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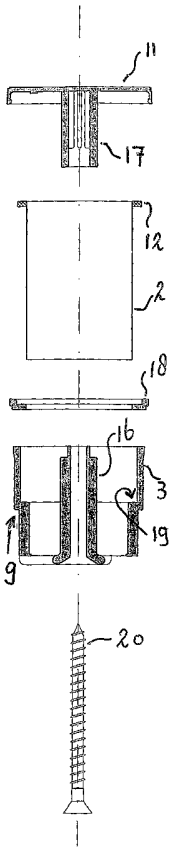
(54) Title: BACKFLOW-PREVENTER



(57) Abstract: The invention is concerned with a seal, particularly in a line which is connected to a sanitary appliance such as a shower drain and the sewer. It has a passageway with a passage (4) of which a sheet like boundary (2) is easily deformable such that said passageway has a first position wherein the passage is gas tight and a second position wherein the passage allows passage of liquid. Said passage boundary biasses said passage in the first position by a force. The passageway (2) is substantially sheath or hose like and the passage (4) is at the outer side thereof and the passage (4) is ring gap like and extends in flow direction (arrow A) over some distance.

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Backflow-preventer

The invention is concerned with a seal, particularly, but not exclusively, to connect sanitary appliances to the public sewer. This seal is preferably of the one way or back flow preventing type.

Although in the following the invention is described in connection with sanitary applications, it will be appreciated that the invention is also applicable in other fields, e.g. to tanks or pipelines with fill opening, such as for chemicals. Another field of application is sealing a vacuum cleaner bag. The seal is not only designed for liquids, but also for gasses and (fluid) solid materials, like granules. E.g. the seal can be assembled into a fill or dispensing opening. Location in a channel is also feasible.

Sinks, toilets, bidets, urinals, bath pools and other sanitary appliances of households, offices, institutions, etc., connected to the public sewer, generally are provided with a bend filled with water (water trap), such that under all circumstances there is provided a closure allowing passage in a single direction between the domestic space (such as bath room) containing the sanitary appliance and the sewer. This one way valve is particulalrly designed to prevent bad odors and dangerous (explosive) gasses to enter the domestic room from the sewer.

Application of a water trap has several disadvantages: as soon as the water is removed therefrom, the correct functioning of the water trap is lost. In particular urine provides inhygienic reaction products with water (such as bad odors, urine stone), such that a water trap must always be flushed with water. The water trap consumes additional space and it does not look attractive.

Recently, one has tried to avoid a number of disadvantages of the bend filled with water by removing the water flushing and filling the bend with parrafin (viz. E.g. US-A-5,711,037).

Another prior art solution makes use of a flexible, tapering hose through which the disposable material flows and of which the narrowed end prevents a back flow and can expand to let disposable materials pass in the desired downstream direction (viz. e.g. EP-A-1.174.549).

Besides, alternatives are known, e.g. in ships or airplanes, wherein use is made of a pivoting, rigid valve which is kept closed by spring pressure and opens when a vacuum develops at the downstream side. Such a known system is, a.o. due to its complexity, not designed for sanitary systems connected to the public sewer. This system can also not prevent that gasses from the sewer pass the seal when the valve is pivoted open.

According to the invention a new seal is proposed, particularly wherein a liquid reservoir, e.g. filled with water or parrafin, is not required to maintain the desired back flow prevention. This seal is particularly suited for a relatively large flow of exhaust materials. It is very reliable, and also cheap and has a long life. Refer to the enclosed claims.

If material to be disposed of (urine, bath water, etc.) is offered, the seal opens automatically. With small feed of such material, the seal opens only locally. Thus no gas, liquid etc. can pass through the seal in back flow direction.

The seal is preferably connected to the from the sanitary device extending (e.g. plastic or metal), preferably at least substantially vertical exhaust channel to the sewer or similar receipt for exhaust materials.

The invention, further objects and corresponding advantages, are illustrated in the following with the aid of a presently prefered embodiment shown in the drawings, which is not meant to limit the exclusive rights, and showing in:

Fig. 1-3 in sectional side view a first, second and third, respectively, embodiment, in closed position;

Fig. 4 a sectional side view of the third embodiment, in open position;

Fig. 5 a cross section of the membrane;

Fig. 6 an alternative of detail VI in fig. 3;

Fig. 7 an exploded sectional view of a further variant of the invention;

Fig. 8 the top and bottom view of some parts of the in fig. 7 shown variant;

Fig. 9 a further alternative in sectional side view.

Fig. 7 and 8 are at true scale.

The seal 1 prevents that matter passes opposite the direction of arrow A. The seal 1 contains a sheath or hose like membrane 2 concentrically within a substantially more rigid tube 3 (e.g. of PVC or steel), such that under normal circumstances the membrane circumferentially sealingly connects to the tube. The membrane 2 can have a closed cross section, however an open cross section is also possible, e.g. wherein the free longitudinal edges mutually overlap in the sealing position (viz. Fig. 5). The membrane 2 is preferably supple pleatable and therefor of relatively thin walled material, such as latex, rubber or rubbery. Its wall thickness usually measures 20% at the most of that of the tube 3.

The structure is such that with a flow in the direction of arrow A said flow finds its way between the membrane 2 and the tube 3, wherein the membrane 2 due to its easy formability moves away from the tube 3 such that the seal opens automatically. The membrane 2 is so to speak compressed by the flow, such that its diameter decreases. When the flow stops, the membrane 2 returns to its original shape and comes to rest against the tube 3, such that the seal 1 automatically closes. Thus the flow goes external of membrane 2 and internal of tube 3, through a ring gap.

Fig. 1 shows how the tube 3 expands at its upper side, such that in the direction of arrow A a narrowing ring gap 4 is made between tube 3 and membrane 2, through which the flow in the direction of arrow A arrives between membrane 2 and tube 3.

Fig. 2 shows how the membrane 2 narrows at its top, such that a ring gap 4 with a function similar to fig 1 is obtained.

Fig. 3 shows how the tube 3 has transverse perforations 5 at its upper end, through which the flow in the direction of arrow A goes first through the perforations 5 and then through the ring gap between membrane 2 and tube 3.

Fig. 3 also shows, how the seal 1 is mounted in a recess, a.o. for a convenient fluid exhaust. E.g. said recess 6 is present in a floor 7 (e.g. of a shower) and is covered by a perforated cap 8. For ease of mounting the tube 3 is provided with a sideways projecting stop 9, e.g. a ring flange, and can tighly fitting be inserted in the (existing) drain 10. The radial perforations

5 are above the stop 9. A closed cap 11 is mounted on top of the tube 3, clamping the flange 12 of the membrane 2 with the tube 3. The cap 8 has a tube stud 13 which is clamped onto the cap 11 with a tight fit.

For a reliable operation a spacer/opener 14 is present within the membrane 2, preferably with an in the direction of the arrow A tapering shape, e.g. a cone or another rotation symmetric body. With that it is prevented that the seal remains open after the flow is stopped since the by the flow compressed hose does not automatically open by e.g. wall adhesion. Preferably the spacer/opener 14 extends over at least the complete length of the membrane 2.

For an improved seal it is prefered that, relative to the direction of arrow A, the diameter of the menbrane 2 increases and/or the diameter of the tube decreases, and this preferably gently such that a (truncated) conical shape is obtained.

Advantageous dimensions (in mm) of the membrane 2 are as follows: diameter from 10, preferably from about 20; wall thickness from 0.1, preferably about 0.2; length from 5, preferably from about 10; length (preferably at least about 1.5 times) larger than diameter; diameter increase over total length from 5%, preferably from about 10%. The length part of the membrane 2 bearing agiant the tube 3 and forming the ring gap like axhaust channel with it, measures preferably from 5, more preferably from about 10 mm, while of this length part the wall thickness is preferably constant (besides fabrication tolerances and natural material shrink).

The inner wall of the tube 3 is, at least over the length part against which the membrane 2 bears and with it the ring gap like exhaust channel forms, prismatic (besides fabrication tolerances and natural shrink).

The membrane 2 is preferably made of rubber, rubbery or other elastomeric material, such as latex, silicon, neoprene, vitron, NPDM or pre-vulcanised natural latex, preferably with a low ammonium content of not more than 20% such as at least substantially 15%. An example of the latter can be obtained under the trade mark LA-5. The membrane 2 can be made by dipping (material

diposition on the outer side of a mould) or injection moulding (pouring material in a mould). The tube 3 is preferably of non elastomeric material, and e.g. of material and dimension such as typical for drains and fittings for sanitary applications.

It will be appreciated that the menbrane 2 and the tube 3 are rotation symmetric. The membrane 2 is mounted without or with just slight pre stress. Membrane 2 and tube 3 are at least substantially co-axial.

Fig. 6 shows of detail VI in fig. 3 an alternative. Of tube 3 is the inner side at its lower end circumferentially displaced inward over some height. The membrane 2 thus only circumferentially seals to the part of the inner side of the tube 3 over a height area. Over the further height part wherein membrane 2 and inner side of the tube 3 coextend, they keep a mutual ring gap 4. Thus opening of the seal in flow through direction is made easier. The wall step of the tube 3 can also be present at another level or made different.

Fig. 7 shows an embodiment wherein, viewed in flow through direction (arrow A), the membrane 2 is downstream from its entrance side maintained in position relative to the tube 3 by mounting means. These mounting means comprise (viz. also fig. 8) radial webs 15, with the one end fixed to the lower edge of the tube 3 and with the other end fixed to a central shaft 16, co-axial with the tube 3, and having a wall thinning, forming a connector, at the end opposite the webs 15. The cap 11 is provided with a shaft 17 of which the end opposite the cap 11 is sheath like.

The tube 3 has a part with smaller outer diameter, according to the inner diameter of the exhaust tube 10 (not shown; viz. Fig. 3). The change to the part with smaller diameter makes a step or flange 9 such as with the embodiment according to fig. 3. Thus the tube 3 is only partly inserted into the exhaust 10.

In the mounted condition the membrane 2 is with its flange 12 mounted to the cap 11 by a ring 18 to be clamped to the cap 11. The connector shaped end of the shaft 16 is inserted in the sheath shaped end of the shaft 17, such that they are mutually in extension. The membrane 2 is inserted into the tube 3 beyond the wall step 19 forming the ring gap 4 (viz. Fig. 6). The screw

20 is screwed into the shaft 17 and keeps the cap 11 and tube 3 together.

Due to the length of the shafts 16 and 17 a flow through gap is maintained between the lower side of the cap 11 and the top edge of the tube 3, that like the flow through perforations 5 of the former embodiment allows the fluid flow in the direction of arrow A from the outside to between the membrane 2 and tube 3.

Since, different from the embodiments of fig. 1-6, this flow through gap is interrupted in circumferential direction of the membrane 2, upstream from the circumferential sealing area where the outer wall of the membrane 2 contacts the inner wall of the tube 3 any obstruction lacks to which dirt, like hairs, can hook. Such dirt can, if it extends into the circumferential sealing area, destroy the proper sealing of the membrane 2 and tube 3. Since such obstruction is lacking, all dirt arriving between the membrane 2 and tube 3 is reliably removed and a proper seal against fluid flow opposite the direction of arrow A is secured.

The embodiment of fig. 7-8 is also better to select the height of the flow through gap without limitation.

Starting from the embodiment of fig. 7-8 an embodiment based on fig. 3 can be obtained by eliminating the shaft 16, webs 15 and screw 20. One or more, e.g. four, axial, e.g. rod like, spacers (with mutual spacing) are present between the tube 3 and cap 11. The cap 11 e.g. bears via the clamping ring 18 onto the spacers bearing on the edge of the tube 3. Clamping ring 18, spacers and tube 3 can in that case be integrated. The space between the spacers determines the flow through perforations 5. The length of the spacers determines the height of the perforations 5.

The tube 3 can be e.g. integrated with the exhaust 10 or such line/channel. E.g. starting from fig. 3 tube 3 is then eliminated and the diameter of membrane 2 is adapted to that of tube 10. The membrane 2 can, e.g. via cap 11, be suspended from the bridging part or covering grate 8 bearing against the floor 7.

A further example thereof is shown in fig. 9 (in top and sectional view according to arrow C-C), wherein the, e.g. central,

tube 10 does not project above the bottom of the, e.g. elongated, drain 6. At a distance above the exhaust 10 a co-axial ring shaped supporting part 21 is via a bridging part 22 mounted to the side walls of the shower drain 6. The assembly of cap 11, membrane 2 and clamping ring 18 can be applied by inserting the membrane with its free end into the ring 21 and the pipe 10 such that clamping ring 18 bears onto ring 21 and membrane 2 sealingly connects to pipe 10 (membrane 2 is shown in phantom). With lips 23 or other anchoring features at the ring 21, the cap 11 can be fixated relative to ring 21. Thus membrane 2 is via ring 22 "floatingly" suspended within pipe 10. The drain 6 can completely drain, because the water between the outer side of membrane 2 and inner wall of pipe 10 can flow away in the direction of arrow A. At a distance above ring 21 the drain 6 can be covered with a grate 8 or such water draining cover.

For a reliable operation of the seal, particularly with a view to maximalisation of the draining capacity, it is prefered that the dimension of the perforations 5 or gap, observed in the direction of arrow A (to be understood as height dimension), is at least about 5 mm, preferably at least 7.5 mm, more preferably at least 10 mm, such as about 15 mm. The length of the membrane 2 is e.g. about 40 mm. Tests have resulted in the following convenient ratios: height of perforations 5 or gap at least about 20%, preferably at least 30%, more preferably at least 40% or at least 50% of the diameter of membrane 2; height of perforations 5 or gap at least about 10%, preferably at least 15%, more preferably at least 20% or 25% of the length of the membrane 2; heigth of perforation 5 or gap at least about 5%, preferably at least 10%, more preferably at least 15% or at least 20% of the sum of the diameter and the length of membrane 2.

An embodiment based on one or more separate measurements of an in here disclosed embodiment, possibly combined with one or more separate measurements from one or more other of the in here disclosed embodiments belongs also to the invention. An embodiment for which an in here disclosed measurement is replaced by an equivalent also belongs to the invention.

CLAIMS

1. Seal, particularly in a line which is connected to a sanitary appliance such as a shower drain and the sewer, with a passageway with a passage (4) of which a preferably sheet like boundary (2) is easily deformable such that said passageway has a first position wherein the passage is at least substantially fluid, particularly gas tight and a second position wherein the passage allows passage of fluid, particularly liquid and wherein preferably said passage boundary biasses said passage in the first position by a force, such as by (own) resilience or pressure difference.

2. Seal according to claim 1, the passageway (2) is substantially sheath or hose like and the passage (4) is at the outer side thereof and/or the passage (4) is ring gap like and extends in flow direction (arrow A) over some distance, such as over at least 5 mm or about 10 mm.

3. Seal according to claim 1 or 2, lowered in a recess (6) in a floor (7) and removably mounted on top of a pipe (10).

4. Seal according to claim 1, 2 or 3, wherein the fluid flows outside the one (2) and inside the other (3) boundary.

5. Seal according to any of claims 1-4, wherein the passage (4) has a down stream narrowing.

6. Seal according to any of claims 1-5, wherein the diameter of a boundary changes in flow through direction.

7. Seal according to any of claims 1-6, wherein a spacer (14) extends within the boundary (2).

8. Seal according to any of claims 1-7, wherein the boundary (2) is closed upstream and open downstream such that it is inflated by a back flow coming from the downstream side of the seal.

9. Seal according to any of claims 1-8, wherein it is designed such that in flow through direction (arrow A) flowing fluid enters the seal sideways or substantially radially and exits the seal substantially axially.

10. Seal according to any of claims 1-9, wherein the one boundary (2) extends beyond the other (3) and possibly is made of elastomere, such as latex or rubbery.

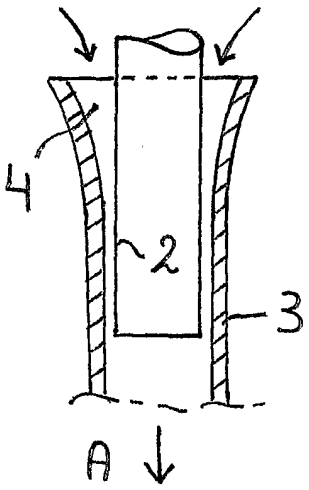

Fig 1

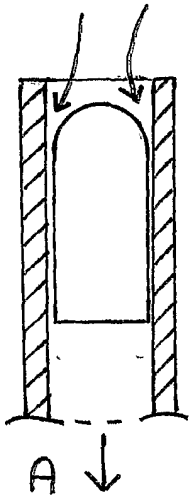

Fig 2

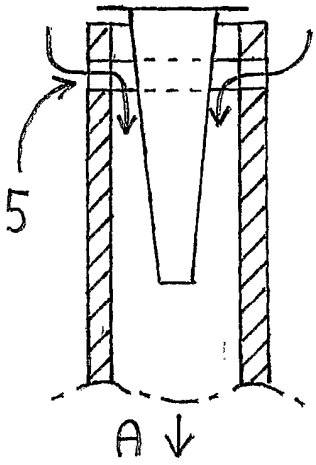

Fig 4

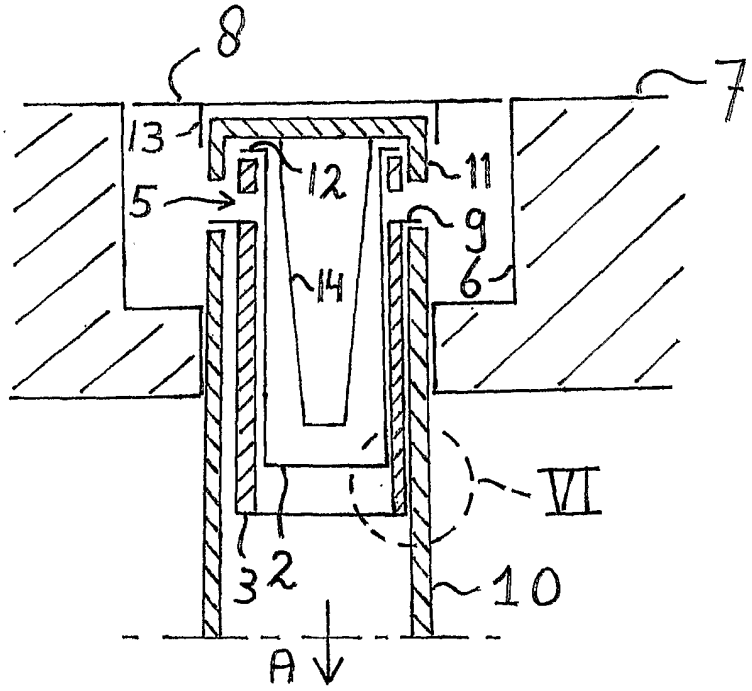

Fig 3

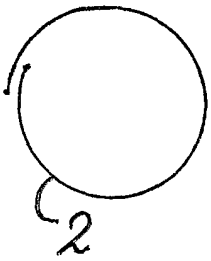

Fig 5

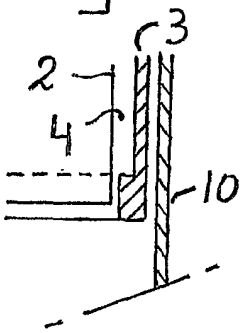

Fig 6

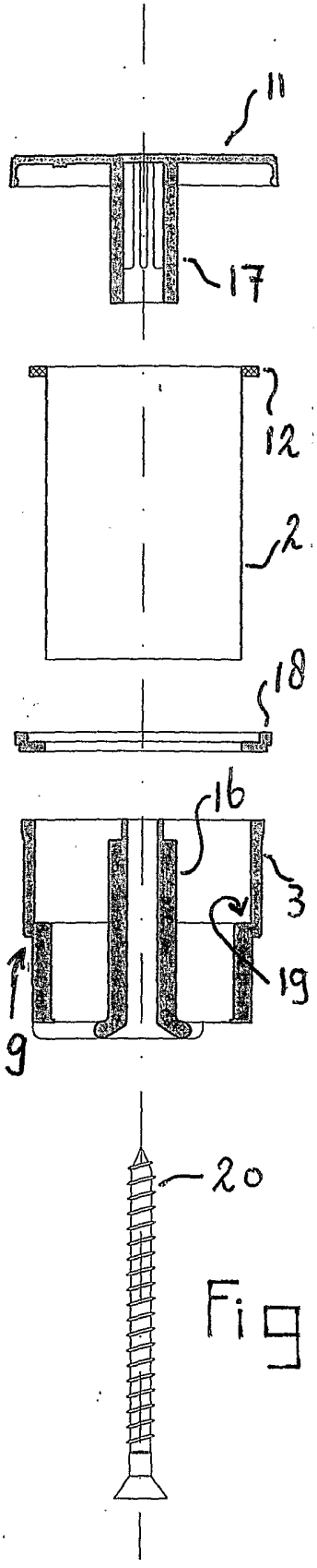

Fig 7

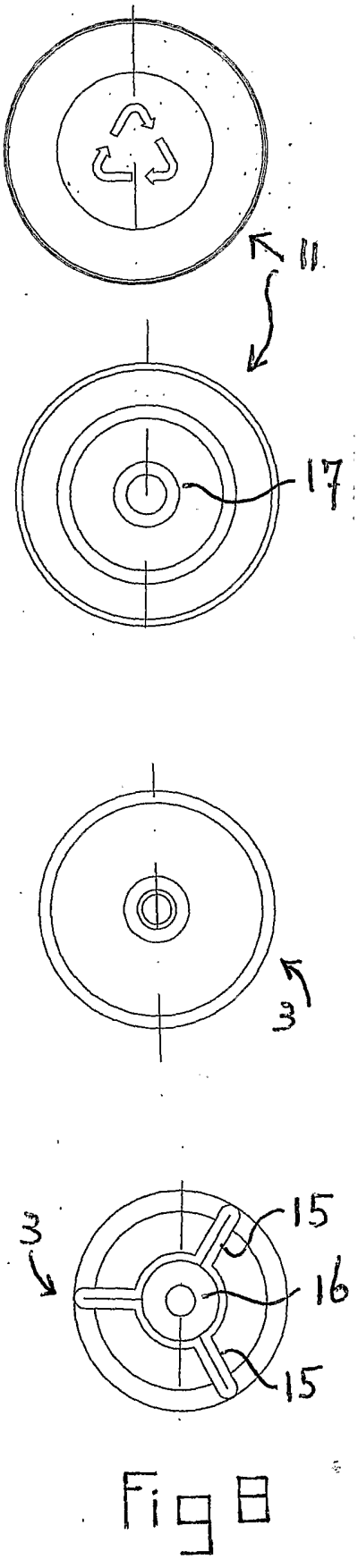

Fig 8

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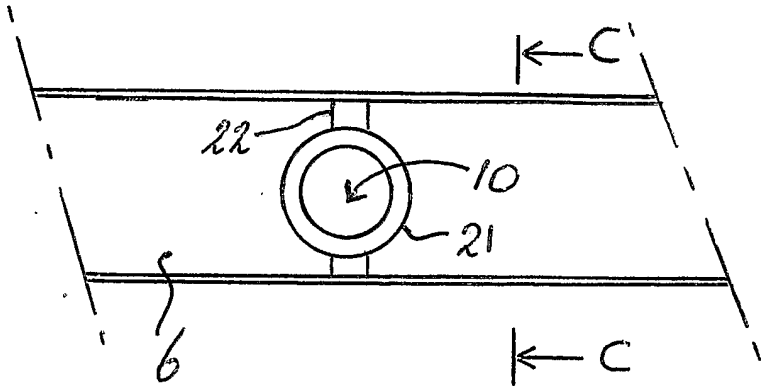

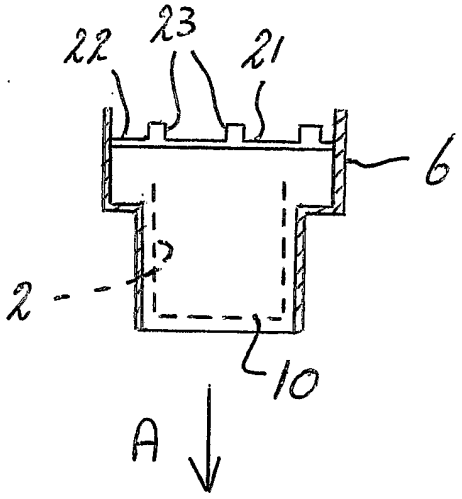

Fig 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2005/000833

A. CLASSIFICATION OF SUBJECT MATTER
INV. E03C1/298 E03F5/042

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E03C F16K E03F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 92/14888 A (AC DEVELOPMENTS LIMITED) 3 September 1992 (1992-09-03) page 4, line 33 - page 7, line 23 figures 1-3	1-10
X	US 6 318 397 B1 (HUBER DONALD G ET AL) 20 November 2001 (2001-11-20) column 4, line 49 - column 6, line 28 figures 1-3	1-4,6,7, 9,10
X	DE 37 06 737 A1 (SCHUBERT & SALZER MASCHINENFABRIK AG; SCHUBERT & SALZER MASCHINENFABRI) 15 September 1988 (1988-09-15) column 4, line 55 - column 8, line 23 figures	1,2,4-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 March 2006	27/03/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Van Bost, S

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/NL2005/000833

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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