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(54) A POURING SPOUT FOR A CONTAINER, A CONTAINER ASSEMBLY AND A METHOD FOR PRODUCING A POURING SPOUT

(57) A pouring spout (10) for attachment to a container neck (11), comprising an outer tubular portion (15) for enclosing an exterior surface of the neck (11) and having a centre axis (A), and an inward extending projection (18) for engaging an exterior flange (25) of the neck (11) for fastening the spout (10) to the neck (11). The spout (10) also comprises an inner tubular portion (20) extending in the axial direction for engaging an interior surface of the neck (11), wherein the inner tubular portion (20) is spaced apart from the outer tubular portion (15) in the radial direction to form a gap (21) between the outer tubular portion (15) and the inner tubular portion (20). A surface of the inner tubular portion (20) facing the outer tubular portion (15) is formed with a plurality of radially displaced steps (22). Disclosed is also an assembly comprising a spout and a container, and a method for producing the spout.

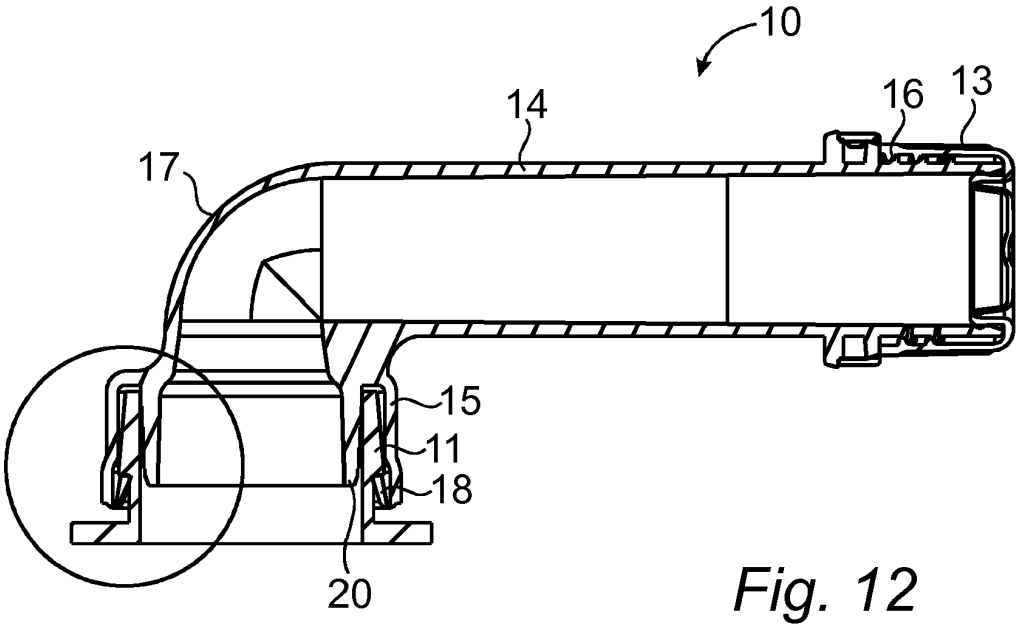

Fig. 12

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a pouring spout for a container. More specifically, the present invention relates to a pouring spout for attachment to a container neck. This type of containers includes cans and similar types of containers. Such cans include gas cans, wherein the pouring spout is attached to the neck of the can to facilitate pouring of its content into a fuel tank. This type of containers also includes containers for oil, washer fluids, detergents, chemicals and similar but can include containers for any liquids or semi liquids.

[0002] The present invention also includes a container assembly comprising a container, such as a can, and a spout mounted on said container to facilitate extraction of its contents. The present invention also relates to a method for producing such a pouring spout.

PRIOR ART

[0003] Different types of pouring spouts for containers, such as gas cans, are part of the prior art. One such type of pouring spout comprises a threaded portion for connection to a threaded neck of the container, wherein the spout is attached to the neck by screwing.

[0004] One problem with pouring spouts according to the prior art is that they can be difficult to use.

[0005] Another problem with such prior art pouring spouts is that the sealing properties can be poor.

SUMMARY OF THE INVENTION

[0006] An object of the invention is to avoid the above-mentioned problems of the prior art. The invention results in pouring spout with favourable sealing properties, which is easy to attach to a container and is easy to use.

[0007] The present invention relates to a pouring spout for attachment to a container neck, comprising an outer tubular portion for enclosing an exterior surface of the neck and having a centre axis, and an inward extending projection for engaging an exterior flange of the neck for fastening the spout to the neck, characterised in that the spout also comprises an inner tubular portion extending in the axial direction for engaging an interior surface of the neck, wherein the inner tubular portion is spaced apart from the outer tubular portion in the radial direction to form a gap between the outer tubular portion and the inner tubular portion, and a surface of the inner tubular portion facing the outer tubular portion is formed in a plurality of radially displaced steps. The combination of the projection for interaction with the flange of the neck together with the steps of the inner tubular portion result in a spout that can be pushed onto the neck without rotation for a safe and reliable attachment of the spout while providing an excellent seal to prevent leakage from the container. The spout and/or neck can be arranged in a resiliently flexible material, such as plastic materials, wherein at least the projection can be arranged resiliently flexible, and wherein the neck and/or inner tubular portion are resiliently flexible by the inherent properties of the material. Both the entire spout and the entire container with the neck can be arranged in similar material, such as similar plastic material, which is favourable from a recycling perspective. For example, both the spout and the container can be formed in polyethylene, such as HDPE.

[0008] An edge portion can be arranged between each of the steps. It has been found that the edge portions further improve the sealing properties of the spout.

[0009] The inner tubular portion can be tapered downward, such as toward a free end thereof, by means of the steps. This facilitates mounting on the neck while providing favourable sealing properties.

[0010] The outer side of the inner tubular portion can be formed with a chamfer to guide the inner tubular portion within the neck and thereby guide the spout onto the neck during assembly.

[0011] The inwards extending projection can be arranged to extend inward and upward, which will result in a favourable locking of the spout to the neck, which can withstand relatively large forces on the spout axially upward also when the projection and/or a notch between the projection and the outer tubular portion is formed with reduced or relatively small material thickness. Such small material thickness will provide easier folding of the projection and thereby easier production while providing material savings.

[0012] The outer tubular portion can be arranged with an inner diameter which is larger in its lower part than in its upper part to form a space for temporarily receiving the projection during mounting on the neck. Hence, a space is provided to facilitate for the projection to be displaced radially when it slides along the neck toward the flange, wherein it returns by its inherent resilient flexible properties when it has reached the flange to engage it and interact with it to attach the spout to the neck.

[0013] The present invention also relates to an assembly comprising the spout and a container, wherein the neck of the container is received in the gap between the inner tubular portion and the outer tubular portion, at least an uppermost step of the inner tubular portion engages the interior side of the neck, and the inwards extending projection of the outer tubular portion engages the flange of the neck to attach the spout to the neck.

[0014] The present invention also relates to a method for producing a pouring spout for attachment to a container neck, comprising the steps of

a) moulding the spout with an outer tubular portion and an axially extending inner tubular portion spaced apart from the outer tubular portion in the radial direction to form a gap between the outer tubular portion and the inner tubular portion, while moulding a projection in the end of the outer tubular portion and moulding a plurality of radially displaced steps in a

surface of the inner tubular portion facing the outer tubular portion, and

b) after step a) folding the projection inwards.

[0015] Further characteristics and advantages of the present invention will become apparent from the description of the embodiments below, the appended drawings and the dependent claims.

SHORT DESCRIPTION OF THE DRAWINGS

[0016] The invention will now be described more in detail with the aid of embodiment examples and with reference to the appended drawings, in which

Fig. 1 is a schematic view of a container provided with a pouring spout according to one embodiment,

Fig. 2 is a schematic side view of the pouring spout according to one embodiment, illustrating the pouring spout after moulding thereof but before folding of a projection of the pouring spout inwards,

Fig. 3 is a schematic rear view of the spout of Fig. 2,

Fig. 4 is a schematic section view of the spout of Fig. 2, illustrating an outer tubular portion and an inner tubular portion of the spout according to one embodiment,

Fig. 5 is a schematic section view of a part of the spout of Fig. 4, illustrating the outer and inner tubular portions and the projection prior to folding more in detail,

Fig. 6 is a schematic side view of a finished pouring spout according to one embodiment, wherein the projection has been folded inwards,

Fig. 7 is a schematic rear view of the spout of Fig. 6,

Fig. 8 is a schematic section view of the spout of Fig. 6, illustrating the projection and the outer and inner tubular portions of the spout after folding of the projection,

Fig. 9 is a schematic section view of a part of the spout of Fig. 8, illustrating the outer and inner tubular portions and the projection after folding more in detail,

Fig. 10 is a schematic side view of the finished pouring spout arranged on a neck of a container and provided with a cap according to one embodiment,

Fig. 11 is a schematic rear view of the spout and the neck of Fig. 10,

Fig. 12 is a schematic section view of the spout and neck of Fig. 10, and

Fig. 13 is a schematic section view of a part of the spout and neck of Fig. 12, illustrating an interaction of the outer and inner tubular portions with the neck more in detail,

THE INVENTION

[0017] With reference to Fig. 1 a pouring spout 10 mounted on a neck 11 of a container 12 is illustrated schematically according to one embodiment. The pouring spout 10 is arranged to facilitate extraction of the contents of the container 12. For example, the pouring spout 10 is arranged in plastic materials, such as a suitable thermoplastic. For example, the pouring spout 10 is formed in polyethylene, such as HDPE. The pouring spout is, e.g. partially produced by moulding, such as injection moulding, using movable jaws and a tool core interacting with the jaws to form a mould for receiving an amount of plastic material for producing the pouring spout 10. The jaws and the tool core are arranged with a particular form for providing the mould for producing the pouring spout 10 according to the invention, which form is evident by the description of the special features of the pouring spout 10 below. The pouring spout 10 is also formed partially by means of a mechanical folding machine, which folding is described more in detail below.

[0018] The container 12 is, for example, a can, such as a gas can for containing fuel. Alternatively, the container 12 is arranged for containing oil, washer fluids, detergents, chemicals and similar. Alternatively, the container 12 is arranged for containing foodstuff, such as beverages. The container 12 is, e.g. arranged for containing a volume of at least 1 litre, such as at least 3 litres or at least 5 litres. For example, the container 12 is arranged in plastic materials or metal. For example, the container 12 is arranged in the same plastic materials as the spout 10. For example, the container 12 is arranged in polyethylene, such as HDPE.

[0019] In Fig.1, the spout 10 is mounted on the neck 11 of the container 12, wherein an interior of the spout 10 is in liquid communication with an interior of the container 12. Hence, the spout 10 comprises an inlet for receiving liquid from the container 12 and an outlet through which the liquid leaves the spout 10. For example, the spout 10 is arranged to be mounted on top of the container 12. In Fig. 1 the spout 10 is provided with a removable cap 13, such as a screw cap, for closing the spout 10 and preventing the contents of the container 12 from being unintentionally extracted through the spout 10.

[0020] With reference to Figs. 2 and 3 the spout 10 is illustrated according to one embodiment, wherein the spout 10 has been moulded and removed but is not finished. For example, the spout 10 as illustrated in Fig. 2 has been removed from the mould for further processing. The spout 10 comprises a pipe portion 14 and a tubular

portion in the form of an outer tubular portion 15, wherein the outer tubular portion 15 is connected to the pipe portion 14. The pipe portion 14 has a free first end and an opposite second end, wherein a thread 16 is arranged in the area of the free first end and the outer tubular portion 15 is connected to the second end. The thread 16 is arranged for engaging a corresponding thread of the cap 13. For example, the thread 16 of the spout 10 is an external thread.

[0021] In the illustrated embodiment, the pipe portion 14 is arranged with a bend 17, so that the outlet of the spout 10 is offset from the inlet. For example, the inlet is arranged perpendicular to the outlet, wherein a centre axis A of the outer tubular portion 15 is perpendicular to a part of a centre axis B of the pipe portion 14 at the free first end thereof. Alternatively, the centre axis A of the outer tubular portion 15 is inclined to the part of the centre axis B of the pipe portion 14 at the free first end thereof. Alternatively, the pipe portion 14 is arranged without the bend 17, wherein the pipe portion 14 is straight and the centre axis A of the outer tubular portion 15 is aligned with the part of the centre axis B of the pipe portion 14 at the free first end thereof. For example, the centre axis A of the outer tubular portion 15 is straight along the entire outer tubular portion 15.

[0022] The spout 10 comprises a projection 18 for fastening of the spout 10 to the neck 11 of the container 12. The projection 18 is connected to the outer tubular portion 15, such as at the end of the outer tubular portion 15. In the illustrated embodiment, the projection 18 is formed at the end of the tubular portion 15 opposite the pipe portion 14. For example, the projection 18 is formed at the end of the tubular portion 15 opposite the bend 17. In the illustrated embodiment, the projection 18 is annular and extend continuously around the outer tubular portion 15. For example, the projection 18 is cylindrical having a circular cross section. Alternatively, the spout 10 comprises a plurality of projections 18 distributed around the outer tubular portion 15.

[0023] In Figs. 2-5, the spout 10 is illustrated after moulding, e.g. by injection moulding, but before finishing thereof. After moulding and before finishing of the spout 10 the projection 18 extends downwards from the outer tubular portion 15, such as away from the outer tubular portion 15 and in a direction away from the pipe portion 14. Hence, and angle between the inner side of the outer tubular portion 15 and the inner side of the projection 18 is then larger than 90 degrees and, for example larger than 120 degrees, and optionally less than 180 degrees. For example, the projection 18 extends obliquely downwards and inwards, so that the projection extends partially axially downwards and partially radially inwards when the spout 10 has been moulded but not finished. In the illustrated embodiment, the outer tubular portion 15 then extends substantially in the axial direction and slightly outwards. In the illustrated embodiment, the projection 18 is connected to the outer tubular portion 18 through a folding notch 19, along which the projection 18 is foldable after moulding, which is described further below. For example, the material thickness at the notch 19 is less than 1 mm, such as 0.2-0.5 mm or around 0.3 mm. The length of the projection 18 from the notch 19 to its free end is, for example 3-10 mm, such as around 5 mm. A material thickness of the projection 18 at its thickest part is, for example 1-2 mm, such as 1.2-1.5 or around 1.4 mm.

[0024] As illustrated in Figs. 4 and 5, the spout 10 comprises an inner tubular portion 20 arranged within the outer tubular portion 15. The inner tubular portion 20 extends substantially in the axial direction of the outer tubular portion 15. For example, the inner tubular portion 20 is cylindrical having a circular cross section. For example, the outer tubular portion 15 is cylindrical having a circular cross section. The outer tubular portion 15 is, for example arranged conical outwards, wherein the outer tubular portion 15 is somewhat tapered towards the pipe portion 14. In Fig. 5, a lower part of the outer tubular portion 15 is angled outwards in relation to an upper part thereof. The inner tubular portion 20 extends substantially coaxial with the outer tubular portion 15. The inner tubular portion 20 is arranged for conducting liquid from the container outlet to the pipe portion 14, through the bend 17 if applicable. The inner tubular portion 20 is spaced apart from the outer tubular portion 15 in the radial direction to form a gap 21 between the outer tubular portion 15 and the inner tubular portion 20. For example, the gap 21 is tapered in a direction towards the pipe portion 14. For example, the inner tubular portion 20 is formed with an outer diameter of 20-50 mm, such as around 30-35 mm, 32-33 mm or 32.46 mm at its widest point.

[0025] The inner tubular portion 20 is formed with steps 22 on a radially outwards facing surface of the inner tubular portion 20, i.e. the surface facing the gap 21 and the outer tubular portion 15. The steps 22 are displaced radially in relation to each other. Hence, a plurality of steps 22 are arranged adjacent to each other in the axial direction, wherein the steps 22 are displaced radially outwards in a direction towards the pipe portion 14. For example, the inner tubular portion 20 is connected to the pipe portion 14 in one end, wherein the opposite end of the inner tubular portion is a free end. Hence, the radially outwards facing side of the inner tubular portion 20 is somewhat conical inward toward its free end due to the steps 22, wherein an outer diameter of the inner tubular portion 20 is larger toward the pipe portion 14 and smaller toward its free end. In the illustrated embodiment, the inner tubular portion 20 is tapered towards its free end by means of the steps 22. The steps 22 are separated by a radially extending edge portion 23. Hence, the steps 22 form axially extending surfaces facing the outer tubular portion 15, wherein the edge portions 23 form radially extending flanges, so that the edge portions 23 form the radial displacements between the steps 22. The edge portions 23 are distinct and, e.g. connects to the steps 22 in a relatively sharp transition. For example, an angle between the steps 22 and an upwards adjacent edge

portion 23 is at least 90 degrees but less than 150 degrees, such as less than 135 degrees or around 120 degrees or less. For example, each edge portion 23 is less than 1 mm, less than 0.5 mm or around 0.2-0.3 mm, such as around 0.25 mm or 0.235 mm in the radial direction. In the illustrated embodiment, the inner tubular portion 20 is formed with five steps 22. Alternatively, the inner tubular portion 20 is formed with two or more steps, such as three to ten steps.

[0026] In the illustrated embodiment, the inner tubular portion 20 is terminated with a chamfer 24 at its free end. The chamfer 24 is arranged radially inward towards the free end of the inner tubular portion 20. The chamfer 24 is arranged on the outer side of the inner tubular portion 20 to guide the spout 10 during mounting on the container neck 11.

[0027] With reference to Figs. 6-8 the spout 10 is illustrated after finishing thereof by folding the projection 18 inward and upward. In Fig. 9 a part of the spout 10 is illustrated to show the folded projection 18 more in detail. After moulding of the spout 10 the projection 18 is folded along the notch 19. For example, the moulded spout 10 is removed from the mould and transferred to a machine for folding the projection 18. Optionally, said machine also applies the cap 13 to the outlet end of the pipe portion 14. Alternatively, the projection 18 is folded in the mould after axial displacement of the tool core, so that the projection 18 can be folded inward. The projection 18 is folded when the material of at least the notch 19 is warm enough for plastic deformation, so that the folded projection 18 stays in its folded position. For example, the projection 18 is folded while the material is still warm from the moulding process, i.e. while the material still is plastically deformable by heat from the moulding process. For example, the projection 18 is folded to a position in which it extends substantially axially upward toward the pipe portion 14. For example, the projection 18 is folded to a position in which its free end is arranged between the outer tubular portion 15 and the inner tubular portion 20, wherein the free end of the projection 18 is folded into the gap 21. For example, the projection 18 is folded within the outer tubular portion 15, so that the outer tubular portion 15 at least partially encloses the projection 18 in the radial direction.

[0028] As can be seen particularly in Fig. 9, the lower part of the outer tubular portion 15 is arranged with greater diameter than the upper part thereof. During folding of the projection 18 the outwards angled lower part of the outer tubular portion 15 is formed into a part with the greater diameter. The lower part of the outer tubular portion 15 is formed, so that the lower part of the gap 21 has greater diameter than the upper part thereof to form a space for temporarily receiving the projection 18 during mounting on a neck 11. Hence, the wider lower part of the outer tubular portion 15 and the wider lower part of the gap 21 is formed with a length corresponding to or being longer than the projection 18.

[0029] With reference to Figs. 10-12 the spout 10 is illustrated after finishing thereof and mounted on the container neck 11. In Fig. 13 parts of the spout 10 and the neck 11 are illustrated more in detail to show the interaction between them. The spout 10 is mounted on the neck 11 of the container 12 after moulding and after finishing of the spout 10 by folding of the projection 18. The spout 10 is mounted on the neck 11 by pushing the spout 10 in the axial direction of the outer tubular portion 15 onto the neck 11. For example, the outer tubular portion 15 is substantially coaxially aligned with the neck 11 and pushed axially onto the neck, optionally without rotation of the spout 10 in relation to the neck 11.

[0030] As illustrated in Figs. 12 and 13 the neck 11 is formed with a flange 25 for engaging the projection 18 to fasten the spout 10 to the neck 11. The flange 25 is arranged on the exterior side of the neck 11 and projects radially outwards. For example, the flange 25 is continuous and extends around the neck 11. For example, the flange 25 extends in the same axial level around the neck 11. In the illustrated embodiment, the neck 11 is conical towards its free end, i.e. its upper end. For example, the neck 11 is tapered towards the free end.

[0031] To fasten the spout 10 to the neck 11 the outer tubular portion 15 is arranged to enclose the neck 11 while the inner tubular portion 20 is arranged within the neck 11. The projection 18 is pushed radially outward by the neck 11 due to the inherent flexible properties of the spout 10 and, optionally also the neck 11. In the illustrated embodiment, the lower part of the outer tubular portion 15 adjacent the projection 18 is formed with a greater diameter than the remaining part of the outer tubular portion 15 toward the pipe portion 14, wherein the lower part with larger diameter is arranged to temporarily accommodate the projection 18 when it is displaced radially outward. The neck 11 is received in the gap 21 by pushing the outer tubular portion 15 axially onto the neck 11 until the projection 18 reaches the flange 25. When the projection 18 reaches the flange 25 the projection 18 springs back radially inward due to its inherent resilient flexible properties to engage the flange 25 and prevent removal of the spout 10 from the neck 11. For example, the projection 18 is then in a default unbiased position or biased radially inward due to the inherent resilient flexible properties. Hence, the spout 10 is locked on the neck 11 when the projection 18 engages the flange 25. For example, the spout 10 is irreversibly attached to the neck 11 and cannot be removed. In the illustrated embodiment, the spout 10 and neck 11 are arranged without threads. For example, the outer side of the neck 11 is smooth and even between its free end and the flange 25. When the spout 10 is pushed onto the neck 11, the inner tubular portion 20 engages the inner side of the neck 11, wherein one or more of the steps 22 engage the neck 11 to seal the neck opening and prevent the content of the container 12 from leaking.

[0032] The spout 10 and the container 12 form an assembly when the spout has been mounted on the neck 11, wherein the neck 11 is arranged in the gap 21 be-

tween the outer tubular portion 15 and the inner tubular portion 20, wherein the projection 18 engages the flange 25, and wherein at least one of the steps 22 engages the inner side of the neck 11. The neck 11, the outer tubular portion 15 and the inner tubular portion 20 are arranged substantially coaxial. In the illustrated embodiment, the inner side of the neck 11 is smooth and even, for example along its entire length or at least from its free end to a level corresponding to its flange 25 or to a level corresponding to the free end of the inner tubular portion 20. In Fig. 13 it can be seen that the outer side of the inner tubular portion 20 is tapered towards its free end. The inner tubular portion 20 is formed tapered towards its free during moulding thereof. However, it is believed that the inner tubular portion 20 will be forced against the inner side of the neck 11 during assembly due to the inherent resilient flexible properties of the inner tubular portion 20, possibly in combination with pressure applied thereon by the contents of the container 12. Hence, after assembly of the spout 10 on the neck 11 of a container 12 having a liquid content, such as fuel, e.g. in the form of petroleum or similar, it is believed that more than one of the steps 22, such as at least two or at least three steps 22, will be in contact with the neck 11 to seal the container 12. If the pressure in the container 12 is increased after assembly, it is believed that additional steps 22, if applicable, will engage the neck 11 to further seal the container 12. For example, the inner tubular portion 20 and the neck 11 are biased toward each other by means of the inherent resilient flexible properties of at least one of them, so that at least one or at least two steps 22 are forced against the neck 11.

Claims

1. A pouring spout (10) for attachment to a container neck (11), comprising an outer tubular portion (15) for enclosing an exterior surface of the neck (11) and having a centre axis (A), and an inward extending projection (18) for engaging an exterior flange (25) of the neck (11) for fastening the spout (10) to the neck (11),
***characterised* in that**
the spout (10) also comprises an inner tubular portion (20) extending in the axial direction for engaging an interior surface of the neck (11), wherein the inner tubular portion (20) is spaced apart from the outer tubular portion (15) in the radial direction to form a gap (21) between the outer tubular portion (15) and the inner tubular portion (20), and
a surface of the inner tubular portion (20) facing the outer tubular portion (15) is formed with a plurality of radially displaced steps (22).

2. A pouring spout according to claim 1, wherein the steps (22) are separated by an edge portion (23).

3. A pouring spout according to claim 1 or 2, wherein the inner tubular portion (20) is tapered by means of the steps (22).

4. A pouring spout according to claim 3, wherein the inner tubular portion (20) has a free end and is tapered towards its free end.

5. A pouring spout according to claim 4, wherein the free end of the inner tubular portion is formed with a chamfer (24).

6. A pouring spout according to any of the preceding claims, wherein the inwards extending projection (18) is formed in the end of the outer tubular portion (15).

7. A pouring spout according to any of the preceding claims, wherein the inwards extending projection (18) extends inwards and upwards.

8. A pouring spout according to any of the preceding claims, wherein the outer tubular portion (15) is arranged with an inner diameter which is larger in its lower part to form a space for temporarily receiving the projection (18) during mounting on the neck (11).

9. An assembly comprising a container (12) and a spout (10) according to any of the preceding claims, wherein the neck (11) of the container is received in the gap (21) between the inner tubular portion (20) and the outer tubular portion (15), at least one step (22) of the inner tubular portion (20) engages the interior side of the neck (11), and the inwards extending projection of the outer tubular portion engages the flange of the neck to attach the spout to the neck.

10. An assembly according to claim 9, wherein at least an uppermost step (22) engages the neck (11).

11. A method for producing a pouring spout (10) for attachment to a container neck (11), comprising the steps of

a) moulding the spout (10) with an outer tubular portion (15) having a centre axis (A), and an axially extending inner tubular portion (20) spaced apart from the outer tubular portion (15) in the radial direction to form a gap (21) between them, while moulding a projection (18) in the end of the outer tubular portion (15) and moulding a plurality of radially displaced steps (22) in a surface of the inner tubular portion (20) facing the outer tubular portion (15), and
b) after step a) folding the projection (18) inwards.

12. A method according to claim 11, including, after step

a) and before step b), the steps of removing the moulded spout (10) from the mould and transferring the moulded spout to a machine for folding the projection (18).

13. A method according to claim 11 or 12, including the step of folding the projection (18) to a position in which it extends inward and upward.

14. A method according to any of claims 11-13, including, in step a), the step of forming the outer tubular portion (15) with an inner diameter which is larger in its lower part to form a space for temporarily receiving the projection (18) during mounting on the neck (11).

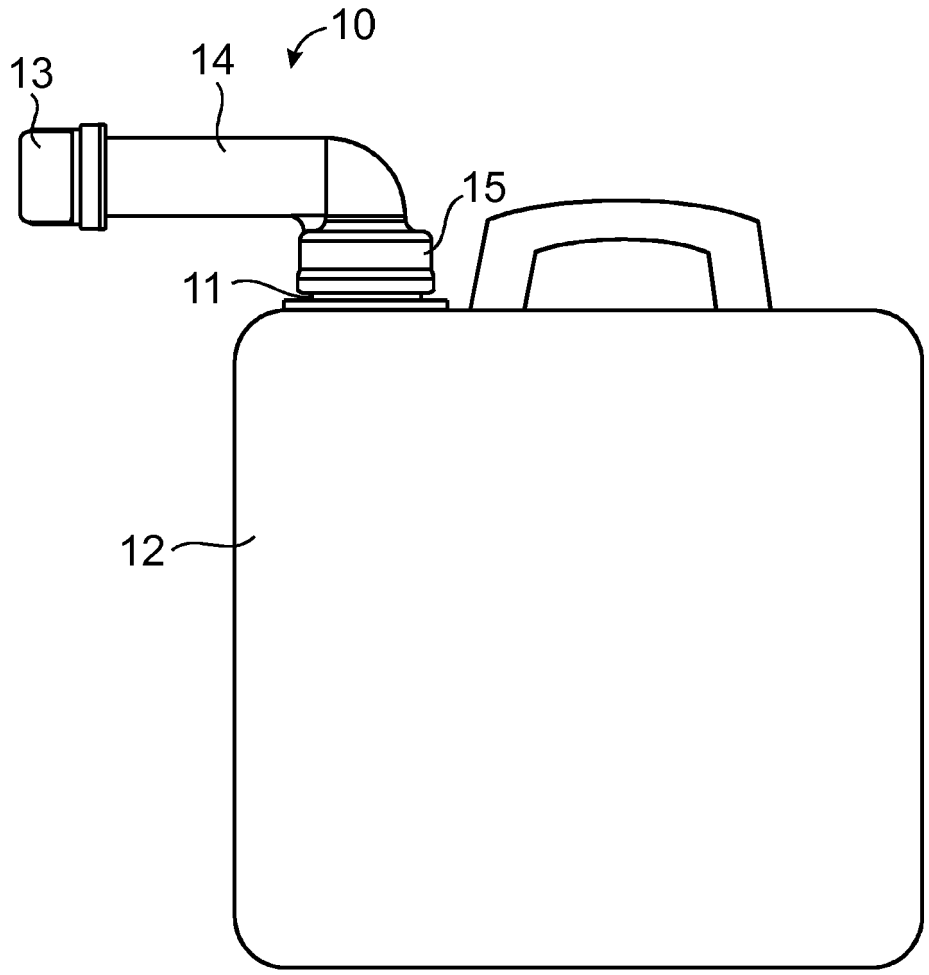

Fig. 1

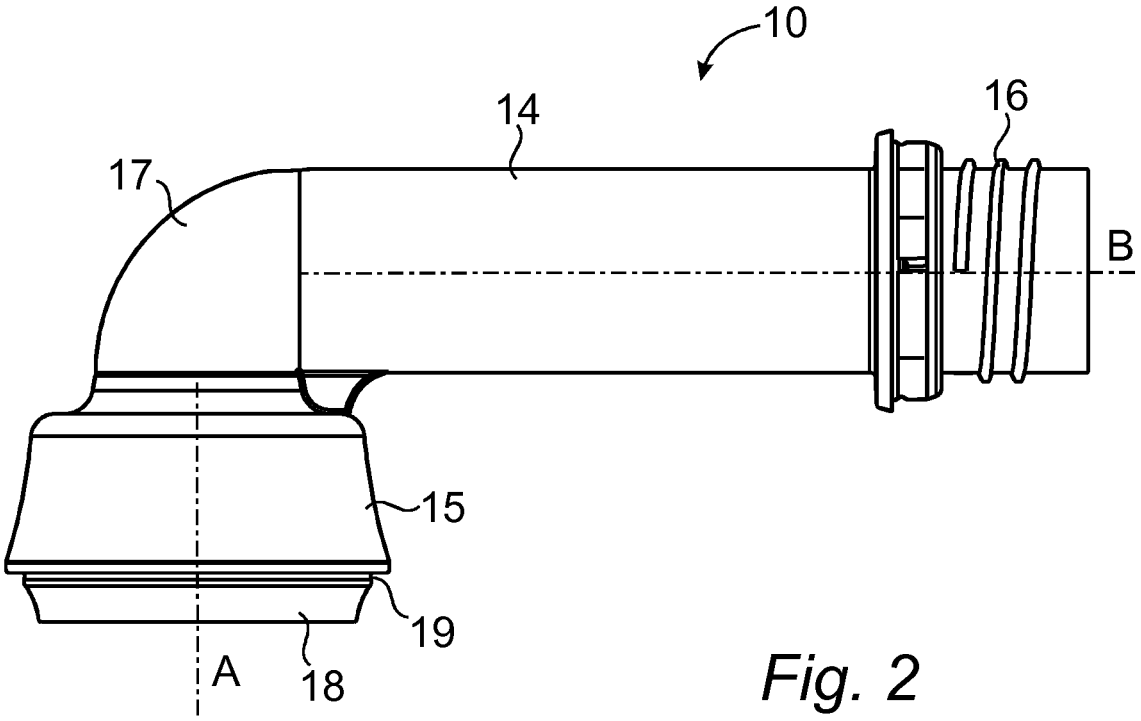

Fig. 2

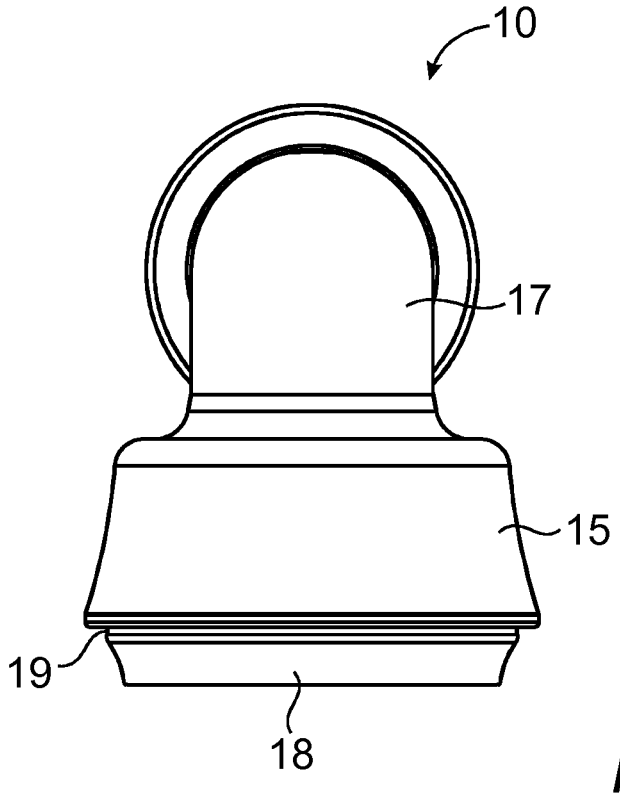

Fig. 3

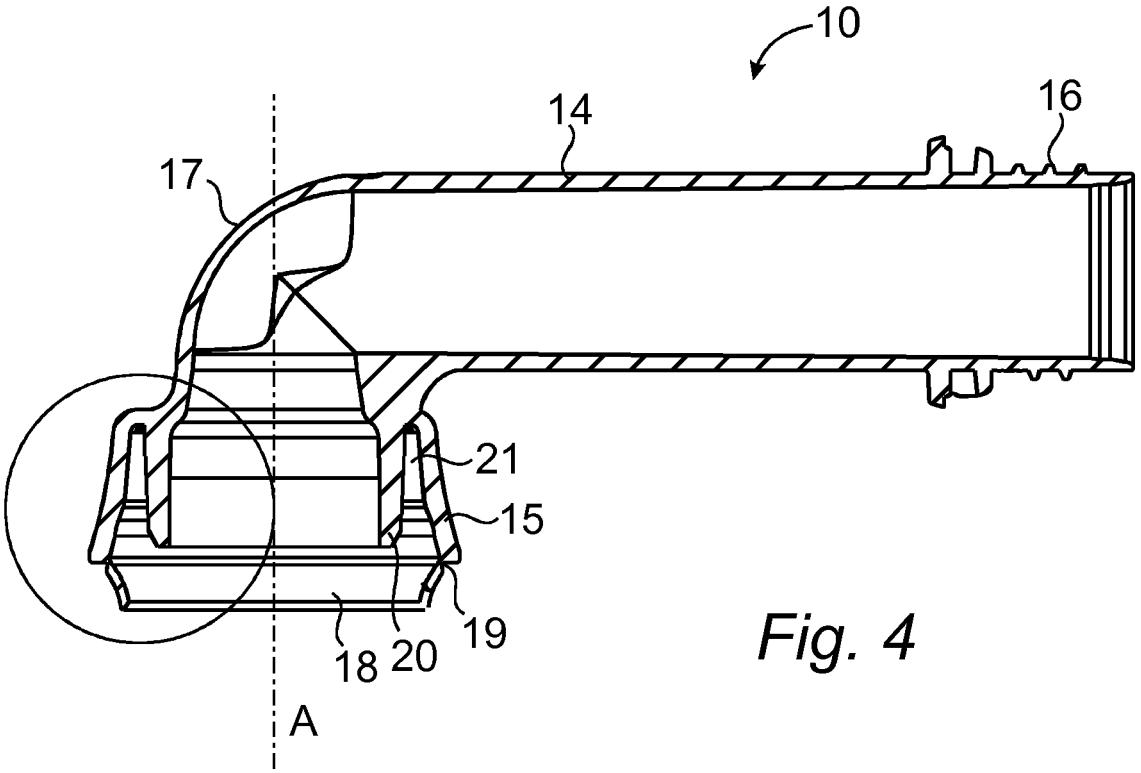

Fig. 4

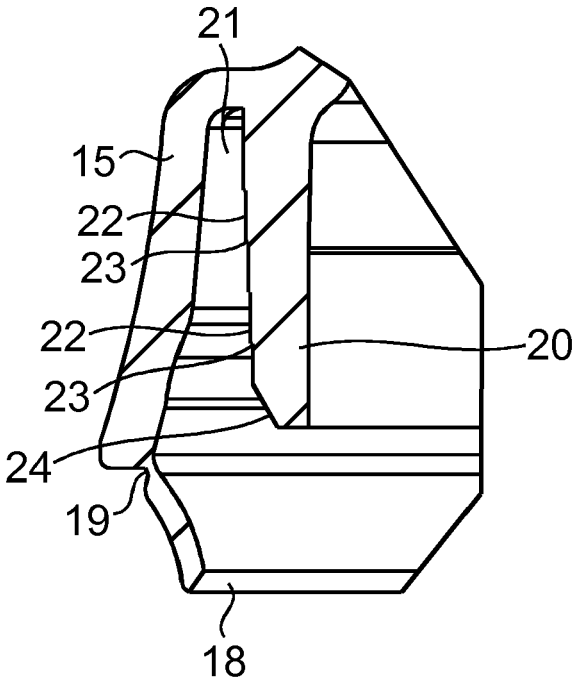

Fig. 5

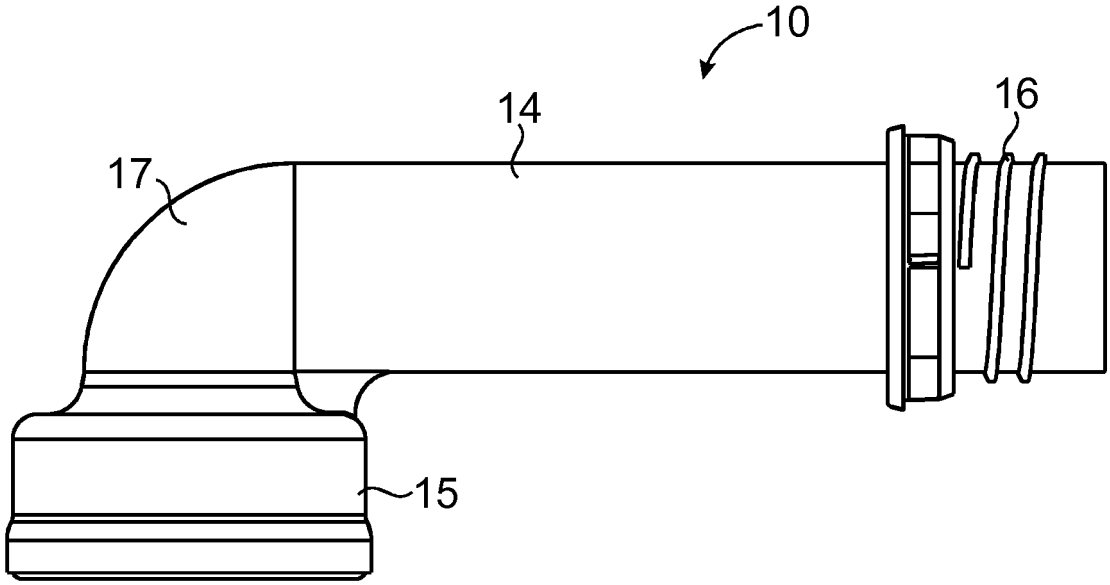

Fig. 6

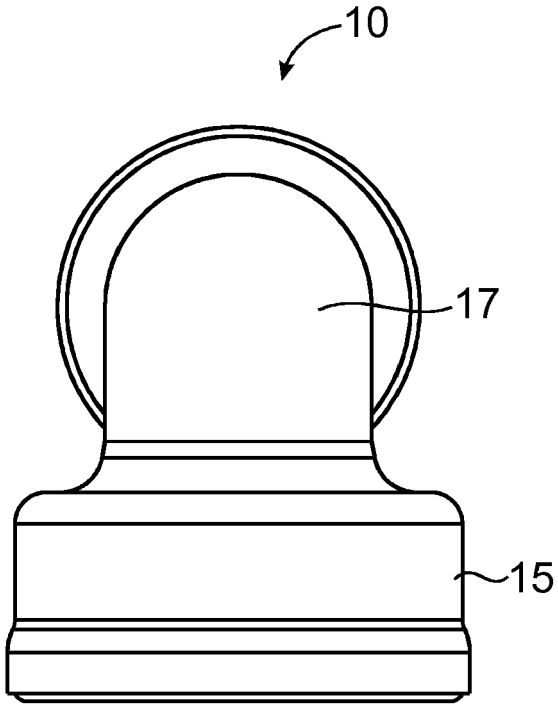

Fig. 7

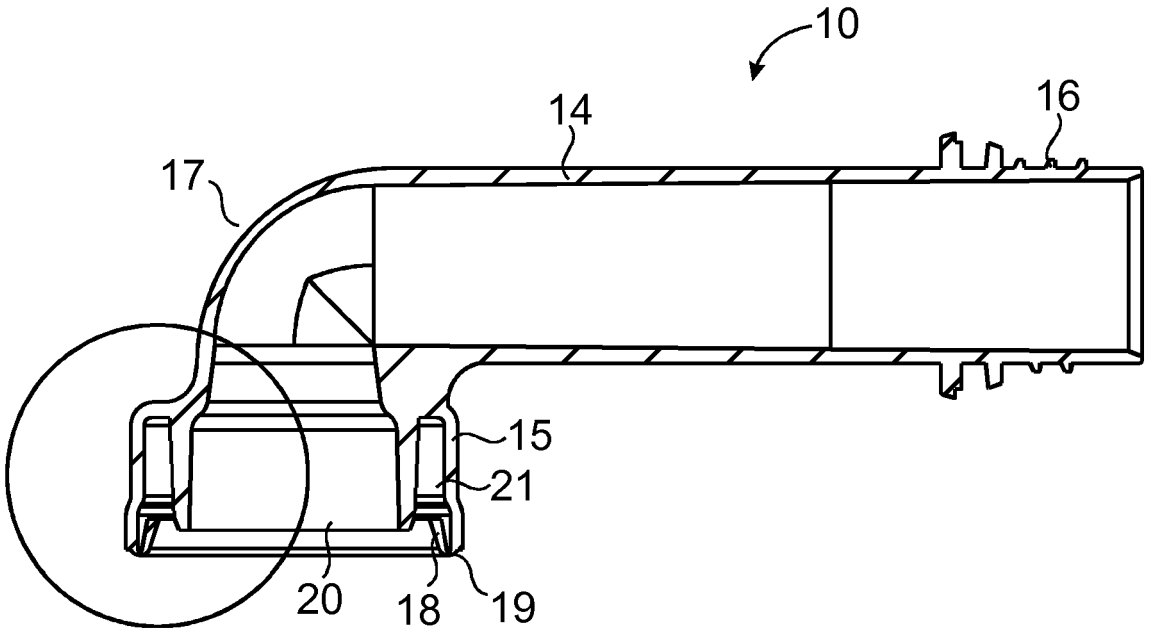

Fig. 8

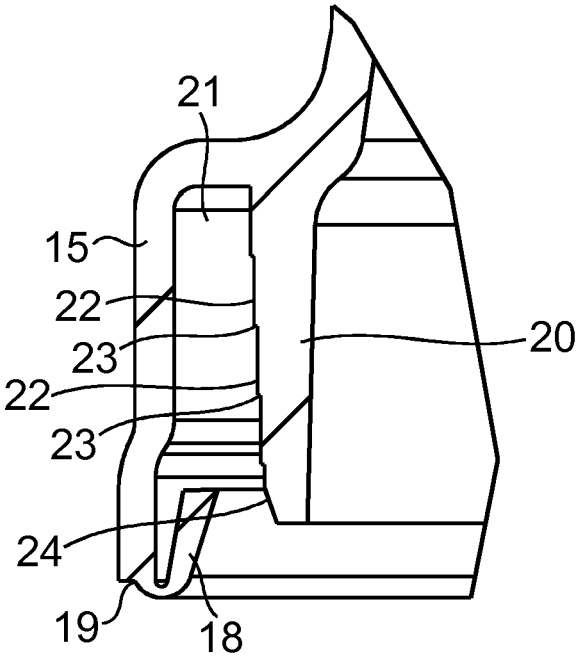

Fig. 9

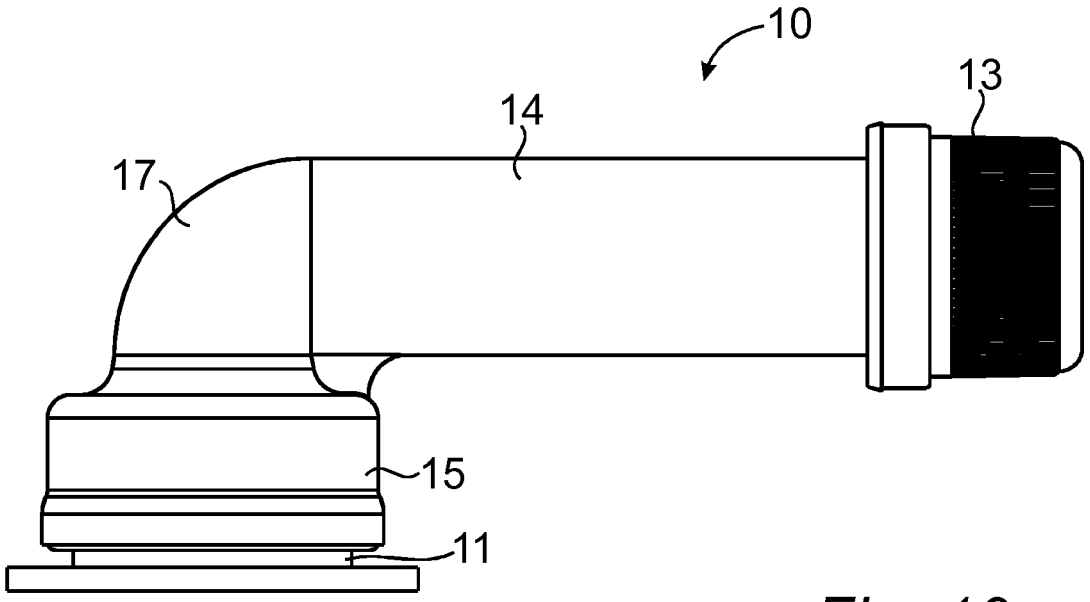

Fig. 10

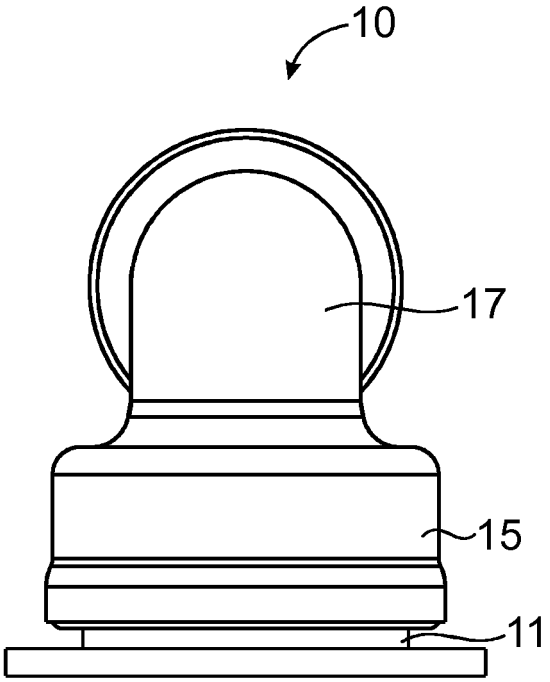

Fig. 11

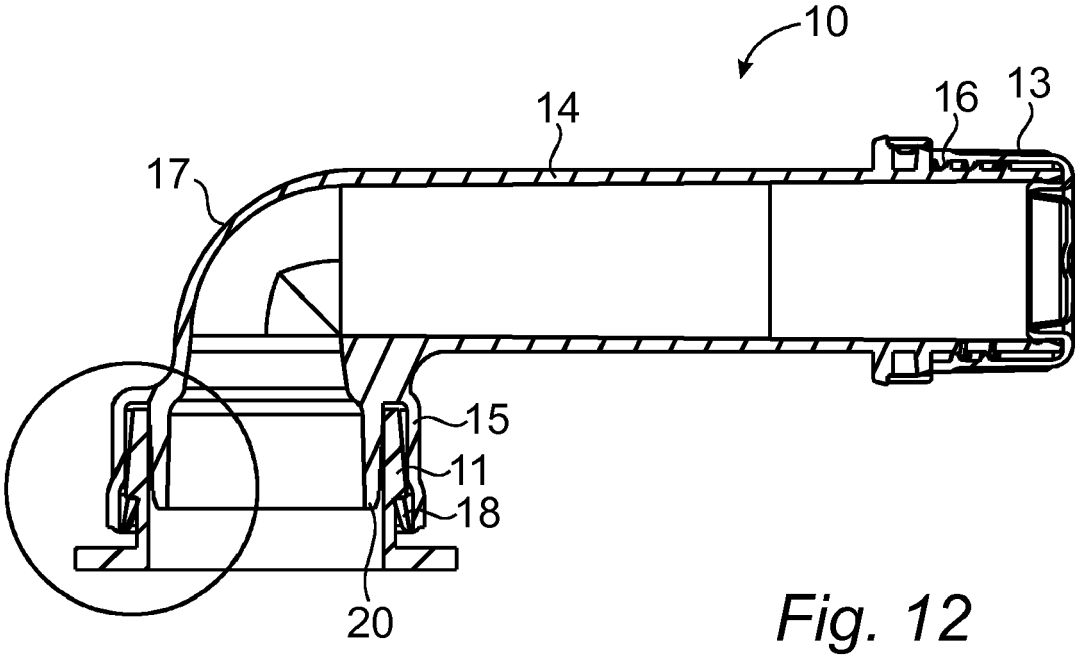

Fig. 12

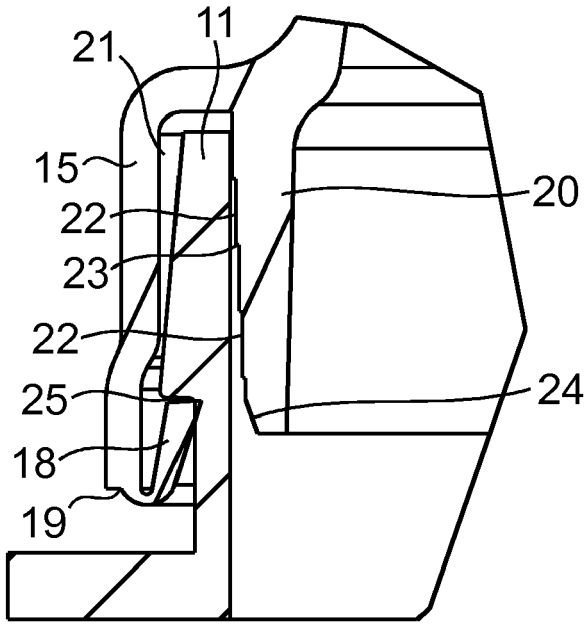

Fig. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 7375

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 July 2017	Zanghi, Amedeo

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