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(71) Applicant: **Technologia JSC**
40020 Sumy (UA)

(72) Inventor: **Zaiets, Sergii Volodymyrovych**
Sumy (UA)

(74) Representative: **Perani & Partners S.p.A.**
Piazza Armando Diaz, 7
20123 Milano (IT)

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(54) **TAMPER-EVIDENT LIQUID-DISPENSING TAP**

(57) Tamper-evident liquid-dispensing tap (1), comprising a containing body (2) having a dispensing opening (2a) for liquid passage, a valve element (3) located inside the containing body (2) and configured to engage the containing body (2) to close the dispensing opening (2a) in a closed configuration, a hollow cap (4) connected to the containing body (2) and defining an internal cavity (5); a driving member (6) movably located into the cap (4) and operatively connected to the valve element (3). The

driving member (6) is configured to move into the cap (4) from a lower position to an upper position to bias the valve element (3) from the closed configuration to an open configuration. The cap (4) comprises tamper evident elements (7) configured to cooperate with the driving member (6) upon first opening and to be moved towards the internal cavity (5) of the cap (4) upon action of the driving member (6) moving from the lower position to the upper position.

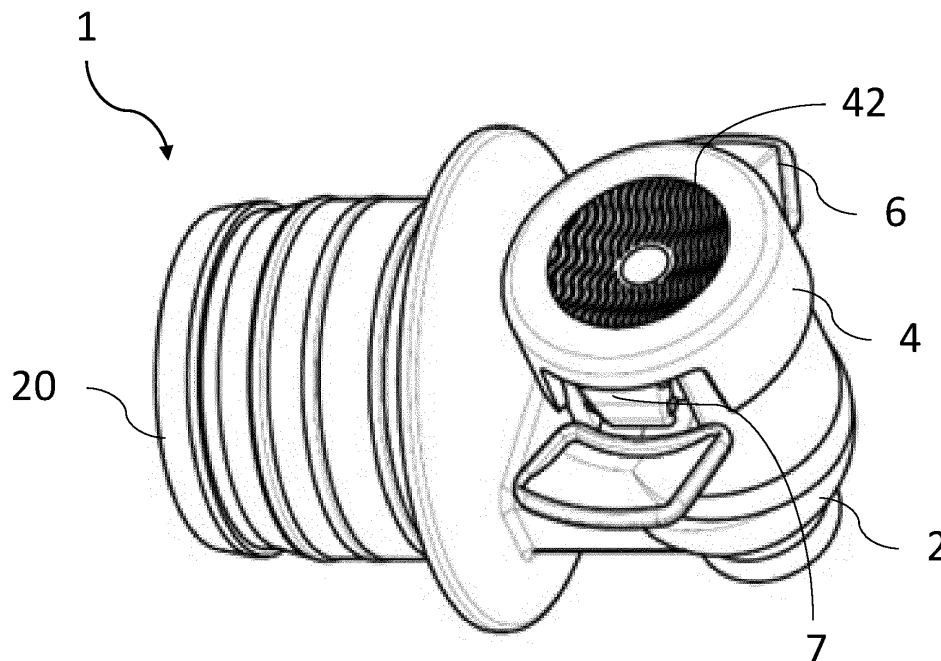


Fig. 2

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Description

FIELD OF INVENTION

[0001] The present invention relates to a tamper-evident tap for dispensing liquid from a container, and specifically from a container of the type "Bag-in-Box" (also referred to as BiB).

Description of Prior Art

[0002] In the prior art, tamper-evident taps for dispensing liquid from a respective container are known. These taps comprise driving members having wings that can be actuated by a user. In particular, a lifting force is applied to bias the driving member from a lower position to an upper position, mainly by the index and middle fingers placed on the wings and by the thumb placed on an upper surface of the tap in a position opposite to the lifting force.

[0003] In the known taps, the driving member moves axially within the cap between the upper and lower positions in order to open the tap. Specifically, the driving member is coupled to a valve, or a membrane, and is configured to bias such valve from a closed configuration to an open configuration. In the closed configuration, the valve is configured to seal the tap and prevent the dispensing of liquids from the container.

[0004] It is known in the prior art to include an anti-counterfeiting or tampering system comprising tamper-evident elements which provide visual evidence of the first opening of the tap to immediately reveal a previous use of the container.

[0005] An example of anti-counterfeiting system is shown in document EP 0432070 A1, which discloses a tap having a tear-off device connected to the upper part of a driving member and to a cap of the tap. The tear-off device is configured to prevent the movement of the driving member until such device is removed from the tap by a user.

[0006] However, such known dispensing taps should comply with the European and international directives (e.g., Directive (EU) 2019/904) on the reduction of impact of single-use plastic articles, according to which a warranty seal, i.e., the tamper-evident element, must not come off the tap as it could be dispersed in the environment if not properly disposed of.

[0007] EP 4069628 A1 discloses a tamper-preventing tap for dispensing liquids and with an automatic opening that complies with these directives. The disclosed tap comprises a driving element with protruding wings coupled to an internal elastic valve and adapted to move axially inside a cap of the tap. It also comprises integrated sealing elements configured to be broken by the driving element when the tap is first opened.

Prior Art Problems

[0008] The known taps have the disadvantage of not

fixing such tamper-evident element to the tap, which can lead to its detachment during transport, making it difficult to recycle it and increasing the risk of individual plastic elements entering the environment.

[0009] Moreover, the tap disclosed in EP 4069628 A1 requires the tamper-evident element (namely the sealing elements) to be broken by the drive element because of the lifting force applied. In this way, there is a risk that the breakage of the sealing elements will disperse a piece or fragment of plastic into the environment. Additionally, the fragments from the broken sealing elements may be introduced into the internal part of the cap and damage the elastic membrane, thereby compromising its sealing function. Worse still, a fragment may be introduced into the liquid as it is dispensed from the container, potentially harming the user.

SUMMARY OF THE INVENTION

[0010] Therefore, object of the present invention is providing a tamper-evident tap for dispensing liquid capable of overcoming the aforementioned prior art drawbacks.

[0011] In particular, the object of the present invention is to provide a tamper-evident tap having an easier tamper-evident system that complies with EU Directive and that reduces the risks of dispersing plastic in the environment.

[0012] The technical purpose and object are substantially fulfilled by a tamper-evident tap that comprises the technical features disclosed in one or more of the accompanying claims.

Advantages

[0013] The tap of the present invention comprises a containing body connectable to a container, a valve element located therein, a hollow cap connected to the containing body and a driving member operatively connected to the valve element and adapted to move within the cap from a lower position to an upper position to bias the valve element from a closed configuration to an open configuration. The cap comprises tamper evident elements configured to cooperate with the driving member in order to be moved towards the cap upon the movement of the driving member to the upper position on first opening.

[0014] Advantageously, the tamper evident elements give visual evidence of first opening of the tap, thus revealing any tampering attempts.

[0015] Still advantageously, the tamper evident elements are bent or pivoted inside the cap, thus reducing the risk of pieces or fragments of plastic being dispersed into the environment. Indeed, the tamper evident elements remain attached to the tap and do not break on the first use of the tap, resulting in a safer and simpler tamper-evident system.

[0016] According to a preferred embodiment of the invention, the tamper evident elements are also retained

within the cap, so that they do not interfere with further operations of the driving member in opening and closing the tap.

BRIEF DESCRIPTION OF THE FIGURES

[0017] The features and advantages of the present invention will become apparent from the following detailed description of a possible practical embodiment thereof, illustrated by way of non-limiting example in the accompanying drawing, in which:

- Figure 1 shows an example of use of the tamper-evident liquid-dispensing tap of the present invention;
- Figure 2 shows an upper perspective view of the tap of the present invention;
- Figure 3 a shows an exploded front view of the tap of the present invention;
- Figure 3b shows an exploded lateral view of the tap of Figure 3a;
- Figure 4a shows an upper perspective view detail of the tap of the present invention;
- Figure 4b shows an upper perspective view of the detail of the tap of Figure 4a in a different configuration;
- Figure 4c shows an enlarged front view of a first opening control element in a first configuration;
- Figure 4d shows a lateral view of the element of Figure 4c;
- Figure 5a shows a sectional view of the tap of the present invention in a first configuration;
- Figure 5b shows a close-up of a detail of Figure 5a;
- Figure 6a shows a sectional view of the tap of the present invention in a second configuration;
- Figure 6b shows a close-up of a detail of Figure 6a;
- Figure 7a shows a sectional view of the tap of the present invention in a third configuration;
- Figure 7b shows a close-up of a detail of Figure 7a;
- Figure 8 shows a sectional view of the tap of the present invention in a fourth configuration;
- Figure 9a shows a perspective view of a detail of the tap of the present invention
- Figure 9b shows a lateral view of the detail of Figure 9a;
- Figure 10 shows a perspective view of an alternative embodiment of the tap of the present invention;
- Figure 11 shows a perspective view of a detail of the tap of Figure 10;
- Figure 12a shows a sectional view of the alternative embodiment of the tap in a first configuration;
- Figure 12b shows a sectional view of the of the alternative embodiment of the tap in a second configuration;
- Figure 12c shows a sectional view of the alternative embodiment of the tap in a third configuration.

DETAILED DESCRIPTION

[0018] With particular reference to the accompanying figures, 1 refers to a tamper-evident liquid-dispensing tap. The tap 1 of the present invention is adapted for the dispensing of liquid from a container, not shown in the attached figures, specifically for a container of the type "Bag-in-Box" (or BiB container).

[0019] The tap 1 comprises a containing body 2 having a dispensing opening 2a delimited by an internal surface 2b. Preferably, as shown in figures 1, 2, 3b, 9a, 10, 12a-12c, the containing body 2 comprises a connecting portion 20 configured to be connected to the container. The dispensing opening 2a allows the dispensing of liquids from the container to the outside the tap 1. Still preferably, the containing body 2 is made of plastic material.

[0020] The tap 1 also comprises a valve element 3 (Figs. 3a, 3b, 5a, 6a, 7a, 8, 12a-12c) located inside the containing body 2 and configured to engage the containing body 2, and specifically the internal surface 2b of the containing body 2, to close the dispensing opening 2a in a closed configuration. Specifically, the valve element 3 is configured to bias from the closed configuration, in which it seals the tap, to an open configuration, in which the valve element 3 allows the dispensing of liquids from the container to the outside of the tap 1. In detail, when the valve element 3 is in the open configuration, the dispensing opening 2a is in fluid communication with the container.

[0021] An example of the closed configuration, before the first opening, is shown in figures 1, 2, 5a, 9a, 10 and 12a, while an example of the closed configuration after the first opening is shown in figure 8. An example of the open configuration is shown instead in figures 7a and 12c.

[0022] Preferably, the valve element 3 comprises an elastic valve or membrane. Still preferably, the valve element 3 is made of an elastic material, for example of rubber. In addition, the valve element 3 has a dome shape. The dome-shaped elastic valve is known in the prior art and will not be described further.

[0023] The tap 1 comprises a hollow cap 4 connected to the containing body 2 and defines an internal cavity 5. Preferably the cap 4 is arranged on a top portion of the containing body 2 with respect to an axial direction X. Still preferably, the cap 4 has a substantially cylindrical shape. Still preferably, the cap 4 is made of plastic material.

[0024] The tap 1 comprises a driving member 6 movably located into the cap 4 and operatively connected to the valve element 3. Specifically, the driving member 6 is arranged inside the internal cavity 5. The driving member 6 is configured to move within the cap 4, and thus into the internal cavity 5, between a lower position and an upper position. In more detail, the driving member 6 is configured to move from the lower position to the upper position to bias the valve element 3 from the closed configuration to the open configuration. Specifically, the driving mem-

ber 6 allows the opening of the tap 1 because of a traction force, i.e., a lifting force, exerted on the driving member 6 by a user, as shown in figure 1. Preferably, the driving member 6 is made of plastic material.

[0025] Preferably, the cap 4 comprises at least a guide 11 configured to stably limit the movement of the driving member 6 within the cap 4. Advantageously, the guide 11 allows a translation of the driving member 6 in the axial direction X, while movements along other directions are prevented.

[0026] According to the preferred embodiment of the present invention, shown in figures 3a, 3b, 5a, 6a, 7a, and 8, the driving member 6 comprises a pin 9 extending along the axial direction X. The valve element 3 comprises a seat 10 configured to receive and connect to the pin 9 of the driving member 6. Preferably, the seat 10 comprises an annular protrusion 10a, while the pin 9 comprises an annular groove 9a configured to receive the annual protrusion 10a.

[0027] Preferably, the tap 1 has an automatic self-closing mechanism. In more detail, the valve element 3 is attached to the driving member 6 and is configured to return the driving member 6 from the upper position to the lower position due to a spring effect of the valve element 3. Indeed, the elastic properties and the dome shape of the valve element 3 ensure the automatic return of the valve element 3 to the closed configuration once the lifting force has ceased.

[0028] The cap 4 comprises a main body 4a that delimits the internal cavity 5 and has a top wall 42. The top wall 42 extends transversally to the axial direction X.

[0029] The cap 4 also comprises tamper evident elements 7 configured to cooperate with the driving member 6 upon first opening. The driving member 6 is configured to act on the tamper evident elements 7 to move them towards the internal cavity 5 of the cap 4 when the driving member 6 moves from the lower position to the upper position on first opening of the tap 1.

[0030] According to the invention, the tamper evident elements 7 are configured to irreversibly move from a first configuration, before the first opening of the tap, and hence before they have been moved inside the cap, to a second configuration, after the first opening.

[0031] Preferably, the tamper evident elements 7 in the first configuration are substantially parallel to the axial direction X. Still preferably, the tamper evident elements 7 in the second configuration are inclined with respect to the axial direction X. More preferably, the tamper evident elements 7 in the second configuration are retained within the cap 4, as better described below.

[0032] Preferably, the tamper evident elements 7 are connected to the top wall 42. Still preferably, each tamper evident element 7 extends between a first end 7' and a second end 7".

[0033] Still preferably, each tamper evident element 7 comprises at least a flexible portion 7a configured to be bent towards the internal cavity 5 by action of the driving member 6 on the tamper evident element 7.

[0034] According to the preferred embodiment, the tamper evident elements 7 are hinged to the top wall 42 of the cap 4 and are configured to pivot or rotate around a respective rotation axis upon action of the driving member 6 on first opening. Preferably, the flexible portion 7a comprises a bending edge 71 located at the second end 7" and hinged to the top wall 42.

[0035] Preferably, the bending edge 71 of each tamper evident element 7 comprises reinforcing ribs 72, as shown in figures 4a-4b.

[0036] Advantageously, the reinforcing ribs 72 allows to maintain the tamper evident elements 7 in the first configuration before and during the assembly of the tap 1. It should be noted that the reinforcing ribs 72 do not prevent the bending of the bending edge 71 of the tamper evident elements 7. Indeed, the reinforcing ribs 72 are configured to be stretched during the bending of the bending edge 71 of tamper evident elements 7 passing from the first configuration to the second configuration.

[0037] According to one embodiment, not shown, the tamper evident elements 7 are flexible. In particular, the flexible portion 7a extends along second end 7" and is configured to be bent towards the internal cavity 5.

[0038] According to an alternative embodiment, not shown, the flexible portion 7a extends between first and second ends 7', 7" and is configured to be bent towards the internal cavity 5.

[0039] According to an aspect of the invention, the flexible portions 7a of the tamper evident elements 7 are configured to be bent substantially by 90°.

[0040] According to an aspect, the first ends 7' of the tamper evident elements 7 are closer to the top wall 42 of the cap 4 when moved towards the internal cavity 5 by the action of the driving member 6.

[0041] It should be noted that the tamper evident elements 7 in the second configuration do not interfere with the dispensing of liquids from the container. Moreover, since the tamper evident elements 7 are moved and bent inside the cap, they advantageously minimize effect of external factors on them that can affect the indivisibility required by European Directives and cause their separation from the tap 1.

[0042] According to a preferred aspect of the invention, the tap 1 comprises a retaining portion 8 configured to retain the tamper evident elements 7 within the internal cavity 5 of the cap 4 after the first opening of the tap 1.

[0043] Preferably, the retaining portion 8 is comprised in the tamper evident elements 7 and/or in the cap 4.

[0044] According to a preferred embodiment of the invention shown in figures 1-9b, each tamper evident element 7 comprises a first retaining portion 8a, while the main body 4a of the cap 4 comprises a second retaining portion 8b configured to engage the first retaining portion 8a.

[0045] Preferably, as shown in figures 4a and 4b, the tamper evident elements 7, and specifically the first retaining portion 8a, comprise first connecting teeth 80a. The cap 4 comprises second connecting teeth

80b connected to the first connecting teeth 80a after the first opening, and specifically when the tamper evident elements 7 are in the second configuration. In other words, the first and second connecting teeth 80a, 80b retain the tamper evident elements 7 inclined with respect to the axial direction X, and preferably inclined by 90°, as evidence of first opening of the tap 1, as shown in figure 8.

[0046] According to an alternative embodiment of the invention shown in figures 10-12c, the retaining portion 8 is comprised in the tamper evident elements 7. Preferably, the retaining portion 8 comprises at least part of the flexible portion 7a. More preferably, the flexible portion 7a comprises a bending line 8c (fig. 11) configured to be deformed when the tamper evident elements 7 move from the first to the second configuration. Advantageously, the deformation of the bending line 8c allows the tamper evident elements to be retained within the cap 4 inclined with respect to the axial direction X. Still advantageously, before the deformation, hence before the first opening of the tap, the bending line 8c allows the tamper evident elements to be maintained in the first configuration before or during the assembly of the tap 1.

[0047] According to an aspect of the invention, the tamper evident elements 7 comprise one or more flaps 70. Each flap 70 has an external surface 70a which is opposite to the internal cavity 5 in the first configuration, thus before the first opening of the tap 1. Preferably, the external surface 70a has a convex shape, and more preferably a curved shape, configured to cooperate with the driving member 6 to move or bend the tamper evident elements 7 inwardly towards the cap.

[0048] Indeed, since the convex shape is located on the external surface 70a of the tamper evident elements 7, the movement of the tamper evident elements 7 is advantageously directed inside the cap 4.

[0049] According to the same aspect, each tamper evident element 7 has a radius lower surface 70b. Specifically, the flap 70 ends with the lower surface 70b. More specifically, the lower surface 70b is continuous with the external surface 70a.

[0050] Advantageously, the lower surface 70b, together with the convex shape of the external surface 70a, prevents movement, rotation and/or bending outward from the cap 4 of the tamper-evident elements 7.

[0051] It should be noted that these advantages are effectively illustrated in figures 5a-7b and 12a-12c, where the first opening of the tap 1 and thus the rotating and/or bending movement of the tamper evident elements 7 moving from the first configuration to the second configuration are shown.

[0052] Another advantage is that the lower surface 70b abuts against the driving member 6 when the tamper evident elements 7 are in the first configuration, as better described in the following of the present description. Indeed, this ensures that a necessary lifting force must be exerted to the driving member 6 in order to open the tap 1 the first time. Indeed, further openings of the tap 1

will require a lower lifting force, which only has to overcome the counteracting elastic force of the elastic valve element 3.

[0053] According to the preferred embodiment, the driving member 6 comprises a main wall 60 transversal to the axial direction X. The main wall 60 has a top surface 61 configured to abut against the lower surface 70b of the tamper evident element 7 when the tamper evident elements 7 are in the first configuration, before first opening, to operatively connect the tamper evident elements 7 to the driving member 6. Specifically, the top surface 61 is configured to prevent the tamper evident elements 7 to be moved, rotated and/or bent outwardly from the cap 4.

[0054] Advantageously, as previously anticipated, the contact between the top surface 61 of the driving member 6 and the lower surface 70b of the tamper evident elements 7 also prevents accidental opening of the tap 1.

[0055] According to the invention, the driving member 6 comprises two opposite wings 62 spaced along a direction transversal to the axial direction X which can be operated by the user to open the tap 1.

[0056] Preferably, the main body 4a of the cap 4 comprises a plurality of slots 40 configured to receive a respective tamper evident element 7.

[0057] According to the preferred embodiment of the invention shown in figures 1-9b, each slot 40 receives a respective wing 62 and a respective tamper evident element 7. Preferably, the cap 4 thus comprises two slots 40. Still preferably, the top surface 61 of the driving member 6 is defined by a top surface of the wings 62. In other words, each tamper evident element 7 abuts against the top surface of the respective wing 62 in the first configuration.

[0058] According to the above-mentioned embodiment, the guide 11 that limits the translation of the driving member 6 within the cap 4 is defined by lateral edges 40a of the slots 40.

[0059] According to an alternative embodiment shown in figures 10-12c, the cap 4 comprises two or more slots 40, each slot 40 receiving a tamper evident element 7, and two openings 41, each one receiving a respective wing 62, and the containing body 2 comprises a plurality of slots 21 for a visual indication of the current configuration of the tap 1, wherein the plurality of slots 21 of the containing body 2 are arranged in correspondence of the plurality of slots 40 of the cap 4. Preferably, the top surface 61 is defined by the top surface of a central portion of the driving member 6, which is operatively coupled to a respective wing 62.

[0060] In this embodiment, the guide 11 that limits the translation of the driving member 6 within the cap 4 is defined by lateral edges 41a of the openings 41.

[0061] According to the preferred aspect of the invention, the cap 4, and specifically the top wall 42 of the cap 4, comprises a top surface 42a. Preferably, the top surface 42a has a concave shape that facilitate the positioning of the thumb of the user and the exertion of the lifting force during the opening of the tap 1.

[0062] According to an aspect, the cap 4 comprises a tamper proof button 43 at the top surface 42a. The button 43 is configured to pass from a rest configuration, in which it preferably has a convex surface (figs. 9a and 9b), to a work configuration, in which it has a concave shape (figs 2, 10), when subjected to an external pressure exerted by a user.

[0063] Advantageously, the button 43 has a further tamper-proof function, since it passes from the rest configuration to the work configuration after the first use of the cap and provides a visual indication of an attempted tampering of the tap 1.

Claims

1. Tamper-evident liquid-dispensing tap (1), comprising:

- a containing body (2) having a dispensing opening (2a) for liquid passage,
- a valve element (3) located inside the containing body (2) and configured to engage the containing body (2) to close the dispensing opening (2a) in a closed configuration,
- a hollow cap (4) connected to the containing body (2) and defining an internal cavity (5);
- a driving member (6) movably located into the cap (4) and operatively connected to the valve element (3), the driving member (6) being configured to move from a lower position to an upper position to bias the valve element (3) from the closed configuration to an open configuration;

characterized in that:

- the cap (4) comprises tamper evident elements (7) configured to cooperate with the driving member (6) upon first opening, the driving member (6) being configured to act on the tamper evident elements (7), when moving from the lower position to the upper position on first opening, to move the tamper evident elements (7) towards the internal cavity (5) of the cap (4).
2. Tap (1) according to claim 1, wherein the cap (4) comprises a top wall (42), each tamper evident element (7) being connected to the top wall (42) and comprising at least a flexible portion (7a) configured to be bent towards the internal cavity (5) by action of the driving member (6) on the tamper evident element (7).
3. Tap (1) according to claim 2, wherein the flexible portions (7a) of the tamper evident elements (7) are configured to be bent substantially by 90°.
4. Tap (1) according to claim 2 or 3, wherein each

tamper evident element (7) extends between a first end (7') and a second end (7''), the first end (7') moving closer to the top wall (42) of the cap (4) upon action of the driving member (6) on the tamper evident element (7) on first opening.

5. Tap (1) according to claim 4, wherein the flexible portion (7a) comprises a bending edge (71) located at the second end (7'') of the respective tamper evident element (7) and hinged to the top wall (42).
6. Tap (1) according to claim 4, wherein the flexible portion (7a) extends along the second end (7'') of the respective tamper evident element (7).
7. Tap (1) according to any one of the preceding claims, wherein the tamper evident elements (7) are configured to irreversibly move from a first configuration, before first opening, to a second configuration, after the first opening.
8. Tap (1) according to claim 7, wherein the tamper evident elements (7) are substantially parallel to an axial direction (X) in the first configuration and inclined with respect to the axial direction (X) in the second configuration.
9. Tap (1) according to claim 7 or 8, wherein each tamper evident element (7) comprises a flap (70) having an external surface (70a), opposite to the internal cavity (5) in the first configuration, the external surface (70a) having a convex shape configured to cooperate with the driving member (6) to move the tamper evident elements (7) inwardly towards the internal cavity (5).
10. Tap (1) according to any of the preceding claims, comprising retaining portions (8) configured to retain the tamper evident elements (7) within the internal cavity (5) of the cap (4) after first opening of the tap (1).
11. Tap (1) according to claim 10, wherein the retaining portions (8) comprise first retaining portions (8a) formed on the tamper evident elements (7) and second retaining portions (8b) formed on a main body (4a) of the cap (4), the second retaining portions (8b) being configured to engage the first retaining portions (8a) to retain the tamper evident elements (7) within the internal cavity (5).
12. Tap (1) according to any of the preceding claims, wherein the tamper evident elements (7) comprise first connecting teeth (80a), a main body (4a) of the cap (4) comprising second connecting teeth (80b) connected to the first connecting teeth (80a) after the first opening of the tap (1).

13. Tap (1) according to any of the preceding claims,
wherein the driving member (6) comprises a top
surface (61) configured to abut against a lower sur-
face (70b) of the tamper evident elements (7) before
first opening to operatively connect the tamper evi- 5
dent elements (7) to the driving member (6), the top
surface (61) being configured to prevent the tamper
evident elements (7) to be moved outwardly from the
cap (4). 10
14. Tap (1) according to any of the preceding claims,
wherein the cap (4) comprises a top surface (42a)
and a tamper proof button (43) at the top surface
(42a), the button (43) being configured to pass from a 15
rest configuration to a work configuration when sub-
jected to an external pressure, the top surface (42a)
having a concave shape in the work configuration.
15. Tap (1) according to any of the preceding claims,
wherein the cap (4) comprises a plurality of slots (40), 20
each slot (40) being configured to receive a respec-
tive tamper evident element (7), and the containing
body (2) comprises a plurality of slots (21) for a visual
indication of the current configuration of the tap (1),
wherein the plurality of slots (21) of the containing 25
body (2) are arranged in correspondence of the
plurality of slots (40) of the cap (4).

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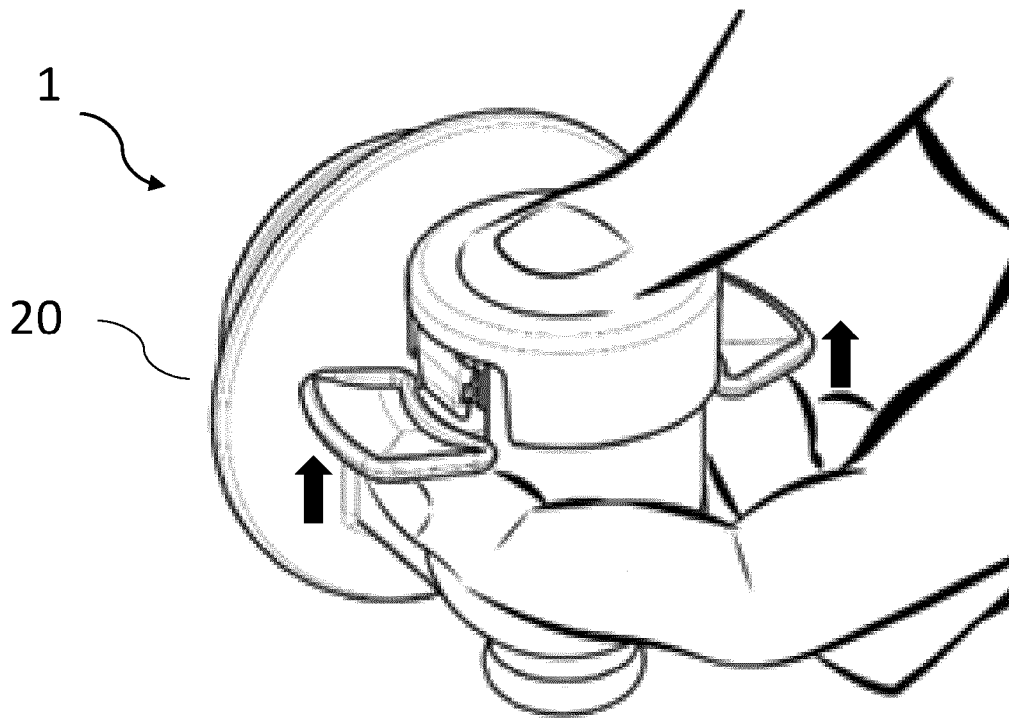


Fig. 1

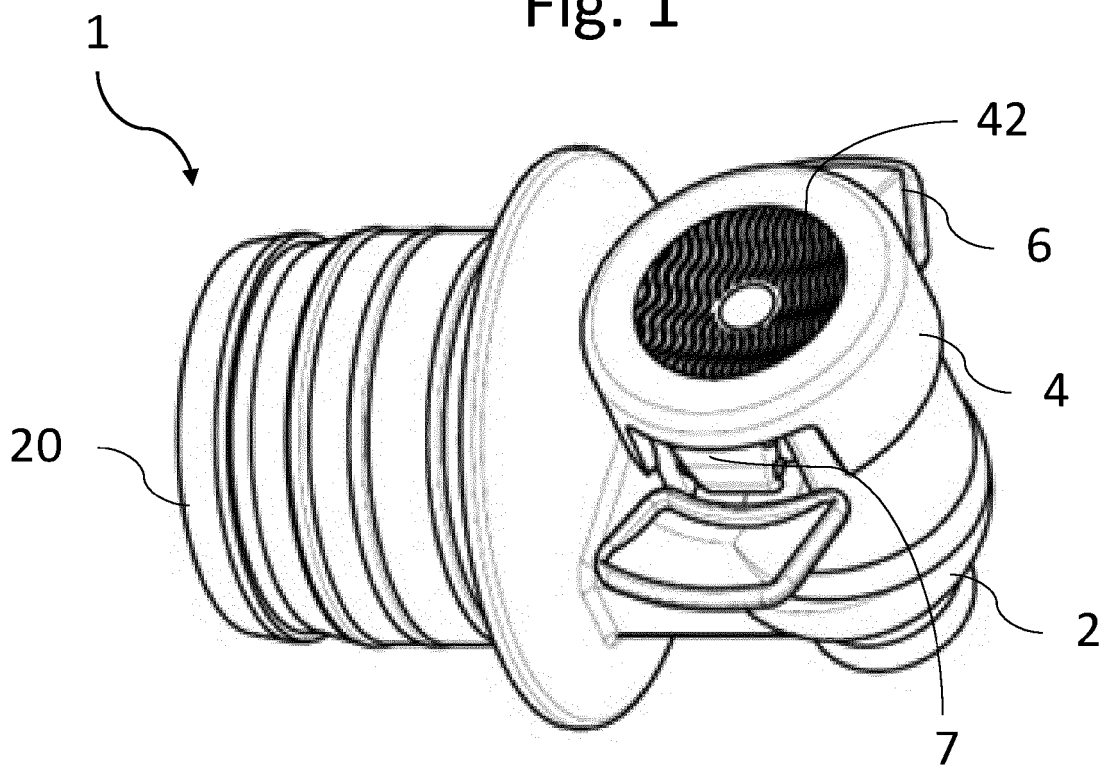


Fig. 2

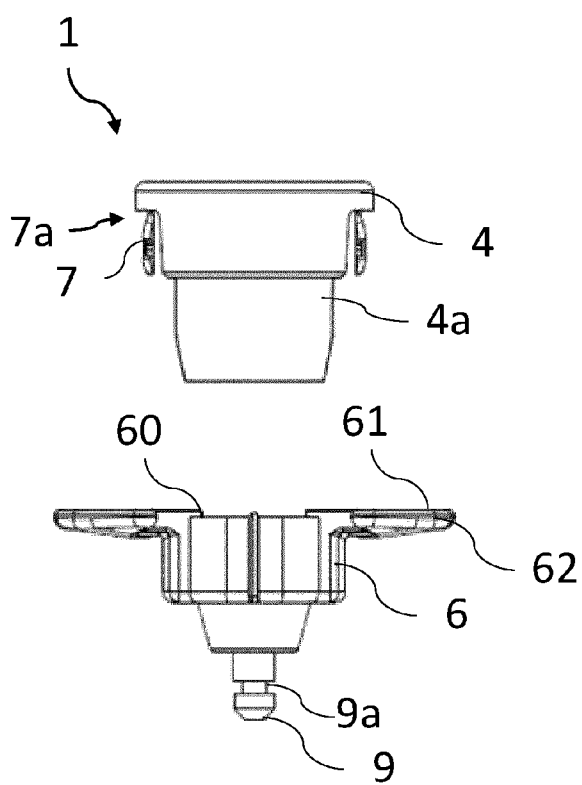


Fig. 3a

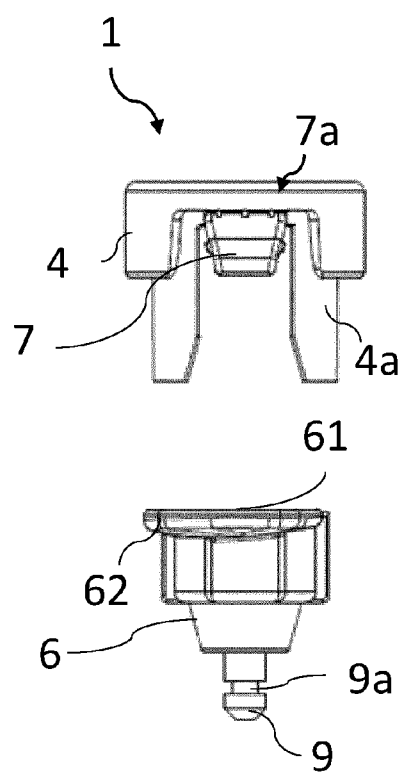
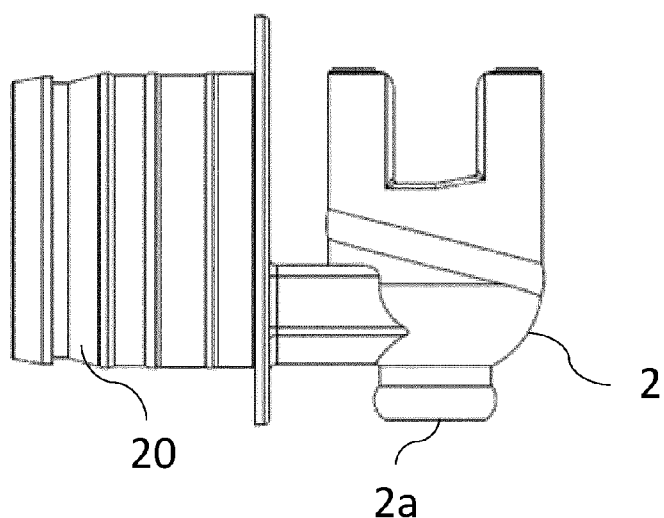
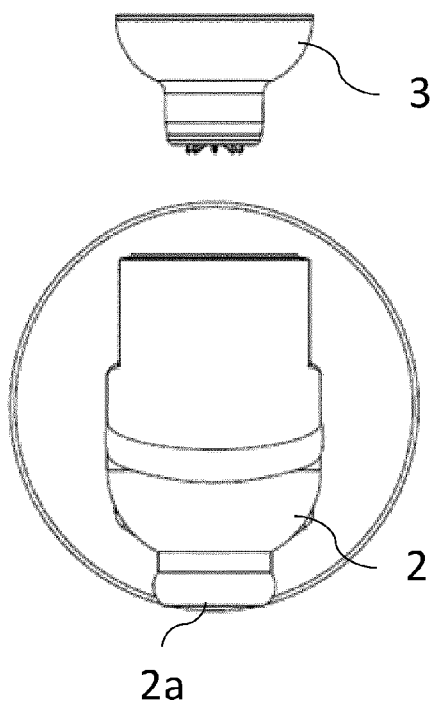


Fig. 3b



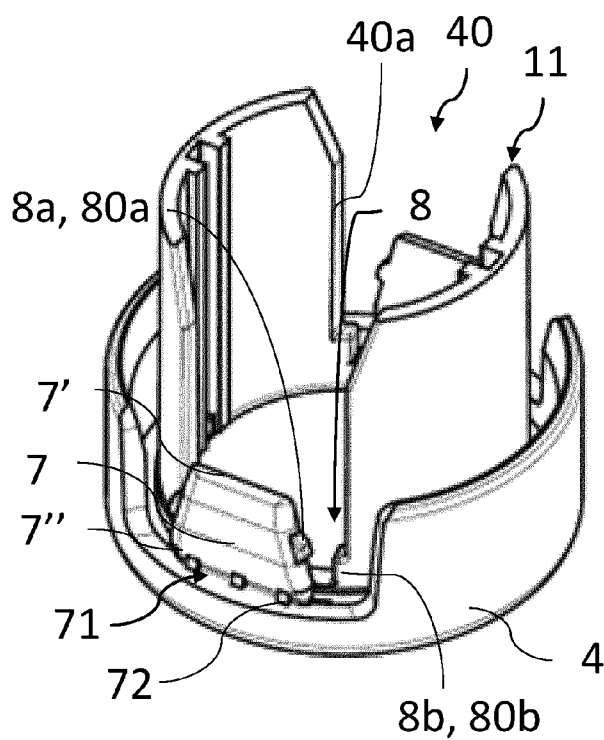


Fig. 4a

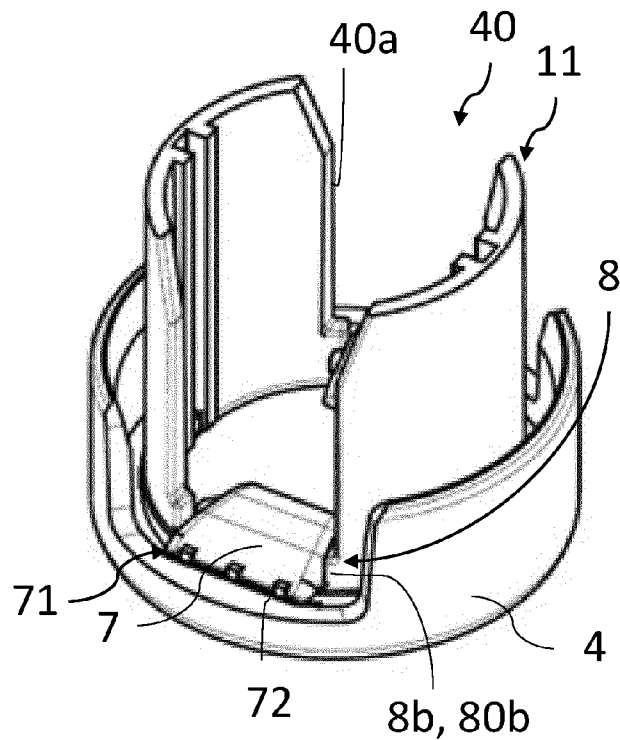


Fig. 4b

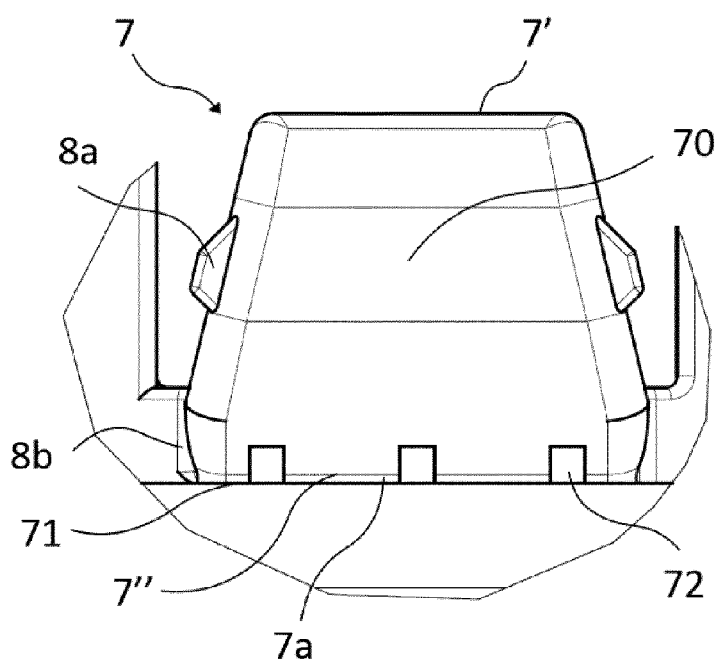


Fig. 4c

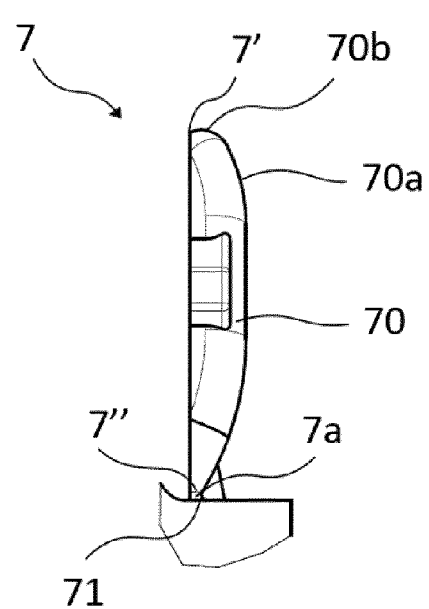


Fig. 4d

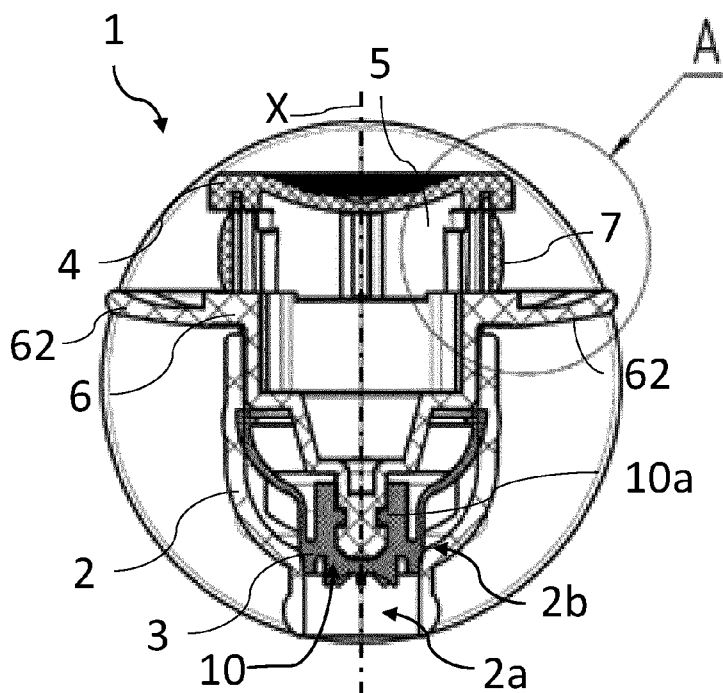


Fig. 5a

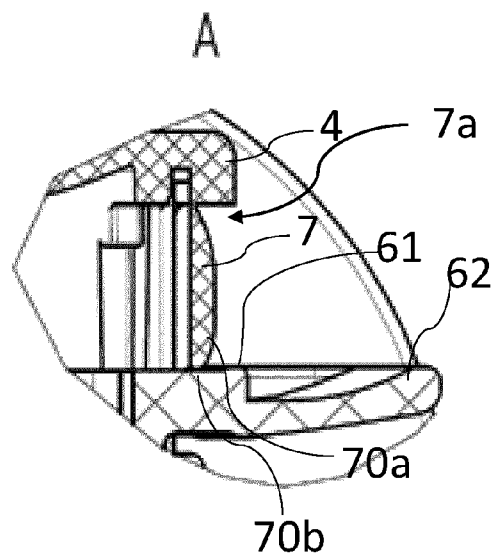


Fig. 5b

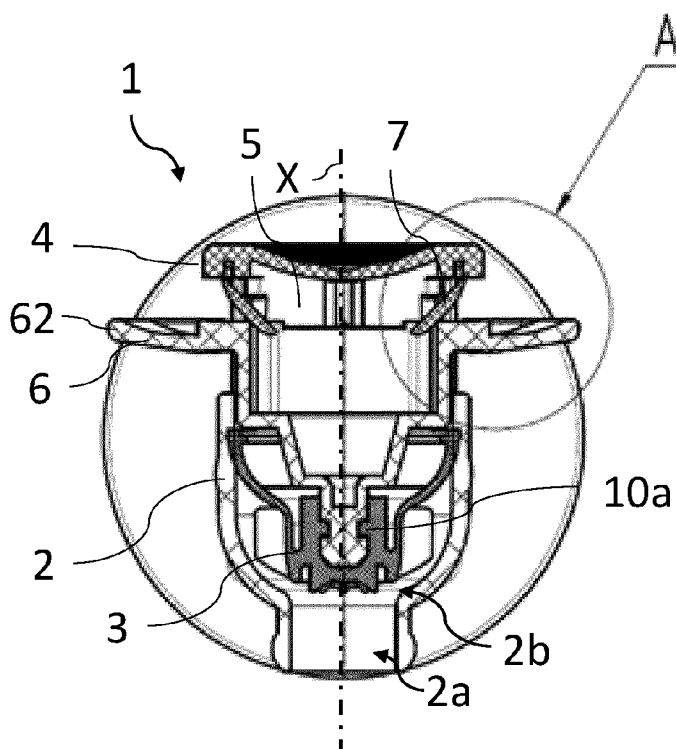


Fig. 6a

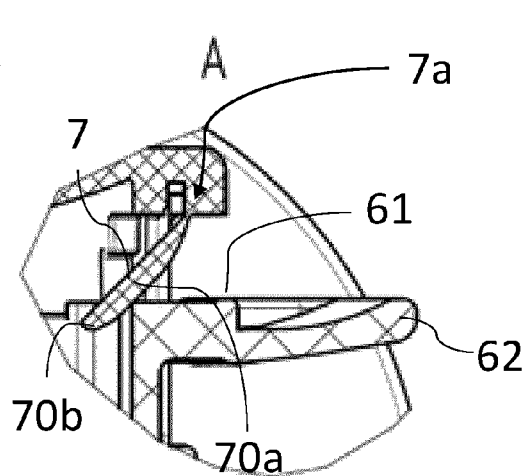


Fig. 6b

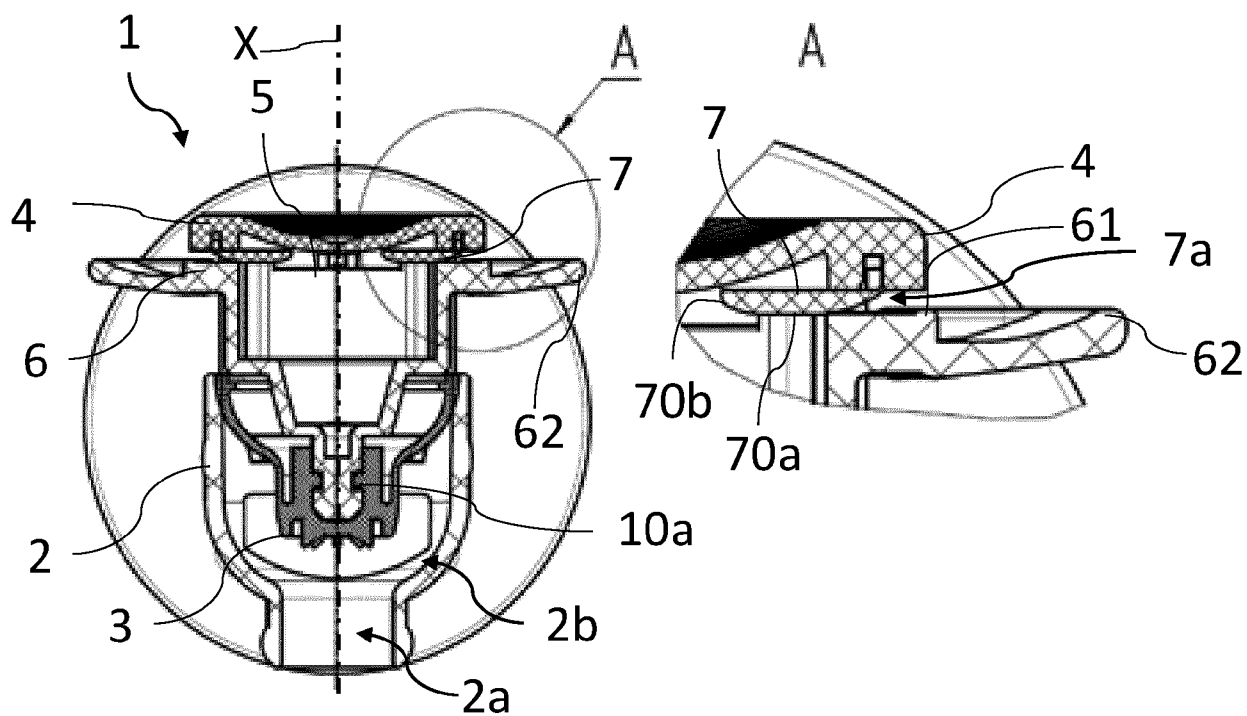


Fig. 7a

Fig. 7b

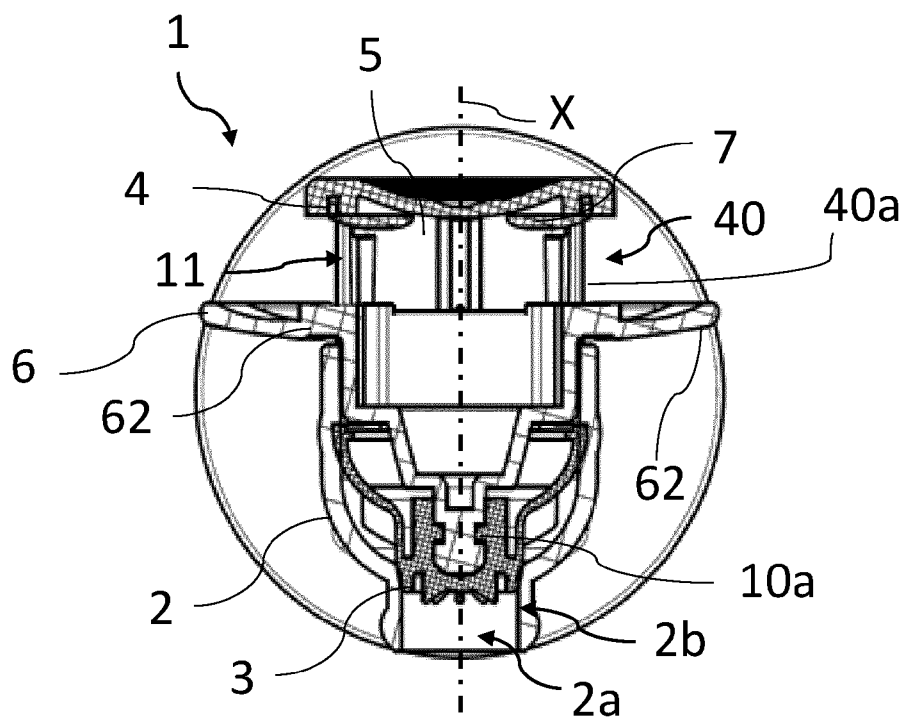


Fig. 8

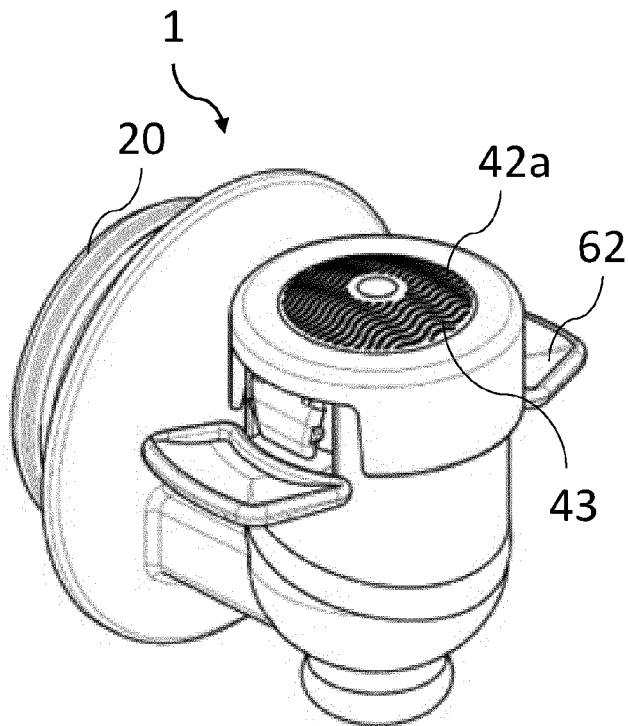


Fig. 9a

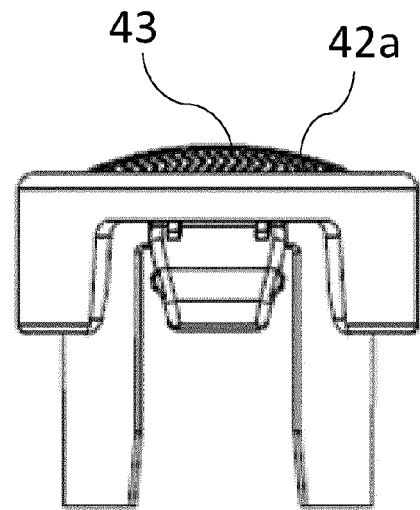


Fig. 9b

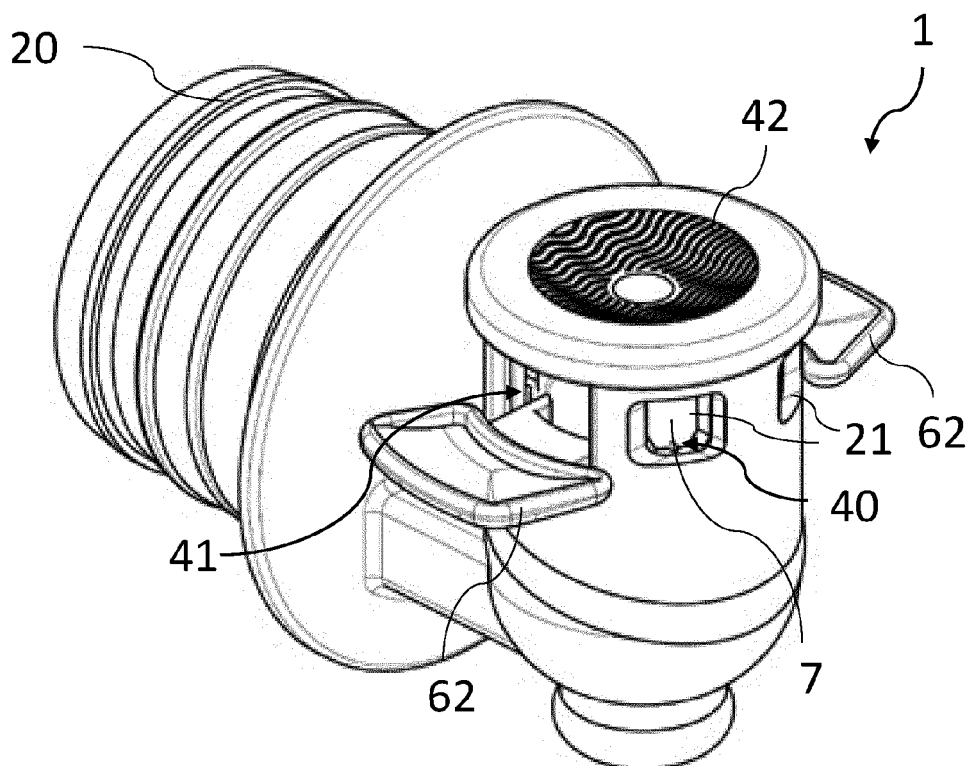


Fig. 10

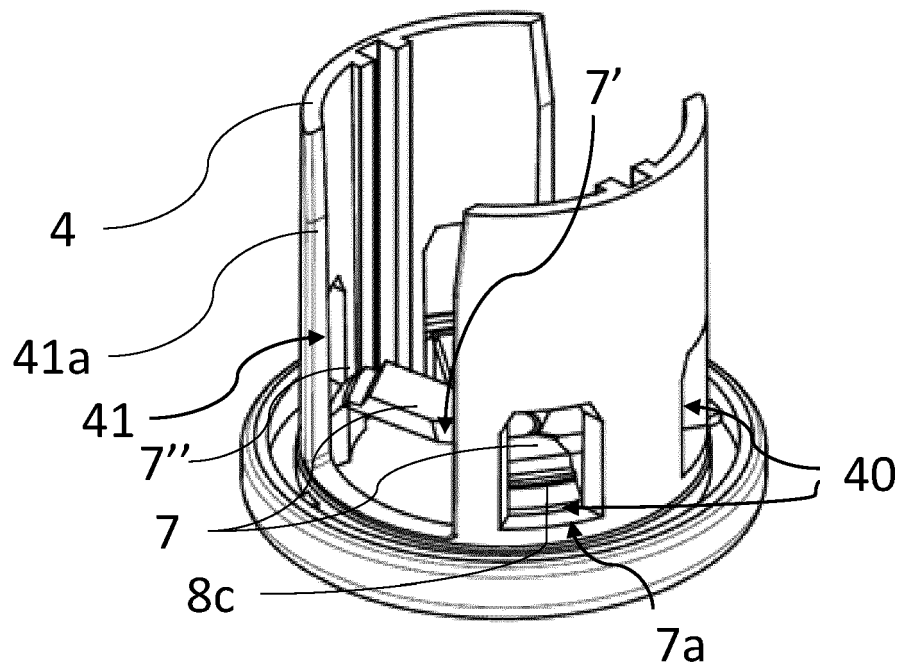


Fig. 11

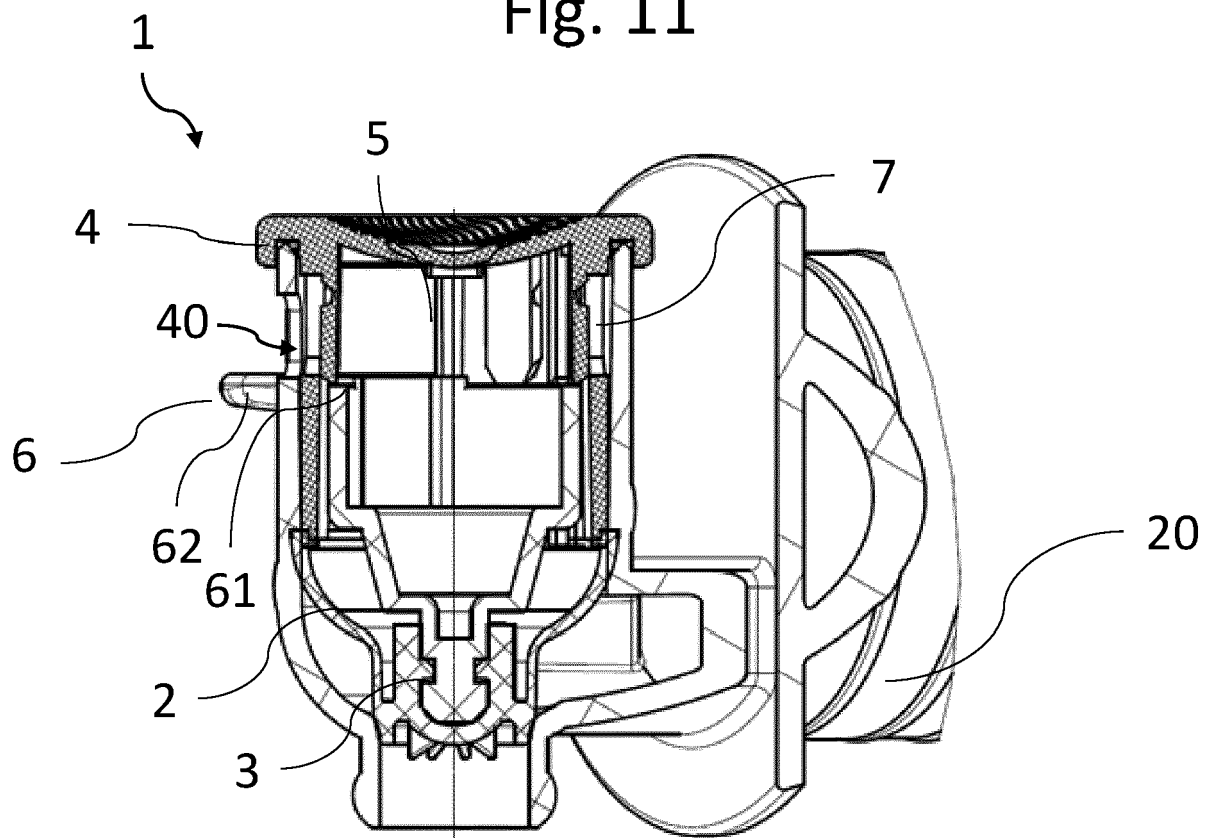


Fig. 12a

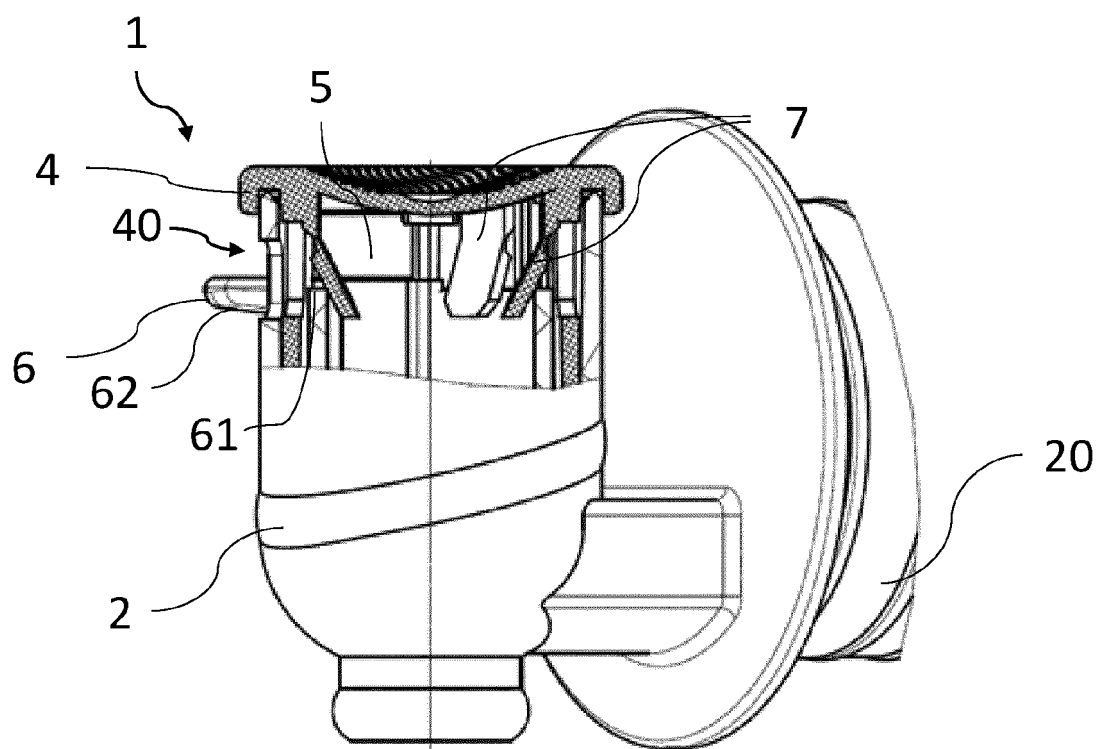


Fig. 12b

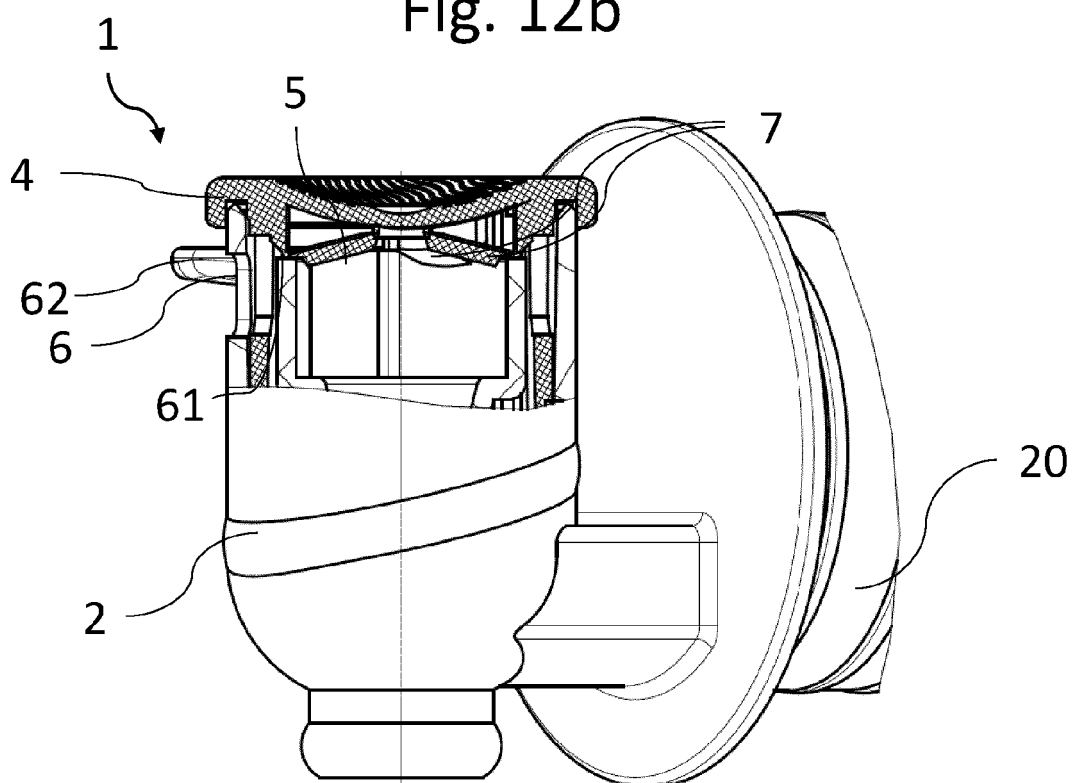


Fig. 12c



EUROPEAN SEARCH REPORT

Application Number

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 June 2024	Examiner Müller, Claus
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