

(19)



(11)

EP 3 124 673 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.02.2017 Bulletin 2017/05

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

(21) Application number: **15179243.9**

(22) Date of filing: **31.07.2015**

(84) Designated Contracting States:
AL 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 RS SE SI SK SM TR

Designated Extension States:

BA ME

Designated Validation States:

MA

(71) Applicant: **Electrolux Appliances Aktiebolag**
105 45 Stockholm (SE)

(72) Inventors:

- **MAIERO, Marco**
33080 Porcia (PN) (IT)
- **VALENT, Lucio**
33080 Porcia (PN) (IT)

(74) Representative: **Electrolux Group Patents**
AB Electrolux
Group Patents
105 45 Stockholm (SE)

(54) **LAUNDRY WASHING MACHINE EQUIPPED WITH AN ANTI-FLOODING SAFETY DEVICE**

(57) The present invention relates to a laundry washing machine (1) equipped with an anti-flooding safety device (20) comprising a duct (80) having an inner hose (25) for supplying water from an external supply line (E) to the laundry washing machine (1) and an outer hose (26) surrounding the inner hose (25) such that a gap (28) is defined therebetween for withholding inside it possible leaking water. The anti-flooding safety device (20) com-

prises a connector (21) for the connection of distal ends (25a, 26a) of the hoses (25, 26) to the laundry washing machine (1). The connector (21) comprises a first inlet (31) and a first conduit portion (32) which fluidly connects the inner hose (25) to the laundry washing machine (1) and comprises a second inlet (41) and a second conduit portion (42) which fluidly connects the gap (28) to the inside of the cabinet (2).

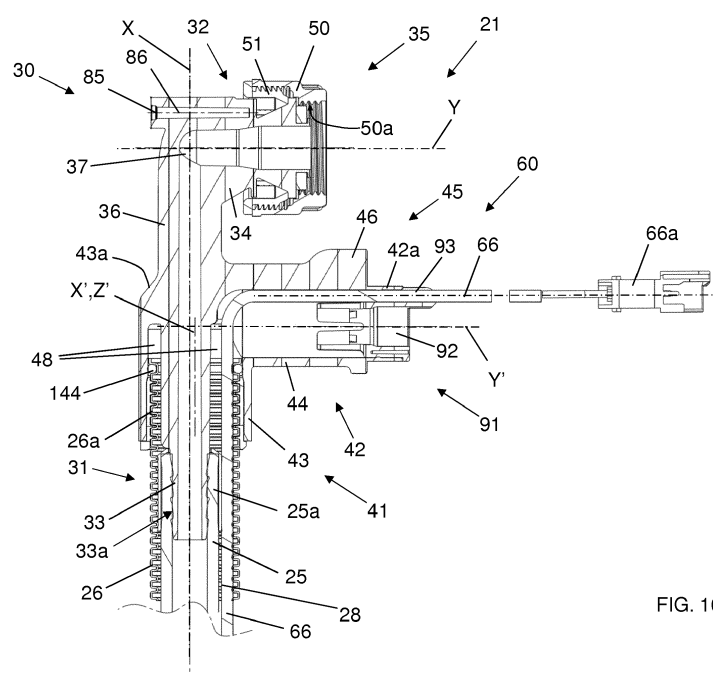


FIG. 10

EP 3 124 673 A1

Description

[0001] The present invention concerns the field of laundry washing techniques.

[0002] In particular, the present invention refers to a laundry washing machine equipped with an anti-flooding safety device designed for connection to the water main.

BACKGROUND ART

[0003] Nowadays the use of laundry washing machines, both "simple" laundry washing machines (i.e. laundry washing machines which can only wash and rinse laundry) and laundry washing-drying machines (i.e. laundry washing machines which can also dry laundry), is widespread.

[0004] In the present description the term "laundry washing machine" will refer to both simple laundry washing machines and laundry washing-drying machines.

[0005] Laundry washing machines generally comprise an external casing, or cabinet, provided with a washing tub which contains a rotatable perforated drum. A loading/unloading door ensures access to the drum where the laundry is placed in order to be washed with water and proper treating agents (i.e. detergent, softener, rinse conditioner, etc.).

[0006] Laundry washing machines typically comprise, inside the cabinet, a products supply unit, or dispenser, for the introduction of the treating agents into the tub. Typically, the water for washing the laundry is conveyed into the tub by making it flow through the dispenser. In an alternative embodiment, the water is conveyed directly into the tub bypassing the dispenser.

[0007] In a first type of known solutions, water from the water main is conveyed inside the cabinet of the laundry washing machine through a flexible hose.

[0008] In different known solutions, water from the water main is conveyed to the cabinet of the laundry washing machine through an anti-flooding safety device. Safety devices of the known type comprise an inner flexible hose which extends longitudinally within an outer flexible hose so that to define a gap therebetween. Proximal ends of the hoses are connectable to the water main and distal ends of the hoses are connectable/connected to the laundry washing machine.

[0009] The water from water main flows through the inner hose. The outer hose withholds inside it and in the gap any possible leaking water from the inner hose.

[0010] The outer hose has therefore the function of preventing any possible leakage of water flowing/contained in the inner hose from being dispersed in the domestic environment, causing flooding. For this purpose, preferably, the proximal ends of said hoses are advantageously provided with a safety valve that closes the flow of water in case the leakage of water is detected.

[0011] Furthermore, a supply valve is typically associated with the cabinet of the laundry washing machine for controlling the adduction of water coming from the water

main and the safety device.

[0012] In a first embodiment of known type safety device, the distal end of the internal hose is mechanically connected to a supply valve fixedly associated to the laundry washing machine. The distal end of the outer hose is connected to the cabinet of the laundry washing machine at an aperture to put in communication the gap of the safety device to the inside of the cabinet. A tray inside the cabinet is provided for collecting any possible leakage of water arriving from the gap. The tray is preferably provided with a sensor device suitable to detect the presence, or the level, of the collected water, that generates a control signal (electrical, pneumatic, or mechanical, according to the cases) which causes switching off of the safety valve, and hence stopping the flow of water from the water main. In this way, in the presence of a failure of the inner hose for delivering the water, any further inflow and hence the risk of flooding is prevented. The safety device presents the advantage of interrupting the supply of water also in the case where the leakage is not due to a failure of the inner hose, but rather to failures of different hydraulic components mounted inside the cabinet.

[0013] However, the laundry washing machines equipped with a safety device of the known art pose some drawbacks.

[0014] A first drawback posed by the known safety device is constituted by the complexity of its distal ends for the connection of the hoses to, respectively, the supply valve and the cabinet of the laundry washing machine.

[0015] Another drawback posed by the known technique is constituted by the fact that the distal ends of the hoses with arrangement for the connection to the supply valve and the cabinet is cumbersome.

[0016] This firstly negatively affects the mounting operation of the safety device. This, in turn, may negatively affect the correct/tight connection of the safety device to the supply valve and/or the cabinet.

[0017] This also negatively affects size and/or manufacturing costs of the safety device and hence size and/or manufacturing costs of the laundry washing machine.

[0018] The object of the present invention is therefore to overcome the drawbacks posed by the known techniques.

[0019] It is an object of the invention to provide an alternative anti-flooding safety device for laundry washing machines of known type.

[0020] It is another object of the invention to provide a laundry washing machine equipped with an anti-flooding safety device having reduced complexity and/or size compared to laundry washing machines of known type.

[0021] It is a further object of the invention to provide a laundry washing machine equipped with an anti-flooding safety device which simplifies the mounting operation of the safety device compared to laundry washing machines of known type.

[0022] It is another object of the invention to provide a laundry washing machine equipped with an anti-flooding

safety device having higher reliability compared to laundry washing machines of known type.

DISCLOSURE OF INVENTION

[0023] The applicant has found that by providing a laundry washing machine equipped with an anti-flooding safety device comprising a duct having an inner hose for supplying water from an external supply line to the laundry washing machine and an outer hose surrounding the inner hose such that a gap is defined therebetween for withholding inside it possible leaking water and by providing the anti-flooding safety device with a connector for the connection of distal ends of the hoses to the laundry washing machine and wherein the connector comprises a first inlet and a first conduit portion which fluidly connects said inner hose to the laundry washing machine and further comprises a second inlet and a second conduit portion which fluidly connects the gap to the inside of the cabinet, it is possible to reduce the complexity and/or the size of the anti-flooding safety device and of the laundry washing machine compared to known system.

[0024] The present invention relates, therefore, to a laundry washing machine equipped with an anti-flooding safety device, said laundry washing machine comprising:

- a cabinet supporting a washing drum adapted to receive laundry and a washing tub externally arranged with respect to said washing drum;
- a water supply unit suited to supply water into said washing tub, said water supply unit being fixedly associated to said cabinet and comprising at least one water supply inlet;

said anti-flooding safety device comprising a duct having at least one inner hose for supplying water from an external supply line to said at least one water supply inlet of said water supply unit and at least one outer hose surrounding said inner hose such that a gap is defined between said hoses for withholding inside it possible leaking water, said inner hose extending longitudinally between a proximal end and a distal end and said outer hose extending longitudinally between a proximal end and a distal end,

wherein said anti-flooding safety device comprises a first connector for the connection of said distal ends of said hoses to said laundry washing machine, said first connector comprising:

- a supplying water conveying line comprising a first inlet for the connection to said distal end of said inner hose and a first conduit portion for the connection to said at least one water inlet of said water supply unit, said supplying water conveying line fluidly connecting said inner hose to said water supply unit;
- a leaking water conveying line comprising a second inlet for the connection to said distal end of said outer

hose and a second conduit portion for the adduction of said leaking water inside said cabinet, said leaking water conveying line fluidly connecting said gap to the inside of said cabinet.

5

[0025] In a preferred embodiment of the invention, the first connector further comprises a fastening device for the connection to the wall portion of the cabinet. Preferably, the first inlet is inserted into the distal end of the inner hose. Preferably, the second inlet is externally connected to the distal end of the outer hose.

10

[0026] In a preferred embodiment of the invention, the second inlet surrounds the first inlet so as to define a chamber therebetween.

15

[0027] According to a preferred embodiment of the invention, the first inlet and/or the second inlet comprises a tubular portion, preferably a cylindrical tubular portion. Also preferably, the first conduit portion and/or the second conduit portion comprises a tubular portion, preferably a cylindrical tubular portion.

20

[0028] In a preferred embodiment of the invention, the first inlet extends along an axis and the first conduit portion extends along an axis, wherein the axis of the first inlet and the axis of the first conduit portion intersect at an angle higher or equal to 90° and lower than 180°, preferably at an angle comprised between 135° and 90°, more preferably at an angle equal to 90°.

25

[0029] In a preferred embodiment of the invention, the second inlet extends along an axis and the second conduit portion extends along an axis, wherein the axis of the second inlet and the axis of the second conduit portion intersect at an angle higher or equal to 90° and lower than 180°, preferably at an angle comprised between 135° and 90°, more preferably at an angle equal to 90°.

30

[0030] According to a preferred embodiment of the invention, the axis of the first inlet and the axis of the second inlet are substantially parallel one to the other. According to a further preferred embodiment of the invention, the axis of the first inlet and the axis of the second inlet substantially coincides.

35

[0031] According to a preferred embodiment of the invention, the axis of the first conduit portion and the axis of the second conduit portion are substantially parallel one to the other.

40

[0032] Preferably, the first conduit portion of the supplying water conveying line and the second conduit portion of the leaking water conveying line are two separate parts of the first connector.

45

[0033] In a preferred embodiment of the invention, the second conduit portion terminates inside the cabinet by passing through an aperture realized in the wall portion of said cabinet.

50

[0034] According to a preferred embodiment of the invention, the supplying water conveying line and the leaking water conveying line define a completed, integral, unitary member.

55

[0035] Preferably, the supplying water conveying line and the leaking water conveying line are obtained in a

single piece construction, preferably made with a plastic material, more preferably by moulding.

[0036] According to a preferred embodiment of the invention, the first conduit portion further comprises a connection device for the connection to the inlet duct. Preferably, the connection device comprises a ring-nut.

[0037] Preferably, a filter is arranged at said connection device.

[0038] In a preferred embodiment of the invention, the second conduit portion further comprises a fastening device for the connection to the laundry washing machine. In a further preferred embodiment of the invention, said fastening device are suited for the connection to the wall portion of the cabinet.

[0039] Preferably, said fastening device comprises a flange extending from the second conduit portion and at least one hole for receiving at least one fastening screw.

[0040] In a preferred embodiment of the invention, the flange extends perpendicularly with respect to the axis of the second conduit portion.

[0041] According to a preferred embodiment of the invention, the anti-flooding safety device further comprises a cover arrangement removably connected to the first connector, the cover arrangement being suitable to protect at least the first conduit portion of the first connector.

[0042] Preferably, the cover arrangement is removably connected to the first connector by means of at least one fastening screw.

[0043] In a preferred embodiment of the invention, the cover arrangement further comprises a water collector device which is arranged below the first conduit portion for the adduction of possible leaking water collected around the first conduit portion inside the cabinet.

[0044] Preferably, the water collector device comprises a drain portion which terminates inside the cabinet by passing through an aperture realized in the wall portion of the cabinet.

[0045] According to a preferred embodiment of the invention, the water supply unit comprises at least one valve, said at least one valve being provided with the water supply inlet.

[0046] In a preferred embodiment of the invention, the anti-flooding safety device further comprises a second connector for the connection of the proximal ends of the hoses to the external supply line.

[0047] Preferably, the second connector comprises a safety valve arrangement which is controllable for stopping the flow of water from the external supply line.

[0048] In a preferred embodiment of the invention, the anti-flooding safety device comprises a signal line connected to a control unit for controlling the safety valve arrangement, the signal line passing through the gap of the duct.

[0049] In a further aspect thereof, the present invention concerns an anti-flooding safety device for a laundry washing machine comprising:

- a cabinet supporting a washing drum adapted to re-

ceive laundry and a washing tub external to said washing drum;

- a water supply unit suited to supply water into said washing tub, said water supply unit being fixedly associated to said cabinet and comprising at least one water supply inlet;

said anti-flooding safety device comprising a duct having at least one inner hose for supplying water from an external supply line to said at least one water supply inlet of said water supply unit and at least one outer hose surrounding said inner hose such that a gap is defined between said hoses for withholding inside it possible leaking water, said inner hose extending longitudinally between a proximal end and a distal end and said outer hose extending longitudinally between a proximal end and a distal end,

wherein said anti-flooding safety device comprises a first connector for the connection of said distal ends of said hoses to said laundry washing machine, said first connector comprising:

- a supplying water conveying line comprising a first inlet for the connection to said distal end of said inner hose and a first conduit portion for the connection to said at least one water inlet of said water supply unit, said supplying water conveying line fluidly connecting said inner hose to said water supply unit;
- a leaking water conveying line comprising a second inlet for the connection to said distal end of said outer hose and a second conduit portion for the adduction of said leaking water inside said cabinet, said leaking water conveying line fluidly connecting said gap to the inside of said cabinet.

[0050] In a preferred embodiment of the invention, the first connector further comprises a fastening device for the connection to the wall portion of the cabinet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0051] Further characteristics and advantages of the present invention will be highlighted in greater detail in the following detailed description of preferred embodiments of the invention, provided with reference to the enclosed drawings. In the drawings, corresponding characteristics and/or components are identified by the same reference numbers. In such drawings:

- Figure 1 shows a perspective rear view of a laundry washing machine equipped with an anti-flooding safety device according to a first embodiment of the invention;
- Figure 2 shows the anti-flooding safety device of Figure 1 isolated from the rest;
- Figure 3 shows an enlarged plan view of the portion of the rear side wall of the cabinet of the laundry washing machine where the anti-flooding safety de-

- vice is connected (with the anti-flooding safety device not visible);
- Figure 4 shows the rear side wall of the cabinet of the laundry washing machine of Figure 3 and part of the anti-flooding safety device disconnected therefrom;
- Figure 5 shows a partially sectioned plan view of the laundry washing machine of Figure 1 sectioned along line V°-V° with the anti-flooding safety device in its connected configuration;
- Figure 6 corresponds to Figure 5 with the anti-flooding safety device disconnected;
- Figure 7 is an exploded view of a first end of the safety device of Figure 2;
- Figure 7A shows an element of Figure 7 from another point of view;
- Figure 8 shows a plan view of a first component of the safety device of Figure 7;
- Figure 9 shows a lateral plan view of the component depicted in Figure 8;
- Figure 10 shows a sectioned plan view of the component depicted in Figure 8 sectioned along line X°-X°;
- Figure 11 shows a perspective view of a detail of the anti-flooding safety device according to a further preferred embodiment of the invention;
- Figure 12 shows a perspective view from inside of a laundry washing machine equipped with the anti-flooding safety device of Figure 11;
- Figure 13 shows a further preferred embodiment of Figure 4;
- Figure 13A shows a detail of Figure 13 from another point of view;
- Figure 14 shows an enlarged plan view of the portion of the rear side wall of the cabinet of the laundry washing machine where the anti-flooding safety device of Figure 13 is connected (with the anti-flooding safety device not visible);
- Figure 15 shows a vertical sectioned plan view of the anti-flooding safety device of Figure 13 in its connected configuration.

DETAILED DESCRIPTION OF THE INVENTION

[0052] The present invention has proved to be particularly advantageous when applied to laundry washing machines, as described below. It should in any case be underlined that the present invention is not limited to laundry washing machines. On the contrary, the present invention can be conveniently applied to laundry washing-drying machines (i.e. laundry washing machines which can also dry laundry).

[0053] In the present description, therefore, the term "laundry washing machine" will refer to both simple laundry washing machines and laundry washing-drying machines.

[0054] Furthermore, reference to "an embodiment" or "one embodiment" or "preferred embodiment/s" within

the framework of the present description is intended to indicate that a particular configuration, structure, or characteristic described in relation to the embodiment is comprised in at least one embodiment. Hence, phrases such as "in an embodiment" or "in one embodiment" and the like, that may be present in different points of the present description, do not necessarily all refer to one and the same embodiment. Furthermore, the details, configurations, structures, or characteristics can be combined in any adequate way in one or more embodiments, even different from the ones exemplified. With reference to Figure 1 a laundry washing machine 1 equipped with an anti-flooding safety device 20 according to a first embodiment of the invention is described, hereinafter simply indicated as "safety device".

[0055] The laundry washing machine 1 comprises an external casing or cabinet 2, in which a washing tub (not shown) is externally arranged with respect to a perforated washing drum (not shown) where the laundry to be treated can be loaded. The cabinet 2 is provided with a loading/unloading door, not visible, which allows access to the drum.

[0056] The external cabinet 2 comprises a vertical front side wall 2a, a vertical rear side wall 2b, two vertical lateral side walls 2c, 2d and an upper side wall 2e.

[0057] The laundry washing machine preferably comprises a wash products dispenser (not shown) to supply wash products into the tub during a washing cycle. Wash products may comprise, for example, detergent, rinse additives, fabric softener or fabric conditioners, water-proofing agents, fabric enhancers, rinse sanitization additives, chlorine-based additives, etc..

[0058] Also a water supply unit 5 (partially visible in figures 5 and 6) is preferably arranged in the upper part of the laundry washing machine 1 and fixedly associated to the cabinet 2. The water supply unit 5 is suited to control the adduction of water coming from an external supply line E, hereinafter indicated as water main E.

[0059] The laundry washing machine 1 advantageously comprises a main control unit, non shown, connected to the various parts of the laundry washing machine 1 in order to ensure its operation.

[0060] The water supply unit 5 preferably comprises a supply valve 6 which is properly controlled, opened and closed, during the washing cycle.

[0061] In different embodiments, the water supply unit may comprise further supply valves, for example a second valve for controlling adduction of hot water coming from a respective hot water external source.

[0062] The supply valve 6 comprises an inlet duct 7 which is designed for the hydraulic connection to the safety device 20.

[0063] As said above, the water supply unit 5 is fixedly associated to the cabinet 2. Preferably the water supply unit 5 is substantially totally arranged inside the cabinet 2. It is clear that part of the water supply unit 5 may protrude from the cabinet 2. For example all, or part, of the inlet duct 7 may protrude from the cabinet 2 or all, or part,

of the supply valve 6 may protrude from the cabinet 2. On the other hand, when the water supply unit 5 is totally arranged inside the cabinet 2 there are no parts of the water supply unit 5 which protrude from the cabinet 2.

[0064] The safety device 20, as better visible in Figure 2, comprises a duct 80 having a first end 17, or distal end, and a second opposite end 18, or proximal end. At said distal end 17 the safety device 20 comprises a first arrangement 21, indicated also with "first connector" alongside the description, which is designed for the connection to the supply valve 6. At said proximal end 18 the safety device 20 comprises a second arrangement 22, indicated also with "second connector" alongside the description, which is designed for the connection to the water main E.

[0065] The second connector 22 preferably comprises a safety valve arrangement 23 and connection means 24, for example a ring-nut, for the connection to the water main E, such as a tap. The safety valve arrangement 23 preferably comprises a solenoid valve (not visible) which is controlled by a signal running over a signal line 66, or wire, that reaches a control unit inside the cabinet 2 through the duct 80, as better explained below. This control unit is preferably part of the main control unit of the laundry washing machine. In different embodiments, nevertheless, the control unit may be a separate unit from the main control unit. In this case, the control unit may preferably communicate with the main control unit.

[0066] In a further preferred embodiment of the invention, the control unit may be located in correspondence of the safety valve arrangement.

[0067] The duct 80 comprises an inner hose 25 and an outer hose 26, such as flexible hoses preferably made of thermoplastic material. The outer hose 26 surrounds the inner hose 25 in such a way that between them an annular gap 28 is defined, as better visible in Figures 5, 6 and 10.

[0068] The materials used for producing the hoses 25 and 26 can be of a type known in the sector, for example PP for the outer hose 26 and PVC or PP for the inner hose 25.

[0069] When the laundry washing machine is working properly, the water coming from the water main E flows from the second connector 22 of the safety device 20 towards the first connector 21 through and inside the inner hose 25. The outer hose 26 withholds inside it and in the annular gap 28 any possible leaking water from the inner hose 25.

[0070] The gap 28 is therefore designed to allow the leaking water to pass between the outer hose 26 and the inner hose 25, preferably also in an axial direction with respect to the two hoses, in particular towards the first connector 21.

[0071] The first connector 21, as said above, is designed for the connection to the supply valve 6. At this purpose, the rear side wall 2b of the cabinet 2, as illustrated in Figures 3 and 4, preferably comprises a first aperture 11 which allows access to the inlet duct 7 of the

supply valve 6.

[0072] As better visible in Figure 4, the inlet duct 7 preferably protrudes from the rear side wall 2b of the cabinet 2.

[0073] Alternatively, in particular when the supply valve 6 is totally placed inside the cabinet 2, the inlet duct 7 preferably may comprise an intermediate duct allowing the connection to the first connector 21.

[0074] The rear side wall 2b of the cabinet 2 further comprises a second aperture 12 which is designed to put in communication the gap 28 of the safety device 20 to the inside of the cabinet 2, as will be described later. A tray (not shown) inside the cabinet 2, preferably at the lower part of the cabinet 2, is provided for collecting any possible leaking water arriving from the gap 28. The tray is then preferably provided with a sensor device suitable to detect the presence, or the level, of the collected water, that generates a control signal (electrical, pneumatic, or mechanical, according to the cases) which preferably causes switching off of the safety valve arrangement 23 and/or of the supply valve 6 and hence stops the flow of water from the water main E.

[0075] In this way, in the presence of a failure of the inner hose 25 for delivering the water, any further inflow and hence the risk of flooding is prevented. The safety device 20 has the advantage of interrupting the supply of water also in the case where the leakage is not due to a failure of the inner hose 25, but rather to failures of different hydraulic components mounted inside the cabinet 2.

[0076] The first connector 21 of the safety device 20, according to the present invention, comprises a supplying water conveying line 30 and a leaking water conveying line 60.

[0077] The supplying water conveying line 30 hydraulically and mechanically connects the terminal portion 25a, or distal end 25a, of the inner hose 25 of the duct 80 to the water supply unit 5, preferably to the inlet duct 7 of the supply valve 6. The supplying water conveying line 30, therefore, fluidly connects the inner hose 25 of the duct 80 to the water supply unit 5.

[0078] It is underlined that in the present application saying that a conveying line "fluidly connects" a first component to a second component means that a fluid can flow from the first component to the second component and vice versa.

[0079] The leaking water conveying line 60 is configured to put in fluid communication the gap 28 between hoses 25, 26 with the inside of the cabinet 2.

[0080] The leaking water conveying line 60, therefore, fluidly connects the gap 28 of the duct 80 to the inside of the cabinet 2.

[0081] The supplying water conveying line 30, as better illustrated in Figure 10, comprises a first inlet 31 for the connection to the distal end 25a of the inner hose 25 and a first conduit portion 32 for the connection to the inlet duct 7 of the supply valve 6. In the embodiment illustrated and described here, the first conduit portion 32 is advan-

tageously directly connected to the inlet duct 7.

[0082] In further preferred embodiments, in particular when the supply valve 6 is totally placed inside the cabinet 2, the inlet duct 7 preferably comprises an intermediate duct allowing the connection to the conduit portion 32.

[0083] The first inlet 31 preferably comprises a tubular portion 33, more preferably cylindrically shaped, which is apt to be inserted into the distal end 25a of the inner hose 25. The first inlet 31 extends along an axis X which substantially coincides with the axis of the distal end 25a of the inner hose 25. The tubular portion 33 preferably has coupling elements 33a on the outside, preferably comprising a corrugation, for coupling with an inlet region of the inner hose 25. It is clear that in different embodiments other equivalent means of fastening may be provided.

[0084] The first conduit portion 32 for the connection to the inlet duct 7 of the supply valve 6 preferably comprises a tubular portion 34, more preferably cylindrically shaped, which is provided with a connection device 35 for the connection to the inlet duct 7 of the supply valve 6. Alternatively, as mentioned above, the inlet duct 7 may preferably comprise an intermediate duct allowing the connection to the conduit portion 32.

[0085] The first conduit portion 32 extends along an axis Y which substantially coincides with the axis of the inlet duct 7 of the supply valve 6.

[0086] The axis Y of the first conduit portion 32 is preferably perpendicular to the axis X of the first inlet 31, as it appears in the preferred embodiment illustrated and described herein with reference to Figure 10.

[0087] The first inlet 31 and the first conduit portion 32 of the supplying water conveying line 30 are connected through an intermediate conduit portion 36 which preferably has a bent section 37.

[0088] Preferably, the intermediate conduit portion 36 and the first inlet 31 are integrated each other.

[0089] More preferably, the intermediate conduit portion 36, except the bent section 37, and the first inlet 31 are coaxially integrated each other.

[0090] Preferably, the first inlet 31, the first conduit portion 32 and the intermediate conduit portion 36 define a completed, integral, unitary member.

[0091] More preferably, they are obtained in a single piece construction preferably made with a plastic material, more preferably made of glass fiber reinforced polyamide (PA66-GF30). They are preferably obtained by moulding, more preferably by injection moulding.

[0092] This construction positively affects the safety device 20 in term of overall size and/or weight.

[0093] Advantageously, the perpendicularity between the axis Y of first conduit portion 32 and the axis X of the first inlet 31 allows to keep the distance D between the distal end 25a of the inner hose 25 and the rear side wall 2b of the cabinet 2, as depicted in Figure 5, as short as possible since the first inlet 31 is substantially parallel and close to the rear side wall 2b of the cabinet 2.

[0094] Advantageously, this renders the safety device 20 less cumbersome.

[0095] In preferred embodiments of the invention, the two axis X, Y are kept substantially perpendicular and intersects at a 90° (right) angle, as in the present case illustrated in Figure 10.

[0096] In different embodiments, the two axis X, Y may intersect at different angles, but preferably lower than 180°. Preferably, the angle between the two axis X, Y is comprised between 135° and 90°, more preferably is equal to 90° (for the reasons explained above).

[0097] In further preferred embodiments of the invention the angle between the two axis X, Y may be also less than 90°.

[0098] The connection device 35 of the first conduit portion 32 for the connection to the inlet duct 7 preferably comprises a ring-nut 50 with inner threads 50a for the connection to corresponding outer threads 7a of the inlet duct 7 (as better visible in Figure 5).

[0099] The connection device 35 further preferably comprises a counter ring-nut 51.

[0100] It is clear that in different embodiments other equivalent connection devices may be provided.

[0101] Also, preferably, a filter 52 is arranged at said connection device 35, more preferably inside the inlet duct 7. Preferably a removable filter 52 is used.

[0102] The leaking water conveying line 60 comprises a second inlet 41 for the connection to the distal end 26a of the outer hose 26 and a second conduit portion 42 which preferably enters the second aperture 12 of the rear side wall 2b of the cabinet 2. The second inlet 41 is externally connected to the distal end 26a of the outer hose 26.

[0103] The second inlet 41 preferably comprises a tubular portion 43, more preferably cylindrically shaped, which is apt to receive the distal end 26a of the outer hose 26.

[0104] The second inlet 41 extends along an axis X' which is substantially parallel with the axis Z' of the distal end 26a of the outer hose 26. In different embodiments the axis X' of the second inlet 41 may coincide with the axis Z' of the distal end 26a of the outer hose 26, or even inclined one to the other.

[0105] Furthermore, preferably, the axis X' of the second inlet 41 is also parallel with the axis X of the first inlet 31. In different embodiments, not shown, the axis X' of the second inlet 41 may coincide with the axis X of the first inlet 31.

[0106] The tubular portion 43 of the second inlet 41 advantageously surrounds the tubular portion 33 of the first inlet 31.

[0107] The upper portion 43a of the tubular portion 43 of the second inlet 41 joins the intermediate conduit portion 36 so that a chamber 48 is defined between the first inlet 31 and the second inlet 41. The chamber 48 fluidly communicates with the gap 28 of the duct 80.

[0108] The tubular portion 43 is preferably coupled with an outlet region of the outer hose 26 by press fit, prefer-

ably with interposition of sealing means (for example an O-ring 144). It is clear that in different embodiments other equivalent means of fastening may be provided.

[0109] The second conduit portion 42 preferably comprises a tubular portion 44, more preferably cylindrically or ovaly shaped. The second conduit portion 42 preferably extends from the second inlet 41 and is fluidly connected with the chamber 48.

[0110] The second conduit portion 42 preferably enters the second aperture 12 of the side wall 2b of the cabinet 2 and terminates inside the same cabinet 2.

[0111] It is clear that the second conduit portion 42 and the first conduit portion 32 are two separate parts of the first connector 21; more in detail the second conduit portion 42 is externally disposed with respect to the first conduit portion 32. Preferably, the second conduit portion 42 extends along an axis Y' which is substantially parallel to the axis Y of the first conduit portion 32.

[0112] In different embodiments, the two axis Y', Y may also be inclined one to the other, preferably by a small angle.

[0113] The axis Y' of the second conduit portion 42 is preferably perpendicular to the axis X' of the second inlet 41, as it appears in the preferred embodiment illustrated and described herein with reference to Figure 10.

[0114] Preferably, the intermediate conduit portion 36 and the first inlet 31 of the supplying water conveying line 30 and the second inlet 41 of the leaking water conveying line 60 are integrated each other.

[0115] Preferably, then, the second inlet 41 and the second conduit portion 42 define a completed, integral, unitary member.

[0116] More preferably, they are obtained in a single piece construction preferably made with a plastic material, more preferably made of glass fiber reinforced polyamide (PA66-GF30). They are preferably obtained by moulding, more preferably by injection moulding.

[0117] Still more preferably, all the elements, namely the second inlet 41, the second conduit portion 42, the first inlet 31, the first conduit portion 32 and the intermediate conduit portion 36, define a completed, integral, unitary member.

[0118] In other words, the supplying water conveying line 30 and the leaking water conveying line 60 define a completed, integral, unitary member.

[0119] Again, they are preferably obtained in a single piece construction preferably made with a plastic material, preferably by moulding, more preferably by injection moulding.

[0120] This construction positively affects the safety device 20 in term of overall size and/or weight. This also renders the safety device 20 less cumbersome.

[0121] Analogously and advantageously, the perpendicularity between the axis Y' of second conduit portion 42 and the axis X' of the second inlet 41 allows to keep the distance D between the distal end 26a of the outer hose 26 and the rear side wall 2b of the cabinet 2 as short as possible since the second inlet 41 is substantially par-

allel and close to the rear side wall 2b of the cabinet 2.

[0122] This further renders the safety device 20 less cumbersome and reduces its overall size.

[0123] In preferred embodiments of the invention, the two axis X', Y' are kept substantially perpendicular and intersects at a 90° (right) angle, as in the present case illustrated in Figure 10.

[0124] In different embodiments, the two axis X', Y' may intersect at different angles, but preferably lower than 180°. More preferably, the angle between the two axis X', Y' is comprised between 135° and 90°, more preferably is equal to 90° (for the reasons explained above).

[0125] In further preferred embodiments of the invention the angle between the two axis X', Y' may be also less than 90°.

[0126] The second conduit portion 42 is further preferably provided with a fastening device 45 for the connection to the rear side wall 2b of the cabinet 2. The fastening device 45 preferably comprises a flange 46 (better visible in Figures 7 and 8) extending from the second conduit portion 42 and fastening means 47, preferably holes 47, for receiving fastening screws (not visible in the Figures). Fastening screws advantageously engage respective holes 147 provided at the rear side wall 2b of the cabinet 2 (visible in Figure 3). The flange 46 preferably extends perpendicularly with respect to the axis Y' of the second conduit portion 42.

[0127] It is clear that in different embodiments equivalent fastening devices may be provided.

[0128] Furthermore, in different embodiments, fastening device for the second conduit portion 42, as for example just described, could be even omitted.

[0129] In such a case, the correct and firm position of the second conduit portion 42 may be obtained by the fixing effect deriving from the connection device 35 of the first conduit portion 32.

[0130] The part 42a of the second conduit portion 42 protruding from the flange 46 substantially represents the terminating portion which is at least partially inserted into the second aperture 12 of the rear side wall 2b of the cabinet 2 (as visible in Figure 5). According to the preferred embodiment here illustrated, leaking water coming from the gap 28 of the duct 80 and flowing through the chamber 48 and the second conduit portion 42 is therefore advantageously discharged inside the cabinet 2.

[0131] Advantageously, the first conduit portion 32 and the second conduit portion 42 of the first connector 21 are two distinct parts and are kept at a substantially precise reciprocal distance, in particular when they are realized as a completed, integral, unitary member. This feature helps the mounting operation of the safety device 20, in particular the correct alignment of the first conduit portion 32 with the inlet duct 7 of the supply valve 6 and the correct alignment of the second conduit portion 42 with the second aperture 12.

[0132] The correct alignment is also obtained between

the connection device 35 of the first conduit portion 32 and the inlet duct 7 of the supply valve 6 and between the fastening device 45 of the second conduit portion 42 and the rear side wall 2b of the cabinet 2.

[0133] Easy mounting operation obtained by said correct alignments increases reliability of the system compared to known system.

[0134] In Figures 9 and 10 the signal line 66 (wire) is also depicted. The wire 66 connects the main control unit (not illustrated) inside the cabinet 2 to the solenoid valve of the safety valve arrangement 23, as explained above. The wire 66 from the solenoid valve reaches the main control unit inside the cabinet 2 by passing through the gap 28 alongside the duct 80, the chamber 48 and the second conduit portion 42 of the first connector 21.

[0135] Figures 9 and 10 also show a terminal electrical connector 66a of the signal line 66 (wire) which is advantageously connectable to the main control unit.

[0136] In different alternative embodiments the wire 66 is a probe, whereas the control unit of the safety valve arrangement is in the same safety valve arrangement.

[0137] In another aspect of the present invention, the safety device 20 further comprises a cover arrangement 90 for the first connector 21. The cover arrangement 90 is suitable to protect the first connector 21 from external environment. The cover arrangement 90 also constituted a safety arrangement against accidental tampering.

[0138] The cover arrangement 90 preferably comprises a cover 81 which is removably connected to the first connector 21. The cover 81 preferably comprises a cup-shaped body which surrounds the first conduit portion 32, the connection device 35 and partially the intermediate portion 36. The cover 81 comprises a slot 82 which allows assembling of the same to the first connector 21 receiving the intermediate portion 36.

[0139] The cover 81 is preferably arranged above the second conduit portion 42, i.e. it does not enclose the second conduit portion 42.

[0140] In further embodiments, nevertheless, the cover may surround also the second conduit portion 42.

[0141] In the preferred embodiment here illustrated, the cover 81 is removably connected to the first connector 21 by means of a screw 83 which is inserted in a hole 84 of the cover 81 and engages a threaded hole 85 realized in a seat 86 of the first connector 21.

[0142] In different embodiments, the connection may be realized differently, for example by means of Velcro fastening means, snap means, etc.

[0143] It has to be noted that in the preferred embodiment above described, the terminal part of the second conduit portion 42, i.e. the above described part indicated with 42a, preferably comprises an hydraulic adaptor 91.

[0144] It has to be further noted that in the preferred embodiment above described, the terminal part 42a of the second conduit portion 42 is advantageously inserted into the second aperture 12 of the rear side wall 2b and enters the same second aperture 12. In different embodiments, nevertheless, the terminal part 42a of the second

conduit portion 42 may be arranged so as to be displaced at a short distance from the rear side wall 2b or in contact with said rear side wall 2b.

[0145] The hydraulic adaptor 91 is advantageously used in case the laundry washing machine 1 is further internally provided with a leaking water conveying device 95, as illustrated in Figures 11 and 12, which is suited to convey the leaking water from the first connector 21 to a proper water collecting housing (for example a tray as said above).

[0146] The hydraulic adaptor 91 is preferably inserted in the terminal part 42a of the second conduit portion 42 in a releasable manner.

[0147] The leaking water conveying device 95 preferably comprises a duct 96 and a terminal hose 97.

[0148] The hydraulic adaptor 91 preferably comprises a first opening 92 which is properly shaped to be connectable to the terminal hose 97 of the leaking water conveying device 95.

[0149] Furthermore, the hydraulic adaptor 91 preferably comprises a second opening 93 which allows the passage of the wire 66, as illustrated for example in figure 10. In different embodiments, nevertheless, the hydraulic adaptor 91 and/or the leaking water conveying device 95 may be omitted.

[0150] With reference to Figures 13 to 15 an anti-flooding safety device 120 according to a further preferred embodiment of the invention is described. In the drawing, corresponding characteristics and/or components of the first embodiment previously described are identified by the same reference numbers.

[0151] This safety device 120 differs from the safety device 20 previously described with reference to Figures 1 to 10 in that the cover 181 of the cover arrangement 190 further comprises a water collector device 185.

[0152] In the preferred embodiment here illustrated, the water collector device 185 is defined by a drain portion 186 of the cover 181. The drain portion 186 is substantially a portion which protrudes from the body of the cover 181. When the cover 181 and the safety device 120 are properly installed, as illustrated in Figure 15, drain portion 186 is arranged below the first conduit portion 32 and the connection device 35. The drain portion 186 is advantageously configured so as to terminate inside the cabinet 2 in a third aperture 13 realized in the rear side wall 2b of the cabinet 2. The third aperture 13 is better visible in Figures 13 and 14.

[0153] The water collector device 185, and in particular the drain portion 186, has the function of collecting water leaking from the first conduit portion 32 and/or the connection device 35 and discharging it inside the cabinet 2 (for example leaking water due to the ring-nut 50 not fitting closely).

[0154] At this purposes, the drain portion 186 is preferably slightly inclined with respect to the horizontal plane so that the leaking water easily falls down by gravity inside the cabinet 2.

[0155] As explained above, a tray then preferably also

collects said leaking water.

[0156] In order to install the cover 181 to the first connector 21, the cover 181 comprises a shaped slot 182 having a first portion 182a and a second portion 182b which extends transversely with respect to the first portion 182a, as illustrated in Figure 13A.

[0157] The cover 181 is first moved towards the first connector 21 with the first portion 182a of the slot 182 receiving the intermediate portion 36 of the first connector 21. The cover 181 is then rotated with the second portion 182a of the slot 182 which receives the intermediate portion 36 of the first connector 21. Rotation is stopped when the drain portion 186 is arranged below the first conduit portion 32 and is also aligned with the third aperture 13 of the rear side wall 2b of the cabinet 2. Finally, the cover 181 and the first connector 21 are fixed in their final operative position, as illustrated in Figure 15.

[0158] In different embodiments, the water collector device may be differently realized. For example, the water collector device may comprise a baffle, preferably slightly inclined with respect to the horizontal plane, protruding from the body of the cover and arranged below the first conduit portion and the connection device and configured so as to terminate inside the cabinet.

[0159] It has thus been shown that the present invention allows all the set objects to be achieved. In particular, it makes it possible to provide an alternative anti-flooding safety system in a laundry washing machine equipped with said safety system.

[0160] It is underlined that the laundry washing machine illustrated in the enclosed figure is of the front-loading type; however it is clear that the system according to the invention can be applied as well to a top-loading washing machine, substantially without any modification.

[0161] While the present invention has been described with reference to the particular embodiments shown in the figures, it should be noted that the present invention is not limited to the specific embodiments illustrated and described herein; on the contrary, further variants of the embodiments described herein fall within the scope of the present invention, which is defined in the claims.

Claims

1. A laundry washing machine (1) equipped with an anti-flooding safety device (20; 120), said laundry washing machine (1) comprising:

- a cabinet (2) supporting a washing drum adapted to receive laundry and a washing tub externally arranged with respect to said washing drum;
- a water supply unit (5) suited to supply water into said washing tub, said water supply unit (5) being fixedly associated to said cabinet (2) and comprising at least one water supply inlet (7);

said anti-flooding safety device (20; 120) comprising a duct (80) having at least one inner hose (25) for supplying water from an external supply line (E) to said at least one water supply inlet (7) of said water supply unit (5) and at least one outer hose (26) surrounding said inner hose (25) such that a gap (28) is defined between said hoses (25, 26) for withholding inside it possible leaking water, said inner hose (25) extending longitudinally between a proximal end and a distal end (25a) and said outer hose (26) extending longitudinally between a proximal end and a distal end (26a),

wherein said anti-flooding safety device (20; 120) comprises a first connector (21) for the connection of said distal ends (25a, 26a) of said hoses (25, 26) to said laundry washing machine (1), said first connector (21) comprising:

- a supplying water conveying line (30) comprising a first inlet (31) for the connection to said distal end (25a) of said inner hose (25) and a first conduit portion (32) for the connection to said at least one water inlet (7) of said water supply unit (5), said supplying water conveying line (30) fluidly connecting said inner hose (25) to said water supply unit (5);
- a leaking water conveying line (60) comprising a second inlet (41) for the connection to said distal end (26a) of said outer hose (26) and a second conduit portion (42) for the adduction of said leaking water inside said cabinet (2), said leaking water conveying line (60) fluidly connecting said gap (28) to the inside of said cabinet (2).

2. A machine (1) according to claim 1, **wherein** said first inlet (31) is inserted into said distal end (25a) of said inner hose (25).

3. A machine (1) according to any of the preceding claims, **wherein** said second inlet (41) is externally connected to said distal end (26a) of said outer hose (26).

4. A machine (1) according to any of the preceding claims, **wherein** said second inlet (41) surrounds said first inlet (31) so as to define a chamber (48) therebetween.

5. A machine (1) according to any of the preceding claims, **wherein** said first inlet (31) and/or said second inlet (41) comprises a tubular portion (33, 43), preferably a cylindrical tubular portion (33, 43).

6. A machine (1) according to any of the preceding claims, **wherein** said first conduit portion (32) and/or said second conduit portion (42) comprises a tubular portion (34, 44), preferably a cylindrical tubular portion (34, 44).

tion (34, 44).

7. A machine (1) according to any of the preceding claims, **wherein** said first inlet (31) extends along an axis (X) and said first conduit portion (32) extends along an axis (Y), wherein said axis (X) of said first inlet (31) and said axis (Y) of said first conduit portion (32) intersect at an angle higher or equal to 90° and lower than 180°, preferably at an angle comprised between 135° and 90°, more preferably at an angle equal to 90°. 5
8. A machine (1) according to any of the preceding claims, **wherein** said second inlet (41) extends along an axis (X') and said second conduit portion (42) extends along an axis (Y'), wherein said axis (X') of said second inlet (41) and said axis (Y') of said second conduit portion (42) intersect at an angle higher or equal to 90° and lower than 180°, preferably at an angle comprised between 135° and 90°, more preferably at an angle equal to 90°. 10
9. A machine (1) according to claims 7 and 8, **wherein** said axis (X) of said first inlet (31) and said axis (X') of said second inlet (41) are substantially parallel one to the other. 15
10. A machine (1) according to claims 7 and 8, **wherein** said axis (Y) of said first conduit portion (32) and said axis (Y') of said second conduit portion (42) are substantially parallel one to the other. 20
11. A machine (1) according to any of the preceding claims, **wherein** said first conduit portion (32) of said supplying water conveying line (30) and said second conduit portion (42) of said leaking water conveying line (60) are two distinct parts of said first connector (21). 25
12. A machine (1) according to any of the preceding claims, **wherein** said supplying water conveying line (30) and said leaking water conveying line (60) define a completed, integral, unitary member. 30
13. A machine (1) according to claim 12, **wherein** said supplying water conveying line (30) and said leaking water conveying line (60) are obtained in a single piece construction, preferably made with a plastic material, more preferably by moulding. 35
14. A machine (1) according to any of the preceding claims, **wherein** said anti-flooding safety device (20; 120) further comprises a cover arrangement (90; 190) removably connected to said first connector (21), said cover arrangement (90; 190) being suitable to protect at least said first conduit portion (32) of said first connector (21). 40

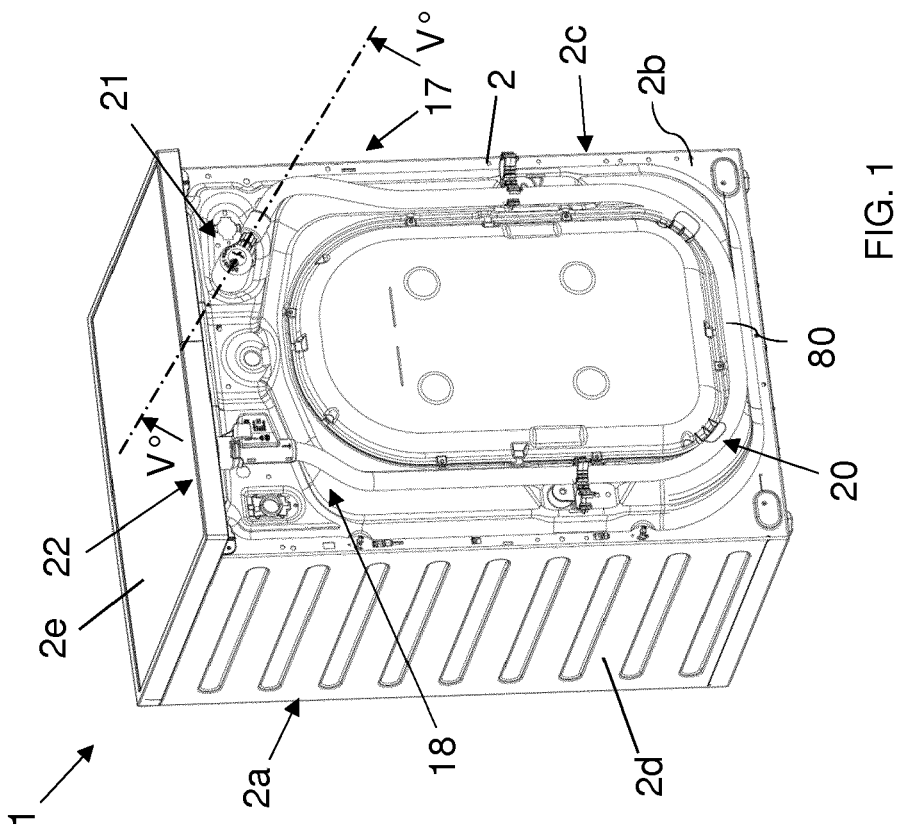
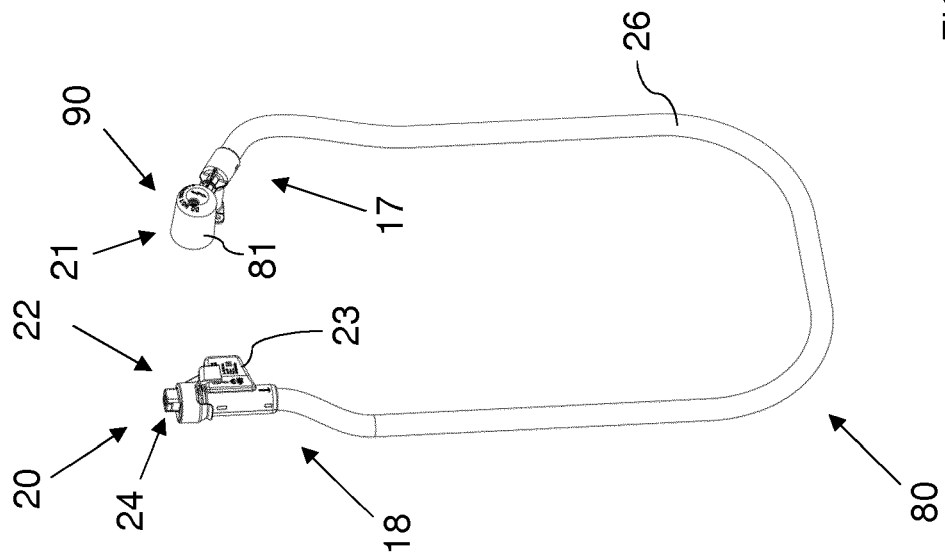
15. An anti-flooding safety device (20; 120) for a laundry washing machine (1) comprising: 45

- a cabinet (2) supporting a washing drum adapted to receive laundry and a washing tub external to said washing drum;
- a water supply unit (5) suited to supply water into said washing tub, said water supply unit (5) being fixedly associated to said cabinet (2) and comprising at least one water supply inlet (7); 50

said anti-flooding safety device (20; 120) comprising a duct (80) having at least one inner hose (25) for supplying water from an external supply line (E) to said at least one water supply inlet (7) of said water supply unit (5) and at least one outer hose (26) surrounding said inner hose (25) such that a gap (28) is defined between said hoses (25, 26) for withholding inside it possible leaking water, said inner hose (25) extending longitudinally between a proximal end and a distal end (25a) and said outer hose (26) extending longitudinally between a proximal end and a distal end (26a),

wherein said anti-flooding safety device (20; 120) comprises a first connector (21) for the connection of said distal ends (25a, 26a) of said hoses (25, 26) to said laundry washing machine (1), said first connector (21) comprising:

- a supplying water conveying line (30) comprising a first inlet (31) for the connection to said distal end (25a) of said inner hose (25) and a first conduit portion (32) for the connection to said at least one water inlet (7) of said water supply unit (5), said supplying water conveying line (30) fluidly connecting said inner hose (25) to said water supply unit (5);
- a leaking water conveying line (60) comprising a second inlet (41) for the connection to said distal end (26a) of said outer hose (26) and a second conduit portion (42) for the adduction of said leaking water inside said cabinet (2), said leaking water conveying line (60) fluidly connecting said gap (28) to the inside of said cabinet (2). 55



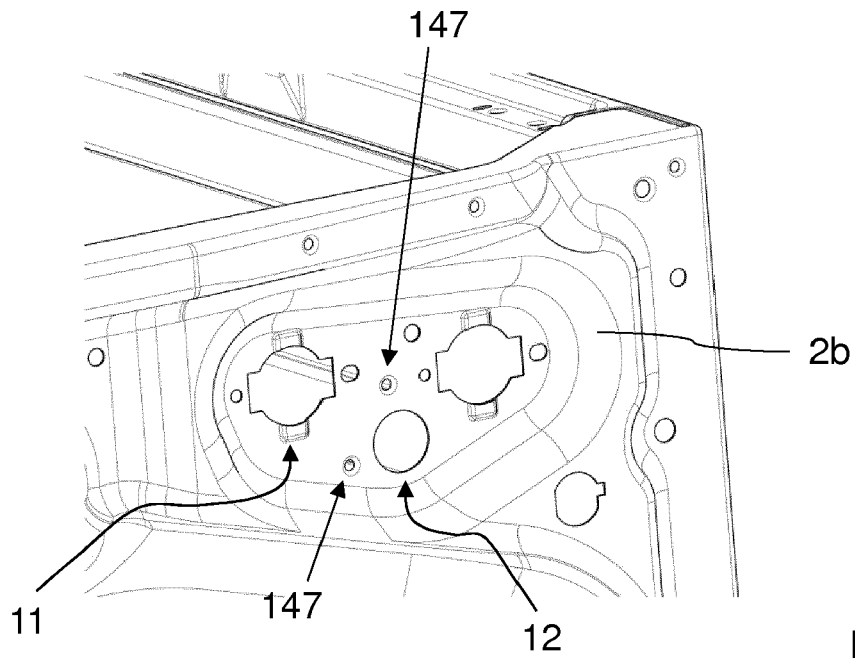


FIG. 3

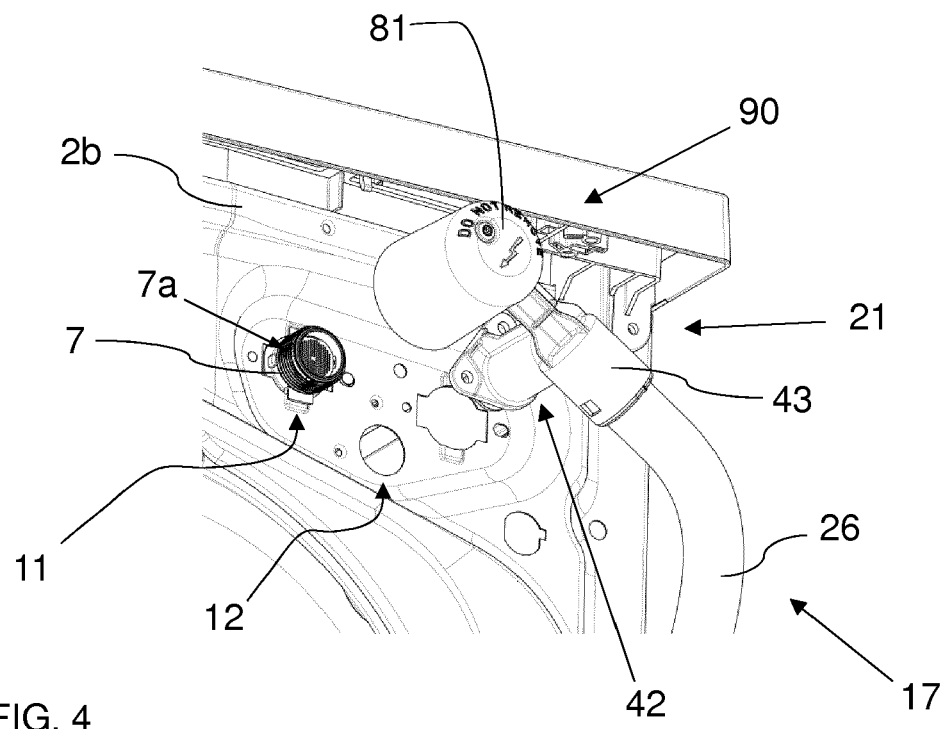
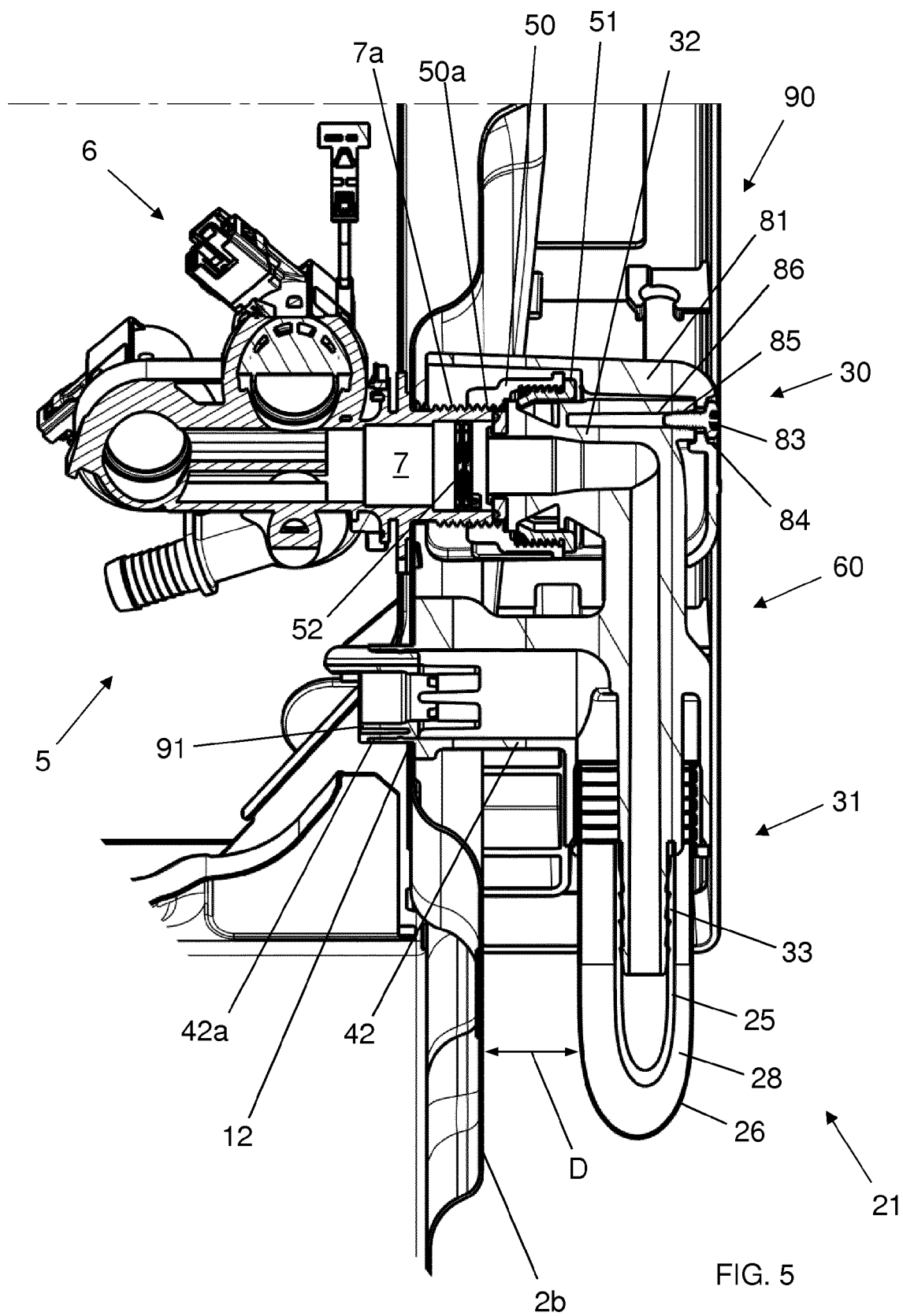


FIG. 4



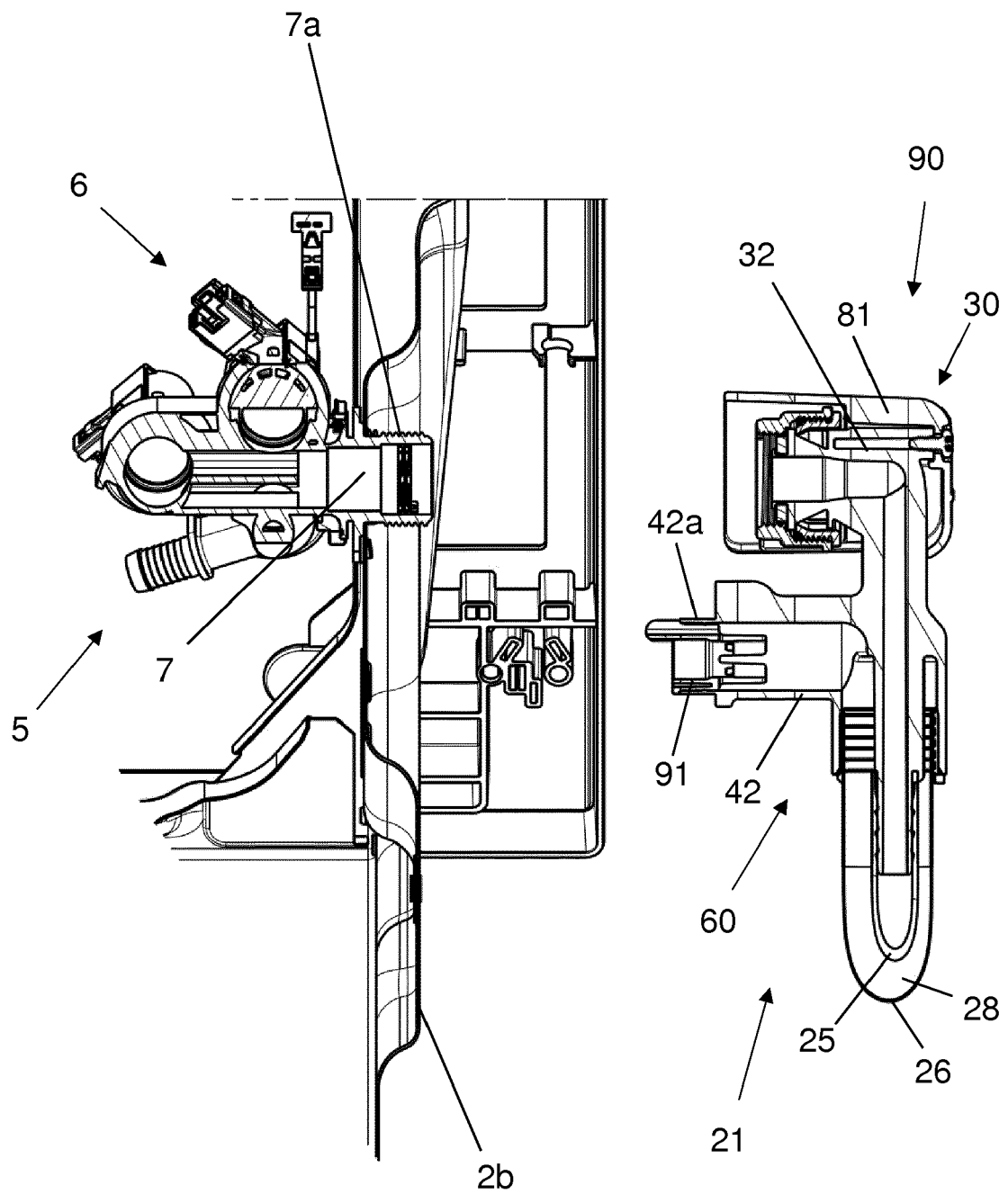


FIG. 6

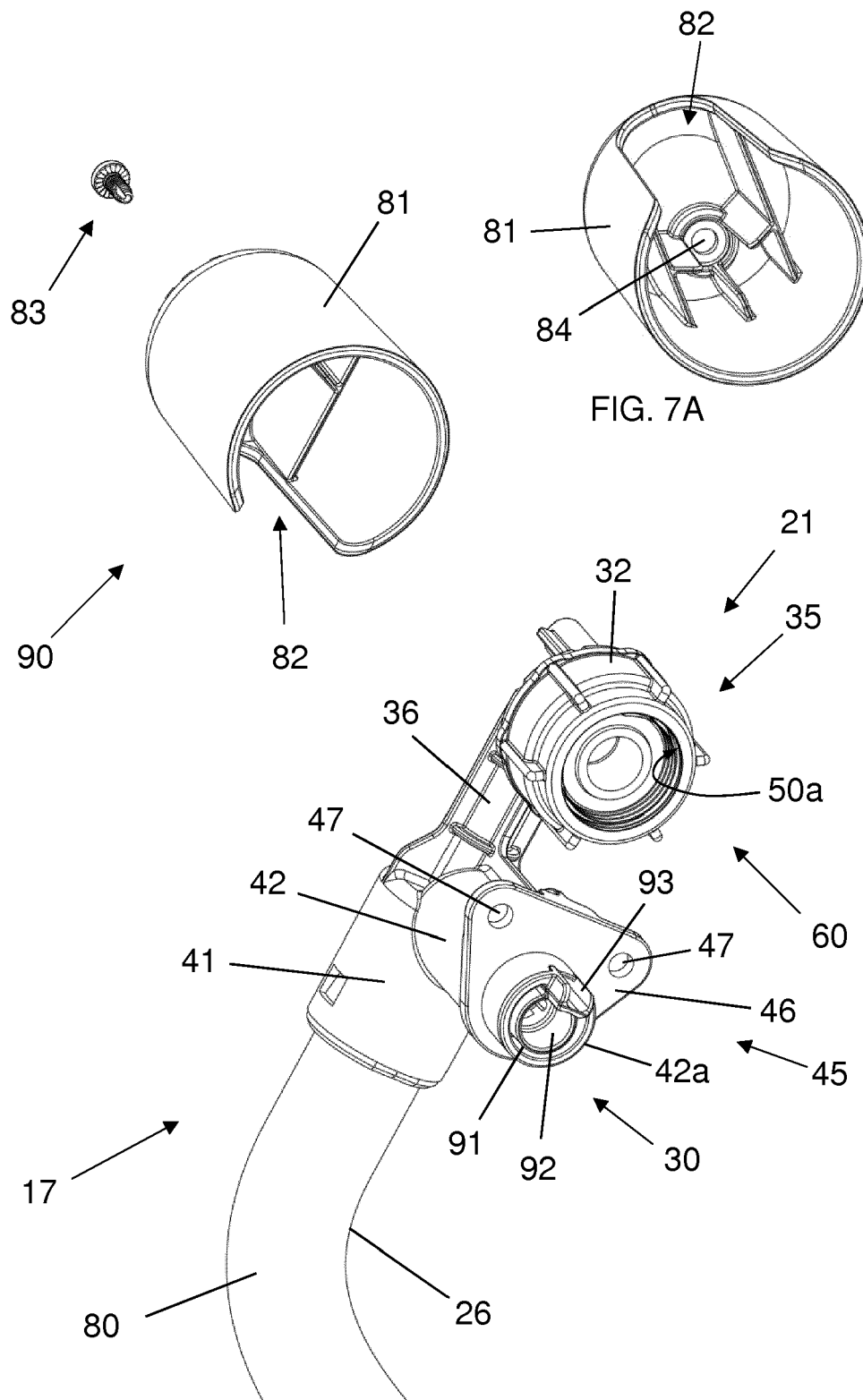
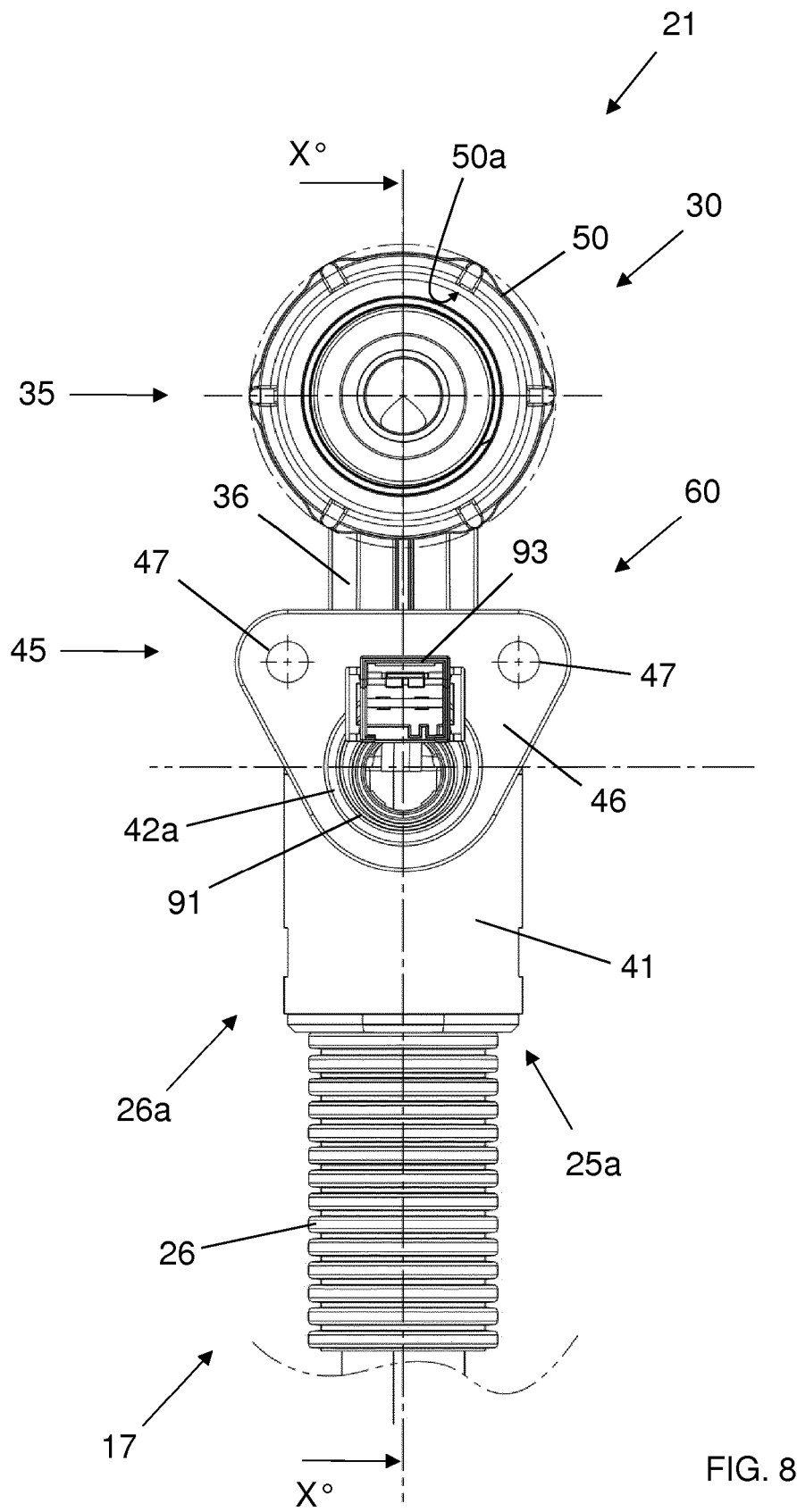


FIG. 7



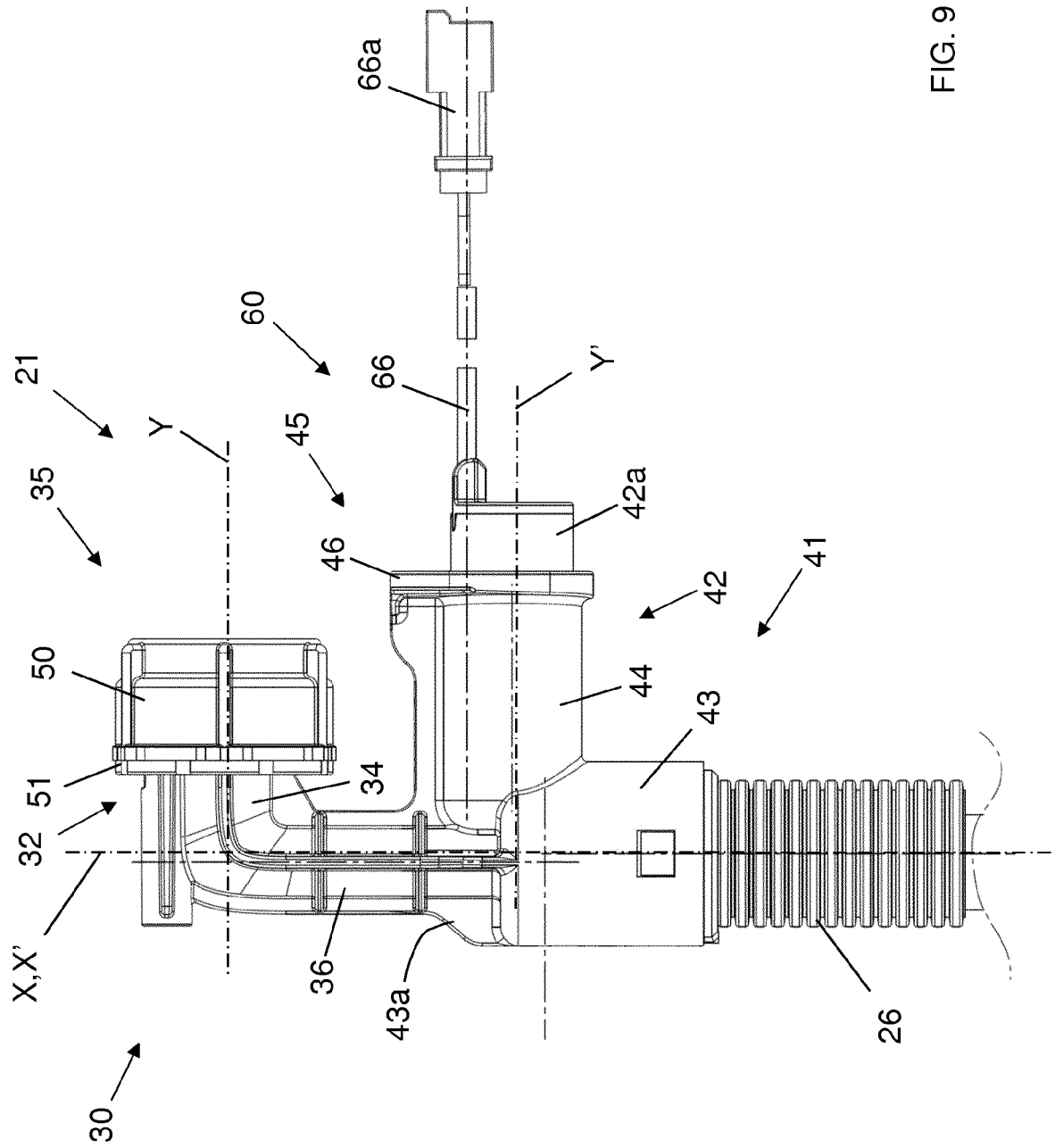
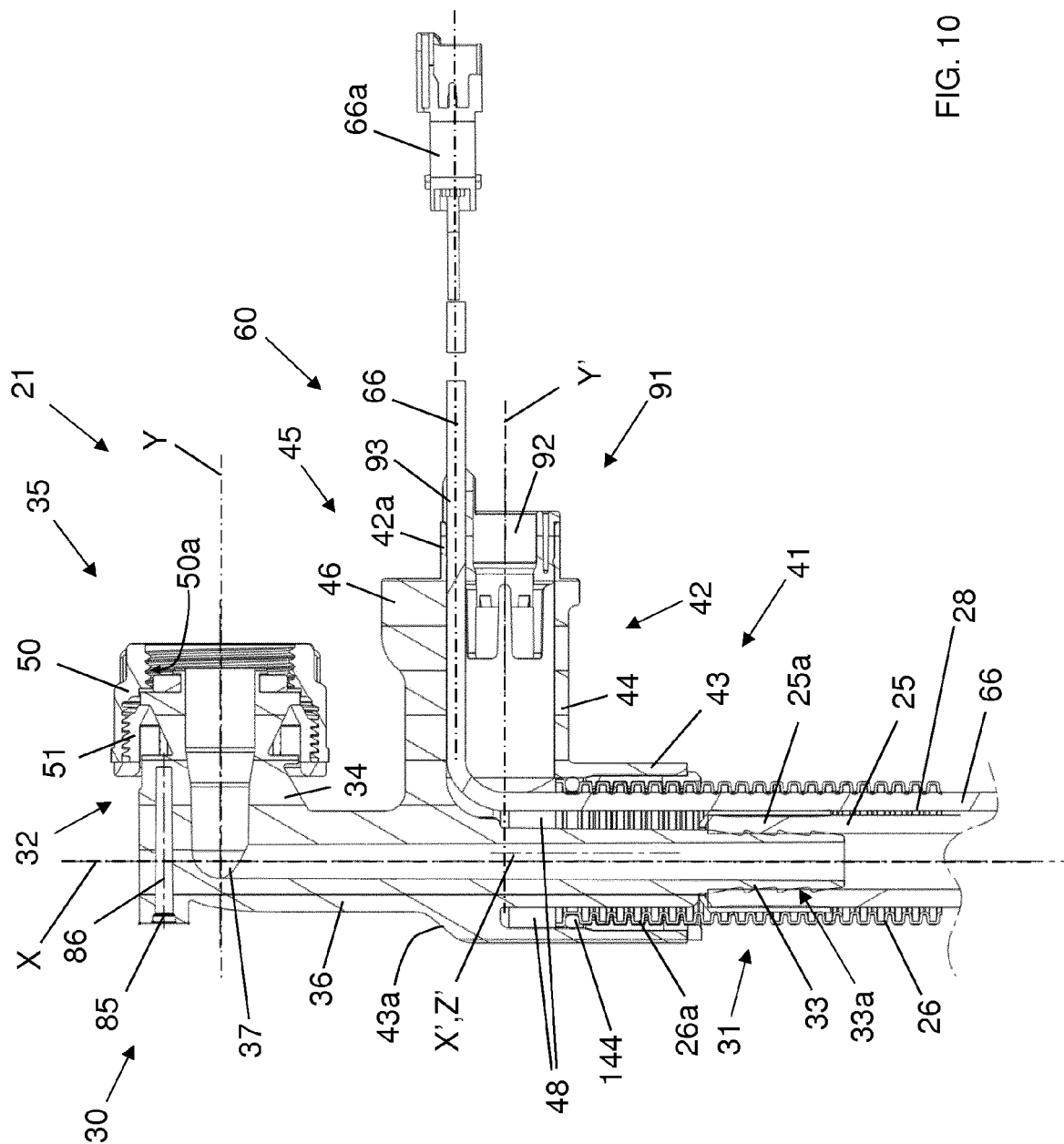


FIG. 9



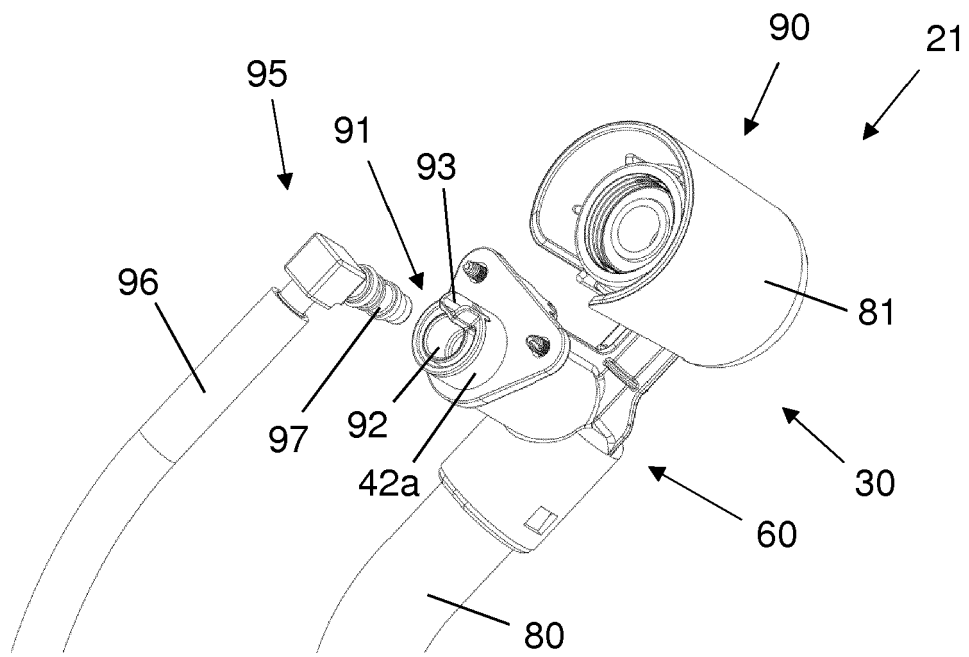


FIG. 11

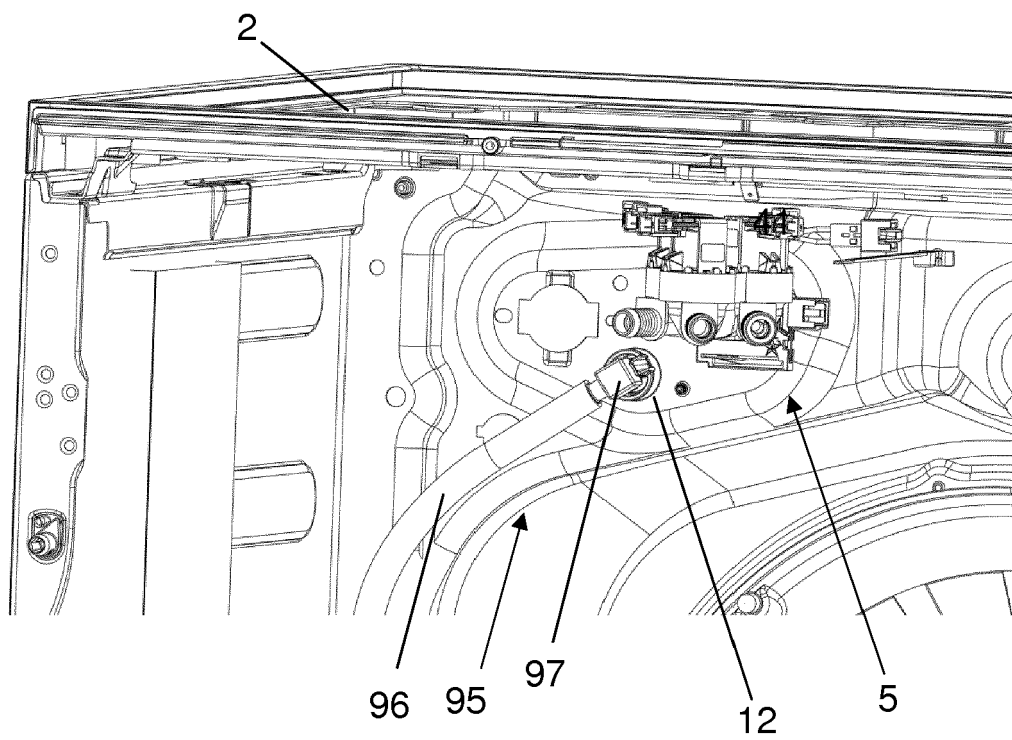
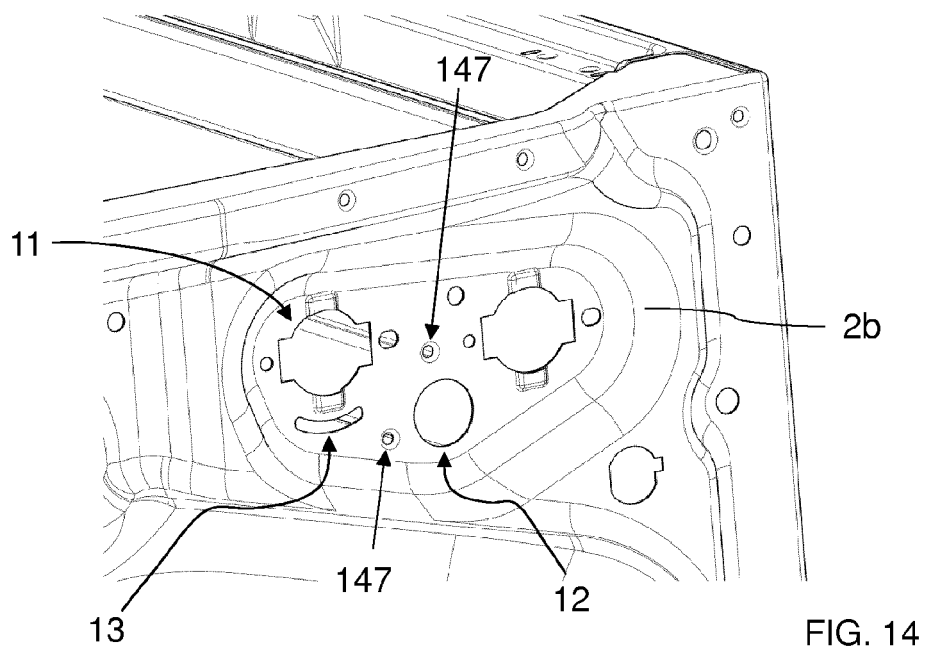
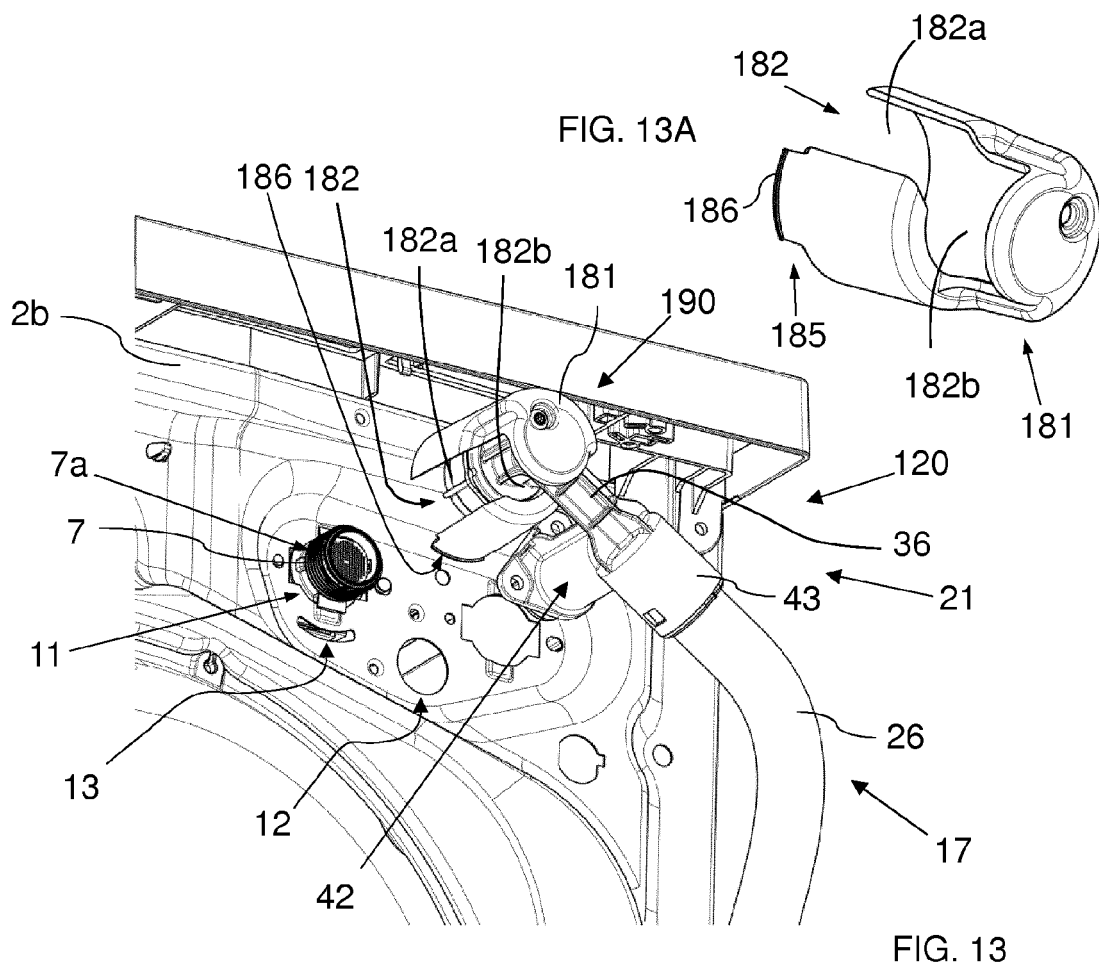


FIG. 12



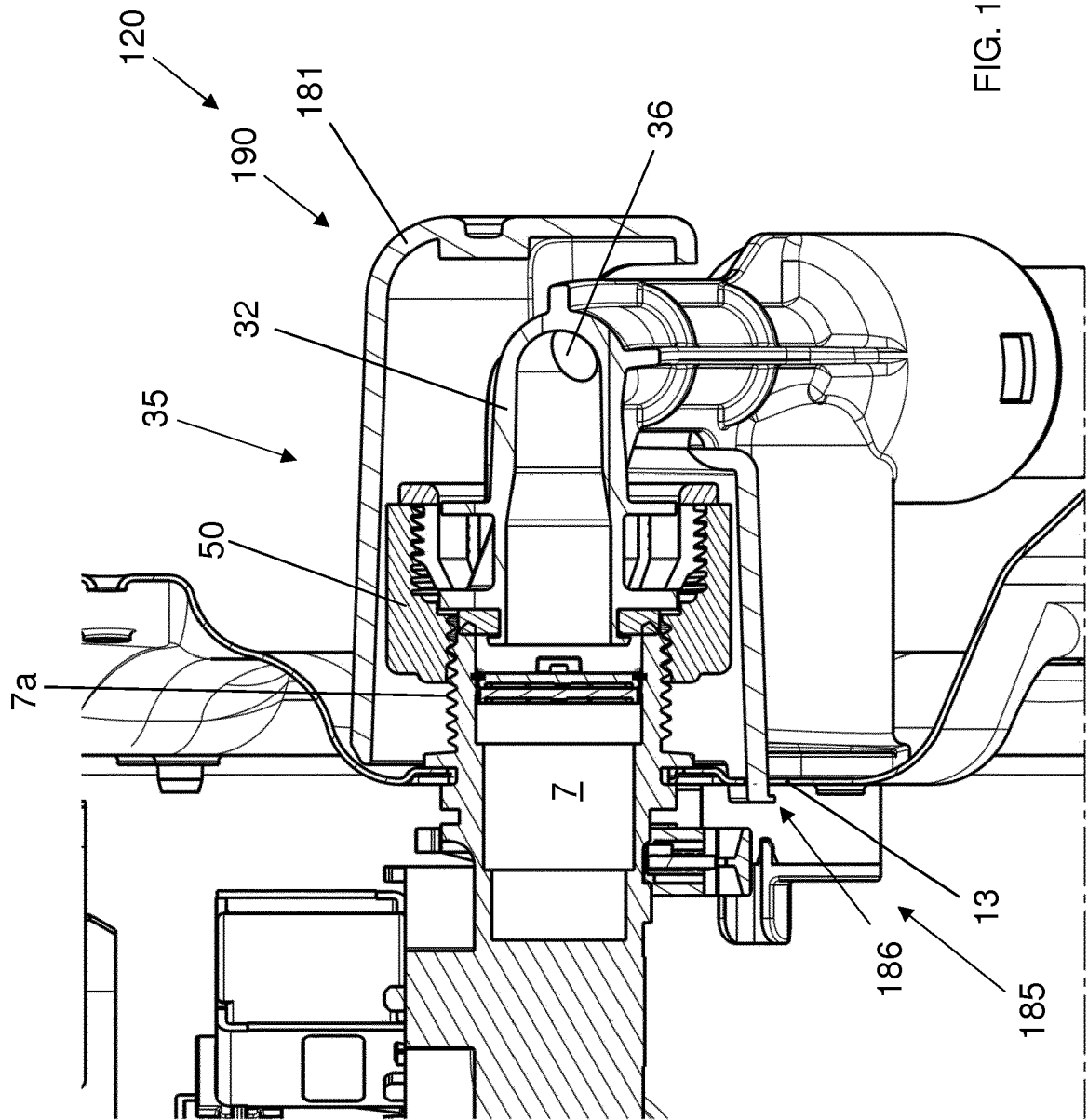


FIG. 15



EUROPEAN SEARCH REPORT

Application Number
EP 15 17 9243

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 39 31 528 A1 (BOSCH SIEMENS HAUSGERAETE [DE]) 11 April 1991 (1991-04-11) * column 2, line 7 - line 62; figure 1 *	1-7, 11, 15	INV. D06F39/08 A47L15/42
X	DE 36 18 258 A1 (ELTEK SPA [IT]) 5 February 1987 (1987-02-05) * the whole document *	1, 15	
A	EP 1 028 190 A2 (ELTEK SPA [IT]) 16 August 2000 (2000-08-16) * the whole document *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			D06F A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 January 2016	Examiner Diaz y Diaz-Caneja
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			

EPO FORM 1503 03/82 (P04C01)

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

EP 15 17 9243

5

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.

14-01-2016

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3931528 A1	11-04-1991	NONE	
DE 3618258 A1	05-02-1987	DE 3618258 A1 IT 1208823 B	05-02-1987 10-07-1989
EP 1028190 A2	16-08-2000	EP 1028190 A2 IT T0990127 A1	16-08-2000 21-08-2000

15

20

25

30

35

40

45

50

55

EPO FORM P0459

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