10); and  
a rib (28) provided between the outer seal (27) and the inner circumferential surface (25A) of the cap side wall (25) for connecting them to each other.
5. The bottle according to any of claims 1 to 4 having an outer diameter of 25 mm or larger in the bottle mouth (10).
6. Use of a bottle according to any one of claims 1 to 5 for containing carbonated drink.

#### Patentansprüche

1. Flasche mit einem Verschluss (20), wobei die Flasche eingerichtet ist, einen positiven Innendruck aufzuweisen,

wobei die Flasche einen Außengewindeteil (11) aufweist, der an einer Außenumfangsfläche (10A) einer Flaschenmündung (10) aufweist, wobei der Außengewindeteil (11) mehrere Vorsprünge (12) aufweist, die radial von der Außenumfangsfläche (10A) der Flaschenmündung (10) vorstehen und mit Unterbrechungen spiralförmig verlaufen, wobei mindestens ein Spalt (13), der konfiguriert ist, als eine Gasentlüftung zu dienen, in benachbarten Vorsprüngen (12) definiert ist, wobei der Verschluss (20) einen Innengewindeteil (21) aufweist, der mit dem Außengewindeteil (11) in Eingriff bringbar ist, wobei der Innengewindeteil (21) einen Umfangsvorsprung (22) aufweist, der von einer Innenumfangsfläche (25A) einer Verschlussseitenwand (25) vorsteht und sich kontinuierlich über mindestens 360 Grad spiralförmig erstreckt, wobei der Umfangsvorsprung (22) teilweise radial ausgeschnitten ist, um mindestens einen ausgeschnittenen Abschnitt (23) zu bilden, **dadurch gekennzeichnet, dass** mindestens ein bzw. jeder ausgeschnittene Abschnitt (23) so angeordnet ist, dass er dem mindestens einen bzw. jedem Spalt (13) des Außengewindeteils (11) entspricht.

2. Flasche nach Anspruch 1, wobei der Umfangsvorsprung (22) teilweise radial ausgeschnitten ist, um mehrere ausgeschnittene Abschnitte (23) zu bilden, und wobei die mehreren ausgeschnittenen Abschnitte (23) in regelmäßigen Abständen vorgesehen sind.
3. Flasche nach Anspruch 2, wobei der mindestens eine ausgeschnittene Abschnitt eine Bogenkante aufweist.
4. Flasche nach einem der Ansprüche 1 bis 3, die ferner aufweist:
- eine äußere Dichtung (27) zum Abdichten der Außenumfangsfläche (10A) der Flaschenmündung (10); und  
eine Rippe (28), die zwischen der äußeren Dichtung (27) und der Innenumfangsfläche (25A) der Verschlussseitenwand (25) vorgesehen ist, um sie miteinander zu verbinden.
5. Flasche nach einem der Ansprüche 1 bis 4, die einen Außendurchmesser von 25 mm oder mehr in der Flaschenmündung (10) aufweist.
6. Verwendung einer Flasche nach einem der Ansprüche 1 bis 5 zum Enthalten eines kohlenensäurehaltigen Getränks.

**Revendications**

1. Bouteille avec un bouchon (20), ladite bouteille étant adaptée pour avoir une pression intérieure positive, 5
- ladite bouteille présentant une partie fileté mâle (11) formée sur une surface circonférentielle extérieure (10A) de l'embouchure (10) de bouteille, 10
- où la partie fileté mâle (11) comprend une pluralité de saillies (12) s'étendant radialement depuis la surface circonférentielle extérieure (10A) de l'embouchure (10) de bouteille et s'étendant hélicoïdalement de manière intermittente, au moins un interstice (13) prévu pour agir comme évent à gaz étant défini dans des saillies (12) adjacentes, où le bouchon (20) comprend une partie fileté femelle (21) engrenable avec la partie fileté mâle (11), 15
- où la partie fileté femelle (21) comprend une saillie circonférentielle (22) s'étendant depuis une surface circonférentielle intérieure (25A) d'une paroi latérale (25) du bouchon et s'étendant hélicoïdalement de manière continue sur au moins 360°, 20
- où la saillie circonférentielle (22) est en partie découpée radialement pour former au moins une partie de découpe (23), **caractérisée en ce qu'**au moins une partie de découpe, ou toutes les parties de découpe (23), sont positionnées de manière à correspondre audit au moins un interstice, ou à tous les interstices (13) de la partie fileté mâle (11). 25
2. Bouteille selon la revendication 1, où la saillie circonférentielle (22) est en partie découpée radialement pour former une pluralité de partie de découpes (23), et où la pluralité de partie de découpes (23) est prévue avec un espacement régulier. 30
3. Bouteille selon la revendication 2, où ladite au moins une partie de découpe présente un bord cintré. 35
4. Bouteille selon l'une des revendications 1 à 3, comprenant en outre : 40
- un joint extérieur (27) destiné à assurer l'étanchéité de la surface circonférentielle extérieure (10A) de l'embouchure (10) de bouteille ; et 45
- une nervure (28) prévue entre le joint extérieur (27) et la surface circonférentielle intérieure (25A) de la paroi latérale (25) du bouchon pour raccorder l'un à l'autre. 50
5. Bouteille selon l'une des revendications 1 à 4, ayant un diamètre extérieur inférieur ou égal à 25 mm sur l'embouchure de bouteille (10). 55
6. Utilisation d'une bouteille selon l'une des revendications 1 à 5 pour contenir une boisson gazeuse.

Fig.1

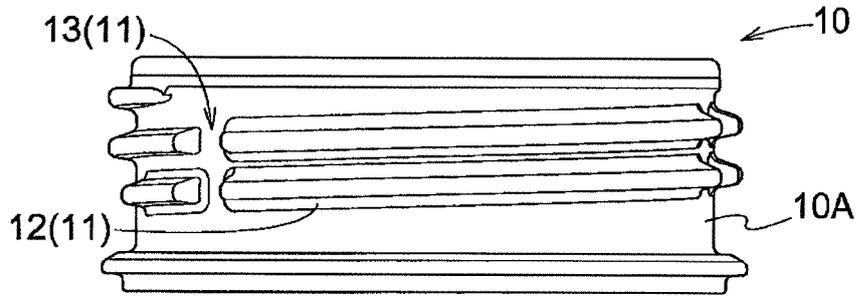


Fig.2

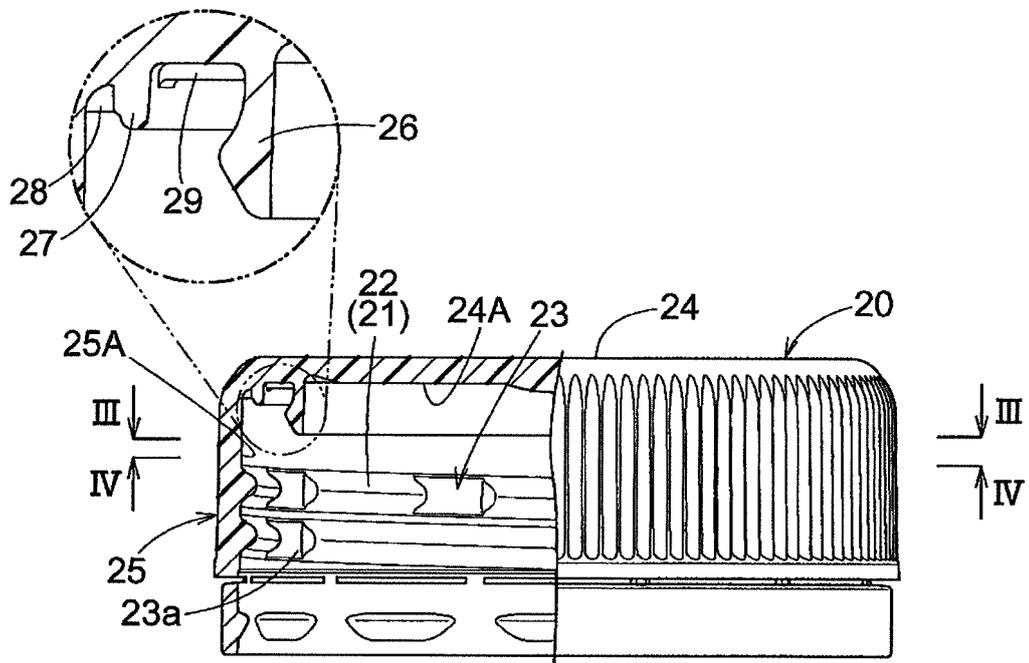


Fig.3

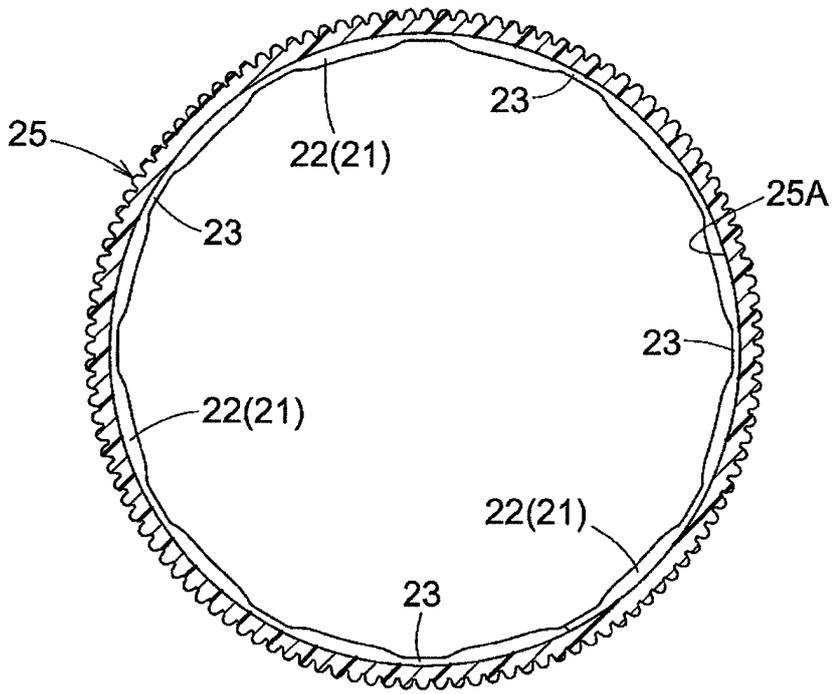


Fig.4

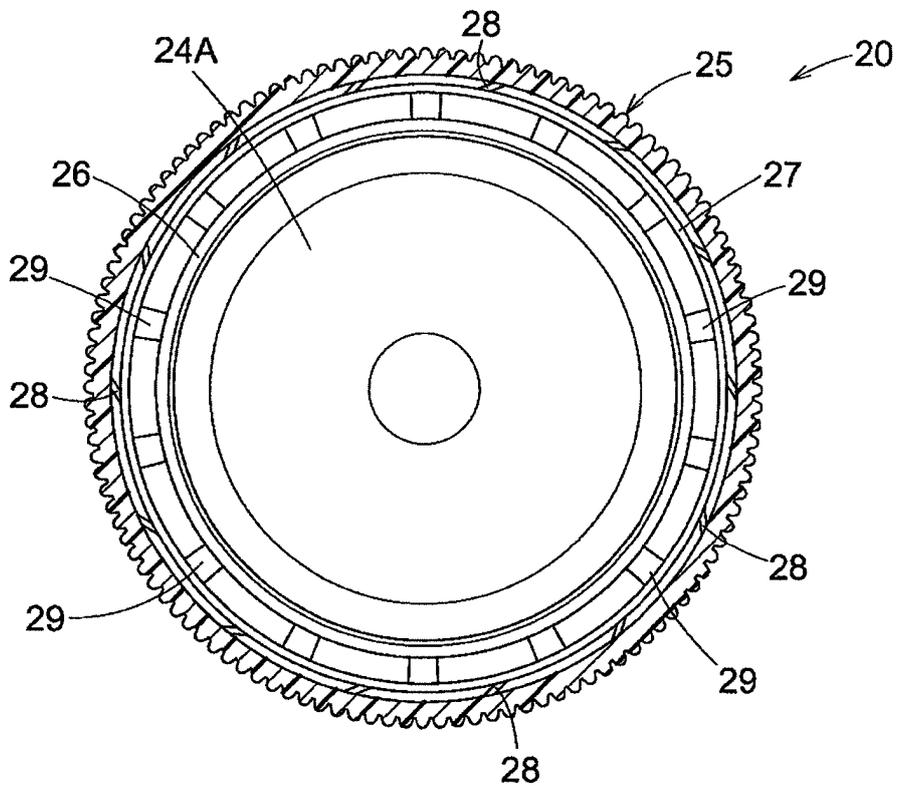


Fig.5

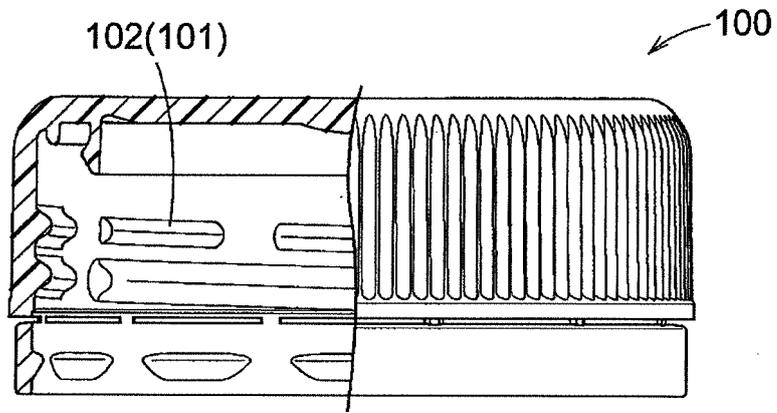
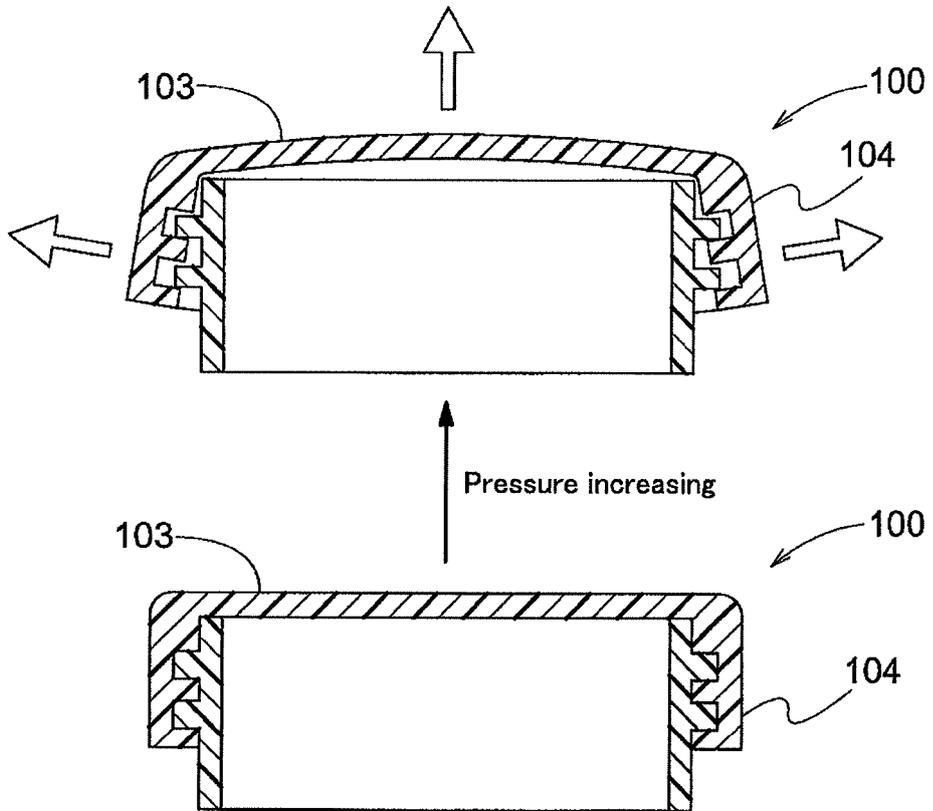


Fig.6



**REFERENCES CITED IN THE DESCRIPTION**

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