



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.01.2011 Bulletin 2011/01

(51) Int Cl.:
A47L 15/42 (2006.01) D06F 39/08 (2006.01)

(21) Application number: **09008609.1**

(22) Date of filing: **01.07.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

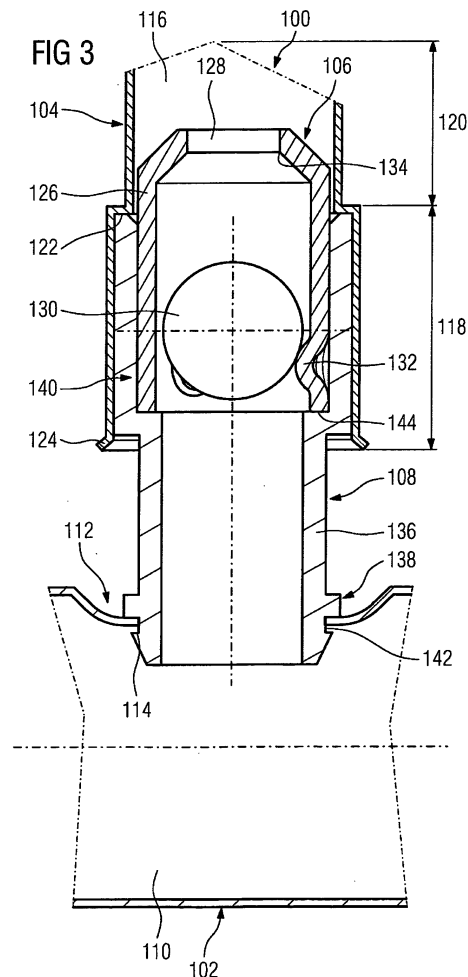
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(54) **Modular system for establishing a connection between a drain hose of a dish washer or washing machine and a branch-off line**

(57) Modular system (10; 50; 100) for establishing a connection between a drain hose of a dish washer or washing machine and a branch-off line, comprising a drain hose (12; 52; 102) defining a drain hose fluid channel (18; 58; 110) and having a connecting section (20; 60; 112); a branch-off line (14; 54; 104) defining a branch-off line fluid channel (26; 64; 116) and having a connecting end (28; 66; 118) to be connected to the connecting section (20; 60; 112) of the drain hose (12; 52; 102); and a valve body (16; 56; 106) defining a valve body fluid channel (36; 70; 128) and configured in such a manner that it is at least partially releasably insertable in the connecting end (28; 66; 118) of the branch-off line (14; 54; 104).



Description

TECHNICAL FIELD

[0001] The present invention refers to a modular system for establishing a connection between a drain hose of a dish washer or washing machine and a branch-off line, comprising a drain hose defining a drain hose fluid channel and having a connection section; a branch-off line defining a branch-off line fluid channel and having a connecting end to be connected to the connecting section of the drain hose; and a valve body defining a valve body fluid channel.

[0002] Dish washers and washing machines are nowadays installed at a progressive rate not a ground level but at an elevated level in order to improve a comfortable handling thereof. A consequence of this installation at an elevated level is that the waste water to be removed from the machine has to cover a large distance to the discharge siphon. This leads to different problems. Due to the drained waste water a negative pressure is generated into the drain hose and in the associated suction pump, which sucks the liquid from machine portions which normally remain flooded. Thus, the suction pump is often operated in an empty condition, whereby the lifetime of the pump can be essentially shortened. Moreover, pumping down disruptions and noise disturbances can appear.

[0003] In order to eliminate these problems modular systems of the above mentioned kind are known. Such modular systems comprise a valve body, which automatically performs a pressure compensation as soon as a negative pressure or no liquid surge prevails within the drain hose.

[0004] EP-A-1 520 926 for example discloses a modular system comprising a drain hose, a branch-off line and a valve body, wherein the valve body is made integral with the branch-off line. The valve body is provided with a closing body, which, when excess pressure or liquid surge prevails, automatically comes to bear sealingly against a sealing surface, so that no liquid can emerge via the branch-off line, and, when a negative pressure or no liquid surge prevails, is automatically disengaged from the sealing surface in order to allow a pressure equalization. By means of the valve body the development of negative pressure within the drain hose can be prevented. Thus, the drain hose, the connected suction pump and other machine parts, which should maintain flooded cannot be emptied, what contributes to the length of lifetime of the suction pump. Moreover, pumping down disruptions and noise disturbances can be prevented.

[0005] FIG 4 is a sectional view of an arrangement similar to the one described in EP-A- 1 520 926 showing a drain hose for the discharge of a waste water from a dish washer or washing machine (not shown), to which a branch-off line 202 is connected by means of a connecting device 204.

[0006] The drain hose 200 defines a drain hose fluid channel 206 and is formed with a receiving opening 208

for receiving the connecting device 204 as well as the branch-off line 202 inserted therein.

[0007] The branch-off line 202 defines a branch-off line fluid channel 210 and comprises a connecting end 212 to be inserted in the connecting device 204 and being formed with an annular projection 214. Made integral with the connecting end 212 is a valve portion 216 holding a bowl-shaped closing body 218. In the condition shown in FIG 4 the closing body 218 rests on a plurality of projections 220, which project radially inwards into the branch-off line fluid channel 210 and are spaced apart from each other. In the upper part of the valve portion 216 the outer diameter of the valve portion 216 is conically narrowed to form an annular valve seat 222, at which the closing body 218 takes its bearing when the fluid channel 210 is flooded with waste water. A line portion 224 joins the valve portion 216.

[0008] The connecting device 204 is made of rubber and defines an axially extending connecting device fluid channel 226. The connecting device 204 has a drain hose fitting and sealing section in the form of an outer annular sealing groove 228, which sealingly receives the wall of the drain hose 200 surrounding the receiving opening 208. Moreover, the connecting device 204 comprises a branch-off line fitting and sealing section essentially formed by the fluid channel 226 and an annular recess 230 extending radially outwards from the fluid channel 220 and sealingly receiving the annular projection 214 of the branch-off line 202.

[0009] As long as the waste water does not reach the closing body 218, the closing body 218 rests on the projection 220, wherein air can pass through the clearances formed between the projections 220. Thus, air can be fed to the drain hose 200 in order to prevent the creation of a negative pressure therein. As soon as the waste water level within the branch-off line 202 reaches the closing body 218, the closing body 218, which has a lower density than the waste water, is floated until it bears against the valve seat 222 in order to prevent a passing of the waste water.

[0010] One drawback of the modular system for establishing a connection between a drain hose and a branch-off line as shown in FIG 4 is that the valve portion is always present, even if not necessary, e.g. when the dish washer or the washing machine is installed at ground level. This leads to needless costs. Moreover, the cleaning of the valve portion is very difficult, because the valve portion is merely accessible from the connecting end of the branch-off line.

[0011] It is an object of the present invention to provide a modular system for establishing a connection between a drain hose of a dish washer or a washing machine and a branch-off line of the above mentioned kind, which is flexible and easy to handle.

[0012] In order to solve this object the present invention provides a modular system for establishing a connection between a drain hose of a dish washer or washing machine and a branch-off line of the above mentioned

kind, wherein the valve body is configured in such a manner, that it is at least partially releasably insertable in the connecting end of the branch-off line. Due to the fact that the valve body is not made integral with the branch-off line but releasably insertable therein, the valve body can be inserted in the branch-off line only in those cases where necessary, e.g. in cases where the dish washer or the washing machine is installed at an elevated level with respect to the ground level. However, when the dish washer or the washing machine is installed at ground level, the valve body can be omitted in order to save expenses. This makes the use of the present modular system very flexible. Moreover, the valve body - if used - can be dismounted at any time in order to perform maintenance work such as cleaning. This makes the modular system very easy and comfortable to handle.

[0013] According to an embodiment of the present invention, the valve body comprises an essentially tubular housing and a closing body moveably inserted therein for opening and closing the valve body fluid channel, wherein the closing body, when excess pressure or liquid surge prevails, is automatically pressed sealingly against a sealing surface, so that no liquid can pass, and, when a negative pressure or no liquid surge prevails, is automatically disengaged from the sealing surface.

[0014] Preferably, the tubular housing comprises at least one projection, which projects into the valve body fluid channel and receives the closing body when disengaged from the sealing surface. Advantageously, several projections are provided, which are spaced apart from each other such that air can pass through the clearances formed between the projections.

[0015] According to an embodiment of the present invention the connecting section of the drain hose is formed by an essentially annular drain hose portion projecting outwards and lateral with respect to the center axis of the drain hose and defining a receiving opening.

[0016] Alternatively, the connecting section of the drain hose can be formed by a receiving opening, which can be provided within a drain hose portion projecting inwards into the drain hose fluid channel.

[0017] According to one embodiment of the present invention the connecting end of the branch-off line and the connecting section of the drain hose are directly connected to each other, in particular by means of material connection or adhesive bonding.

[0018] Alternatively, a connecting device for connecting the drain hose and the branch-off line may be provided.

[0019] Preferably, the connecting device comprises a tubular body preferably made of an elastic material, in particular rubber, and defining an axially extending fluid channel, said tubular body having a drain hose fitting and sealing section and a valve body and/or branch-off line fitting and sealing section.

[0020] The drain hose fitting and sealing section can comprise at its outer side an annular sealing groove for sealingly receiving the connecting section of the drain

hose.

[0021] Preferably, the valve body is provided at its outer circumference with at least one sealing means, in particular with an O-ring, in order to ensure a fluid tight-fit between the valve body and the branch-off line.

[0022] Moreover, the present invention provides a method for establishing a connection between a drain hose and a branch-off line using a modular system as defined above. The method comprises the steps of at least partially releasably inserting the valve body in the connecting end of the branch-off line and connecting the connecting end of the branch-off line to the connecting section of the drain hose.

[0023] According to one embodiment of the present invention, the material of the branch-off line is material bonded to the material of the drain hose.

[0024] Alternatively, the connection can be established by means of the connecting device. In the latter case, the valve body is preferably sealingly inserted in the valve body fitting and sealing section of the connecting device.

[0025] The connecting end of the branch-off line is preferably sealingly put over the outer side of the valve body fitting and sealing section of the connecting device and sealingly connected thereto by means of a force-fit, a positive fit or a material fit.

[0026] The foregoing and other objects of the present invention are better understood by referring to the following detailed description of several preferred embodiments of the present invention and the appendent drawing, in which

FIG 1 is a sectional view of a modular system for establishing a connection between a drain hose of a dish washer or washing machine and a branch-off line according to a first embodiment of the present invention;

FIG 2 is a sectional view of a modular system according to a second embodiment of the present invention;

FIG 3 is a sectional view of a modular system according to a third embodiment of the present invention; and

FIG 4 is a sectional view of a conventional modular system.

[0027] The modular system 10 according to the first embodiment of the present invention as shown in FIG 1 comprises a drain hose 12 of a dish washer or washing machine, a branch-off line 14 and a valve body 16.

[0028] The drain hose 12 defines a drain hose fluid channel 18 and has a connecting section 20, which is formed by an essentially annular drain hose portion 22 projecting outwards and lateral with respect to the center axes 24 of the drain hose 12.

[0029] The branch-off line 14 defines a branch-off line fluid channel 26 and comprises a connecting end 28 to be connected to the connecting section 20 of the drain hose 12, a valve body receiving section 30 for releasably receiving the valve body 16 and a line section 32.

[0030] The valve body 16 comprises an essentially tubular housing 34, which defines a valve body fluid channel 36. Moreover, the valve body 16 is provided with a bowl-shaped closing body 38 inserted into the tubular housing 34 for opening and closing the valve body fluid channel 36. The closing body 38 rests on a plurality of projections 40, which are formed integral with the tubular housing 34 at its lower end, are spaced apart from each other and radially project into the valve body fluid channel 36. At the upper end of the tubular housing 34 an annular sealing surface 42 is provided against which the closing body 38 bears in order to close the valve body fluid channel 36. The density of the material of the closing body 38 is higher than the one of air and lower than the one of water, such that the closing body 38, when excess pressure or liquid surge prevails, is automatically moved upwards and pressed sealingly against the sealing surface 42, so that no liquid can pass, and, when a negative pressure or no liquid surge prevails, is automatically disengaged from the sealing surface 42 and moves downwards until it rests on the projections 40.

[0031] In order to assemble the modular system 10 shown in FIG 1 the valve body 16 is firstly releasably inserted into the valve body receiving section 30 of the branch-off line 14, wherein the valve body 16 is held in place by means of holding projections 44, which are formed integral with the branch-off line 14 in the transition portion between the connecting end 28 and the valve body receiving section 30 and project radially into the branch-off line fluid channel 26. Thereafter, the connecting end 28 of the branch-off line 14 is put over the annular drain hose portion 22 of the connecting section 20 of the drain hose 12, whereupon the free end of the connecting end 28 is welded to the drain hose 12 in order to provide a material fit.

[0032] The modular system 10 shown in FIG 1 is advantageous in that the user can decide whether or not he wishes to install the valve body 16 prior to the connection of the branch-off line 14 and the drain hose 12.

[0033] FIG 2 shows a modular system 50 according to the second embodiment of the present invention. The modular system 50 comprises a drain hose 52, a branch-off line 54, a valve body 56 and a connecting device 57.

[0034] The drain hose 52 defines a drain hose fluid channel 58 and has a connecting section 60, which projects inwards into the drain hose fluid channel 58 and comprises a receiving opening 62 for receiving the connecting device 57.

[0035] The branch-off line 54 defines a branch-off line fluid channel 64 and comprises a connecting end 66 for releasably receiving the valve body 56.

[0036] The valve body 56 comprises an essentially tubular housing 68 defining a valve body fluid channel 70.

A bowl-shaped closing body 72 is movably received in the valve body fluid channel 70. In the condition shown in FIG 2, the closing body 72 rests on projections 74, which are formed integral with the tubular housing 68 and radially project into the valve body fluid channel 70. The projections 74 are spaced apart from each other such that air can pass through the clearances defined between them. At the upper end of the tubular housing 68 a sealing surface 76 is provided against which the closing body 72 is sealingly pressed in order to close the valve body fluid channel 70. At the outer diameter of the tubular housing 68 two O-rings 78 and 80 are fixed in order to provide a fluid tight connection between the valve body 56 and the branch-off line 54.

[0037] The connecting device 57 comprises an essentially tubular body 82, which is made of an elastic material, in particular rubber and defines an axially extending connecting device fluid channel 84. The tubular body 82 has a drain hose fitting and sealing section 86 and a valve body fitting and sealing section 88. The drain hose fitting and sealing section 86 comprises an outer annular groove 90 for receiving the connecting section 60 of the drain hose 52. The valve body fitting and sealing section 88 is formed by a portion of the connecting device 57 having an enlarged inner diameter essentially corresponding to the outer diameter of the tubular housing 68 of the valve body 56 and defining a step 92 serving as a stopper for the valve body 56.

[0038] In order to assemble the modular system 50 shown in FIG 2 the upper end of the valve body 56 is firstly releasably inserted into the branch-off line 54. Thereafter, the lower end of the valve body 56 is inserted in the valve body fitting and sealing section 88 of the connecting device 57. Subsequently the connecting device 57 is connected to the drain hose 52 by receiving the connecting section 60 of the drain hose 52 in the annular groove 90 of the drain hose fitting and sealing section 86 of the connecting device 57.

[0039] FIG 3 shows a modular system 100 according to a third embodiment of the present invention. The modular system 100 comprises a drain hose 102, a branch-off line 104, a valve body 106 and a connecting device 108.

[0040] The drain hose 102 defines a drain hose fluid channel 110 and has a connecting section 112, which projects inwards into the drain hose fluid channel 110 and is formed with a receiving opening 114.

[0041] The branch-off line 104 defines a branch-off line fluid channel 116 and comprises a connecting end 118 and a line section 120. The connecting end 118 has a larger inner diameter than the line section 120 such that an annular step 122 is formed between these sections. Moreover, the connecting end 108 is provided at its free end with an insertion cone 124 for simplifying the insertion of the connecting device 108 as it is described later.

[0042] The valve body 106 comprises an essentially tubular housing 126 defining the valve body fluid channel 128. Moreover, the valve body 106 is provided with a

bowl-shaped closing body 130, which is movably received within the valve body fluid channel 128. In the condition shown in FIG 3 the closing body 130 rests on several projections 132, which are formed integral with the tubular housing 126 and project radially inwards into the valve body fluid channel 128. The projections 132 are spaced apart from each other such that air can pass through the clearances defined between the projections.

[0043] At its upper end the tubular housing 126 is formed with a sealing surface 134 against which the closing body 130 is automatically pressed sealingly when excess pressure or liquid surge prevails. As soon as a negative pressure or no liquid surge prevails, the closing body 130 is automatically disengaged from the sealing surface 134 to rest on the projections 132.

[0044] The connecting device 108 comprises an essentially tubular body 136 defining a connecting device fluid channel 137 and having a drain hose fitting and sealing section 138 at its lower end and a valve body and branch-off line fitting and sealing section 140 at its upper end. The drain hose fitting and sealing section 138 is essentially formed by an outer annular groove 142 for receiving the connecting section 112 of the drain hose 102. The inner diameter of the valve body and the branch-off line fitting and sealing section 140 is enlarged with respect to the one of the drain hose fitting and sealing section 138, such that a step 144 is formed between these sections serving as a stopper for the valve body 126. The inner diameter of the valve body and branch-off line fitting and sealing section 140 essentially corresponds to the one of the outer diameter of the tubular housing 126 of the valve body 106, wherein its outer diameter essentially corresponds to the inner diameter of the connecting end 118 of the branch-off line 104.

[0045] In order to assemble the modular system 100 shown in FIG 3, the valve body 106 is firstly inserted into the inner diameter of the valve body and branch-off line fitting and sealing section 140 of the connecting device 108 such that a force-fit is created. Thereafter, the connecting end 118 of the branch-off line 104 is put over the outer diameter of the valve body and branch-off line fitting and sealing section 140 of the connecting device 108, wherein the insertion cone 124 supports an easy put over. Finally, the connecting device 108 is connected to the drain hose 102.

Claims

1. Modular system (10; 50; 100) for establishing a connection between a drain hose of a dish washer or washing machine and a branch-off line, comprising a drain hose (12; 52; 102) defining a drain hose fluid channel (18; 58; 110) and having a connecting section (20; 60; 112); a branch-off line (14; 54; 104) defining a branch-off line fluid channel (26; 64; 116) and having a connecting end (28; 66; 118) to be connected to the connecting section (20; 60; 112) of the

drain hose (12; 52; 102); and a valve body (16; 56; 106) defining a valve body fluid channel (36; 70; 128) and configured in such a manner that it is at least partially releasably insertable in the connecting end (28; 66; 118) of the branch-off line (14; 54; 104).

2. System (10; 50; 100) according to claim 1, **characterized in that** the valve body (16; 56; 106) comprises an essentially tubular housing (34; 68; 126) and a closing body (38; 72; 130) movably inserted therein for opening and closing the valve body fluid channel (36; 70; 128), wherein the closing body (38; 72; 130), when excess pressure or liquid surge prevails, is automatically pressed sealingly against a sealing surface (42; 76; 134), so that no liquid can pass, and, when a negative pressure or no liquid surge prevails, is automatically disengaged from the sealing surface (42; 76; 134).
3. System (10; 50; 100) according to claim 2, **characterized in that** the tubular housing (34; 68; 126) comprises at least one projection (40; 74; 132), which projects into the valve body fluid channel (36; 70; 128) and receives the closing body (38; 72; 130) when disengaged from the sealing surface (42; 76; 134).
4. System (10; 50; 100) according to claim 3, **characterized in that** several projections (40; 74; 132) are provided, which are spaced apart from each other.
5. System (10) according to one of the foregoing claims, **characterized in that** the connecting section (20) of the drain hose (12) is formed by an essentially annular drain hose portion (22) projecting outwards and lateral with respect to the center axis (24) of the drain hose (12).
6. System (50; 100) according to one of the claims 1 to 4, **characterized in that** the connecting section (60; 112) of the drain hose (52; 102) is formed by a receiving opening (62; 114).
7. System (50; 100) according to claim 6, **characterized in that** the receiving opening (62; 114) is provided within a drain hose portion projecting inwards into the drain hose fluid channel (58; 110).
8. System (50; 100) according to one of the foregoing claims, **characterized in that** a connecting device (57; 108) for connecting the drain hose (52; 102) and the branch-off line (54; 104) is provided.
9. System (50; 100) according to claim 8, **characterized in that** the connecting device (57; 108) comprises a tubular body (82; 136) preferably made of an elastic material, in particular rubber, and defining an axially extending fluid channel (84; 137), said tu-

bular body having a drain hose fitting and sealing section (86; 138) and a valve body and/or branch-off line fitting and sealing section (88; 140).

10. System (50; 100) according to claim 9, **characterized in that** the drain hose fitting and sealing section (86; 138) comprises at its outer side an annular sealing groove (90; 142) for sealingly receiving the connecting section (60; 112) of the drain hose (52; 102). 5
11. System (50) according to one of the foregoing claims, **characterized in that** the valve body (56) is provided at its outer circumference with at least one sealing means, in particular with an O-ring (78; 80). 10
12. Method for establishing a connection between a drain hose (12; 52; 102) and a branch-off line (14; 54; 104) using a modular system (10; 50; 100) according to one of the foregoing claims, **characterized by** the steps of 15
 - at least partially releasably inserting the valve body (16; 56; 106) in the connecting end (28; 66; 118) of the branch-off line (14; 54; 104) and
 - connecting the connecting end (28; 66; 118) of the branch-off line (14; 54; 104) to the connecting section (20; 60; 112) of the drain hose (12; 52; 102). 20 25
13. Method according to claim 12, **characterized in that** the material of the branch-off line (14) is material bonded to the material of the drain hose (12). 30
14. Method according to claim 12, **characterized in that** the connection is established by means of the connecting device (57; 108) . 35
15. Method according to claim 14, **characterized in that** the valve body (56; 108) is sealingly inserted in the valve body fitting and sealing section (88; 140) of the connecting device (57; 108) and/or **characterized in that** the connecting end (118) of the branch-off line (104) is sealingly put over the outer side of the valve body fitting and sealing section (140) of the connecting device (108) and sealingly connected thereto by means of force-fit, positive fit or material fit. 40 45

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FIG 1

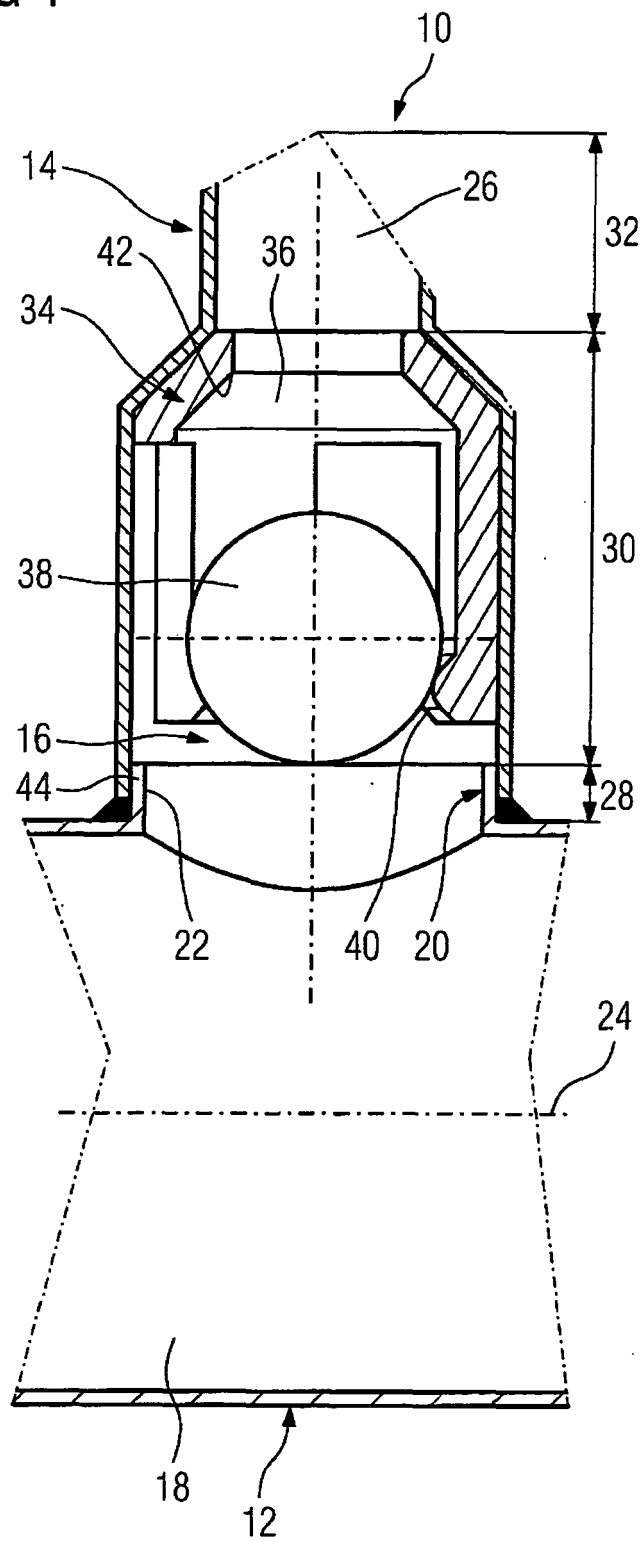
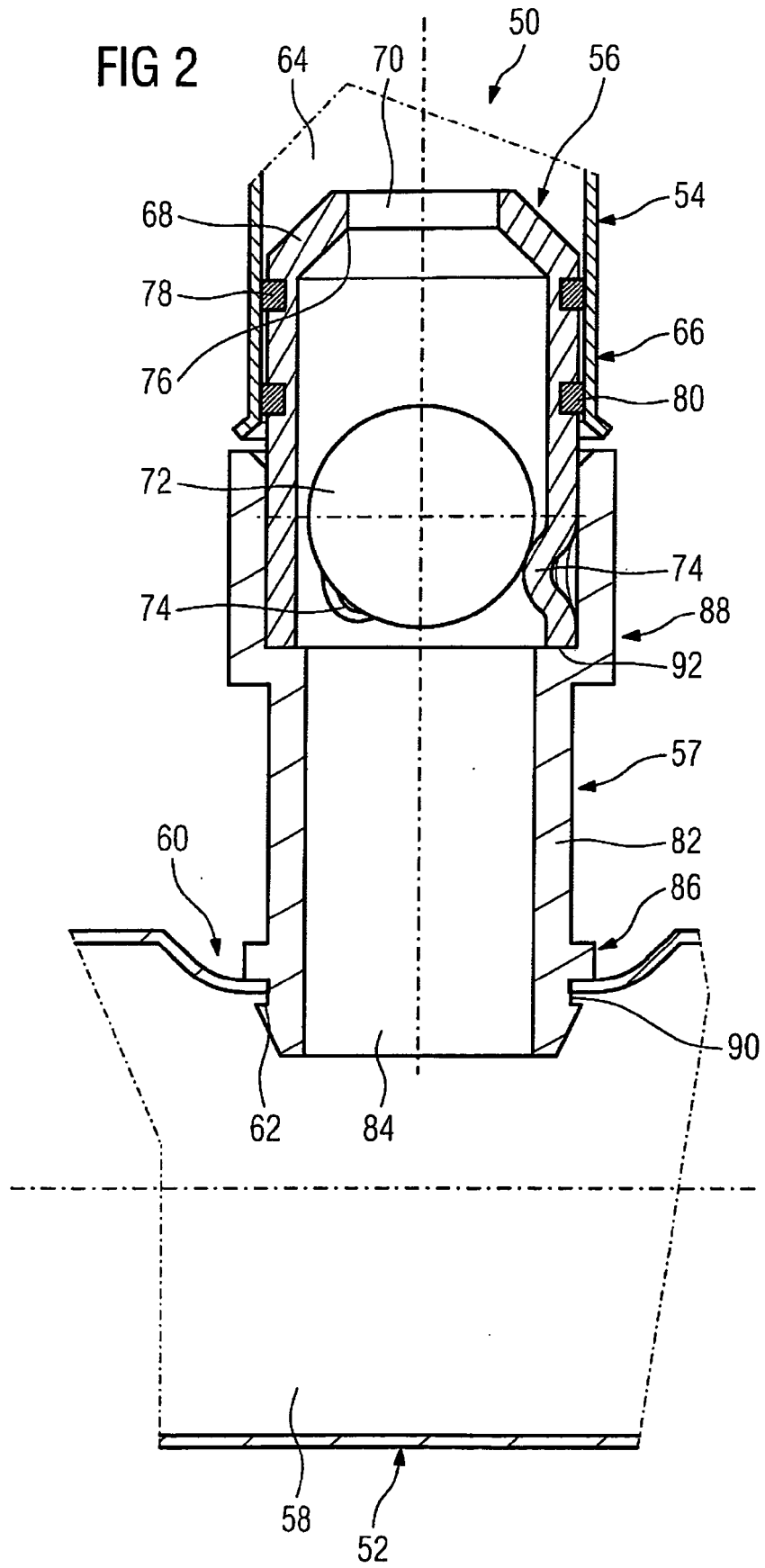


FIG 2



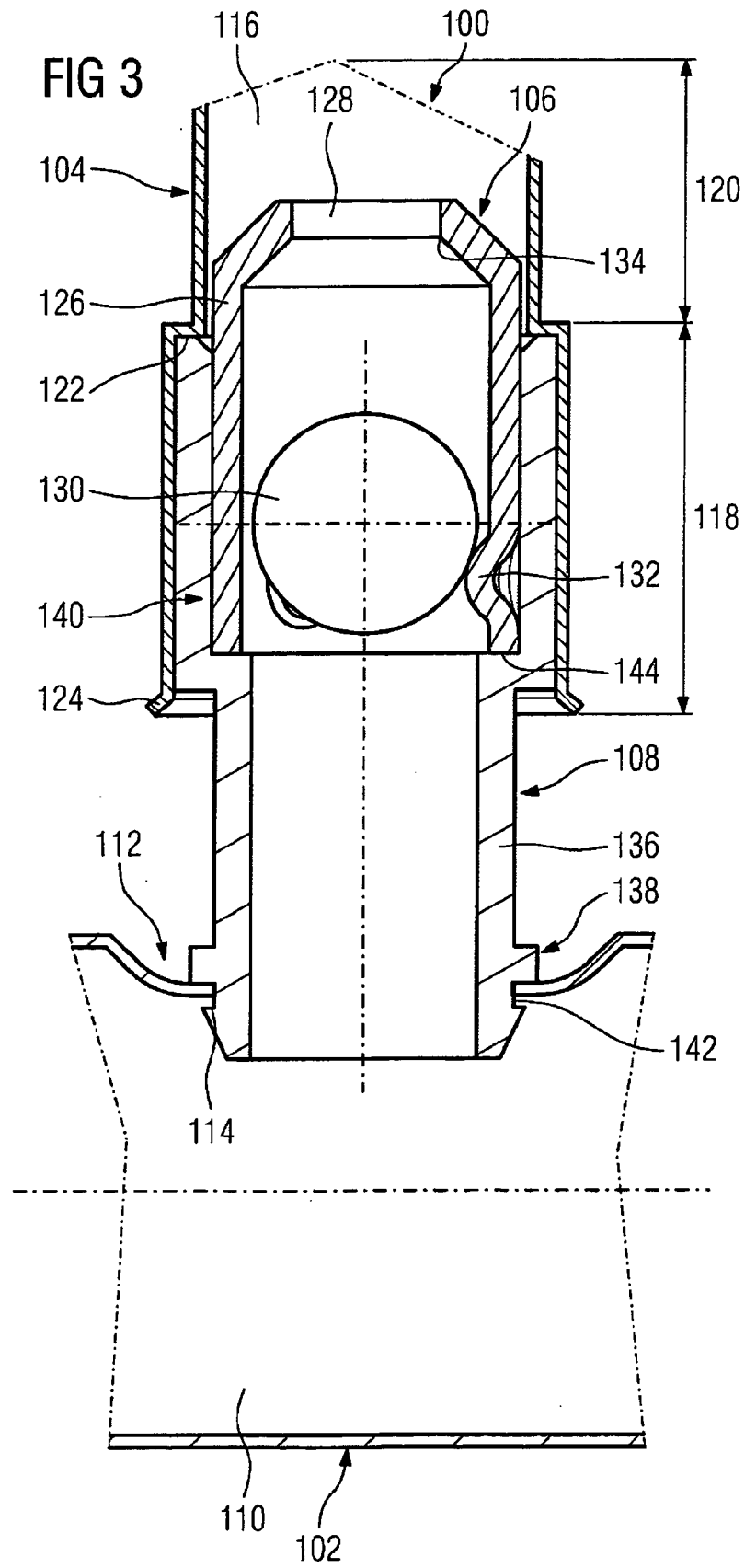
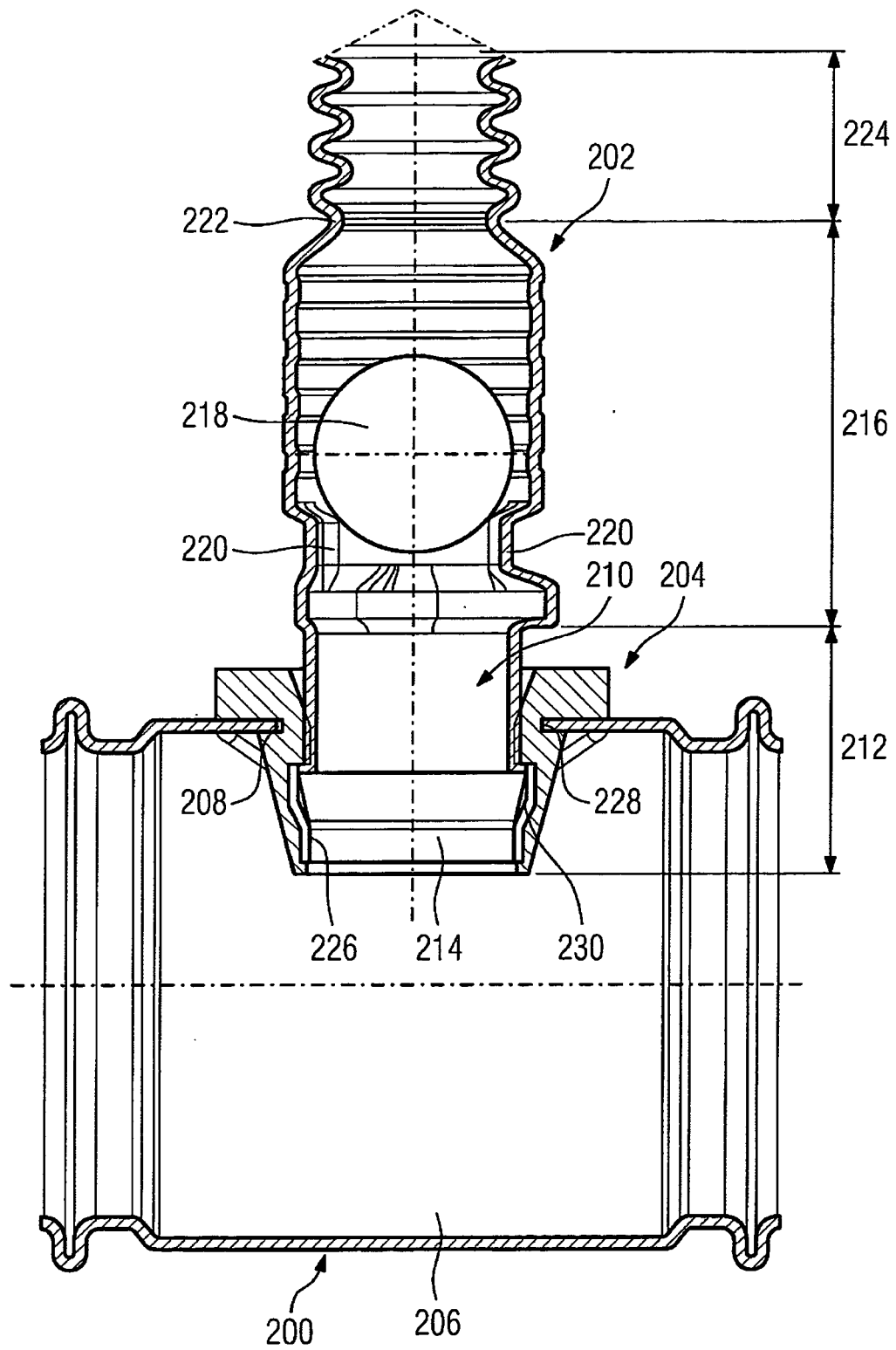


FIG 4





EUROPEAN SEARCH REPORT

Application Number
EP 09 00 8609

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,A	EP 1 520 926 A (FRAENKISCHE ROHRWERKEGEBR KIRC [DE] KIRCHNER FRAENK ROHR [DE]) 6 April 2005 (2005-04-06) * the whole document *	1-15	INV. A47L15/42 D06F39/08
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			A47L D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 September 2009	Examiner Stroppa, Giovanni
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 00 8609

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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16-09-2009

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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