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## (54) Device for preventing backflow of liquids

(57) A device for preventing backflow of liquids in a conveying line for (waste) water and the like comprises a flow member (2) having a first end (5) and a second end (6). The first end is open and the second end can be opened and closed. For this purpose, the second end (6) is made of a deformable material, such that it is deformable between a substantially flat, tightly shut closed position and a widened open position. The second end is formed of a relatively hard material, which is biased to the closed position, preferably in the form of an edge (8) abutting a portion (12) made of a softer material.

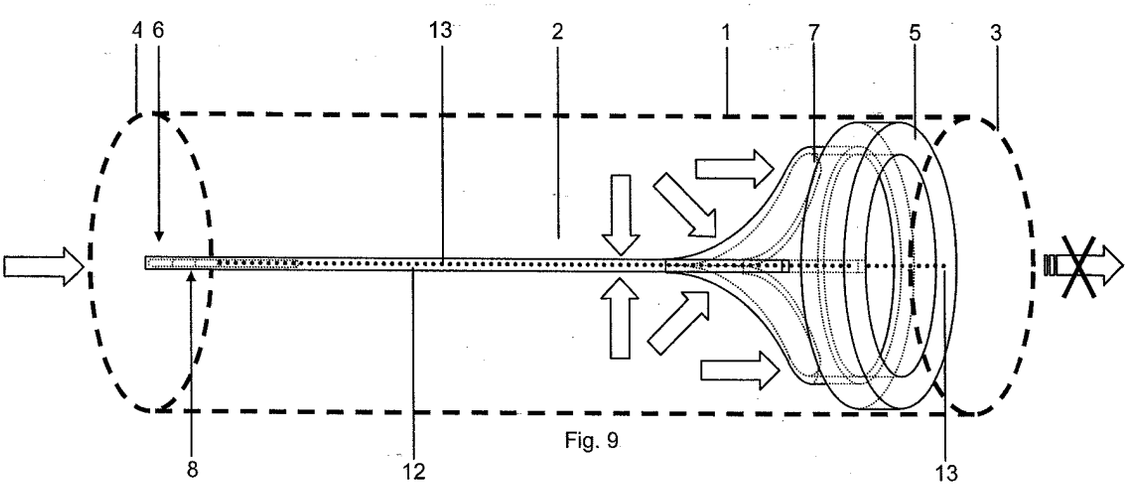


Fig. 9

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## Description

**[0001]** The invention relates to a device for preventing backflow of liquids, in particular for use in a conveying line for (waste) water and the like, for example in sewage systems.

**[0002]** Such devices are known in various embodiments thereof, they may also be referred to as non-return valves. Usually, such devices comprise a shut-off member which is movable in a direction parallel to the direction of flow of the liquid, which shut-off member consists of a hard material and which mates with a seat on the flow member.

**[0003]** The object of the invention is to provide a novel device for preventing backflow of liquids.

**[0004]** In order to accomplish that object, the device according to the invention comprises a flow member having a first end and a second end, which first end is preferably open and which second end can be opened and closed, for which purpose the second end is made of a deformable material, such that said second end is deformable between a substantially flat, tightly shut closed position, and a widened, open position, said second end being formed of a relatively hard material, which is biased to the closed position.

**[0005]** Since use is made of a deformable material without any loose parts, a reliable device is obtained. The bias on the relatively hard material of the second end must be geared to the expected pressures in the through-flow means, of course.

**[0006]** Preferably, an edge comprising said relatively hard material, which is spring-loaded in the direction of the closed position, is formed on the second end. Advantageously, the edge on said second end is made up of at least two portions, which are interconnected in a pivot-like manner at their places of contact.

**[0007]** In this way there is created a closure which is similar to that of the opening of a "squeeze purse".

**[0008]** Advantageously, a portion made of a relatively soft, deformable material abuts the edge on said second end.

**[0009]** The advantage of this embodiment is that it is possible to obtain an adequate seal in this portion, also if the edge does not shut off completely. This is the case in particular if a liquid pressure prevails in the downstream portion of the conveying line. Said pressure will act on the outer side of the portion made of the relatively soft material, as a result of which said portion is squeezed tightly shut, as it were, and an especially adequate self-sealing action is obtained.

**[0010]** It is advantageous in this respect if pressure-resistant elements are provided in the portion made of the relatively soft material, which elements offer resistance in particular against pressure in a direction at least substantially parallel to the central axis of the second end.

**[0011]** The presence of said pressure-resistant elements makes it possible to select the soft, deformable material by its sealing action rather than by its constructional strength. Said constructional strength is provided by the pressure-resistant elements.

**[0012]** The invention will be explained in more detail hereinafter with reference to the drawings, which very schematically illustrate an embodiment of the device according to the invention.

Fig. 1 is a perspective view of a device according to the invention, in which a housing that surrounds the device is schematically indicated.

Figs. 2, 3 and 4 are a side view, a front view and a top plan view, respectively, in which the subject matter of Fig. 1 is shown on a smaller scale.

Figs. 5 - 8 are views corresponding to Figs. 1 - 4, which show the device of Figs. 1 - 4 in the open position thereof.

Figs. 9 - 12 are views corresponding to Figs. 5 - 8, which show the device in the closed position thereof.

**[0013]** Figs. 1 - 4 show a device for preventing backflow of liquids, in particular for use in a conveying line for (waste) water and the like, for example in a pressurised sewer system. The invention can also be used in other liquid conveying lines, of course, in which the liquid being conveyed may or may not contain solid impurities.

**[0014]** The device comprises a liquid-tight housing 1 (illustrated in dashed lines), in which a flow member 2 is accommodated. The housing comprises a first connection 3 and a second connection 4 at opposite ends for being connected to pipes or other types of channels of a liquid conveying system or the like.

**[0015]** The flow member 2 has a first end 5 and a second end 6. The first end 5 is formed on the upstream end of a pipe-shaped portion 7 of the flow member 2. Said first end 5 is open at all times, and the pipe-shaped portion 7 is made of a substantially non-deformable material.

**[0016]** The second end 6 is configured to be deformable between a substantially flat, tightly shut closed position, and a widened, open position. In this embodiment, the second end 6 is configured similarly to the opening of a "squeeze purse". For that purpose, the second end 6 is provided with an edge 8 of a relatively hard material, which is biased to the closed position. Said material may be a harder rubber, for example, or an elastically deformable metal, such as steel or the like, which may be coated with a rubber.

**[0017]** In either case, the material is biased to the closed position, or, in other words, the material is relaxed in said closed position, and a force must be exerted when deforming the edge 8 from the closed position. In this way a memory effect is obtained, such that said second end 6 will not open until an internal pressure is exerted from the first connection 3. When said pressure is released or reversed, the first end 5 will move towards the closed position.

**[0018]** In this case the edge 8 consists of two edge portions 9 and 10, which are interconnected by pivot means 11 at both ends. Thus, the edge portions 9 and 10 extend in a substantially straight line between the pivot means 11 in the closed position (see Figs. 3 and 11), whilst the edge portions 9 and 8 have each been deformed into a semi-circular shape, a semi-oval shape (see Fig. 7) or other curved shape in the open position.

**[0019]** At a position adjoining the edge 8, the flow member 2 comprises a portion 12 of a relatively soft, deformable material, such as a soft rubber. Said portion 12 joins the pipe-shaped portion 7 and is provided with pressure-resistant elements 13, two in this case, which are aligned with the pivot means 11 in this embodiment. The pressure-resistant elements 13 ensure that said portion will resist deformation in a direction parallel to the central axis of the second end 6, i.e. parallel to the direction of flow of the flow member 2 in this embodiment. The portion 12 is therefore capable of deformation in a direction at least substantially perpendicularly to the direction of flow, but not in a direction parallel thereto. The soft material of said portion 12 can therefore be selected by its ability to provide an adequate seal in the closed position of the flow member 2. Said pressure-resistant elements may also be provided at other positions, of course, or other types of elements may be used, as long as the sealing action is not adversely affected thereby. In this embodiment, the portion 12 is relatively long so as to ensure that the flow member 12 is shut off in an adequate manner.

**[0020]** Figs. 5 - 8 show the situation in which the pressure at the first connection 3 is higher than at the second connection 4 of the housing 1, as a result of which liquid tends to flow from the first connection to the second. The fluid pressure causes the edge portions 9 and 10 of the edge to be deformed to a curved position, as a result of which a passage is formed at the second end 6 of the flow member 2 (see the arrows).

**[0021]** Figs. 9 - 12 show the situation in which the pressure at the second connection 4 is higher than at the first connection 3. Said pressure causes the edge portions 9 and 10 to return to the biased position again, whilst the soft material of the portion 12 is pressed together inwardly to a closed position (see the arrows) by the external, higher fluid pressure, as a result of which a very good seal is obtained, also in the situation in which an incomplete seal is obtained at the edge 8, for example as a result of a hard particle still being present in the liquid at that location.

**[0022]** From the foregoing it will be apparent that the invention provides a device for preventing backflow of liquid that is remarkable for its reliable operation and for providing an adequate seal in the closed position.

**[0023]** The invention is not limited to the embodiment as described above and illustrated in the drawing, which can be varied in many ways within the scope of the invention.

## Claims

1. A device for preventing backflow of liquids, in particular for use in a conveying line for (waste) water and the like, comprising a flow member (2) having a first end (5) and a second end (6), which first end is preferably open and which second end can be opened and closed, for which purpose the second end (6) is made of a deformable material, such that said second end is deformable between a substantially flat, tightly shut closed position, and a widened, open position, said second end (6) being formed of a relatively hard material, which is biased to the closed position

2. A device according to claim 1, wherein an edge (8) comprising said relatively hard material is formed on said second end (6).

3. A device according to claim 2, wherein the edge (8) on said second end (6) is made up of at least two portions (9, 10), which are interconnected in a pivot-like manner at their places of contact (11).

4. A device according to claim 2 or 3, wherein a portion (12) made of a relatively soft, deformable material abuts the edge (8) on said second end (6).

5. A device according to claim 4, wherein pressure-resistant elements (13) are provided in the portion (12) made of the relatively soft material, which elements offer resistance in particular against pressure in a direction at least substantially parallel to the central axis of the second end (6).

6. A device according to any claims 3 and 5, wherein said pressure-resistant elements (13) are provided at least in line with said pivot-like places of contact (11).

7. A device according to any one of the claims 4 - 6, wherein a substantially non-deformable pipe-shaped portion (7) provided with said first end (5) abuts the portion (12) made of the relatively soft material.

8. A device according to any one of the preceding claims, wherein the flow member (2) is accommodated in a liquid-tight housing (1) which surrounds the flow member and which comprises connections at both ends (3, 4) for being connected to further liquid conveying lines.

9. A device according to any one of the claims 2 - 8, wherein the edge on the second end (6) is formed of a hard, rubbery material, or of an elastically deformable metal that is preferably coated with a rubbery material.

**10.** A pipe for conveying liquid, in particular waste water, provided with a device according to any one of the preceding claims.

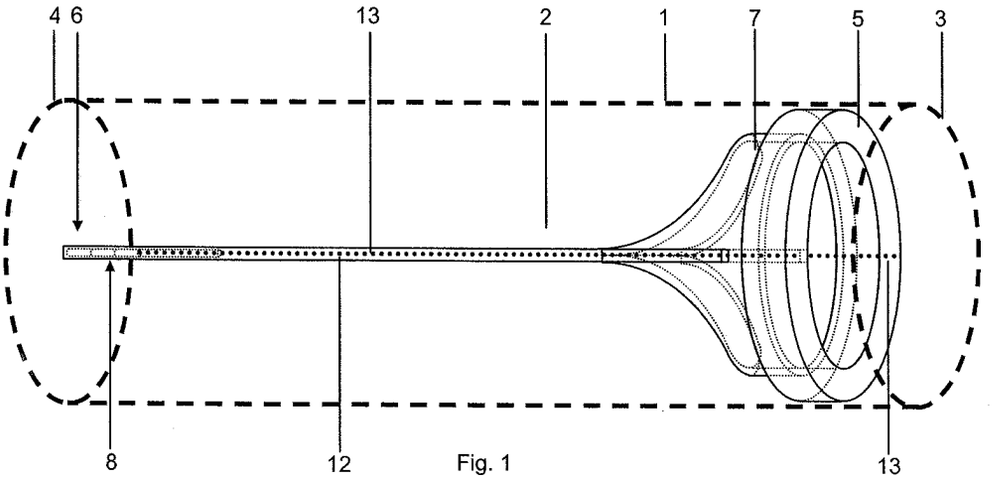


Fig. 1

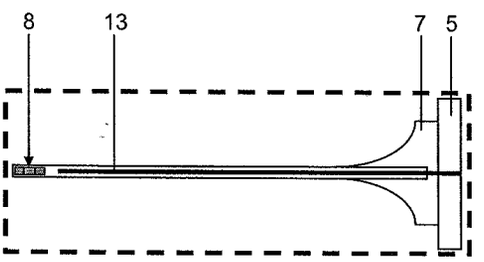


Fig. 2

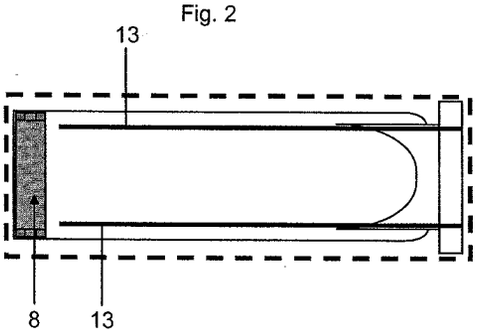


Fig. 4

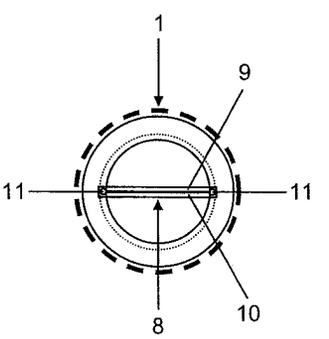


Fig. 3

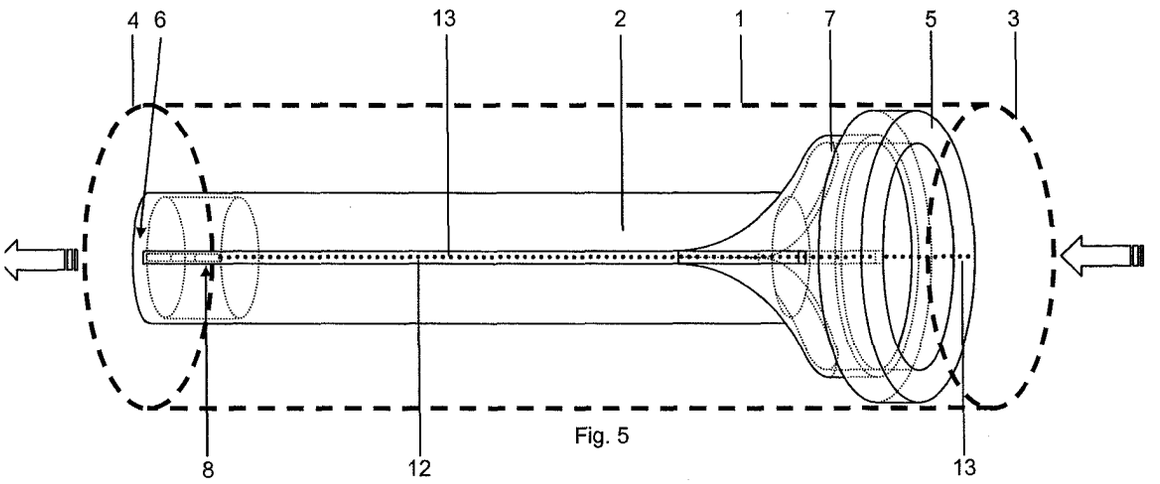


Fig. 5

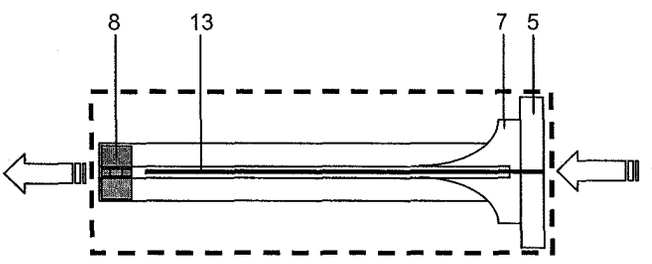


Fig. 6

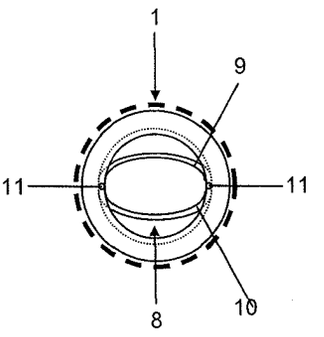


Fig. 7

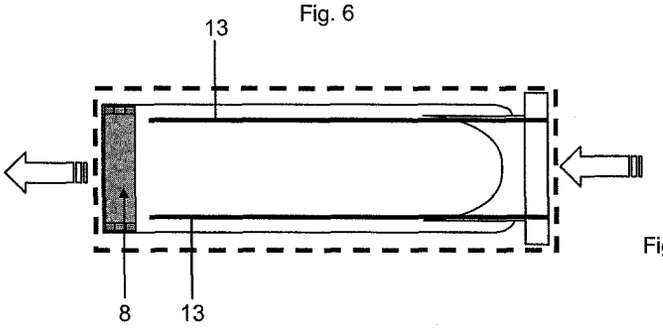


Fig. 8

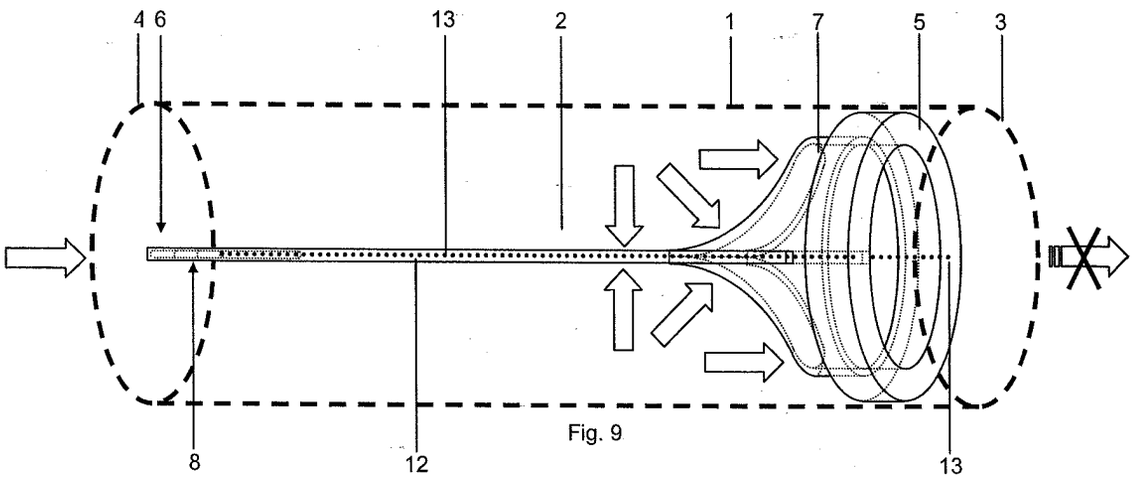


Fig. 9

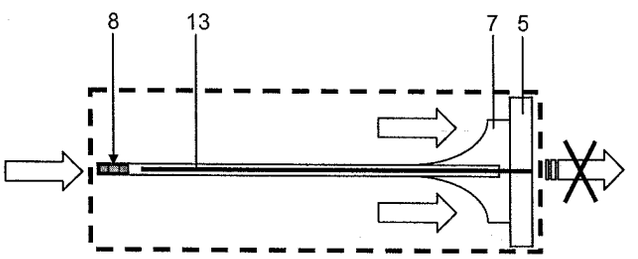


Fig. 10

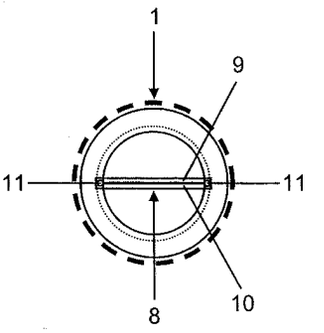


Fig. 11

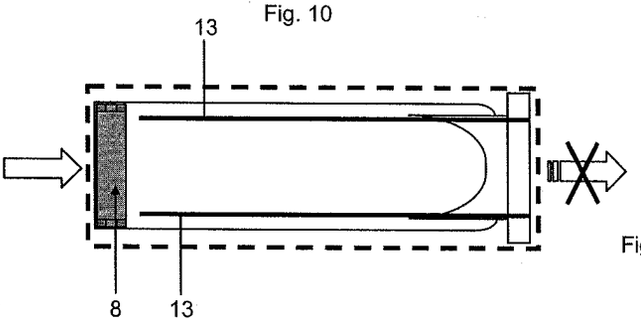


Fig. 12

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Application Number
EP 04 10 5563

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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 |
|---|---|---|
| Munich | 11 February 2005 | Flygare, E |

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 10 5563

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