

[0005]

Patent Literature 1: JP 2007-118967 A

Summary of Invention

5

Technical Problem

[0006]

With the pilfer-proof mechanism having a safety button, a user can easily recognize that a container is sealed. For this reason, such a mechanism is expected to be applied to a wide range of containers. However, depending on conditions such as the material and dimensions of the cap, even if the cap includes a disc-shaped safety button similar to that employed in twist caps in the related art, no sound may be generated, or the volume of the sound may be very small. This is because, when the material has a relatively low elastic modulus or when the dimensions of the cap are small, not enough energy is stored by the deformation of the safety button to produce a sound.

15 [0007]

Furthermore, the safety button of the related art may generate no sound or only a very faint sound when the pressure difference between the inside and the outside of the container is insufficient. However, the pressure difference between the inside and the outside of the container varies greatly depending on the type of container and liquid product, and thus it may be difficult to produce a liquid product under conditions in which the safety button of the related art reliably functions.

20 [0008]

Therefore, it is desirable to produce a cap capable of generating a sound having a sufficient volume, even when the safety button of the related art in the cap is unlikely to function.

25

Solution to Problem

[0009]

A cap according to the present invention is a metal cap including a top surface part having a circular shape and a skirt part extending downward from the top surface part, in which the top surface part includes a protrusion portion having a spiral shape.

30 [0010]

According to this configuration, it is possible to generate a sound having a sufficient volume, even when the cap includes a safety button in the related art that is unlikely to function.

35

[0011]

Preferred aspects of the present invention will be described below. However, the scope of the present invention is not limited by the preferred aspects described below.

[0012]

5 In one aspect of the cap according to the present invention, it is preferable that the protrusion portion has a step between windings thereof.

[0013]

According to this configuration, the protrusion portion can easily move and a threshold value of the pressure difference between the inside and the outside of the container for generating the sound is relatively small, so that a cap is obtained in which sound is more easily generated.

[0014]

15 In one aspect of the cap according to the present invention, it is preferable that the protrusion portion includes a plurality of panel portions inclined in both a circumferential direction and a radial direction of the top surface part.

[0015]

According to this configuration, the protrusion portion can easily move and a threshold value of the pressure difference between the inside and the outside of the container for generating the sound is relatively small, so that a cap is obtained in which sound is more easily generated.

[0016]

Further features and advantages of the present invention will become more apparent from the following description of exemplary and non-limiting embodiments with reference to the drawings.

25

Brief Description of Drawings

[0017]

FIG. 1 is a perspective view of a cap according to an embodiment.

30 FIG. 2 is a view illustrating a first cross section (a cross section taken along line II-II in FIG. 1) of the cap according to the embodiment.

FIG. 3 is a view illustrating a second cross section (a cross section taken along line III-III in FIG. 1) of the cap according to the embodiment.

FIG. 4 is a perspective view of a cap according to a modification.

35 FIG. 5 is a view illustrating a cross section (a cross section taken along line V-V in FIG. 4) of the cap according to the modification.

Description of Embodiments

[0018]

A first embodiment of a cap according to the present invention will be described with reference to the drawings. Below, an example will be described in which the cap according to the present invention is applied to a pilfer-proof cap 10 (hereinafter, simply referred to as “cap 10”) used for sealing a mouth part of a bottle.

[0019]

Configuration of Cap

The cap 10 according to the present embodiment includes a top surface part 1 having a circular shape and a skirt part 2 extending downward from the top surface part 1 (FIG. 1). A sealing material is fitted into an inner side surface of the top surface part 1. When used, the cap 10 is screwed into a male screw portion formed on the mouth part of the bottle. In the following description, when referring to an up-down direction (or a height direction), the side of the top surface part 1 is referred to as “up” (or “high”), and a direction in which the skirt part 2 extends downward from the top surface part 1 is referred to as “down” (or “low”).

[0020]

The top surface part 1 and the skirt part 2 are integrally formed of an aluminum material (an example of a metal). Here, the aluminum material may be pure aluminum or may be an aluminum alloy. The sealing material is made of a resin. Examples of the resin material used here include but are not limited to polyethylene, polypropylene, and polyethylene terephthalate. Note that the skirt part 2 has a known structure for a skirt part of this type of pilfer-proof cap. More specifically, a protrusion or a tamper-proof ring on which a fingertip of a user is easily caught may be formed on an outer side of the skirt part 2. Furthermore, a female screw portion to be screwed to the male screw portion formed in the mouth part of the bottle, or a protrusion for sealing the mouth part of the bottle, may be provided on an inner side of the skirt part 2.

[0021]

The top surface part 1 is provided with one protrusion portion 3 having a spiral shape. The protrusion portion 3 is provided in a shape in which the height gradually increases in a spiral from an end part 31 disposed on the edge side of the top surface part 1 toward a central part 32 disposed at the center of the top surface part 1. In the present embodiment, the protrusion portion 3 is formed in a spiral shape having three turns in one thread, and a step 33 is formed between the turns.

[0022]

The protrusion portion 3 having the spiral shape is formed on the top surface part 1. Thus, there is a combination of a first cross section and a second cross section in which shapes of the first cross section and the second cross section do not coincide with each other. The first cross section is a vertical cross section of the top surface part passing through a center 11 of the top surface part 1, and the second cross section is another vertical cross section. For example, a cross section taken along line II-II in FIG. 1 is illustrated as a first cross section 12 in FIG. 2, and a cross section taken along line III-III in FIG. 1 is illustrated as a second cross section 13 in FIG. 3. When comparing FIG. 2 and FIG. 3, it is understood that the arrangement of the portions derived from the protrusion portion 3 is different between the first cross section 12 and the second cross section 13, and that the first cross section 12 and the second cross section 13 do not coincide with each other.

[0023]

Usage Method

A method of using the cap 10 according to the present embodiment will be described. After a bottle is filled with a product and sterilized by heating, the mouth part of the bottle is sealed with the cap 10 while the temperature of the bottle and the product is higher than room temperature. To seal the mouth part of the bottle with the cap 10, any method known as a sealing method using a pilfer-proof cap may be used.

[0024]

Subsequently, as the temperature of the bottle sealed by the cap 10 decreases, the internal pressure of the bottle decreases. Therefore, a pressure difference is generated between the inside and the outside of the bottle, and the top surface part 1 is sucked toward the inner side of the bottle. Here, the protrusion portion 3 is provided on the top surface part 1 and the height of the protrusion portion 3 gradually increases from the end part 31 toward the central part 32. Thus, the top surface part 1 is deformed more easily than in a case where the top surface part 1 has a flat shape. Therefore, the top surface part 1 is easily curved toward the inner side of the bottle by the pressure difference between the inside and the outside of the bottle.

[0025]

When the cap 10 is opened, the pressure difference between the inside and the outside of the bottle is eliminated. At this time, the top surface part 1 is deformed so that the curvature of the top surface part 1 is eliminated, and a sound is generated in association with the deformation. The generation of this sound ensures that the bottle was sealed before being opened.

[0026]

Other Embodiments

Finally, other embodiments of the cap according to the present invention will be described. Note that the configuration disclosed in each of the following embodiments can also be applied in combination with the configuration disclosed in another embodiment as long as no contradiction arises.

[0027]

In the embodiments described above, a configuration in which the top surface part and the skirt part of the cap are formed of an aluminum material is described as an example. However, the cap according to the present invention may be formed of any metal without limitation. Examples of metals that may form the cap according to the present invention include but are not limited to aluminum and steel.

[0028]

In the above-described embodiment, an example is described in which the cap according to the present invention is applied to a pilfer-proof cap. However, in addition to the pilfer-proof cap, the cap according to the present invention can be applied to a metal cap of a known type such as a twist-off cap.

[0029]

In the above-described embodiment, an example of a configuration is described in which the protrusion portion 3 is formed in a spiral shape having three turns in one thread. However, in the spiral shape of the protrusion portion according to the present invention, the number of turns is not limited and can be set as desired in consideration of the dimensions and the like of the top surface part, for example. However, it is preferable that the spiral shape of the protrusion portion has from two to seven turns.

[0030]

Furthermore, dimensional conditions of the spiral shape of the protrusion portion can also be determined as desired in consideration of the dimensions of the top surface part and the like. However, the height of the central part with respect to the end part of the spiral shape is preferably equal to or larger than 3 mm and equal to or less than 20 mm. Additionally, the width of each turn of the spiral shape is preferably equal to or larger than 1 mm and equal to or less than 15 mm. Furthermore, it is preferable that the area occupied by the protrusion portion is equal to or larger than 25% and equal to or less than 90% of the area of the top surface part.

[0031]

In the above-described embodiment, a configuration in which the step 33 is formed between the turns of the protrusion portion 3 is described as an example.

However, the structure of the protrusion portion according to the present invention is not limited to this example. For example, a plurality of panel portions 34 may be combined to form a spiral shape (FIGS. 4 and 5). In this modification, each of the panel portions 34 has an upwardly protruding curved shape. Each of the panel portions 34 is inclined such that the upper side of the spiral is higher than the lower side of the spiral, to correspond to the shape of the protrusion portion 3 in which the height gradually increases from the end part 31 toward the central part 32. Similarly, since the central part 32 is higher than the end part 31, each of the panel portions 34 is also inclined in a radial direction of the top surface part 1. In the above-described embodiment, the step 33 is formed between the turns of the protrusion portion 3 and two turns adjacent to each other in the radial direction are not continuous. However, in the present modification, two turns adjacent to each other in the radial direction are continuous. Two panel portions adjacent along the spiral shape are also continuously formed. Thus, since the entire spiral shape of the protrusion portion 3 is continuously formed, the protrusion portion 3 moves relatively smoothly and easily and a sound is easily generated.

[0032]

Also, with respect to other configurations, it should be understood that the embodiments disclosed in the present specification are illustrative in all respects and that the scope of the present invention is not limited by the embodiments. It will be easily understood by those skilled in the art that appropriate modifications can be made without departing from the spirit of the present invention. Accordingly, other embodiments modified without departing from the spirit of the present invention are naturally included in the scope of the present invention.

Industrial Applicability

[0033]

The present invention can be utilized in a cap for sealing a mouth part of a bottle filled with food or a beverage, for example.

Reference Signs List

[0034]

10: Pilfer-proof cap

1: Top surface part

11: Center

12: First cross section

13: Second cross section

- 2: Skirt part
- 3: Protrusion portion
- 31: End part
- 32: Central part
- 5 33: Step
- 34: Panel portion

Claims

[Claim 1]

- 5 A cap formed of metal, the cap comprising:
a top surface part having a circular shape; and
a skirt part extending downward from the top surface part, wherein
the top surface part includes a protrusion portion having a spiral shape.

[Claim 2]

- 10 The cap according to claim 1, wherein the protrusion portion has a step between
windings thereof.

[Claim 3]

- 15 The cap according to claim 1, wherein
the protrusion portion includes a plurality of panel portions arrayed in a spiral
shape, and
each of the panel portions is inclined along the spiral shape such that an upper
side of the spiral shape is higher than a lower side of the spiral shape, and such that a
radially inner side of the top surface part is higher than a radially outer side of the top
20 surface part.