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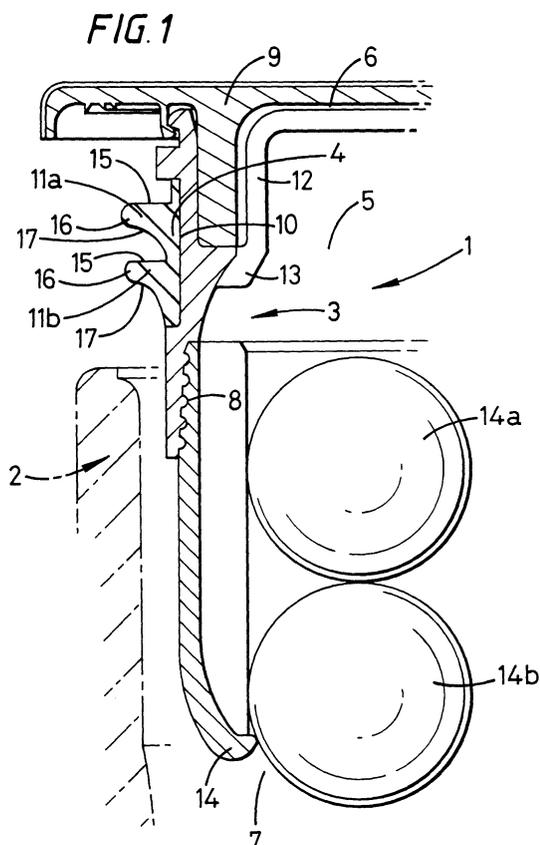
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(54) **Moulded closure**

(57) The invention provides in a first aspect a container closure 1 adapted to form to the inner surface of a neck portion of a container for liquids 2, the closure comprising an inner body 3 and an outer seal 4, wherein the outer seal comprises at least two circumferentially extending ribs 11 and is adapted to form a seal for the container neck in use, the invention being characterized in the upper surface 15 of the uppermost rib is adapted to be urged into contact with the underside 17 of the adjacent rib upon insertion into the container neck thereby to increase the force supplied to the container neck in use.

The invention also provides that the inner body 3 and the outer seal 4 have compatible polymer base, the elongation to break value of the inner body being less than that of the outer seal whereby the inner body and the outer seal are directly adherent to each other after formation.



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## Description

**[0001]** The present invention relates to a closure for a container for liquids.

**[0002]** In our European Patent Publication Number 0571070 we have described a fitment or closure for cooperation with a neck portion of a container for liquids, said fitment comprising an outer body adapted to conform to the neck portion of the container, and formed with a shaped bore extending from an inlet to an outlet with a guard member partially obturating the outlet; and a valve body provided in said inlet, a plurality of circumferentially spaced apertures being formed between the valve body and the inlet, the outlet opening from a chamber provided adjacent the apertures and between the apertures and the outlet. The invention in that instance is characterised in that the volume of the chamber exceeds at all times the volume of the apertures, thereby to alleviate glugging by providing that air may pass into the neck portion at a rate equal to, or greater than the rate at which liquid flows out. This fitment therefore has anti-glugging properties and it has anti-pilfering properties because the fitment only allows unidirectional flow of liquid out of the container. Such a fitment can be used on containers carrying high value alcoholic liquids such as whisky, gin or vodka.

**[0003]** The disadvantage of such fitments are that they do not always form an air-tight seal with the container neck because the size of the bore of the neck of the container may alter significantly as between containers. The shape of the bore of the neck of the container is also not always quite circular in cross-section in various examples. If the fitment does not form an air-tight seal any liquids which are in the container may leak, evaporate or become oxidised over time.

**[0004]** Attempts have been made to alleviate this problem by providing a two part closure, an outer part of which has a greater modulus of elasticity than the main or body portion thereof. However, if the fitments are formed of two separable materials co-joined by the elastic properties of the outer member of the fitment, the said outer member may be readily displaced during assembly in a container neck. The addition of an adhesive layer between the outer member and the body is expensive and difficult to achieve with facility.

**[0005]** An object of the present invention is to provide an improved container closure which overcomes the aforementioned problems and is cost effective to produce and apply to a container.

**[0006]** According to one aspect of the present invention there is provided a container closure adapted to conform to a neck portion of a container for liquids, the closure comprising an inner body and an outer seal; characterised in that materials of the inner body and outer seal have a compatible polymer base, the elongation to break value of the inner body being less than that of the outer seal and in that the inner body and the outer seal are directly adherent to each other after formation.

Optionally the tensile modulus of the inner body is greater than that of the outer seal.

**[0007]** In this regard, the elongation to break value of a material is the extent to which the material can stretch from its original length without breaking. It is given as a percentage

value of the original length based on a standard length of material of standard constant cross-section.

**[0008]** The invention may alternatively be characterised in that the inner body and outer seal are each formed with a compatible polymer base, the tensile modulus of the inner body being greater than that of the outer seal, and in that the inner body and the outer seal are directly adherent to each other after formation.

**[0009]** As the inner body and the outer seal are formed with a compatible polymer base they can be directly coupled to each other at formation, that is to say that no adhesive will be required to attach the outer seal to the inner body. So the outer seal can be directly moulded onto the inner body in the mould; most preferably in the same mould.

**[0010]** Preferably the elongation to break value of the inner body is between 60-80%. More preferably the elongation to break value of the inner body is between 65-75%. Most preferably the elongation to break value of the inner body is substantially 70%.

**[0011]** If the polymeric material from which the inner body is made has a elongation to break value or a tensile modulus within any of the above described ranges then the material will be sufficiently robust or strong so that the container closure cannot be breached without evidence of pilfering, for example. However, with such a range of elongation to break values the inner body retains its shape on insertion thereof in to the bore portion of the container neck, thereby facilitating application of the closure.

**[0012]** Additionally, the inner body must be made from a sufficiently strong material so that the shape of the inner body does not distort significantly during use. Any significant distortion would result in the container closure failing to perform its function adequately.

**[0013]** In a preferred embodiment the elongation to break value of the outer seal is between 250 to 550%. More preferably the elongation to break value of the outer seal is between 350-450%.

**[0014]** Appropriate tensile moduli values for the outer seal are between 400 and 1000 MPa; preferably between 550 and 850 MPa. For the inner body, the tensile moduli may be between 1200 and 1750 MPa, preferably between 130 to 1600 MPa.

**[0015]** If the polymeric material from which the outer seal is made has a elongation to break value or tensile modulus within any of the above described ranges, then the material will be sufficiently resilient to conform to the shape of the bore portion of the neck of the container and therefore form a tight seal. In this respect, any distortion of the container closure occurring in use will be expressed in the outer seal rather than the inner body.

**[0016]** Conveniently the inner body is formed with a polyolefin co-polymer.

**[0017]** Preferably the outer seal is formed with a butadiene co-polymer.

**[0018]** In preferred embodiments the compatible polymer is polypropylene.

**[0019]** Conveniently the outer seal is formed from a co-polymer comprising butadiene and polypropylene.

**[0020]** Preferably the outer seal comprises at least one circumferential rib. More preferably the outer seal comprises two circumferential ribs. Most preferably the outer seal comprises three circumferential ribs. If there is more than one circumferential rib then only one circumferential rib need be continuous.

**[0021]** The circumferential ribs ensure that there is a tight seal between the bore portion of the container neck and the container closure.

**[0022]** In a preferred embodiment the inner body is configured to reduce glugging. Anti-glugging properties can be conferred on the container closure by ensuring that the rate of air passing into the bore portion of the container neck is equal to or greater than the rate at which liquid flows out.

**[0023]** Conveniently the inner body is configured to reduce pilfering. In an arrangement with this feature there is increased security against unauthorised adulteration of the contents of the container.

**[0024]** According to another aspect of the invention there is provided an assembly comprising a container and a closure; wherein the closure is formed as hereinbefore described.

**[0025]** According to a yet further aspect of the invention there is provided a container closure adapted to conform to a neck portion of a container for liquids, the closure comprising an inner body and an outer seal; wherein the outer seal comprises at least one circumferentially extending rib having a generally saw tooth configuration whereby the upper surface of said rib is generally perpendicular to the axis of the closure and is adapted to form a seal with said container neck in use.

**[0026]** The invention is characterized in that the upper surface of a rib below the uppermost rib is adapted in use to be urged into contact with the underside of the adjacent rib above on insertion into the container neck, thereby to increase the force applied to the container neck. As will be seen, the ribs in use rely upon each other to generate the force required to effectively seal the closure into the container neck and to resist the withdrawal therefrom.

**[0027]** Preferably at least one of the circumferentially extending ribs is continuous. If at least one of the circumferentially extending ribs is not continuous then the closure would not form an air tight seal. However, the airtight seal function of the ribs can be adequately performed by one continuous rib and one or more discontinuous ribs. Equally, the closure may comprise only two continuous ribs.

**[0028]** Preferably the container closure comprises at

least two circumferentially extending ribs, such circumferentially extending ribs having different diameters and/or masses, and being arranged such that the rib with the largest diameter or mass is positioned remote from the end of the container closure which is adapted for insertion first into the neck portion of the container during assembly.

**[0029]** Conveniently the rib with the smallest diameter or mass is positioned adjacent the end of the container which is adapted to be inserted first into the neck portion of the container during assembly.

**[0030]** As the circumferentially extending rib with the smallest diameter or mass enters the neck portion of the container first the resistance is relatively low; greater resistance is then occasioned as the remaining ribs enter the neck portion of the container. The ribs necessarily deform so that the ends of the saw toothed configuration tend to be directed toward the opening of the neck of the container while being supported by the rib below. Accordingly, while being supported by the rib below, although the entry of the closure into the neck is relatively straightforward, a significantly greater force is required to extract the closure from the neck because of the shape and positioning of the ribs, and the ribs seal effectively onto the container neck.

**[0031]** The invention will now be described, by way of illustration only, with reference to the following example and the accompanying figures, wherein;

Figure 1 shows an anti-glug closure of the invention in vertical cross-section with the ribs shown in their at-rest positions prior to insertion; and

Figure 2 shows a vertical cross-section of Figure 1 with the closure applied to the container neck.

**[0032]** A container closure 1 is adapted to conform to a bore portion of a container neck 2 for liquids. The container closure 1 includes an inner body 3 and an outer seal 4. The inner body 3 is formed with a shaped through bore 5 extending from an outlet end 6 to an inlet end 7. The exterior of the inner body 3 which is formed in this instance of a polypropylene-polystyrene co-polymer, is formed either with an external screw thread 8 adjacent the outlet end 6 or with a plurality of circumferentially extending ribs for clipped interengagement. The inner body 3 terminates towards its lower end into a container neck plug 14, the surface of which is a clearance fit into a container neck 2. An outer flange 9 is adapted to overlay the rim of the container neck 2 in use.

**[0033]** A guard member 12 provided with radial outlet channels is positioned at the outlet end 6 of the bore 5. The guard member 12 has a plurality of connectors 13, in this case for support of the guard member 12 and provides a measure of pilfer-proofing, therefore reducing the likelihood of adulteration. At an inlet end 7 of the bore 5 are two superposed spherical obturating members 14a/14b. The obturating members can slide up and

down the bore 5 from the recess 13 toward the inlet end 7. The obturating members 14a/14b ensure that there is a unidirectional flow of liquid from the inlet end 7 to the outlet end 6.

**[0034]** A recess 10 is provided on the external surface of the inner body to which the outer seal 4 conforms. The outer seal, which is formed in this instance from a butadiene and polypropylene co-polymer, has two circumferential ribs 11a/11b. The outer seal has an elongation to break value of 250 to 550% and a tensile modulus value of 400-1000MPa. As the outer seal 4 and the inner body 3 are formed with a compatible base polymer they adhere together when co-moulded without the need for an adhesive.

**[0035]** The circumferential rib 11a has a larger circumferential diameter or mass than the circumferential rib 11b, and has a generally saw-toothed configuration. Each rib 11a and 11b is provided with a generally radial extending surface 15, a nose portion 16 and a taper portion 17.

**[0036]** In use, the container closure 1 is slid inlet end 7 first into the bore portion of the container neck 2. As the container closure is engaged, the nose portion 16 of the circumferential ribs 11a/11b deform and form a tight seal with the surface of the bore portion of the container neck 2, in part at least because the upper surface 15 of the lower rib is urged into contact with the under surface 17 of the upper rib. Even if the bore portion of the container is misshapen or larger than the container closure 1, the geometry of the circumferential ribs 11a/11b will compensate and form a tight seal. The circumferential rib 11b will enter the neck portion before circumferential rib 11a and will deform relatively easily compared to circumferential rib 11a. Accordingly whereas a significant force will be required to correctly position the container closure 1 in the bore portion of the container neck 2, the removal of the closure 1 from the container neck is really difficult. After the container closure 1 is correctly positioned, the flange 9 is brought over the top of the outlet end 6 and the neck of the container to seal the container until liquid therein is required.

**[0037]** In order to pour liquid from the container, the flange 9 is removed from the container. The container may then be inverted so that the obturating members 14a/14b are moved towards the recess 13. Due to anti-glugging properties of the container closure 1 the liquid flows steadily from the container. When the liquid has been poured from the container and the container has been turned upright, the flange 9 can be replaced over the top of the outlet end 6 and the neck of the container.

**[0038]** In use, it is almost impossible to remove the container closure 1 because, among other things, the circumferential ribs 11a/11b have deformed significantly into contact with each other so that they can only be moved by pushing the container closure downwards into the bore portion of the neck of the container. However, this will require considerable effort because of the size of the circumferential rib 11a. Withdrawal of the closure

from the container neck is even more difficult due to the geometry of the ribs.

**[0039]** It will be understood that the embodiment illustrated shows one application of the invention only for the purposes of illustration. In practice the invention may be applied to the many different configurations, the detailed embodiments being straightforward for those skilled in the art to implement.

**[0040]** For example the compatible base polymer could be any suitable polymer with the correct elongation to break values and/or tensile moduli. Likewise the co-polymer could be formed with any suitable polyolefin or polyalkylene or other suitable polymer with the correct elongation to break values as given above.

**[0041]** Further any number of circumferential ribs may be used. If there is more than two circumferential rib then only one of the circumferential ribs need be continuous.

## 20 Claims

1. A container closure (1) adapted to conform to an inner surface of a neck portion of a container for liquids (2), the closure comprising an inner body (3) and an outer seal (4); wherein the outer seal comprises at least two circumferentially extending ribs (11) and is adapted to form a seal with said container neck in use, characterised that the upper surface (15) of the rib (11b) below the uppermost rib is adapted in use to be urged into contact with the underside (17) of the adjacent rib (11a) above on insertion into the container neck, thereby to increase the force applied to the container neck.
2. A container closure according to claim 1 wherein each of the ribs is of a generally saw tooth configuration whereby the upper surface (15) of each of said ribs is generally perpendicular to the axis of the closure.
3. A container closure according to claims 1 or 2 wherein at least one of the circumferentially extending ribs is continuous.
4. A container closure according to any claims 1 to 3 comprising at least two circumferential ribs (11a, 11b), each circumferential rib having a different diameter and/or mass and being arranged such that the circumferential rib with the largest diameter or mass is positioned remote from the end of the container closure which is adapted for insertion first into the neck portion of the container during assembly.
5. A container closure according to any one of claims 1 to 4 wherein the circumferential rib with the smallest diameter and/or mass is positioned adjacent the end of the container closure which is adapted to be

inserted first into the neck portion of the container during assembly.

6. A container closure (1) adapted to conform to a neck portion of a container for liquids (2), the closure comprising an inner body (3) and an outer seal (4); characterised in that materials of the inner body and outer seal have a compatible polymer base, the elongation to break value of the inner body being less than that of the outer seal and in that the inner body and the outer seal are directly adherent to each other after formation. 5  
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7. A closure according to claim 6 wherein the tensile modulus of the inner body is greater than that of the outer seal. 15
8. A closure according to claim 7 wherein the elongation to break value of the inner body is between 60 and 80%. 20
9. A closure according to any preceding claim wherein the elongation to break value of the outer seal is between 250 to 550%. 25
10. A closure according to any preceding claim wherein the inner body is formed with a polyolefin co-polymer. 30
11. A closure according to any preceding claim wherein the outer seal is formed with a butadiene co-polymer, or a co-polymer comprising butadiene and polypropylene. 35
12. A closure according to any preceding claim wherein the compatible polymer base is polypropylene. 40
13. A closure according to any preceding claim wherein the outer seal comprises at least one continuous circumferential rib. 45
14. A closure according to any preceding claim wherein the inner body is configured to reduce glugging or pilfering. 50

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**FIG. 1**

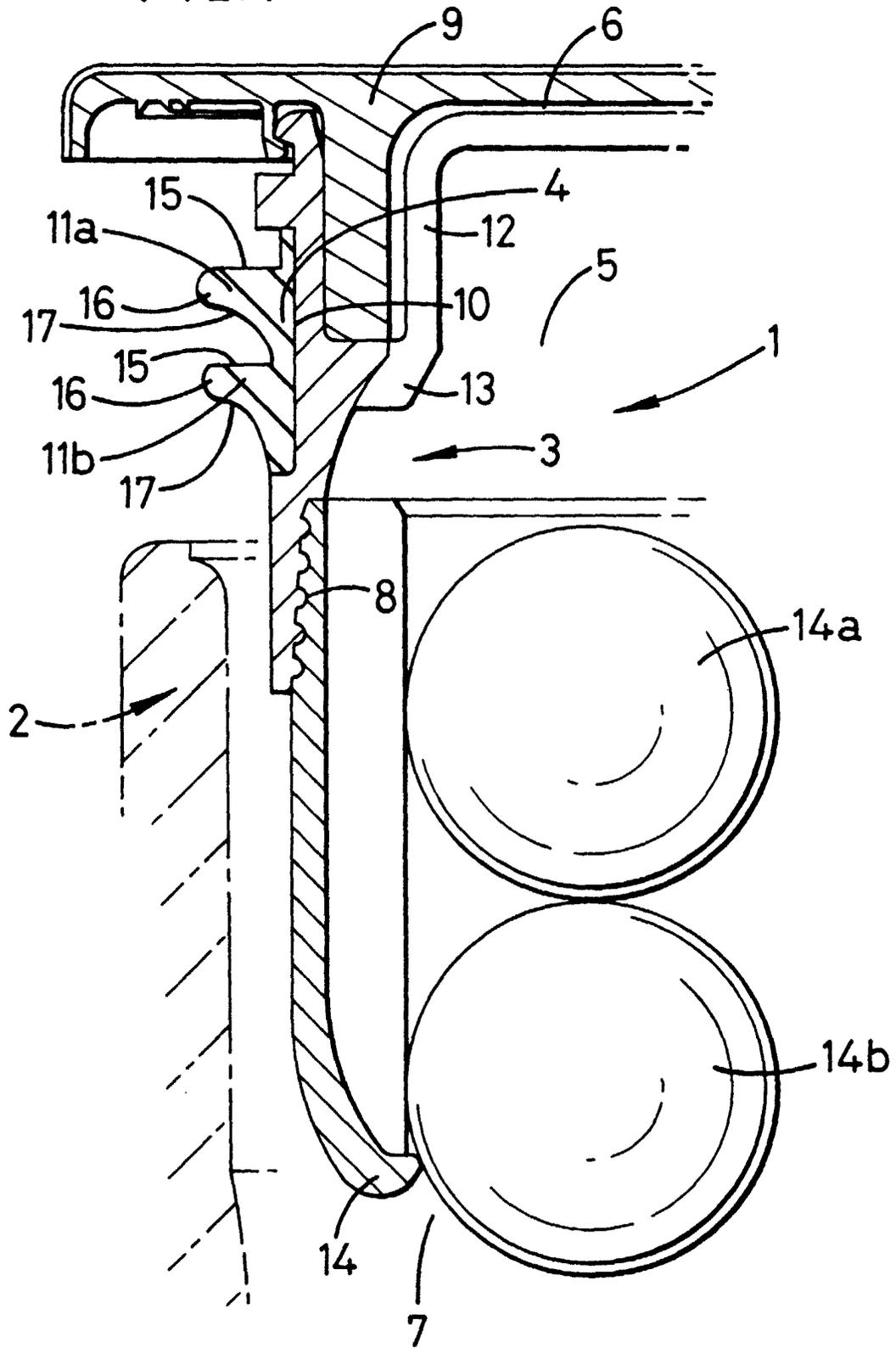
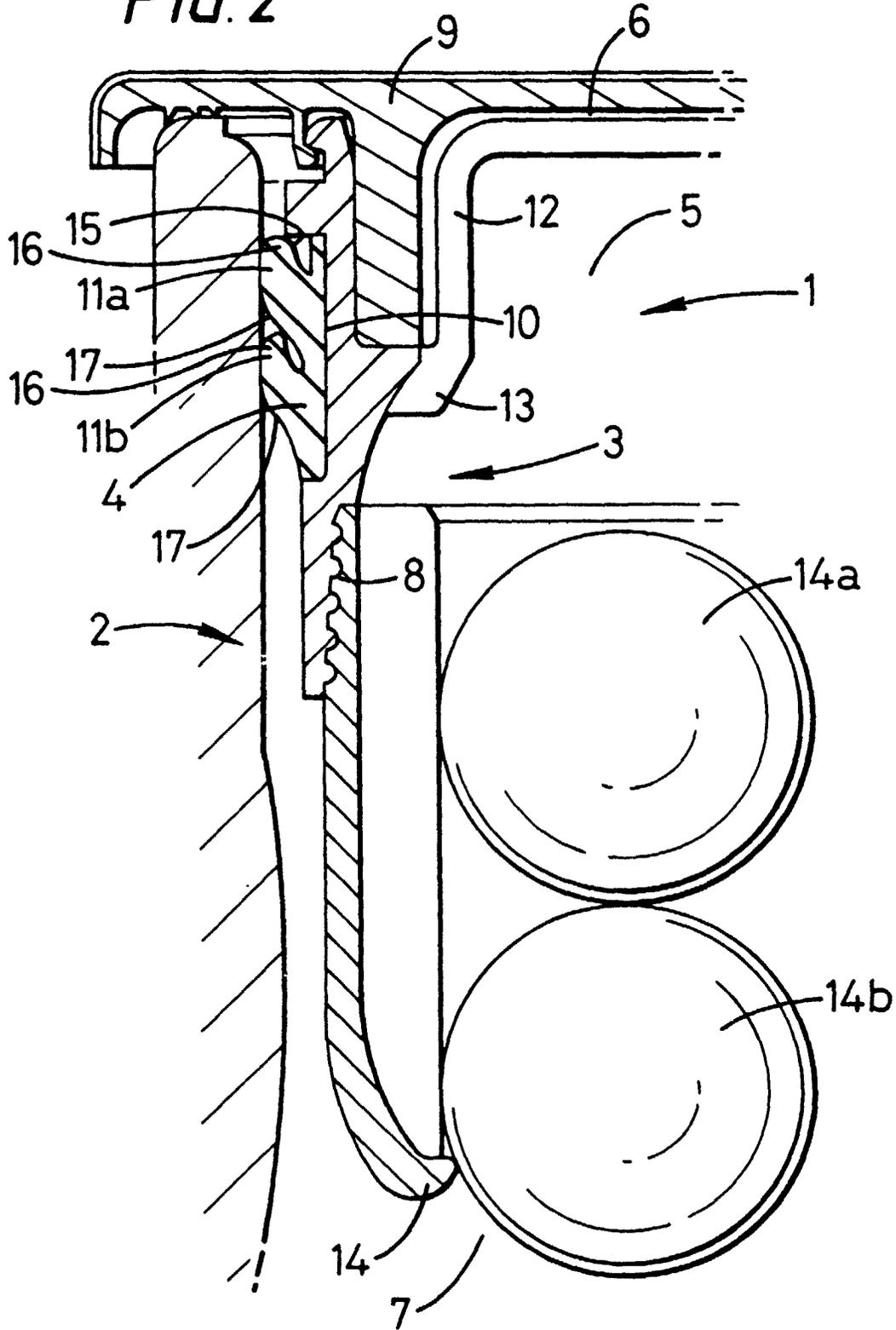


FIG. 2





European Patent  
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EUROPEAN SEARCH REPORT

Application Number  
EP 99 30 8434

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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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	2 February 2000	Sundell, O	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	
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ANNEX TO THE EUROPEAN SEARCH REPORT  
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