(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 224 051 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.09.2010 Bulletin 2010/35

(51) Int Cl.:
D06F 39/08 *(2006.01)*

(21) Application number: **10152271.2**

(22) Date of filing: **01.02.2010**

(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

(30) Priority: **03.02.2009 IT TO20090063**

(71) Applicant: **T & P - S.p.A.**
21040 Venegono Superiore (VA) (IT)

(72) Inventors:
- **Lavazza, Alberto**
  21010, Cardano al Campo (VA) (IT)
- **Rotta, Andrea**
  22070, Appiano Gentile (CO) (IT)

(74) Representative: **Camolese, Marco et al**
Metroconsult S.r.L.
Via Sestriere 100
10060 None (TO) (IT)

(54) Anti-flooding safety device for a washing machine, and method of assembly thereof

(57) The present invention relates to an anti-flooding safety device (1) for a washing machine, of the type comprising:
- a valve body (2), preferably made of plastic material, which defines a passage duct (3) comprising an inlet section (3A) for connecting the device (1) to a liquid supply source, an outlet section (3B) for connecting the device to a pipe (4) for supplying said liquid to a washing machine, and an intermediate section (3C) for connecting said inlet section (3A) to said outlet section (3B);
- a shut-off device (6), in particular comprising at least one solenoid valve, said shut-off device (6) being associated with the passage duct (3) of the valve body (2);
- an electric cable (7) which allows to control said shut-off device (6) for the purpose of shutting off the passage duct (3).

The invention is **characterized in that** said valve body (2) comprises an orifice (9) for inserting the electric cable (7) in order to connect a terminal (7A) of said electric cable (7) to the shut-off device (6).

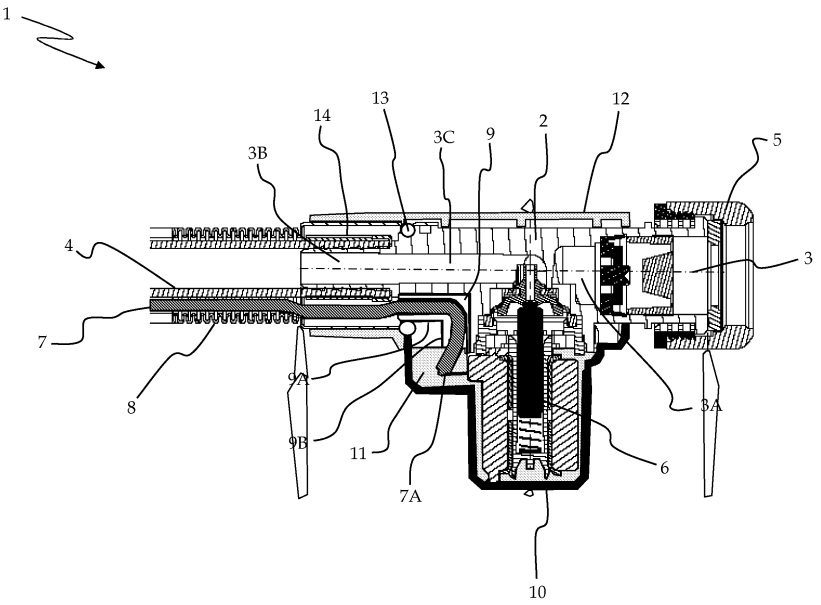

Fig. 2

EP 2 224 051 A1

Description

[0001] The present invention relates to an anti-flooding safety device for a washing machine according to the preamble of claim 1. In addition, the present invention also relates to a method of assembly of an anti-flooding safety device for a washing machine.

[0002] When using washing machines known in the art, there is a risk that the surrounding environment gets flooded following a sudden leak in the wash liquid supply or drain system. For example, sudden leaks may be due to faulty components of the washing machine or to broken wash liquid supply or drain pipes.

[0003] Consequently, the washing machines known in the art include anti-flooding safety devices for continuously monitoring and checking the presence of any leaks in the washing machine, in particular during the wash liquid supply and drain steps.

[0004] The anti-flooding safety devices known in the art comprise a valve body in which a passage duct for a liquid is defined, said passage duct comprising:

- an inlet section, for connecting the device to a liquid supply source;
- an outlet section, for connecting the device to a pipe for supplying said liquid to a washing machine;
- an intermediate section, for connecting said inlet duct to said outlet duct.

[0005] The anti-flooding devices known in the art also comprise:

- a shut-off device, in particular comprising at least one solenoid valve, associated with said passage duct;
- an electric cable, which allows to control the shut-off device in a manner such that said passage duct is shut off in the event that leakage of liquid occurs from a component of the washing machine.

[0006] Typically, the shut-off device is associated with the intermediate section of the passage duct and the electric cable is arranged in an annular space obtained between said pipe for supplying the liquid to a washing machine and an outer pipe, in particular of the corrugated type. The main function of said outer pipe is to protect the liquid supply pipe and, should said latter pipe fail, to collect the leaking liquid and supply it to the washing machine, where suitable means are provided for leak detection.

[0007] The anti-flooding devices known in the art suffer from several problems, mostly due to the positioning of the electric cable and to the connection thereof to the shut-off device.

[0008] In fact, in order to ensure that the entire anti-flooding device operates properly, it is necessary that the electric cable be connected to the shut-off device hermetically, so as to prevent any accidental electric contacts also in the event of a wash liquid leak, as well as to prevent any leaking liquid from flowing out of the device on the solenoid valve side. In addition, the connection between the electric cable and the shut-off device must be optimal from a mechanical viewpoint as well.

[0009] German patent No. DE4304712 discloses an anti-flooding device like the one previously described, wherein the outlet section of the passage duct has a fixing ring that embraces the outlet section and is integral with a gasket adapted to be coupled to a sleeve mounted on one end of the corrugated outer pipe. Both the fixing ring and the gasket integral therewith have a hole that allows for inserting the electric cable, which must then be connected to the shut-off device.

[0010] However, even the anti-flooding device described in said German patent no. DE4304712 has some drawbacks, in that the number of components used for installing the electric cable is rather large and necessarily implies that costly and complex operations are required in order to assemble the device.

[0011] Furthermore, in the event that the device is not assembled with due attention and/or the above-described components are not properly manufactured, the hydraulic seal of the whole device may be inadequate.

[0012] In this frame, it is the main object of the present invention to overcome the above-mentioned drawbacks by providing an anti-flooding safety device for a washing machine, as well as a method of assembly of said anti-flooding device, which is so conceived as to ensure a hermetic connection, from the hydraulic point of view, between the electric cable and the shut-off device, so that the anti-flooding device can be safe against accidental electric contact also in the event of leakage of wash liquid.

[0013] It is another object of the present invention to provide an anti-flooding device which ensures an optimal connection between the electric cable and the shut-off device from a mechanical viewpoint as well.

[0014] It is a further object of the present invention to provide an anti-flooding safety device for a washing machine which is so conceived as to simplify the assembly of the components thereof and which does not necessarily imply that costly and complex operations are to be carried out for completing said assembly.

[0015] Said objects are achieved by the present invention through an anti-flooding safety device for a washing machine and a method of assembly thereof incorporating the features set out in the appended claims, which are intended as an integral part of the present description.

[0016] Further objects, features and advantages of the present invention will become apparent from the following detailed description and from the annexed drawings, which are supplied by way of non-limiting example, wherein:

- Fig. 1 is a side view of an anti-flooding safety device for a washing machine according to the present invention;

- Fig. 2 is a sectional view of the anti-flooding device of Fig. 1.

[0017] Referring now to the annexed drawings, reference numeral 1 designates as a whole an anti-flooding safety device for a washing machine according to the present invention.

[0018] Device 1 comprises a valve body 2, preferably made of plastic material, which defines a passage duct (indicated as a whole in the annexed drawings by reference numeral 3 and a dashed-dotted line) through which the liquid is supplied to a washing machine (not shown in the drawings).

[0019] In particular, passage duct 3 of valve body 2 is so constructed as to comprise:

- an inlet section 3A for connecting device 1 to a liquid supply source (not shown);
- an outlet section 3B for connecting device 1 to a pipe 4 for supplying said liquid to a washing machine;
- an intermediate section 3C for connecting said inlet section 3A to said outlet section 3B.

[0020] Said inlet section 3A is preferably fitted with a ring nut 5 for coupling device 1 to said liquid supply source, in particular a tap. In addition, said inlet section 3A may also be fitted with a sealing gasket and/or a filter and/or a flow regulator.

[0021] Device 1 further comprises:

- a shut-off device 6, in particular comprising at least one solenoid valve, said shut-off device 6 being associated with passage duct 3 of valve body 2, in particular with intermediate duct 3C;
- an electric cable 7 which allows to control said shut-off device 6 for the purpose of shutting off passage duct 3, said electric cable 7 being located in an annular space obtained between said pipe 4 and an outer pipe 8, in particular of the corrugated type.

[0022] The activation of shut-off device 6 takes place in a manner known in the art, and allows to shut off said passage duct 3 should any liquid leak from a component of the washing machine.

[0023] According to the present invention, valve body 2 comprises an orifice 9 for inserting electric cable 7 in order to connect a terminal 7A of said electric cable 7 to shut-off device 6.

[0024] In a preferred embodiment of anti-flooding device 1 in accordance with the present invention, said orifice 9 comprises:

- a first section 9A substantially parallel to the passage duct 3;
- a second section 9B substantially perpendicular to the passage duct 3.

[0025] The particular provision of orifice 9 in valve body 2 provides a particularly advantageous connection between electric cable 7 and shut-off device 6. In fact, when inserted in orifice 9, electric cable 7 is protected by valve body 2, in particular that portion of electric cable 7 which is closer to terminal 7A; consequently, said terminal 7A can be connected hermetically to shut-off device 6 even in the presence of wash liquid leaks.

[0026] Moreover, the provision of orifice 9 allows to obtain an anti-flooding device 1 which is easy to assemble and which does not require any costly or complex operations. As a matter of fact, said orifice 9 can be obtained in a particularly advantageous manner while moulding valve body 2.

[0027] Anti-flooding device 1 according to the present invention also comprises a casing 10 that ensures mechanical protection of shut-off device 6; at the same time, said casing 10 provides a covering for shut-off device 6 which is also aesthetically compatible with the washing machine connected to anti-flooding device 1.

[0028] Preferably, the inner portion of said casing 10 contains an insulating material 11, in particular epoxy resin, suitable for providing additional insulation of terminal 7A of said electric cable 7 and of the connection thereof with shut-off device 6.

[0029] Anti-flooding device 1 according to the present invention further comprises a cover 12 adapted to be coupled to casing 10 for the purpose of enclosing valve body 2. The coupling between casing 10 and cover 12, as well as the coupling between the outer pipe and casing 10 and/or cover 12, is preferably ensured by suitable snap-type coupling means.

[0030] Device 1 also comprises a sealing ring 13 arranged on the outer surface of outlet section 3B in order to couple the latter to corrugated outer pipe 8 and ensure an optimal hydraulic seal even if a leakage of wash liquid occurs.

[0031] Device 1 additionally comprises a metal bushing 14 which allows liquid supply pipe 4 to be secured to the outlet section 3B of passage duct 3. It is however clear that device 1 may alternatively comprise equivalent means for securing pipe 4 to said outlet section 3B.

[0032] It is clear from the above description and from the drawings referred to therein that the provision of orifice 9 in valve body 2 of anti-flooding device 1 allows to obtain a particularly advantageous connection between electric cable 7 and shut-off device 6.

[0033] The advantages of the invention are also apparent in regard to a method of assembly of an anti-flooding device 1 for a washing machine according to the present invention.

[0034] In particular, said method comprises the following steps:

a) associating a shut-off device 6, in particular comprising at least one solenoid valve, with a passage duct 3 of a valve body 2 of said anti-flooding device 1;
b) inserting an electric cable 7, which allows to control said shut-off device 6 for the purpose of shutting

off passage duct 3, into an orifice 9 obtained in said valve body 2;

c) connecting a terminal 7A of said electric cable 7 to shut-off device 6.

Preferably, the method of assembly of anti-flooding device 1 according to the present invention comprises the following steps:

d) inserting an insulating material 11, in particular epoxy resin, into a casing 10;

e) positioning shut-off device 6 and terminal 7A of electric cable 7 in said insulating material, so as to ensure mechanic and hydraulic protection of said terminal 7A and shut-off device 6.

The method of assembly of anti-flooding device 1 according to the present invention further comprises the following steps:

f) securing a pipe 4 for supplying a liquid to said washing machine to an outlet section 3B of passage duct 3, in particular by caulking a metal bushing 14;

g) mounting an outer pipe 8 onto valve body 2, in a manner such that said electric cable 7 is located in an annular space obtained between outer pipe 8 and said pipe 4.

[0035] Preferably, said step f) of securing pipe 4 is preceded by the positioning of a sealing ring 13 onto the outer surface of said outlet section 3B, so as to provide an adequate coupling between the latter and outer pipe 8 and to ensure an optimal hydraulic seal even if a leakage of wash liquid occurs.

[0036] Additionally, the method of assembly of anti-flooding device 1 according to the present invention may comprise the step of coupling a cover 12 to casing 10 in order to enclose valve body 2, said coupling being in particular obtained through suitable snap-type coupling means.

[0037] The advantages of an anti-flooding safety device for a washing machine and of a method of assembly of an anti-flooding device according to the present invention are apparent from the above description.

[0038] In particular, said advantages lie in that the particular provision of orifice 9 in valve body 2 allows to obtain a hermetical connection, from the hydraulic point of view, between electric cable 7 and shut-off device 6, so that anti-flooding device 1 can be safe against accidental electric contact also in the event of leakage of wash liquid. Furthermore, thanks to the particular assembly of anti-flooding device 1 according to the present invention, any leaking liquid cannot flow out of anti-flooding device 1 on the side of shut-off device 6.

[0039] A further advantage of anti-flooding device 1 according to the present invention is that it is so conceived as to simplify the assembly of the components thereof; as a result, it does not require any costly or complex assembly work.

[0040] Yet another advantage of the present invention is that, by inserting an insulating material 11, in particular epoxy resin, inside casing 10, it is possible to obtain a hermetical connection between electric cable 7 and shut-off device 6.

[0041] The device and method described herein by way of example may be subject to many possible variations without departing from the novelty spirit of the inventive idea; it is also clear that in the practical implementation of the invention the illustrated details may have different shapes or be replaced with other technically equivalent elements.

[0042] It can therefore be easily understood that the present invention is not limited to the above-described device and method, but may be subject to many modifications, improvements or replacements of equivalent parts and elements without departing from the inventive idea, as clearly specified in the following claims.

Claims

1. Anti-flooding safety device (1) for a washing machine, of the type comprising:

   - a valve body (2), preferably made of plastic material, which defines a passage duct (3) comprising an inlet section (3A) for connecting the device (1) to a liquid supply source, an outlet section (3B) for connecting the device (1) to a pipe (4) for supplying said liquid to a washing machine, and an intermediate section (3C) for connecting said inlet section (3A) to said outlet section (3B);
   - a shut-off device (6), in particular comprising at least one solenoid valve, said shut-off device (6) being associated with the passage duct (3) of the valve body (2);
   - an electric cable (7) which allows to control said shut-off device (6) for the purpose of shutting off the passage duct (3),

   characterized in that
   said valve body (2) comprises an orifice (9) for inserting the electric cable (7) in order to connect a terminal (7A) of said electric cable (7) to the shut-off device (6).

2. Device (1) according to claim 1, **characterized in that** said orifice (9) comprises:

   - a first section (9A) substantially parallel to the passage duct (3);
   - a second section (9B) substantially perpendicular to the passage duct (3).

3. Device (1) according to claim 1, **characterized in that** said electric cable (7) is located in an annular space obtained between said pipe (4) and an outer pipe (8), in particular of the corrugated type.

4. Device (1) according to claim 3, **characterized by** comprising a sealing ring (13) positioned on the outer surface of the outlet section (3B) for coupling said outlet section (3B) to the external corrugated pipe (8).

5. Device (1) according to claim 1, **characterized by** comprising a casing (10) that ensures mechanical protection of the shut-off device (6) and contains an insulating material (11), in particular epoxy resin, suitable for providing additional insulation of the terminal (7A) of said electric cable (7) and of the connection thereof with the shut-off device (6).

6. Device (1) according to claim 5, **characterized by** comprising a cover (12) adapted to be coupled to the casing (10), in particular through snap-type coupling means, for the purpose of enclosing the valve body (2).

7. Device (1) according to claim 1, **characterized by** comprising a metal bushing (14) which allows the liquid supply pipe (4) to be secured to the outlet section (3B) of the passage duct (3).

8. Method for assembling an anti-flooding device (1) for a washing machine, comprising the following steps:

a) associating a shut-off device (6), in particular comprising at least one solenoid valve, with a passage duct (3) of a valve body (2) of said anti-flooding device (1);
b) inserting an electric cable (7), which allows to control said shut-off device (6) for the purpose of shutting off the passage duct (3), into an orifice (9) obtained in said valve body (2);
c) connecting a terminal (7A) of said electric cable (7) to the shut-off device (6).

9. Method according to claim 8, **characterized by** comprising the following steps:

d) inserting an insulating material (11), in particular epoxy resin, into a casing (10);
e) positioning the shut-off device (6) and the terminal (7A) of the electric cable (7) in said insulating material, so as to ensure mechanic and hydraulic protection of said terminal (7A) and shut-off device (6).

10. Method according to claim 9, **characterized by** further comprising the following steps:

f) securing a pipe (4) for supplying a liquid to said washing machine to an outlet section (3B) of the passage duct (3), in particular by caulking a metal bushing (14);
g) mounting an outer pipe (8) onto the valve body (2) in a manner such that said electric cable (7) is located in an annular space obtained between the outer pipe (8) and said pipe (4).

11. Method according to claim 10, **characterized in that** said step f) is preceded by the positioning of a sealing ring (13) onto the outer surface of said outlet section (3B), so as to provide an adequate coupling between the latter and the outer pipe (8) and to ensure an optimal hydraulic seal even if a leakage of wash liquid occurs.

12. Method according to claim 9, **characterized in that** a cover (12) is coupled to the casing (10) for the purpose of enclosing the valve body (2), said coupling being in particular obtained through suitable snap-type coupling means.

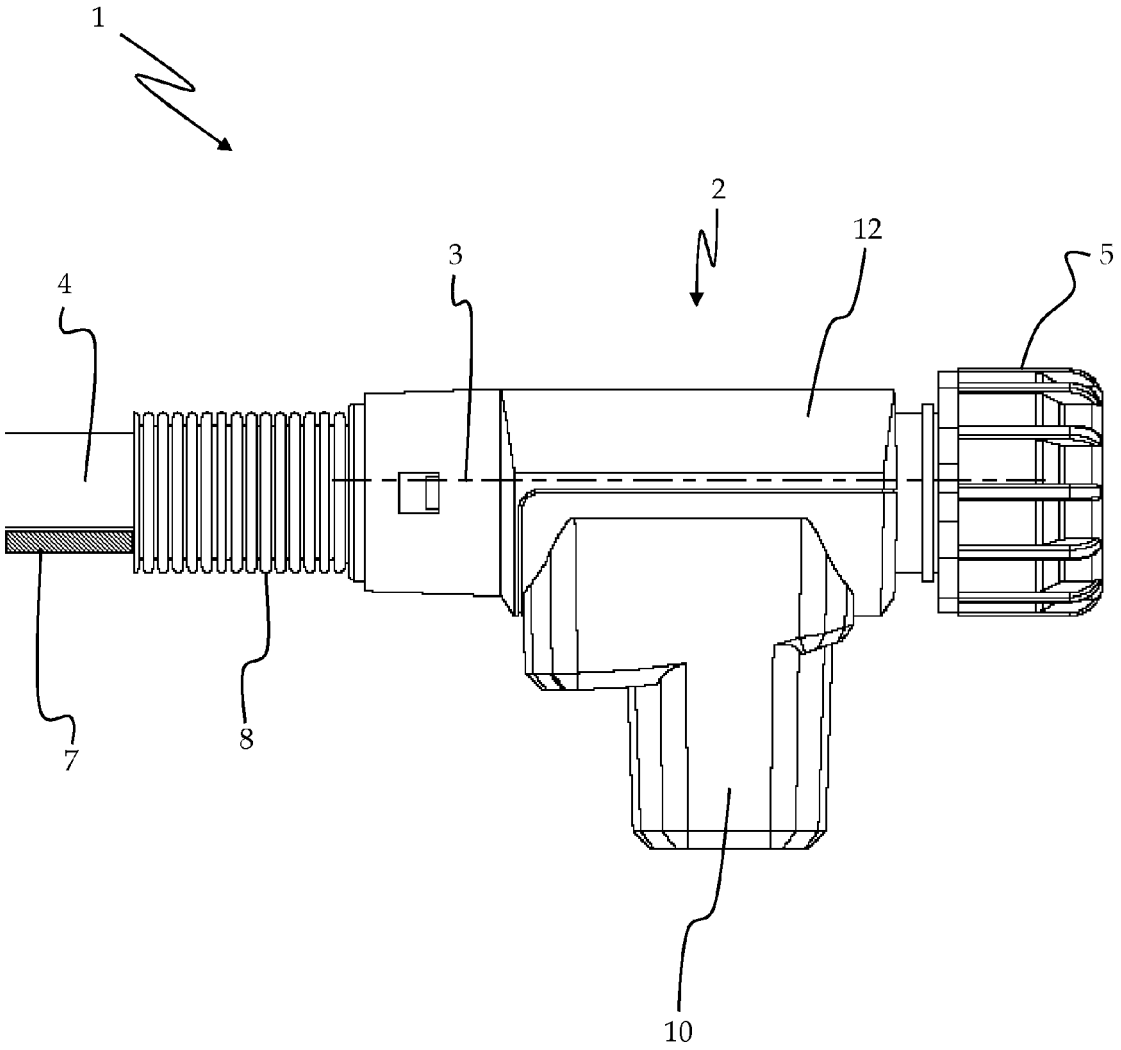

Fig. 1

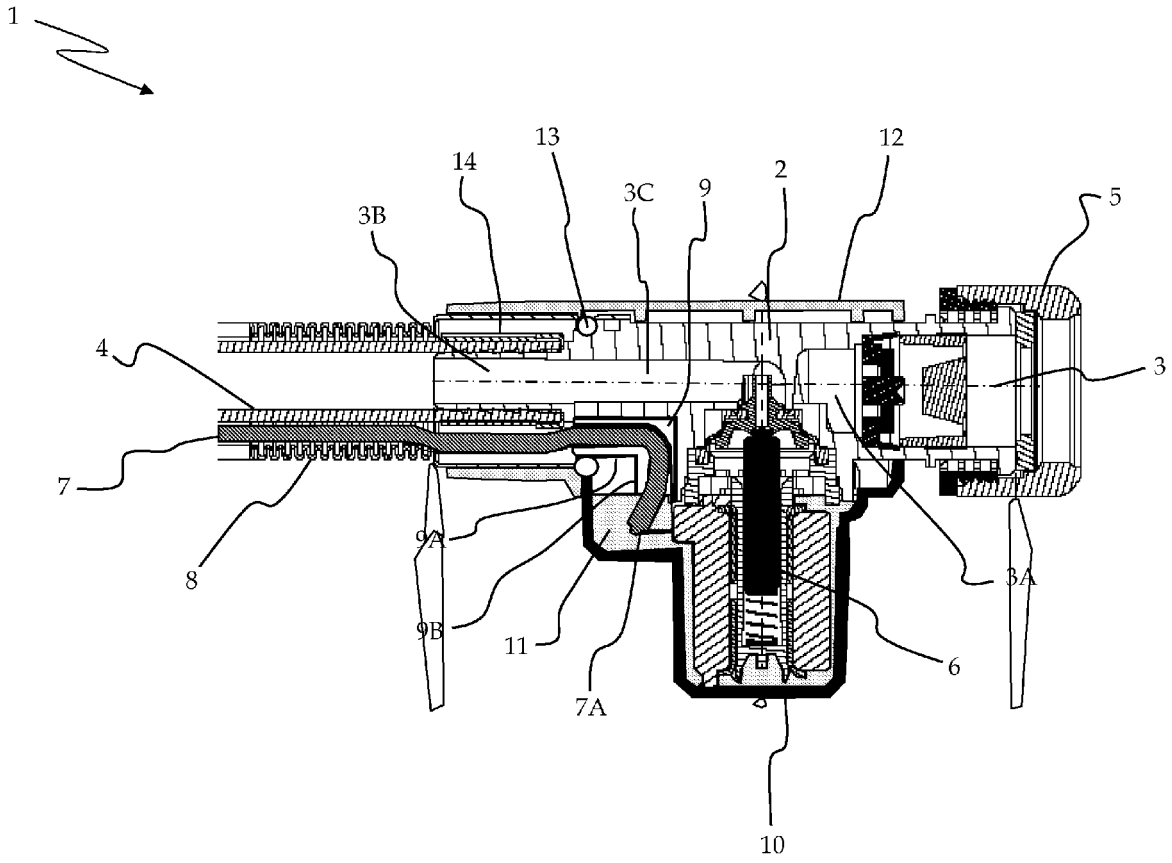

Fig. 2

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 10 15 2271

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	DE 43 04 712 A1 (BOSCH SIEMENS HAUSGERAETE [DE]) 18 August 1994 (1994-08-18) * the whole document *	1-12	INV. D06F39/08
A	EP 1 350 883 A (BITRON SPA [IT]) 8 October 2003 (2003-10-08) * the whole document *	1-12	
A	US 2007/102027 A1 (BANG JONG C [KR]) 10 May 2007 (2007-05-10) * the whole document *	1-12	

TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 July 2010	Stroppa, Giovanni

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

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

4

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 15 2271

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-07-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4304712 A1	18-08-1994	ES 2110864 A1	16-02-1998
		FR 2701536 A1	19-08-1994
		IT 1273770 B	10-07-1997
		SE 509061 C2	30-11-1998
		SE 9400274 A	17-08-1994
EP 1350883 A	08-10-2003	IT TO020020264 A1	25-09-2003
US 2007102027 A1	10-05-2007	DE 112005000933 T5	26-04-2007
		WO 2006033562 A1	30-03-2006
		KR 20060027887 A	29-03-2006

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 4304712 **[0009] [0010]**