



EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.07.2017 Bulletin 2017/29

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

(21) Application number: **17151345.0**

(22) Date of filing: **13.01.2017**

(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 MD

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(30) Priority: **13.01.2016 IT UB20169959**

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(54) **WATER SUPPLY DEVICE FOR A HOUSEHOLD WASHING MACHINE, IN PARTICULAR A DISHWASHER, AND HOUSHOLD WASHING MACHINE HAVING SUCH A DEVICE**

(57) The present invention relates to a dispenser device (1) for dispensing a liquid in a washing machine for household use, in particular a dishwasher, said dispenser device (1) being of the type that comprises:

- an inner cavity (2);
- a first air-break device (10) positioned in said inner cavity (2) and associated with a supply duct (3) for supplying the liquid coming from the water main.

The present invention is characterized in that said dispenser device (1) comprises a second air-break device (20) positioned in said inner cavity (2) and arranged in series with respect to the first air-break device (10).

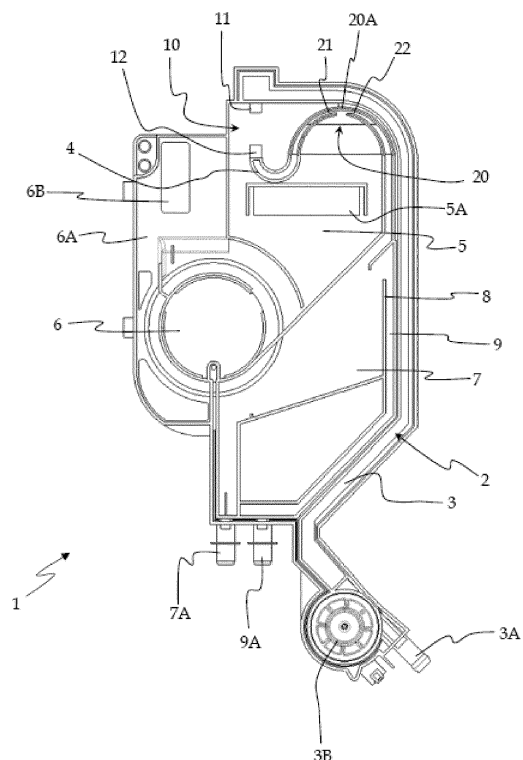


Fig. 1

Description

[0001] The present invention relates to a dispenser device for dispensing a liquid in a washing machine for household use, in particular a dishwasher, according to the preamble of claim 1.

[0002] The present invention also relates to an associated washing machine for household use, in particular a dishwasher.

[0003] It is known that household washing machines, particularly dishwashers, comprise a dispenser device for dispensing a washing liquid into the wash tub. Said dispenser device is typically made from plastic material and is positioned outside the wash tub, generally in association with one of the side walls of the washing machine.

[0004] In particular, this type of dispenser device typically consists of a flat, hollow body comprising:

- a first half-shell (or bottom wall) with transverse walls;
- a second half-shell (or cover), which is so shaped as to substantially match the shape of the first half-shell and which is secured to the transverse walls of said first half-shell.

[0005] Usually said first and second half-shells are obtained from plastic material by injection moulding, and are joined together by welding, generally by hot-blade welding.

[0006] Moreover, the dispenser devices known in the art typically comprise a plurality of components that allow the device to carry out several different functions (hence the name "multifunction device" usually given to the dispenser devices known in the art); for example, said components may comprise:

- an air-break device associated with a liquid supply duct, for preventing the liquid from returning into the water main should a vacuum be created therein,
- an opening for venting the vapours generated inside the wash tub.

[0007] In particular, the air-break devices are necessary to avoid the risk that chemical solutions, dirty water or germ-enriched water may penetrate the drinking water main, especially when a vacuum is generated in the drinking water main (e.g. while maintenance or repair work is being carried out) and the washing machine connected to said water main is turned on at the same time.

[0008] It should also be noted that, in a washing machine of a known type, the dispenser device is usually associated with a softener device that comprises a resin container, which contains ion-exchange resins, and a regeneration tank, which contains an agent (in particular, brine) for regenerating the ion-exchange resins; as a consequence, the dispenser device is so realized as to comprise:

- a first duct connected to the resin container;
- at least one chamber for collecting the resin regeneration liquid, said at least one chamber being connected to the regeneration tank by means of a second duct.

[0009] It must be pointed out that the dispenser devices known in the art may lack a chamber dedicated to collecting the regeneration liquid, since they may be so realized as to comprise a single chamber in which the liquid is collected to be then directed (in particular, via a switching valve) towards the resin container or the regeneration tank.

[0010] However, the dispenser devices known in the art suffer from a few drawbacks.

[0011] In particular, an important drawback suffered by the solutions known in the art is that, in the event of a malfunction of the dispenser device and/ or clogging of the output ducts leading to the tub of the washing machine or to any devices between the dispenser device and said tub, the regular water outflow from the dispenser device will be inhibited; the malfunction of the dispenser device may even prevent the air-break device from performing its function of preventing the liquid from flowing back into the water main.

[0012] It is therefore clear that the dispenser devices known in the art cannot ensure proper operation of the air-break device in adverse conditions, and this problem may also lead to adverse consequences on the water main to which the dispenser device and the associated washing machine are connected.

[0013] It should be noted that a malfunctioning dispenser device may also cause uncontrolled leakage of liquid outside the dispenser device itself, and such leakage may cause electrical safety problems because it may affect electric components installed in the lower part of the washing machine, or dripping of liquid onto the floor whereon the washing machine stands.

[0014] In this frame, it is the main object of the present invention to provide a dispenser device for dispensing a liquid in a washing machine for household use, in particular a dishwasher, and a related washing machine comprising said dispenser device, which are so realized as to overcome the drawbacks of the prior art.

[0015] In particular, it is one object of the present invention to provide a dispenser device and a related washing machine which are so realized that the regular water outflow from the dispenser device will not be inhibited in the event of a malfunction of said dispenser device, in particular also in the event of clogging of the output ducts leading to the tub of the washing machine and/or to any devices between the dispenser device and said tub.

[0016] It is another object of the present invention to provide a dispenser device and a related washing machine that can ensure optimal operation of the air-break device, preventing the liquid from flowing back into the water main even in adverse conditions.

[0017] It is a further object of the present invention to

provide a dispenser device and a related washing machine which are so realized as to avoid the risk of uncontrolled leakage of liquid outside the dispenser device, thus preventing electric safety problems and/or dripping of liquid onto the floor whereon the washing machine stands.

[0018] It is yet another object of the present invention to provide a dispenser device which is simple, economical and as small as possible.

[0019] Said objects are achieved by the present invention through a dispenser device for dispensing a liquid in a washing machine for household use, in particular a dishwasher, and a related washing machine comprising said dispenser device, incorporating the features set out in the appended claims, which are an integral part of the present description.

[0020] 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 explanatory example, wherein:

- Fig. 1 schematically shows a vertical sectional view of a dispenser device for dispensing a liquid in a washing machine for household use, in particular a dishwasher, according to the present invention;
- Fig. 2 schematically shows a vertical sectional view of a first variant of the dispenser device according to the present invention;
- Fig. 3 schematically shows a vertical sectional view of a second variant of the dispenser device according to the present invention.

[0021] Fig. 1 shows a vertical sectional view of a dispenser device for dispensing a liquid in a washing machine for household use, in particular a dishwasher, according to the present invention.

[0022] In said figure, reference numeral 1 designates the liquid dispenser device, which comprises an inner cavity, designated as a whole by reference numeral 2; the annexed drawings do not show the washing machine for household use, in particular a dishwasher, which comprises said dispenser device 1.

[0023] Preferably, the dispenser device 1 comprises said inner cavity 2 (i.e. it is hollow), since it is made up of two half-shells (not shown) that are substantially symmetrical and coupled to each other. In particular, said half-shells can be made from plastic material by injection moulding, and the coupling of the two half-shells can be accomplished by means of a welding process, in particular a hot-blade welding process. It is however clear that the dispenser device 1 may also be so realized as to comprise a monolithic body, in particular made from plastic material by injection moulding, comprising two (substantially rectangular) main faces opposite to each other and connected together by a perimetric wall so as to define an inner cavity.

[0024] It should be noted that the dispenser device 1

is also known in the prior art as a "multifunction device".

[0025] Furthermore, the dispenser device 1 as a whole preferably has a flat shape, particularly in order to facilitate the coupling thereof to a wall of the washing machine without taking up too much room; in particular, in an operating condition the dispenser device 1 is associated with (or mounted on) the washing machine in such a way as to prevalently lie in a vertical plane.

[0026] The dispenser device 1 comprises a first air-break device (designated as a whole by reference numeral 10) positioned in said inner cavity 2 and associated with a supply duct 3 for supplying the liquid coming from the water main.

[0027] As is known, said first air-break device 10 prevents the liquid from flowing back into the water main.

[0028] Preferably, the supply duct 3 consists of opposite side walls that rise in the inner cavity 2; in particular, said walls protrude from one of the half-shells and are closed by the other half-shell.

[0029] The first air-break device 10 comprises a first half-duct 11 and a second half-duct 12 provided with respective ends facing each other, leaving a gap in between to create the air break.

[0030] In the embodiment shown in Fig. 1, the first half-duct 11 and the second half-duct 12 have a tapered shape, in particular the narrower cross-section consisting of the respective ends, wherein said respective ends are arranged along the same straight line. Preferably, the ends of the first half-duct 11 and of the second half-duct 12 are positioned at a distance of at least 20 mm, so as to allow the liquid to follow an adequate air path in compliance with the regulations in force in the industry. Moreover, the end of the second half-duct 12 preferably has a larger cross-section than the end of the first half-duct 11, so that it can receive the liquid coming from said first half-duct 11.

[0031] As a consequence, the first air-break device 10 shown in Fig. 1 is of the "injection" type (also known as "AD type"), since the first half-duct 11 forms an injector (that can be defined as a "spray nozzle"), which allows the fluid to flow into the second half-duct 12 (which can be defined as a "collection nozzle") faced to the first half-duct 11.

[0032] It should be noted that the first half-duct 11 is essentially an extension of the supply duct 3.

[0033] Moreover, in the embodiment shown in Fig. 1 the first half-duct 11 and the second half-duct 12 are directly obtained in said inner cavity 2 of the dispenser device 1.

[0034] Fig. 1 also shows that said supply duct 3 is associated with a first fitting 3A for connecting the dispenser device 1 to the water main; also, the first fitting 3A is connected to the water main through a suitable pipe associated with an electrovalve controlled by a control unit of the washing machine (the pipe, the electrovalve and the control unit are not shown in the annexed drawings).

[0035] Furthermore, the supply duct 3 can be associated with a volumetric flow meter 3B that allows meas-

uring the liquid being fed into the dispenser device 1. Preferably, said flow meter 3B is a turbine-type meter comprising an impeller fitted with a magnet associated with an element sensing the magnetic field generated by the magnet; for example, said sensing element may be a Reed contact with foils enclosed within an enclosure filled with inert gas, or a Hall-effect sensor. Also, the volumetric flow meter 3B may be integrated into the body of the dispenser device 1, or may be made as a separate unit. As is known, the volumetric flow meter 3B generates signals that are sent to a control unit (not shown), in particular an electronic or electromechanical one, of the washing machine for the purpose of determining the quantity of liquid flowing through the dispenser device 1.

[0036] In accordance with the present invention, the dispenser device 1 comprises a second air-break device (designated as a whole by reference numeral 20) positioned in said inner cavity 2 and arranged in series with respect to the first air-break device 10.

[0037] In substance, according to the teachings of the present invention the dispenser device 1 is so realized as to comprise a first air-break device 10 and a second air-break device 20 arranged in succession, in particular with respect to the path followed by the liquid coming from the supply duct 3 and from the water main. In particular, the second air-break device 20 comprises a first tract 21 and a second tract 22 provided with respective ends facing each other, leaving a gap in between to create a second air break.

[0038] Preferably, the second half-duct 12 of the first air-break device 10 is associated with a pipe 4 that leads to the first tract 21 of the second air-break device 20. Also as concerns the second air-break device 20, the end of the second tract 22 preferably has a larger cross-section than the end of the first tract 21, so that it can collect the liquid coming from said first tract 21.

[0039] In the embodiment shown in Fig. 1, the first tract 21 and the second tract 22 are so realized as to give the second air-break device 20 an arched shape; in particular, the first tract 21 and the second tract 22 are joined together by a top wall 20A and the air break essentially consists of a gap between the first tract 21 and the second tract 22, said gap being located under said top wall 20A.

[0040] In the embodiment shown in Fig. 1, the first tract 21 and the second tract 22 are directly obtained in said inner cavity 2 of the dispenser device 1; it is however clear that said first tract 21 and second tract 22 may also belong to an insert (not shown) to be inserted into the inner cavity 2 of the dispenser device 1.

[0041] The particular provisions of the present invention allow overcoming the drawbacks of prior-art dispenser devices by providing a dispenser device 1 realized to avoid that the regular water outflow from said dispenser device 1 might be inhibited even in case of a malfunction, in particular even in case of clogging of the output ducts leading to the tub of the washing machine and/or to any devices between the dispenser device 1 and said tub.

[0042] In fact, the peculiar provision of a first air-break

device 10 and a second air-break device 20 arranged in series and in succession, particularly with respect to the path followed by the liquid, ensures optimal operation while preventing the liquid from flowing back into the water main even in adverse conditions. Moreover, such provisions allow preventing uncontrolled leakage of water outside the dispenser device, thus preventing electric safety problems and/or dripping of water onto the floor whereon the washing machine stands.

[0043] It is also clear that the dispenser device 1 according to the present invention is simple, economical and small.

[0044] In a preferred embodiment, the first air-break device 10 and the second air-break device 20 are positioned in a first compartment (designated by reference numeral 5) for collecting the liquid that cannot flow past the first air-break device 10 and the second air-break device 20; preferably, said first compartment 5 comprises a window 5A that allows the liquid to escape when the first compartment 5 is overfilled.

[0045] It should also be noted that said first compartment 5 is in communication with an opening 6 for collecting and venting the vapours coming from the wash tub, said opening 6 also performing the function of delivering into the tub of the washing machine the liquid that cannot flow past the first air-break device 10 and the second air-break device 20.

[0046] Preferably, said opening 6 is substantially circular in shape and communicates with the inner cavity 2; furthermore, it is formed in at least one of the half-shells (or main faces, when the dispenser device 1 is made as a monolithic body) that make up the dispenser device 1.

[0047] The provision of said window 5A contributes to ensuring optimal operation of the dispenser device 1 and preventing the liquid from returning into the water main even in adverse conditions; in particular, said window 5A cooperates with the first air-break device 10 and with the second air-break device 20 in order to attain such purpose.

[0048] The dispenser device 1 further comprises a second compartment 6A for venting and/or condensing said vapours coming from the opening 6, which vapours are then drained into the environment through a second opening 6B located at the top of the second compartment 6A.

[0049] The dispenser device 1 according to the present invention further comprises a collection chamber 7 into which the liquid coming from the second tract 22 of the second air-break device 20 can enter, in particular said collection chamber 7 being associated with a second fitting 7A that allows the collection chamber 7 to be connected to a softener device (not shown in the drawings), in particular to a regeneration tank containing an agent (in particular, brine) for regenerating ion-exchange resins. Preferably, the flow of liquid from the collection chamber 7 to the regeneration tank is controlled by an electrovalve (not shown) controlled by the control unit of the

washing machine; as is known, the capacity of the collection chamber 7 is preferably suited to the quantity and/or volume of resins in the resin container.

[0050] Said dispenser device 1 further comprises a partition 8 that allows separating the collection chamber 7 from a channel 9 associated with a third fitting 9A; as a consequence, after having filled the collection chamber 7 and having risen above the level of the partition 8, the liquid will overflow into the channel 9 and will then reach the wash tub, through the third fitting 9A, after having flowed through a softener device (not shown), in particular through a resin container (containing ion-exchange resins) of said dispenser device.

[0051] In substance, in accordance with the teachings of the present invention, the liquid arriving at the first fitting 3A will then proceed (possibly after having been measured by the volumetric flow meter 3B) in the supply duct 3, flow through the first air-break device 10, proceed in the duct 4, flow through the second air-break device 20, and then enter the collection chamber 7. After having filled the collection chamber 7 and having risen above the level of the partition 8, the liquid will overflow into the channel 9 to reach the wash tub after having flowed through the resin container of a softener device. The liquid in the collection chamber 7 will be delivered (in particular when an electrovalve is opened) into the regeneration tank in order to regenerate the resins contained in the resin container.

[0052] It should be noted that the dispenser device 1 according to the present invention may also be so realized that the collection chamber 7 is connected to both a resin container and a regeneration tank of a softener device (not shown in the drawings); for example, such a connection may be obtained by means of a switching element (e.g. a switching valve) allowing the liquid to be directed from the collection chamber 7 to the resin container and/or to the regeneration tank.

[0053] The features and advantages of the dispenser device 1 according to the present invention and of the related washing machine are apparent from the above description.

[0054] In fact, the particular provisions of the present invention allow overcoming the drawbacks of prior-art dispenser devices by providing a dispenser device 1 realized to avoid that the regular water outflow from said dispenser device 1 might be inhibited even in case of a malfunction, in particular even in case of clogging of the output ducts leading to the tub of the washing machine and/or to any devices between the dispenser device and said tub. In fact, the peculiar configuration of a first air-break device 10 and a second air-break device 20 arranged in series and in succession, particularly with respect to the path followed by the liquid, will ensure optimal operation and will prevent the liquid from flowing back into the water main even in adverse conditions.

[0055] A further advantage of the dispenser device 1 according to the present invention lies in the fact that it is so realized as to prevent uncontrolled leakage of water

outside the dispenser device 1, thus preventing electric safety problems and/or dripping of water onto the floor whereon the washing machine stands.

[0056] A further advantage of the dispenser device 1 according to the present invention lies in the fact that it is simple, economical and small.

[0057] The dispenser device for dispensing a liquid in a washing machine for household use, in particular a dishwasher, and the related washing machine 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. For example, the numerous possible variants include those shown in the annexed Figs. 2 and 3.

[0058] As far as the dispenser device 1 shown in Figs. 2 and 3 is concerned, it essentially corresponds to the one previously described with reference to Fig. 1. However, the peculiarity of the variant shown in Fig. 2 is that the first air-break device 10 consists of an insert (of the "injection" or "AD" type) that comprises the first half-duct 11 and the second half-duct 12, both having a tapered shape, the respective ends of which are arranged along the same straight line.

[0059] In particular, the insert that constitutes the first air-break device 10 of Fig. 2 comprises a room 13 positioned between the first half-duct 11 and the second half-duct 12, in particular said room 13 having a substantially cylindrical shape. In a preferred embodiment, said substantially cylindrical room 13 has a height (corresponding to the distance between the ends of the first half-duct 11 and of the second half-duct 12) of approx. 20 mm and a diameter of at least 40 mm. Also, said room 13 comprises a slit 13A for letting into the first compartment 5 the liquid that cannot flow past the first air-break device 10.

[0060] As regards the variant shown in Fig. 3, the dispenser device 1 comprises a second air-break device 20 with a first tract 21 and a second tract 22 having a tapered shape, and wherein the respective ends are arranged along the same straight line; as a consequence, in the variant shown in Fig. 3 also the second air-break device 20 is of the "injection" or "AD" type.

[0061] In addition, in this embodiment the first tract 21 of the second air-break device 20 may essentially consist of an extension of the second half-duct 12 of the first air-break device 10 (as can be seen in Fig. 3); as an alternative, the first tract 21 may be associated with the second half-duct 12 by means of an element corresponding to the pipe 4 shown in Figures 1 and 2.

[0062] According to a further variant (not shown), also the first half-duct 11 and the second half-duct 12 of the first air-break device 10 may be so realized as to give the first air-break device 20 an arched shape.

[0063] It can therefore be easily understood that the present invention is not limited to the above-described dispenser device and washing machine, but may be sub-

ject 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. Dispenser device (1) for dispensing a liquid in a washing machine for household use, in particular a dishwasher, said dispenser device (1) being of the type that comprises:

- an inner cavity (2);
- a first air-break device (10) positioned in said inner cavity (2) and associated with a supply duct (3) for supplying the liquid coming from the water main,

characterized in that

the dispenser device (1) comprises a second air-break device (20) positioned in said inner cavity (2) and arranged in series with respect to the first air-break device (10).

2. Dispenser device (1) according to claim 1, **characterized in that** the first air-break device (10) comprises a first half-duct (11) and a second half-duct (12) provided with respective ends facing each other, leaving a gap in between to create the air break.
3. Dispenser device (1) according to claim 2, **characterized in that** the first half-duct (11) and the second half-duct (12) have a tapered shape, in particular the narrower cross-section consisting of the respective ends, wherein said respective ends are arranged along the same straight line.
4. Dispenser device (1) according to one or more of claims 2 and 3, **characterized in that** the ends of the first half-duct (11) and of the second half-duct (12) are positioned at a distance of at least 20 mm.
5. Dispenser device (1) according to one or more of claims 2 to 4, **characterized in that** the end of the second half-duct (12) preferably has a larger cross-section than the end of the first half-duct (11).
6. Dispenser device (1) according to one or more of claims 2 to 5, **characterized in that** the first half-duct (11) and the second half-duct (12) are directly obtained in said inner cavity (2) of the dispenser device (1).
7. Dispenser device (1) according to one or more of claims 2 to 5, **characterized in that** said first air-break device (10) consists of an insert comprising the first half-duct (11) and the second half-duct (12)

having a tapered shape, and wherein the respective ends are arranged along the same straight line.

8. Dispenser device (1) according to claim 7, **characterized in that** said insert comprises a room (13) positioned between the first half-duct (11) and the second half-duct (12), in particular said room (13) having a substantially cylindrical shape.
9. Dispenser device (1) according to one or more of the preceding claims, **characterized in that** said second air-break device (20) comprises a first tract (21) and a second tract (22) provided with respective ends facing each other and leaving a gap.
10. Dispenser device (1) according to claim 9, **characterized in that** the end of the second tract (22) has a larger cross-section than the end of the first tract (22).
11. Dispenser device (1) according to one or more of claims 9 and 10, **characterized in that** the first tract (21) and the second tract (22) are so realized as to give the second air-break device (20) an arched shape, in particular the first tract (21) and the second tract (22) being joined together by a top wall (20A) and the air break essentially consisting of a gap between the first tract (21) and the second tract (22), said gap being located under said top wall (20A).
12. Dispenser device (1) according to one or more of the preceding claims 9 to 11, **characterized in that** the first tract (21) and the second tract (22) are directly obtained in said inner cavity (2) of the dispenser device (1).
13. Dispenser device (1) according to one or more of claims 9 and 10, **characterized in that** the first tract (21) and the second tract (22) of the second air-break device (20) have a tapered shape, wherein the respective ends are arranged along the same straight line.
14. Dispenser device (1) according to one or more of the preceding claims 9 to 13, **characterized in that** it comprises a collection chamber (7) into which the liquid coming from the second tract (22) of the second air-break device (20) can enter, in particular said collection chamber (7) being associated with a second fitting (7A) that allows the collection chamber (7) to be connected to a softener device.
15. Washing machine for household use, in particular a dishwasher, comprising a dispenser device (1) according to one or more of the preceding claims 1 to 14.

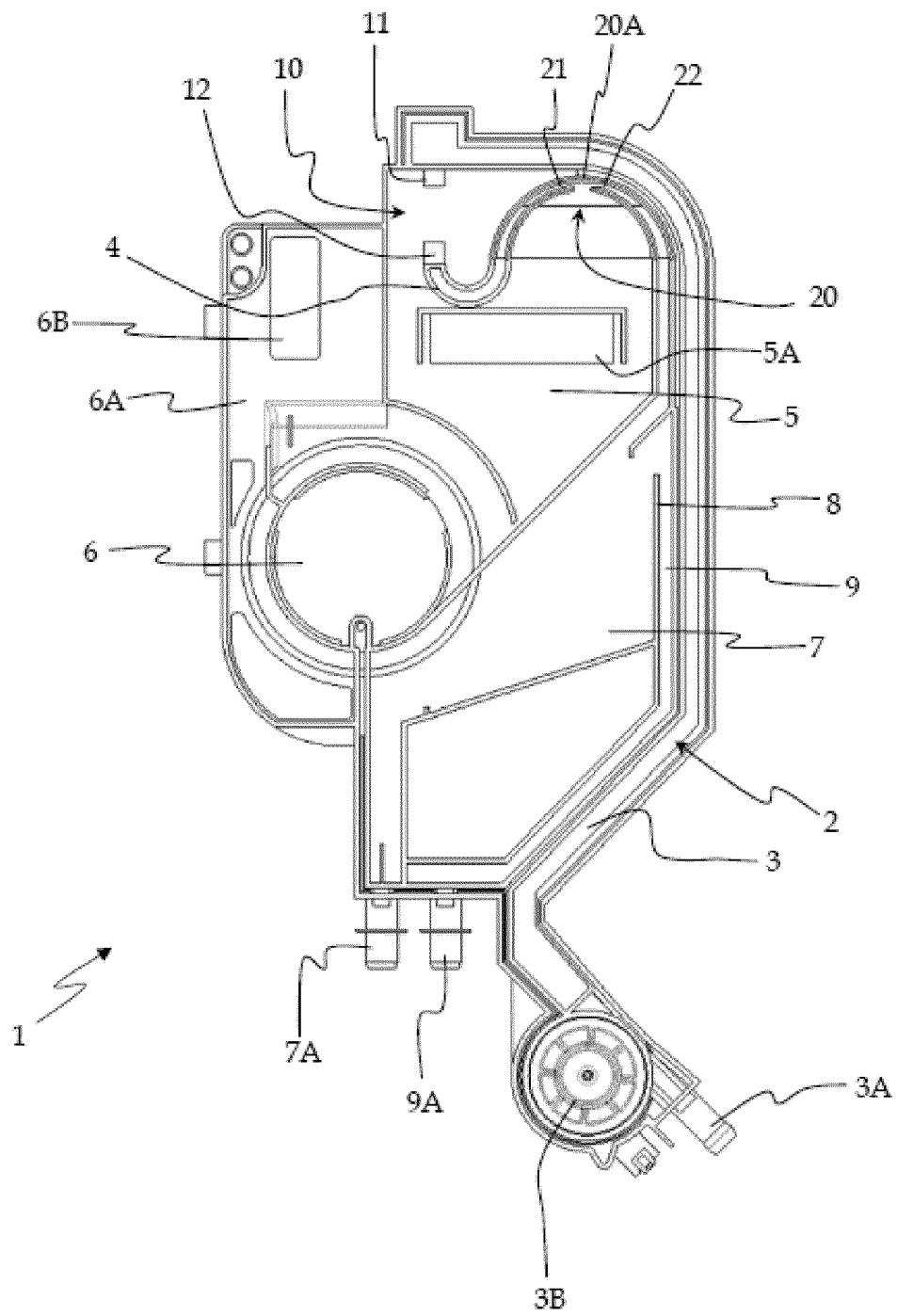


Fig. 1

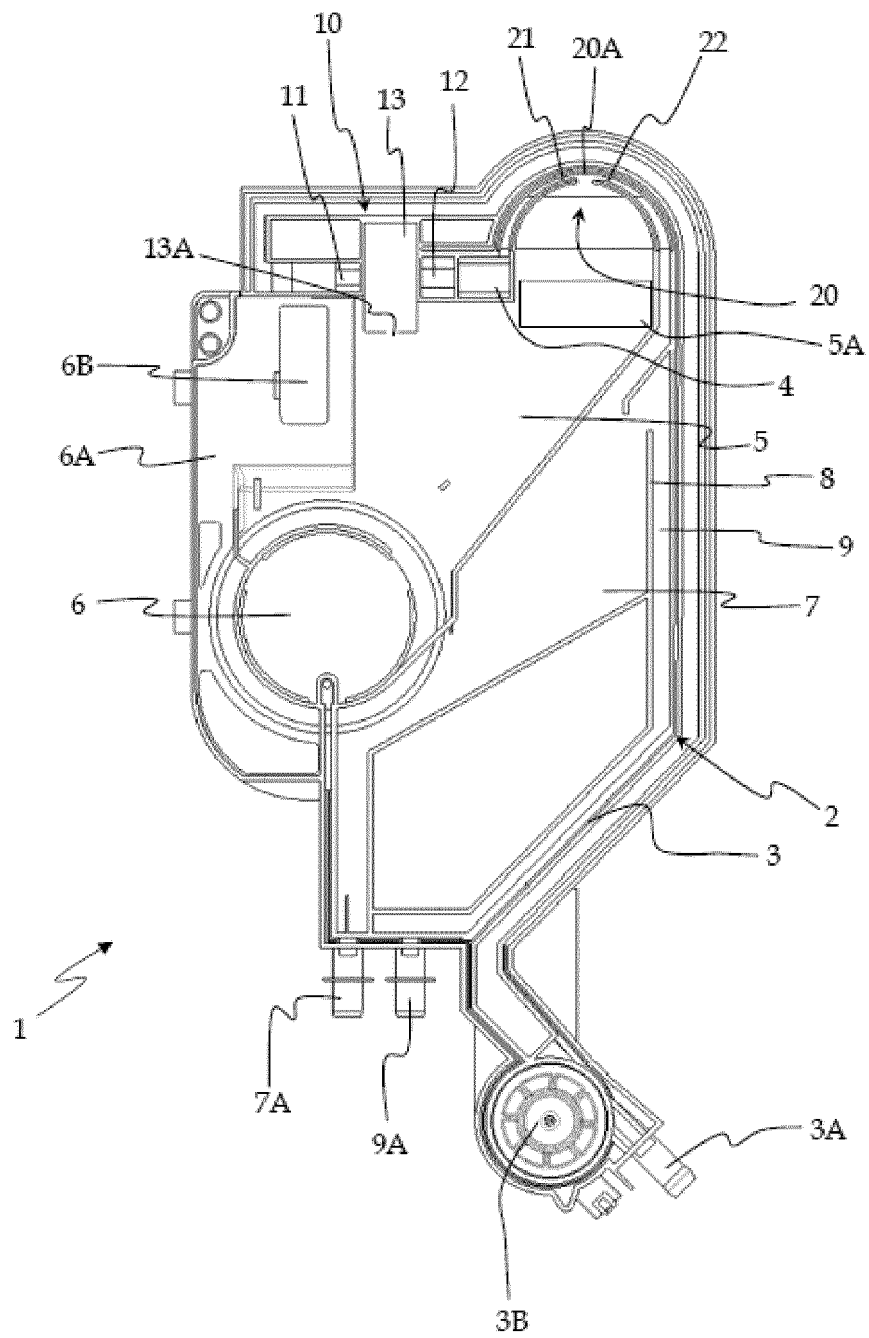


Fig. 2

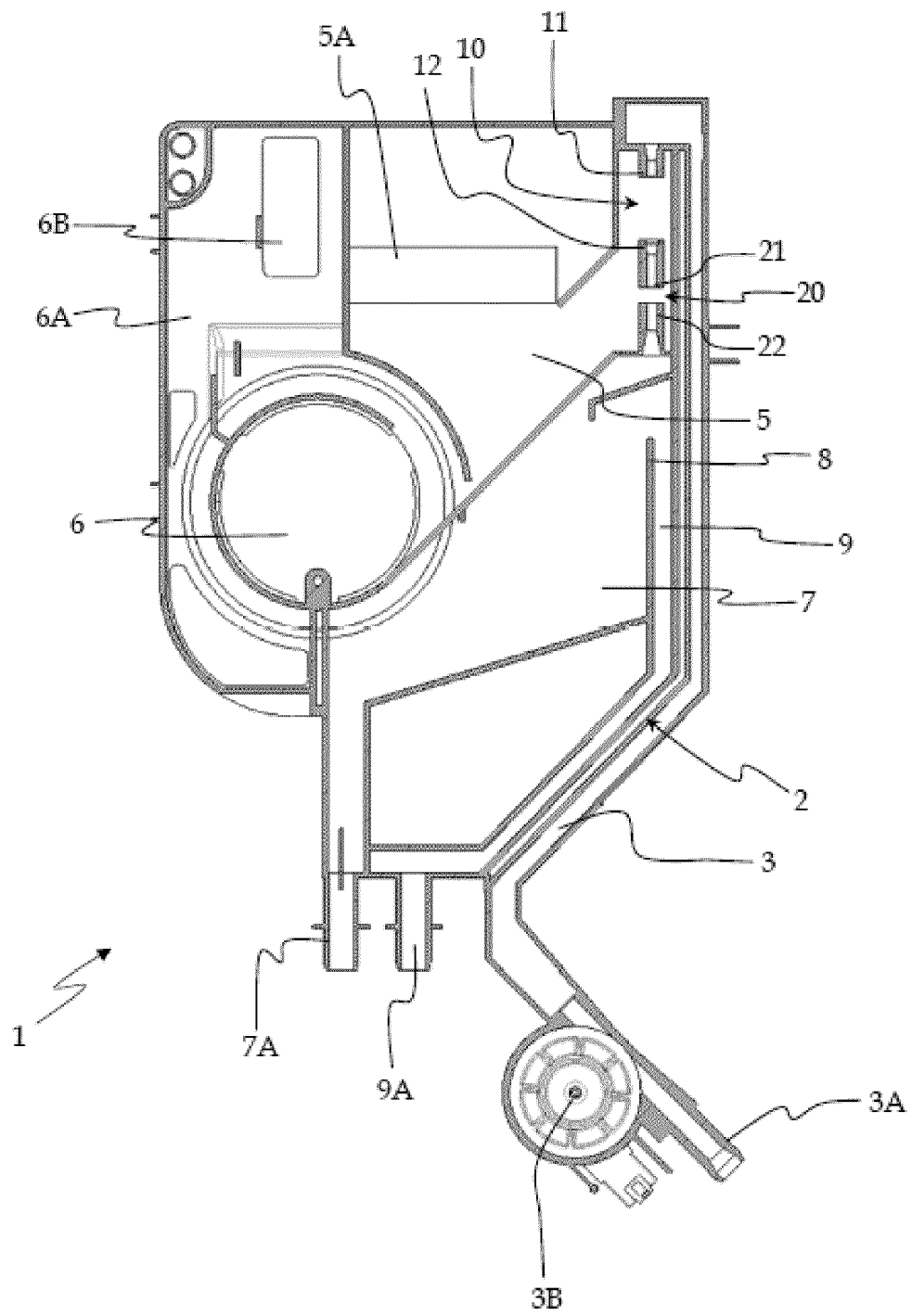


Fig. 3



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 15 1345

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 March 2017	Examiner Lodato, Alessandra
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 17 15 1345

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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