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(54) Water outlet system for a dishwasher

(57) The present invention relates to a dishwasher (1) comprising a first washing compartment (10), having a washing tub (11) for receiving objects that are to be washed, and a water outlet system (12), for leading water out of the washing tub (11) to a wastewater system arranged outside the first washing compartment (10), such as a domestic wastewater system.

The dishwasher (1) further comprises a second washing compartment (20), having a washing tub (21) for receiving objects that are to be washed, and a water outlet system (22), for leading water out of the washing tub (21) to a wastewater system arranged outside the second washing compartment (20), such as a domestic wastewater system.

A control unit (30) is operatively associated with the first washing compartment (10) and the second washing compartment (20), the control unit (30) being arranged for controlling the water outlet system (12) of the first washing compartment (10), and the water outlet system (22) of the second washing compartment (20); such that at any given instant, at the most one water outlet system (12, 22) is leading water out of its corresponding washing tub (11, 21).

The present invention also relates to a method of letting water out of such a dishwasher (1).

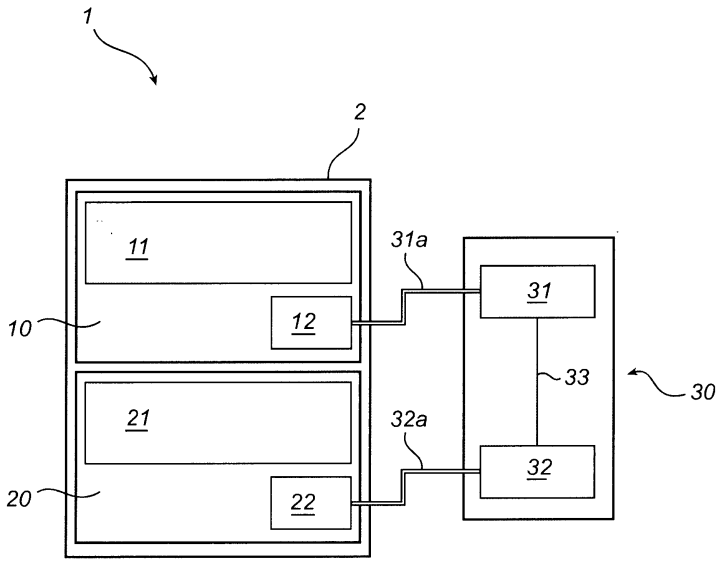

Fig. 1

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Description

Technical field

[0001] The present disclosure relates to a dishwasher. More particularly, the present disclosure relates to a dishwasher having at least two washing compartments and a control unit for controlling a water outlet system for each washing compartment.

[0002] The present disclosure further relates to a method for letting water out of such a dishwasher.

Background

[0003] In general, multi-compartment dishwashers are well-known. Typically, a multi-compartment dishwasher includes multiple drawers or pull-out washing compartments, slidably mounted in a cabinet. Drawer dishwashers are known from e.g. US 6,460,555B1 and US 6,447,081B1.

[0004] When designing dishwashers, there are space constraints imposed by standards for kitchen appliances, cabinetry, etc. For example, a dishwasher cabinet may need to fit within a space that is 817.5-877.5 mm high, 595 mm wide and 570 mm deep.

[0005] In order to maximize the amount of objects that can be washed in a compartment of a dishwasher, there is a general need for space saving measures in respect of the arrangement of the functional components of the dishwasher. Especially, there are space constraints related to drawer dishwashers.

[0006] In most drawer dishwashers with multiple drawers, each drawer has a washing compartment, that can perform a washing operation. A washing operation is performed in the washing compartments 10, 20, in order to clean the dishes in the washing tub 11, 21. A washing operation comprises several procedures like a water intake procedure, a washing procedure, a heating procedure, a drain procedure and a drying procedure.

[0007] The drawer dishwasher is generally arranged such that a washing operation can be performed in only one of the washing compartments, or in several washing compartments simultaneously. Each washing compartment includes a water outlet system. The water outlet system comprises among other things a drain pump, which is activated during the drain procedure, of a washing operation, for discharge of wastewater to a domestic wastewater system.

[0008] In conventional dishwashers a quite short hose connects the water outlet system of the dishwasher to the domestic wastewater system. In drawer dishwashers the hose from a washing compartment has to be quite long, about 1.0 m or even longer, long enough to be able to follow the drawer when the drawer is pulled out of the cabinet. The hose should therefore with advantage take up as little space as possible and therefore have an as small sectional area as possible in order to facilitate the use of a large washing compartment and thereby maximize the amount of objects that can be washed therein.

[0009] There is therefore a need for a multi-compartment dishwasher having as large washing compartments as possible and comprising a water outlet system, which makes it possible to discharge wastewater, from the washing compartments, to a wastewater system, in an effective way.

Summary

[0010] The invention is based on the knowledge that the drain procedure, in drawer dishwasher with two washing compartments, slacken speed if pumping out water from two washing compartments simultaneously. The problem is not removed by using hoses with larger sectional area, since such hoses are space consuming and the outlet can still further on become a narrow neck. It is possible to increase the capacity of the drainpump to receive a more effective drain procedure, but such a drainpump is space consuming and expensive.

[0011] Tests have been accomplished wherein the water outlet systems of the first and the second washing compartments each comprises a hose for leading water out of the corresponding washing tub. The hose from the first washing compartment is assembled with the hose from the second washing compartment in a common hose, the common hose is then connected to a wastewater system. Tests with hoses having small sectional area, for the purpose of saving space behind the washing compartment, shows that the ability of the water outlet system to pump out water from the washing compartment in an effective way deteriorates with reduced sectional area.

[0012] Therefore further tests have been accomplished using a common hose with a larger sectional area but the water outlet process was still deficient. At least one of the above defined problems are solved by a dishwasher according to the preamble of claim 1, which dishwasher is **characterized in that** a control unit is operatively associated with the first washing compartment and the second washing compartment, the control unit being arranged for controlling the water outlet system of the first washing compartment, and the water outlet system of the second washing compartment; such that at any given instant, at the most one water outlet system is leading water out of its corresponding washing tub.

[0013] By arranging a control unit to control the water outlet system of each washing compartment it is possible to control that only one water outlet system at the time lets water out of its corresponding washing tub.

[0014] By arranging the control unit with a first sub control unit for controlling the water outlet system of the first washing compartment, and a second sub control unit for controlling the water outlet system of the second washing compartment, and a communication link between the sub control units for enabling communication between the sub control units a less vulnerable system is achieved. If one sub control unit brakes down the other one can still

run its corresponding washing compartment.

[0015] By arranging the control unit to control the drain pump of each washing compartment, such that at any given instant, at the most one drain pump is pumping out water from its corresponding washing tub a more effective drainage procedure is achieved. Since only one drain pump is pumping at a time a lower level of noise is also achieved.

[0016] Air bubbles that occurs in the drain pump may prevent the drain pump from pumping out water in an effective way. By arranging a valve downstreams of the drain pump the arising of air bubbles in the drain pump is prevented and a reliable and secure system is achieved.

[0017] Drawer dishwashers are often placed/mounted on a higher level than the wastewater system, especially the upper drawer. This fact may result in that the water in the drawer self-discharges. By arranging at least one part of the hose coming from the drain pump of on a higher level than the corresponding drain pump self-discharging of the corresponding washing tubs is prevented.

[0018] The fact that the hoses may be folded behind the washing compartments results in that a large resistance arises in the hoses which results in a slow drainage procedure. An even slower drainage procedure occur if both washing tubs needs to let water out simultaneously. By arranging at least a part of the hoses in a coil a controllable motion of the hose is achieved when the washing compartments are pulled out of the cabinet.

[0019] In one embodiment of the invention the dishwasher is a drawer dishwasher.

[0020] The present invention further involves a method for letting water out of a multi-compartment dishwasher. The method comprises the step of:

controlling the water outlet systems, such that at any given instant, at the most one water outlet is leading water out of its corresponding washing tub. This method results in a secure and effective water outlet precedure.

Brief description of The Drawings

[0021] The invention will in the following be described in more detail with reference to the enclosed drawings, wherein:

Fig 1a schematically illustrates a block diagram of a multi-compartment drawer dishwasher according to the invention.

Fig 2 schematically illustrates a view of a drain pump arrangement in a multi-compartment drawer dishwasher according to the invention.

Fig 3a schematically illustrates a view, seen from behind, of a drainhose arrangement in a multi-compartment drawer dishwasher according to the invention.

Fig 3b schematically illustrates a side view of a drainhose arrangement in a multi-compartment drawer dishwasher according to the invention,

wherein one drawer is pulled out of a cabinet.

Description of Embodiments

[0022] The present invention will be described in more detail hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like numbers refer to like elements. In the embodiment of the invention described in the figures, a dishwasher 1 is shown.

[0023] The dishwasher 1 comprises a first washing compartment 10 and a second washing compartment 20. The washing compartments 10, 20 are slidably mounted as drawers in a common cabinet 2. Dishwashers in which the washing compartments 10, 20 are configured as drawers are generally known as drawer-type dishwashers. Each washing compartment 10, 20 having a washing tub 11, 21 for receiving objects that are to be washed.

[0024] A washing operation is performed in the washing compartments 10, 20, in order to clean the dishes in the washing tub 11, 21. A washing operation comprises several procedures and begins with a water intake procedure. The dishes are cleaned during a washing procedure. The water that is used to wash the dishes in the washing procedure is heated during a heating procedure. A drain procedure is activated for discharging water from the washing tub 11, 21 and a drying procedure is activated for drying the cleaned dishes.

[0025] This disclosure deals with the drain procedure for discharging water from the washing tub 11, 21.

[0026] In the embodiment described below the first washing compartment 10 is substantially equal to, and comprises substantially the same components as, the second washing compartment 20. Configurations with three or several washing compartments are also possible.

[0027] Each washing compartment 10, 20 has two substantially opposite side walls, a front part, a rear part and a bottom part. The washing tub 11, 21 is arranged inside the washing compartment 10, 20. Two substantially opposite side walls, a front portion, a rear portion 11 a, 21 a and a bottom part 11 b, 21 b define the washing tub 11, 21.

[0028] In one embodiment of the invention each washing compartment 10, 20 and its corresponding washing tub 11, 21 are arranged as one unit.

[0029] Each washing compartment 10, 20 further having a water outlet system 12, 22, for leading water out of its corresponding washing tub 11, 21 to a wastewater system arranged outside the washing compartment 10, 20, such as a domestic wastewater system.

[0030] The water outlet system 12, 22 comprises a

sump 121, 221, a water outlet 122, 222, a drain pump 123, 223, an inner hose 124, 224, a valve 125, 225 having a inlet part 125a, 225a and an outlet part 125b, 225b. A valve disc (not shown) is arranged close to the inlet part 125a, 225a of the valve 125, 225. A clack valve (not shown) is arranged close to the outlet part 125b, 225b of the valve 125, 225. The water outlet system 12, 22 further comprises an outer hose 126, 226.

[0031] A filter portion is provided in the bottom part 11 b, 21 b of the washing tub 11, 21. The filter portion is positioned above the sump 121, 221, which is formed in the bottom part 11 b, 21 b of the washing tub, such that the filter portion separates the sump from an upper dish receiving part of the washing tub 11, 21.

[0032] The water outlet 122, 222 can for example consist of a piece of hose made from rubber, like silicone rubber, or plastic, or be composed of a pipe moulded in rigid plastic or other for the purpose suitable materials. The water outlet 122, 222 is partly arranged inside, in the bottom of, the sump 121, 221 for leading the water from the sump 121, 221 towards the drain pump 123, 223.

[0033] The drain pump 123, 223 is arranged in a recess 11c, 21c in the rear part of the washing compartment 10, 20 and against the rear portion 11 b, 21 b of the washing tub 11, 21, see fig 2 and 3a. Different drain pumps of conventional kind can be used. A quite small, but effective enough for its purpose, drain pump 123, 223 is with advantage used in the system for space saving reasons. The drain pump 123, 223 pumps the water coming from the washing tub 11, 21 via the inner hose 124, 224 up towards the valve 125, 225 and through the body of the valve 125, 225. The inner hose 124, 224 is attached to the inlet part 125a, 225a of the valve 125, 225 and the outer hose 126, 226 is attached to the outlet part 125b, 225b of the valve 125, 225. At least one of the valves 125, 225 of the first and second washing compartments 10, 20 is arranged on a higher level than the corresponding drain pump 123, 223, with advantage both the valves 125, 225. The valves 125, 225 are arranged at a higher level than the corresponding drain pump 123, 223 is order to prevent self-discharging of the washing tub 11, 21. Problems with self-discharging may arise when the washing compartment 10, 20 is placed at a higher level than the wastewater system. The valve disc (not shown) is arranged inside the valve body 125, 225 in order to make it possible to ventilate the drainpump 123, 223 and thereby prevent problems due to air bubbles in the drain pump 123, 223. During the water intake procedure water ends up in the sump 121, 221 and the water pressure presses the water towards the drain pump. Due to the valve the air that would have ended up in the drain pump 123, 223 passes through the pump and is ventilated via the valve 125, 225. The drain pump 123, 223 is thereby filled only with water before the drainage procedure starts. During the drainage procedure water passes via the valve disc (not shown), the clack valve (not shown) and out through the outer hose 126, 226.

[0034] The clack valve can for example consist of a "strip" of silicone rubber arranged inside a hose and is partly arranged for preventing that waste water coming from the drain pump 123, 223 to flow back to the washing tub 11, 21. If, for example, a washing operation only is activated in the first washing compartment 10 a high water pressure arises in the common hose 41 and the wastewater from the washing tub 11 of the first washing compartment 10 is partly pressed towards the wastewater system and partly towards the second washing compartment 20, via the outer hose 226 due to high water pressure in the outer hose 126 of the first washing compartment 10 and thereby also the hoses 126, 41. The main purpose of the clack valve is therefore to prevent wastewater from the first washing tub 11 to end up in the second washing tub 21 or vice versa.

[0035] In each of the first 10 and second 20 washing compartments is the corresponding water outlet 12, 22 arranged substaintially upstreams of the drain pump 123, 223 and the valve 125, 225 is arranged substantially downstreams of the drain pump 123, 223.

[0036] Both the inner hose 126 coming from the first washing compartment 10 and the outer hose 226 coming from the second washing compartment 20 assemble in a branch pipe 40, and from there a common hose 41 leads the water from both washing tubs 11, 21 to a wastewater system arranged outside the washing compartment 10, 20, such as a domestic wastewater system. The water can also be led to a washing-up sink or a floor drain. The inner hose 124, 224 the outer hose 126, 226 and the common hose are with advantage of equal dimensions.

[0037] In accordance with the present invention, the dishwasher 1 includes a control unit 30, see fig 1, which is operatively connected to the two washing compartments 10, 20. The control unit 30 controls the course of the washing operations in the washing compartments 10, 20, as well as the different procedures performed during a washing operation. The control unit 30 is arranged for controlling the water outlet system 12 of the first washing compartment 10, and the water outlet system 22 of the second washing compartment 20; such that at any given instant, at the most one water outlet system 12, 22 is leading water out of its corresponding washing tub 10, 20.

[0038] The control unit 30 comprises a first sub control unit 31 for controlling the water outlet system 12 of the first washing compartment 10. A communication link 31 a is arranged between the sub control unit 31 and the water outlet system 12 for enabling communication between the sub control units 31 and the water outlet system 12.

[0039] The control unit 30 further comprises a second sub control unit 32 for controlling the water outlet system 22 of the second washing compartment 20. A communication link 32a is arranged between the sub control unit 32 and the water outlet system 22 for enabling communication between the sub control unit 32 and the water outlet system 22.

[0040] For enabling communication between the sub

control units 31, 32, which communication allows mutual adaptation of the washing operations of the different washing compartments 10, 20, there is a communication link 33 between the sub control units 31, 32. The communication link can take various forms, such as a wire line link or a wireless link.

[0041] This disclosure deals with the way the control unit 30 controls the water outlet procedures of the different washing compartments 10, 20 in a multi-compartment dishwasher 1. The control unit 30 is arranged to control the drainpumps 121,221 such that at any given instant, at the most one drain pump 121, 221 is pumping out water from its corresponding washing tub 11, 21.

[0042] When water needs to be led out from the washing tub 11, 21, during a washing operation and when a washing operation is ready, the water outlet system 12, 22 asks its corresponding sub contol unit 31, 32 if the drain pump 123, 223 can start pumping water. If, for example, the washing operation running in the first washing compartment 10 needs to start the drain pump 123, a signal is sent to the first sub control unit 31 via the communication link 31 a. The first sub control unit 31 in turn sends a signal to the second sub control unit 32 via the communication link 33 asking if the drain pump 123 of the first washing compartment 10 can start pumping. The second sub control unit 32 sends a signal via the communication link 32a asking the water outlet system 22 of the second washing compartment 20, if the drain pump 223 of the second washing compartment 20 is pumping. The water outlet system sends a yes (one) or a no (zero) back to the second sub control unit 32. The second sub control unit in turn sends a yes or a no back to the first sub control unit 31. If it is a "yes/one" the drain pump 123 has to wait and ask again after a predeterminated time. If it is a "no/zero" the drain pump 123 can start pumping water out of the first washing compartment 10.

[0043] Water from the first washing compartment 10 is guided via the corresponding inner hose 124 and water from the second washing compartment 20 is guided via the corresponding inner hose 226. The first and the second hose assemble in a common hose leading water out to a wastewater system, such as a domestic wastewater system.

[0044] The dishwasher 1 according to the present invention can with advantage be a drawer dishwasher.

[0045] The present invention involves a method for letting water out of a multi-compartment dishwasher, which method comprises the step of: controlling the water outlet systems 12, 22, such that at any given instant, at the most one water outlet 122, 222 is leading water out of its corresponding washing tub 10, 20.

[0046] In the drawings and specification, there have been disclosed preferred embodiments and examples of the invention and, although specific terms are employed, thay are used in a generic and descriptive sense only and not for the purpose of limitation, the scope of the invention being seth forthin the following claims.

Claims

1. A dishwasher comprising:

a first washing compartment (10), having a washing tub (11) for receiving objects that are to be washed, and a water outlet system (12), for leading water out of the washing tub (11) to a wastewater system arranged outside the first washing compartment (10), such as a domestic wastewater system;
a second washing compartment (20), having a washing tub (21) for receiving objects that are to be washed, and a water outlet system (22), for leading water out of the washing tub (21) to a wastewater system arranged outside the second washing compartment (20), such as a domestic wastewater system;

characterized in that a control unit (30) is operatively associated with the first washing compartment (10) and the second washing compartment (20), the control unit (30) being arranged for controlling the water outlet system (12) of the first washing compartment (10), and the water outlet system (22) of the second washing compartment (20); such that at any given instant, at the most one water outlet system (12, 22) is leading water out of its corresponding washing tub (11, 21).

2. The dishwasher as claimed in claim 1, wherein the control unit (30) comprises a first sub control unit (31) for controlling the water outlet system (12) of the first washing compartment (10), and a second sub control unit (32) for controlling the water outlet system (22) of the second washing compartment (20), and a communication link (33) between the sub control units (31, 32) for enabling communication between the sub control units (31, 32).

3. The dishwasher as claimed in claim 1 or 2, wherein the water outlet system (12) of the first washing compartment (10) comprises a drain pump (123) for pumping out water from the washing tub (11) of the first washing compartment (10), and
the water outlet system (22) of the second washing compartment (20) comprises a drain pump (223) for pumping out water from the washing tub (21) of the second washing compartment (20), and wherein
the control unit (30) is arranged to control the drainpumps (123, 223), such that at any given instant, at the most one drain pump (123, 223) is pumping out water from its corresponding washing tub (11, 21).

4. The dishwasher as claimed in claim 3, wherein;
the water outlet system (12) of the first washing compartment (10) comprises a valve (125), receiving water from the drain pump (123), for preventing air to

enter the drain pump (123) and wherein;
the water outlet system (22) of the second washing compartment (20) comprises a valve (225), receiving water from the drain pump (223), for preventing air to enter the drain pump (223).

5. The dishwasher as claimed in claim 1-4, wherein at least one part of a hose (124, 224), connecting the water outlet system (12, 22) of the first (10) and second (20) washing compartments with a wastewater system, such as a domestic wastewater system, is arranged on a higher level than the corresponding water outlet system (12, 22), for preventing self-discharging of the corresponding washing tubs (11, 21).

6. The dishwasher as claimed in any one of the preceding claims, wherein at least one part of a hose (126, 226) is arranged as a coil on a rear side of the drawer.

7. The dishwasher as claimed in any one of the preceding claims, wherein the dishwasher (1) is a drawer dishwasher.

8. Method for letting water out of a multi-compartment dishwasher, which dishwasher (1) has:

a first washing compartment (10), having a washing tub (11) for receiving objects that are to be washed, and a water outlet system (12) for leading water out of the washing tub (11) to a wastewater system arranged outside the first washing compartment (10), such as a domestic wastewater system;
a second washing compartment (20), having a washing tub (21) for receiving objects that are to be washed, and a water outlet system (22) for leading water out of the washing tub (21) to a wastewater system arranged outside the first washing compartment (20), such as a domestic wastewater system;
the method comprising the step of:

controlling the water outlet systems (12, 22) of the first (10) and the second (20) washing compartment, such that at any given instant, at the most one water outlet (122, 222) is leading water out of its corresponding washing tub (10, 20).

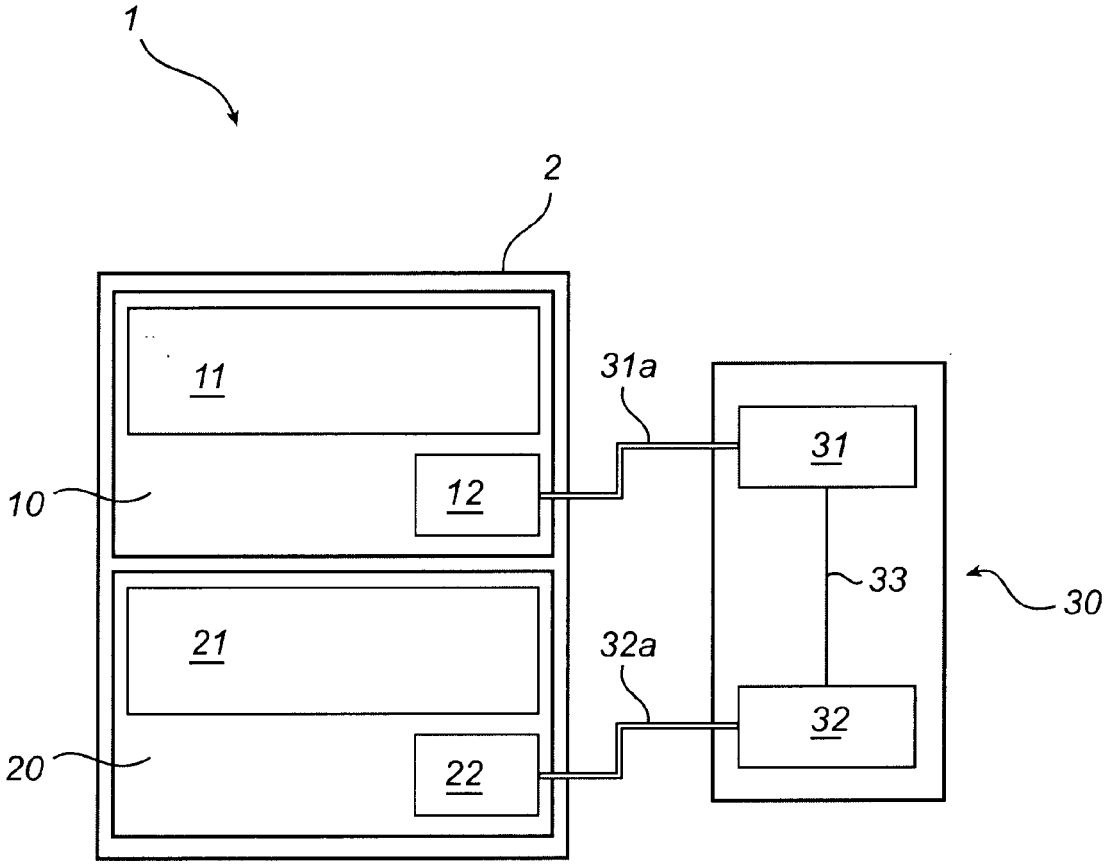

Fig. 1

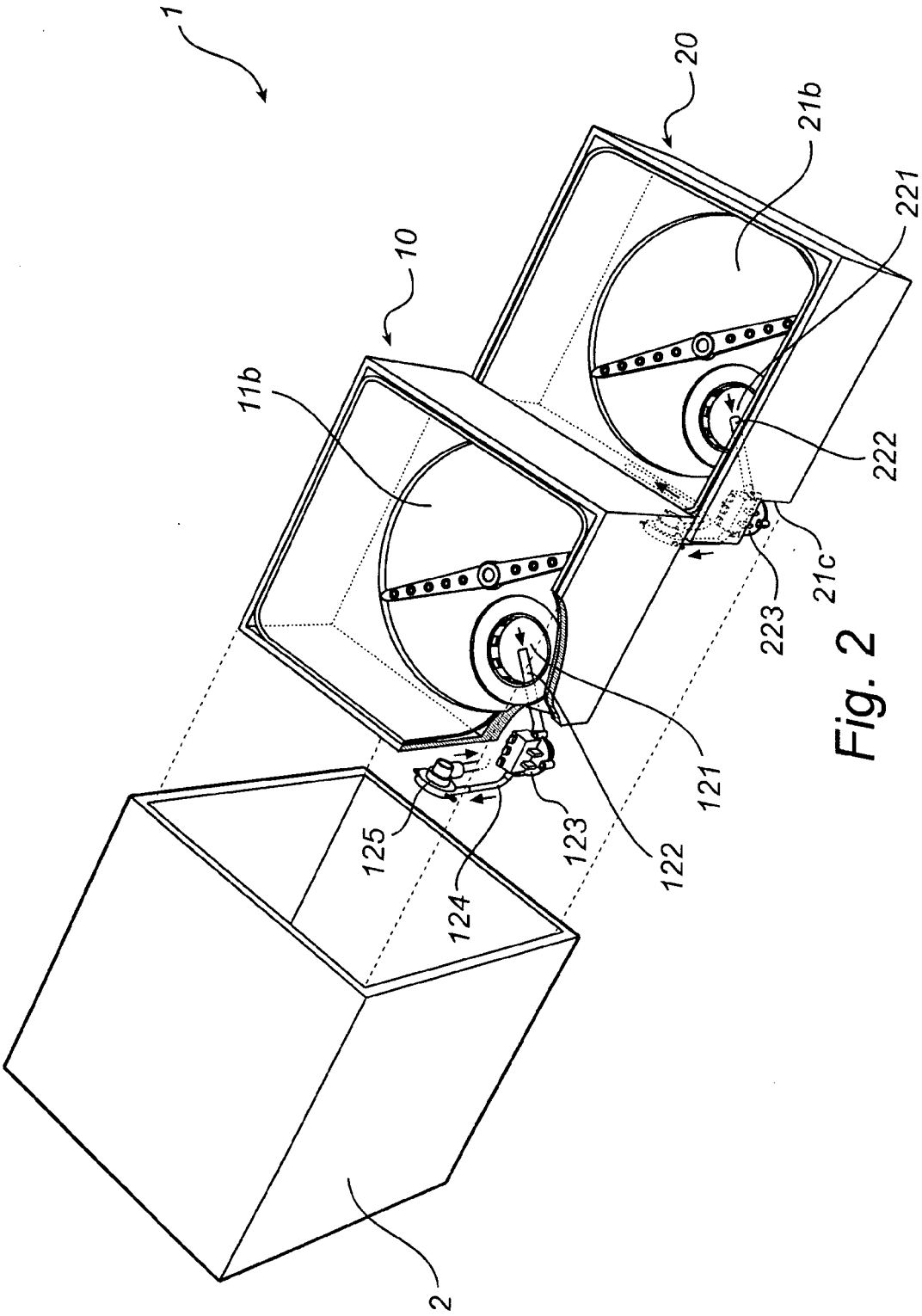

Fig. 2

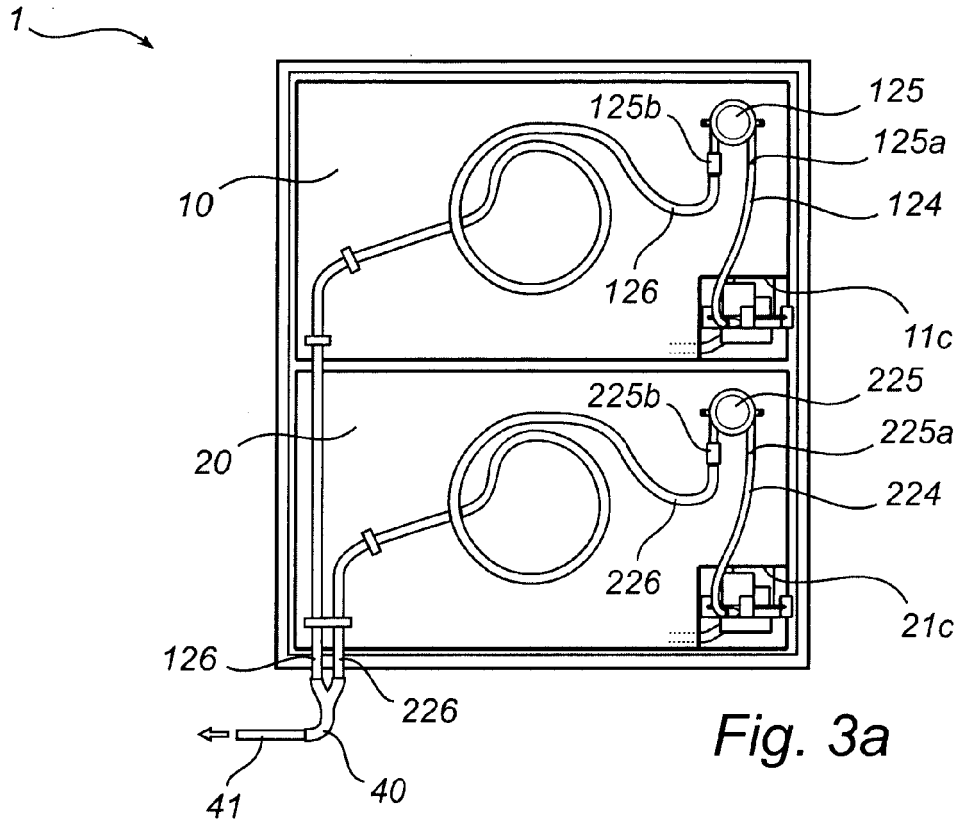
1
125
125b
125a
10
124
126
11c
225
225b
225a
20
224
226
21c
126
226
41
40

Fig. 3a

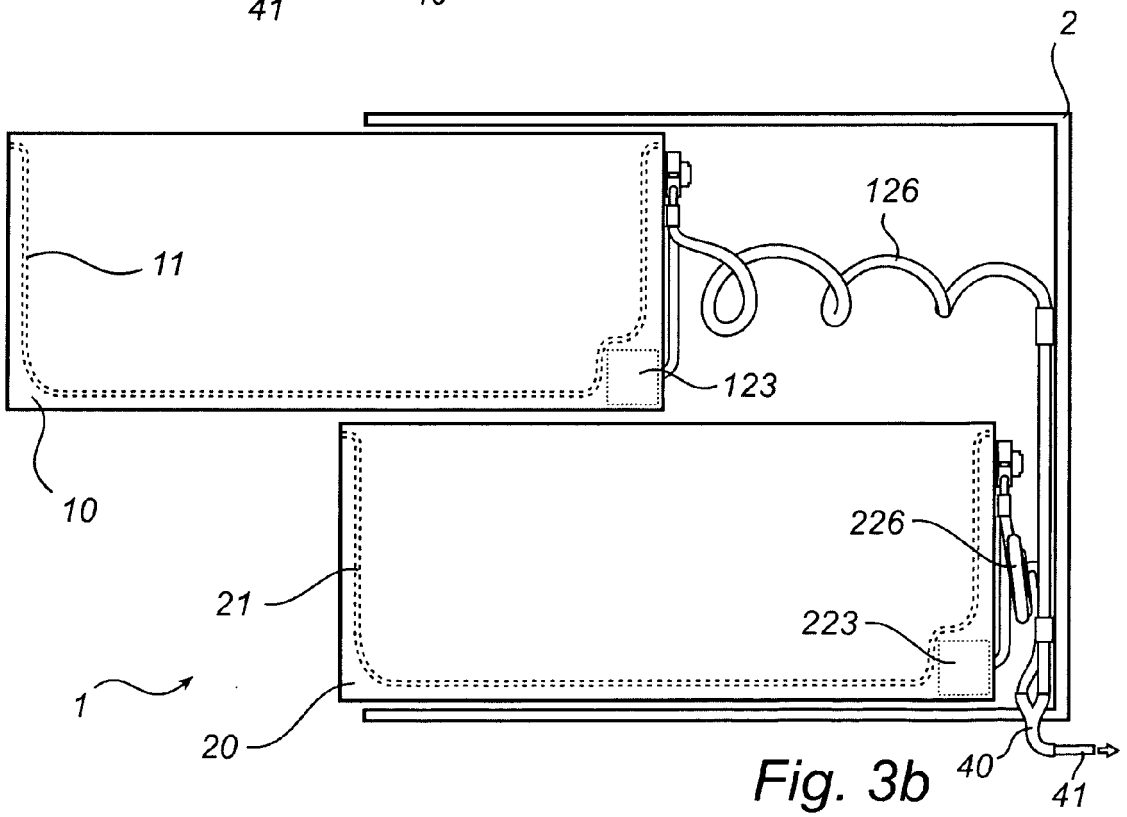
2
126
11
123
10
226
21
223
1
20
40
41

Fig. 3b

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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 9999

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 Y	US 3 288 154 A (JACOBS JAMES W) 29 November 1966 (1966-11-29) * column 1, line 9 - line 11 * * column 1, line 33 - line 41 * * column 4, line 73 - column 7, line 14 * * figures 1-3,8,9 *	1,8 2-7	INV. A47L15/42
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 November 2008	Redelsperger, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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