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(54) **DISHWASHER WITH DIVERTER MEANS CONTROLLABLE WITHOUT FEEDBACK AND METHOD FOR OPERATING A DISHWASHER WITH A DIVERTER MEANS CONTROLLED WITHOUT FEEDBACK**

nection (15a) fluid is outputted via the first outlet (5) and wherein according to another fluid connection (15b) fluid is outputted via the second outlet (6), and a control unit (10) for selecting a fluid connection (15a, 15b), wherein the control unit (10) operates the diverter means (13) in dependency of an established fluid connection (15a) to set up a selected fluid connection (15b). The established fluid connection (15a) is hereby identified in dependency of an operation parameter of the pump unit (12).



Description

[0001] The present invention refers to a dishwasher according to claim 1 and to a method according to claim 11.

Background of the Invention

[0002] Some of the known dishwashers, especially high-end ones, are capable to use half capacity for small number of dishes to use less water and energy. For this purpose, they only send water to one of the rack (basket) spray arm. The main part used for this purpose is a diverter, which consists of a turning wheel with two holes (or more) and markers on this wheel.

[0003] Current control mechanisms of diverters are complex. First of all, when the system starts the initial position is not known. So, the diverter automatically starts to turn. On the other hand, a switch (or similar) is reading the markings of the wheel, which is different than other and the sizes are defined in datasheet. As a result, MCU need to read markings to get exact diverter position it is also necessary to have such an initial turn to get the position data.

[0004] Document US20120125382A discloses a dishwasher that comprises a tub defining a wash chamber and having an open face providing access to the wash chamber, a door selectively closing the open face, at least one dish rack located within the wash chamber, at least one sprayer located within the wash chamber, at least one nozzle having at least one aperture located in the wash chamber beneath the at least one dish rack, a liquid supply providing liquid to the at least one sprayer and the at least one nozzle, and a diverter valve selectively fluidly coupling the liquid supply to the at least one sprayer and the at least one nozzle, wherein actuation of the diverter valve controls the supply of liquid from the liquid supply to one of the at least one sprayer and the at least one nozzle.

[0005] Document US20070119488A discloses a dish washer which includes a disc type passage control valve formed to have a simple disc structure, thereby being capable of smoothly supplying wash water to a washing arm. The dish washer includes an upper washing arm, a lower washing arm, a sump for receiving wash water, a washing pump for pumping the wash water, and a passage control valve including a passage opening/closing plate having a plate or disc shape and functioning to open/close a passage guiding the wash water to the upper washing arm or to the lower washing arm.

[0006] Document US20040173245A describes a dishwasher, which comprises a tub having bottom, opposing side, rear and top walls which collectively define a washing chamber adapted to receive and cleanse soiled kitchenware; at least one wash arm for spraying washing fluid onto kitchenware placed into the washing chamber; a pumping unit, including a motor, for directing washing fluid to the at least one wash arm; a filter chamber, adapted to receive a portion of the washing fluid, for entrapping soil from the washing fluid while permitting cleansed washing fluid to be directed back into the washing chamber; a drain exposed to the filter chamber; an overflow tube leading upwardly from the filter chamber such that washing fluid can rise within the overflow tube upon collection of soil in the filter chamber; a sensor for signaling a presence of washing fluid in the overflow tube; and a controller, linked to the sensor, for initiating a drain operation for the dishwasher.

[0007] Document US7350527B2 discloses a filter system for a dishwasher having a floor, a wash pump and a drain pump, the filter system comprising: a sump in the floor having a sidewall and a bottom wall having an inlet leading to the wash pump and an inlet leading to the drain pump; a filter assembly positioned in the sump including: a generally vertical filter retainer and an overlying perforate hood; a multiple porosity filter element carried on the filter retainer; and a back wash sprayer connected to the wash pump and rotatable mounted inside the filter retainer and having at least one nozzle directed toward the filter element; and a dishwasher control, and a pressure sensor positioned on the sidewall of the sump to detect accumulation of soil particles on the filter element and connected to the dishwasher control and arranged to activate the drain pump to remove soil particles from the sump when a predetermined accumulation of soil particles is detected, the sensor being arranged to detect that the back wash sprayer is rotating and the dishwasher control is arranged to provide a check filter signal to the user when the sensor fails to detect back wash sprayer rotation; wherein the inlet leading to the wash pump is positioned inside the filter assembly and the inlet leading to the drain pump is positioned outside the filter assembly.

[0008] Document US2015265128A discloses a method and a device for, detecting clogging of a dishwasher filter. The device is arranged to drain the dishwasher on process water, measure operating current of a motor driving a dishwasher drain pump and determine whether the dishwasher filter is clogged based on the measured drain pump motor operating current.

[0009] Document US20060219262A discloses a control device and method for detecting and controlling a water fill level in a dishwasher or other similar appliance that includes a pump motor. The control monitors the pump motor current over time, determines a current change, and compares the current change to a threshold current change that is indicative of the water level.

[0010] Document US7776159A1 discloses a control system for controlling a fill operation of a dishwasher having a pump and a pump motor driving the pump, and the dishwasher having a valve for controlling the flow of water to the

dishwasher includes a monitoring device configured to be coupled to at least one of the pump and the pump motor. The monitoring device generates an output relating to at least one of an operating current and a speed of the pump motor. The control system also includes a controller configured to be operatively coupled to the valve, wherein the controller receives the output and is configured to operate the valve based on the output. The output relates to a fill condition of the dishwasher.

[0011] Thus, the prior art dishwashers are not able to control a diverter mechanism without feedback.

Object of the Invention

[0012] Therefore, it is the object of the present invention to provide an improved dishwasher, in particular a dishwasher that controls a diverter mechanism in a beneficial manner.

Description of the Invention

[0013] The before mentioned object is solved by a dishwasher according to claim 1. The dishwasher according to the invention comprises preferably at least a receiving space for receiving goods, in particular dishes, to be cleaned, a first fluid outlet and a second fluid outlet for subjecting a fluid to different sections within the receiving space, a pump unit for pumping the fluid from a fluid source to at least one of said outlets, a diverter means for setting up multiple fluid connections between the outlets and the pump unit, wherein according to one fluid connection fluid is outputted via the first outlet and wherein according to another fluid connection fluid is outputted via the second outlet, and a control unit for selecting a fluid connection, wherein the control unit operates the diverter means in dependency of an established fluid connection to set up the selected fluid connection. The established fluid connection is thereby identified in dependency of an operation parameter of the pump unit.

[0014] This solution is beneficial since the diverter means respectively the overall diverter assembly has no feedback output. MCU reads the water pump currents. In initial position MCU starts to pump unit and the pump unit pumps water to diverter.

[0015] According to the present invention the position of the turning wheel is thus preferably estimated by measuring current drawn from water pump, which turns preferably in only one direction.

[0016] Since the required power differs in case a defined amount of fluid, in particular a liquid, in particular at least containing water, is pumped through a short pipe or through a long pipe or if the average diameter of the pipe is small or large, it can be understood that the necessary power for conducting a fluid from a pump unit to different outlets differs at least due to at least one of said pipe settings. Thus, the pump unit requires different degrees of current in such cases. In case a specific current is measured it can thus be derived from that data, which fluid flow passage is set up by the diverter means. Thus, the position or state or setting of the diverter means can be directly derived from the current consumption of the pump unit. Further feedback routines are therefore not necessary.

[0017] Further preferred embodiments are described with respect to the dependent claims and/or in the following parts of the description.

[0018] According to a preferred embodiment of the present invention the operation parameter is the actual current with which the pump unit is operated. Alternatively, or additionally the operation parameter can be the noise of the pump unit and/or vibrations of the pump unit. This embodiment is beneficial since such parameters are depending on the actual state of operation of the pump unit and are therefore giving a representative information about how the fluid is directed inside the dishwasher.

[0019] The diverting means comprises according to a further preferred embodiment of the present invention an actuator means for mechanically opening or closing of fluid connections between the outlets and the pump unit, wherein at least three differently configured fluid connections can be opened or closed by the actuator means, wherein a first fluid connection connects the first outlet and the pump unit, wherein a second fluid connection connects the second outlet and the pump unit and wherein a third fluid connection connects the first outlet and the second outlet with the pump unit. The first outlet is hereby preferably connected to an upper spray means and the second outlet is hereby preferably connected to a lower spray means, wherein the upper spray means is preferably arranged above, in particular in vertical direction, in particular coaxial, above the lower spray means inside the receiving room, wherein the pump unit is caused to be operated with a first current in case the first fluid connection is selected or wherein the pump unit is caused to be operated with a second current in case the second fluid connection is selected or wherein the pump unit is caused to be operated with a third current in case the third fluid connection is selected, wherein the first current and the second current and the third current differ from each other. The third current is hereby preferably smaller than the first current and/or the second current.

[0020] The diverter means comprises according to a further preferred embodiment of the present invention a turning wheel, wherein the turning wheel has multiple openings, in particular holes, for establishing the fluid connections and wherein the turning wheel can be actuated by the actuator means. The turning wheel has at least two openings and

preferably three or at least three openings or four or at least four openings. This embodiment is beneficial since such a diverter means causes less complexity compared with an actuated valve device. It is also easy to actuate and easy to control (due to the present invention). The actuator means can be an electric motor.

[0021] A measurement means for measuring the operation parameter, in particular the current consumption, during operation of the pump unit is provided according to a further preferred embodiment of the present invention. The measurement means preferably outputs signals or data representing the operation parameter, in particular the current consumption, of the pump unit.

[0022] The inventive dishwasher comprises according to a further preferred embodiment of the present invention more than two outlets and more than three different fluid connections. The outlets are preferably arranged in such a manner that different areas within the receiving space can be subjected with fluid. It is alternatively possible that the same area within the receiving space can be subjected via the openings in different, in particular opposing, directions. Particular preferably multiple receiving baskets, that can be arranged on different levels within the receiving space, are provided. Preferably each basket can be subjected with fluid via one, in particular dedicated, opening.

[0023] The pump unit preferably comprises a pump element and a pump actuator element, wherein the operation parameter represents an operation parameter of the pump actuator element. The pump actuator element is preferably a motor, in particular an electric, pneumatic or hydraulic motor.

[0024] According to a further preferred embodiment of the present invention a selection means for selecting a specific washing routine out of multiple washing routines by a user is provided. The multiple washing routines are preferably stored in a data memory and executable by the control unit, wherein at least two washing routines differ with respect to the routing of the fluid. The control unit preferably operates the diverter means in dependency of a routine selected by the selection means. This embodiment is beneficial, since different routines can be applied. One routine might be applied in case goods, in particular dishes, to be cleaned are arranged in a specific section or area within the dishwasher. In this case the diverter means can be set to conduct fluid to the respective area, thus energy and water can be saved.

[0025] The before mentioned object is also solved by a method according to claim 11 for operating a dishwasher. The inventive method preferably comprises at least the steps: Measuring of at least one parameter of a pump unit during operation of that pump unit and operating a diverter means for establishing of a predefined fluid connection between the pump unit and at least one of several outlets out of multiple fluid connections in dependency of the measured parameter. This method is beneficial since no feedback loop between the diverter means and the pump unit is required, thus the desired setting can be set up much faster compared to the solutions known from the art.

[0026] According to a further preferred embodiment of the present invention the operation parameter is measured, in particularly constantly or sequentially measured, by a measurement means during operation of the dishwasher. The measurement means preferably outputs signals or data representing the operation parameter, wherein the signals or data are directed to a control unit, wherein the control unit controls the diverter means, in particular at least or timewise or partly, in dependency of the signals or data outputted by the measurement means.

[0027] An actuator element of the diverter means is preferably operated by the control unit in dependency of a selection command, in particular a routine, stored in a memory or a manually inputted command, and in dependency of the measured parameter, wherein the measured parameter is preferably represented by a value, wherein said value differs between a starting value that represents the initially established fluid connection and a target value that represents the selected fluid connection, wherein the actuator element is operated until the target value is measured.

[0028] The control unit preferably determines data about the selected fluid connection in dependency of the measured parameter of the pump unit. Additionally, or as a next step the control unit preferably causes the diverter means to establish different fluid connections in a row, wherein the control unit, in particularly constantly, identifies the presently established fluid connection by an evaluation of the present pump unit parameter.

[0029] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which components of the invention are exemplarily illustrated. Components of the systems and methods according to the inventions, which match at least essentially with respect to their function can be marked with the same reference sign, wherein such components do not have to be marked or described in all figures.

[0030] In the following the invention is just exemplarily described with respect to the attached figures.

Brief Description of the Drawings

[0031]

Fig. 1 shows a schematic illustration of a dishwasher according to the present invention and

Fig. 2 shows a schematic illustration of a diverter means and a schematic illustration of the turning wheel of the diverter means.

[0032] Fig. 1 shows a dishwasher 1. The inventive dishwasher 1 comprises at least a control means 10 and a motor driver respectively actuation means 11 for powering a pump element and a diverter means 13. It can be alternatively understood that the pump element and the actuation means 11 are forming the pump unit 12. A measurement means 25 for measuring of at least one operation parameter of the pump unit 12 is preferably arranged between the pump element and the actuation means 11 or at the pump element. The measurement means 25 preferably measures the current consumption of the pump element during operation of the pump element. A signal or data representing the measured current is generated by the measurement means 25. Said signal or data is then preferably transferred along connection 19 as feedback to control unit 10. The pump element feeds fluid, in particular water or a liquid containing water, from a source 7 via a diverter means 13 and via outlets 5 and/or 6 to a receiving space 2. Reference number 14a indicates a fluid connection between the source 7 and the pipe unit 12 and reference number 14b indicates a fluid connection between the pump unit 12 and the diverter means 13.

[0033] Thus, the measurement means 25 outputs data or signals representing the measured parameter, wherein the data or signals are routed to the control means 10. The control means 10 analyzes or evaluates or handles the received data or signals in a predefined manner. The actuation means 11 is actuated or controlled in dependency of the analyzed or evaluated or handled data or signals. The actuation means 11 preferably provides electric energy to actuate an actuator element 21. The electric energy is preferably transmitted via connection 17.

[0034] The diverter means 13 is designed to set up multiple different fluid conducting paths 15a, 15b, 15a-15b. One fluid conducting path 15a connects the pump unit 12 with the first respectively upper outlet 5 and another fluid connection path 15b connects the pump unit 12 with the second respectively lower outlet 6. One, some or all outlets 5, 6 can be coupled to spray arm means 16a, 16b, for subjecting the fluid, in particular in a rotation movement, onto the goods to be cleaned. The goods 4 to be cleaned can be pre-held in one or multiple, in particular at least or exactly 2, 3, 4, 5 or more, baskets 3.

[0035] Preferably at least three differently configured fluid connections can be opened or closed by the actuator means 21. A first fluid connection 15a hereby connects the first outlet 5 and the pump unit 12. A spray arm means 16a can be attached to said first outlet 5. A second fluid connection 15b preferably connects the second outlet 6 and the pump unit 12. A second spray arm means 16b can be attached to the second outlet 6. The spray arm means 16a, 16b are preferably rotatable arranged within the receiving space 2. A third fluid connection 15a-15b is preferably set up by a connection between the first outlet 5 and the second outlet 6 with the pump unit 12. Each fluid connection 15a, 15b, 15a-15b preferably results from a specific arrangement or orientation or actuation of the diverter means 13.

[0036] In case a fluid connection 15a, 15b, 15a-15b is set up by the diverter means 13 and in case the pump unit 12 is operated the operation parameter, in particular current consumption, can be measured by the measurement means 25. Since the operation parameter of the pump unit 12 varies in dependency of the set up fluid connection each fluid connection can be identified by the respective operation parameter of the pump unit 12. Thus, in case the pump unit 12 is activated the position or setting of the diverter means 13 can be derived from the operation parameter of the pump unit 12. Thus, the diverter means 13 can be actuated to form a specific further setting without the need of a calibration step. In case the diverter means 13 is designed as turn wheel, the turn wheel can be turned in particular in one direction until the value of the measured operation parameter fits to the value that represents the desired fluid conduction path 15a, 15b, 15a-15b. Thus, the MCU / mainboard or control unit 10 start to read current drawn from the pump. In the shown case different quantized current levels can occur. E.g. in case the fluid connection path comprises both fluid connection paths 15a and 15b, the pump unit 12 is operated with the lowest current, since the resistance of the fluid connection path is lowest. In case the upper fluid path 15a is closed and the lower fluid path 15b is opened the pump unit 12 is operated with a mid-level current. Further, in case the upper fluid connection path 15a is opened and the lower fluid connection path 15b is closed the pump unit 12 is operated with the highest current level. With continues reading of currents, MCU 10 will keep exact diverter means 13 position.

[0037] If the user wants to change cleaning mode or only one basket 3 will be used for any reason for dishwashing, the diverter means 13 is energized and diverter disc 22 changes its position when a new position is set, MCU/Mainboard 10 understands the position by just measuring currents according to the before mentioned limitations.

[0038] Fig. 2 shows on the left side a diverter means 13 having a diverter enclosure 20 and at least two fluid connection path 15a, 15b attached to it.

[0039] Fig. 2 further shows on the right side a turning wheel 22 respectively a diverter selection disc that is preferably arranged underneath the diverter enclosure 20. The turning wheel 22 comprises multiple holes that can be selectively arranged by turning, in particular by means of a diverter motor respectively diverter actuator element 21, to enable fluid conduction through one or more of the selected fluid paths 15a, 15b, 15a-15b.

[0040] Most of dishwashers 1 have two spray arms 16a, 16b so that all examples are given that way but it is also possible more than two arm assembly.

[0041] Thus, the present invention refers to a dishwasher 1. The dishwasher according to the present invention comprises at least a receiving space 2 for receiving goods 4 to be cleaned, a first fluid outlet 5 and a second fluid outlet 6 for subjecting a fluid to different sections within the receiving space 2, a pump unit 12 for pumping the fluid from a fluid

source 7 to at least one of said outlets 5, 6, a diverter means 13 for setting up multiple fluid connections 15a, 15b between the outlets 5, 6 and the pump unit 12, wherein according to one fluid connection 15a fluid is outputted via the first outlet 5 and wherein according to another fluid connection 15b fluid is outputted via the second outlet 6, and a control unit 10 for selecting a fluid connection 15a, 15b, wherein the control unit 10 operates the diverter means 13 in dependency of an established fluid connection 15a to set up a selected fluid connection 15b. The established fluid connection 15a is hereby identified in dependency of an operation parameter of the pump unit 12.

Reference numbers

1	Dishwasher	16a	Upper spray arm (upper basket)
2	Receiving space	16b	Lower spray arm (lower basket)
3	Basket	17	Control and energy for diverter actuator element or diverter disc turning motor (21)
4	Goods	18	Control and energy for pump means
5	First fluid outlet		
6	second fluid outlet	19	Current measurement feedback
7	fluid source	20	Diverter enclosure
10	control unit or mainboard or MCU	21	Diverter motor or diverter actuator element
11	actuator element or motor driver	22	Diverter selection disc or turning wheel
12	pump unit	23	first opening
13	Diverter means	24	second opening
14a	Water in to pump	25	measurement means
14b	Water in to diverter		
15a	Water to upper spray arm (upper basket)		
15b	Water to lower spray arm (lower basket)		

Claims

1. Dishwasher (1),
at least comprising
a receiving space (2) for receiving goods (4) to be cleaned,
a first fluid outlet (5) and a second fluid outlet (6) for subjecting a fluid to different sections within the receiving space (2),
a pump unit (12) for pumping the fluid from a fluid source (7) to at least one of said outlets (5, 6),
a diverter means (13) for setting up multiple fluid connections (15a, 15b) between the outlets (5, 6) and the pump unit (12), wherein according to one fluid connection (15a) fluid is outputted via the first outlet (5) and wherein according to another fluid connection (15b) fluid is outputted via the second outlet (6), and
a control unit (10) for selecting a fluid connection (15a, 15b), wherein the control unit (10) operates the diverter means (13) in dependency of an established fluid connection (15a) to set up a selected fluid connection (15b),
characterized in that
the established fluid connection (15a) is identified in dependency of an operation parameter of the pump unit (12).
2. Dishwasher according to claim 1,
characterized in that
the operation parameter is the actual current with which the pump unit (12) is operated.
3. Dishwasher according to claim 1 or claim 2,
characterized in that
the diverting means (13) comprises an actuator means (21) for mechanically opening or closing of fluid connections (15a, 15b, 15a-15b) between the outlets (5, 6) and the pump unit (12),
wherein at least three differently configured fluid connections can be opened or closed by the actuator means (21),
wherein a first fluid connection (15a) connects the first outlet (5) and the pump unit (12),
wherein a second fluid connection (15b) connects the second outlet (6) and the pump unit (12) and

wherein a third fluid connection (15a-15b) connects the first outlet (5) and the second outlet (6) with the pump unit (12).

4. Dishwasher according to claim 3,

characterized in that

the first outlet (5) is connected to an upper spray means (16a) and the second outlet (6) is connected to a lower spray means (16b), wherein the upper spray means (16a) is arranged above the lower spray means (16b) inside the receiving space (2), wherein the pump unit (12) is caused to be operate with a first current in case the first fluid connection (15a) is selected or

wherein the pump unit (12) is caused to be operate with a second current in case the second fluid connection (15b) is selected or

wherein the pump unit (12) is caused to be operate with a third current in case the third fluid connection (15a-15b) is selected,

wherein the first current and the second current and the third current differ from each other.

5. Dishwasher according to claim 4,

characterized in that

the third current is smaller than the first current and the second current.

6. Dishwasher according to claims 3 to 5,

characterized in that,

the diverter means (13) comprises a turning wheel (22),

wherein the turning wheel (22) has multiple openings (23, 24, 25) for establishing the fluid connections (15a, 15b, 15a-15b) and

wherein the turning wheel (22) can be actuated by the actuator element.

7. Dishwasher according to any of the preceding claims,

characterized in that

a current measurement means (25) for measuring the current consumption during operation of the pump unit (12) is provided,

wherein the current measurement means (25) outputs signals or data representing the current consumption of the pump unit (12).

8. Dishwasher according to any of the preceding claims,

characterized in that

more than two outlets (5, 6) and more than three different fluid connections (15a, 15b, 15a-15b) are provided.

9. Dishwasher according to any of the preceding claims,

characterized in that

the pump unit (12) comprises a pump element and a pump actuator element, wherein the operation parameter represents an operation parameter of the pump actuator element.

10. Dishwasher according to any of the preceding claims,

characterized in that

a selection means (26) for selecting a specific washing routine out of multiple washing routines by a user is provided, wherein the multiple washing routines are stored in a data memory and executable by the control unit (10),

wherein at least two washing routines differ with respect to the routing of the fluid,

wherein the control unit (10) operates the diverter means (13) in dependency of a routine selected by the selection means (26).

11. Method for operating a dishwasher,

at least comprising the steps:

measuring of at least one parameter of a pump unit (12) during operation of that pump unit (12),

operating a diverter means (13) for establishing of a predefined fluid connection between the pump unit (13) and at least one of several outlets (5, 6) out of multiple fluid connections (15a, 15b, 15a-15b) in dependency of the measured parameter.

12. Method according to claim 11,

characterized in that

during operation of the dishwasher (1) the operation parameter is preferably constantly measured by a measurement means (25) and the measurement means (25) outputs signals or data, wherein the signals or data are directed to a control unit (10), wherein the control unit (10) controls the diverter means (13).

13. Method according to claim 12,

characterized in that,

the control unit (10) determines data about the selected fluid connection in dependency of the measured parameter of the pump unit (12).

14. Method according to claim 12 or claim 13,

characterized in that,

an actuator means (21) of the diverter means (13) is operated by the control unit in dependency of a selection command, in particular a routine stored in a memory or a manually inputted command, and in dependency of the measured parameter,

wherein the measured parameter is represented by a value,

wherein said value differs between a starting value that represents the initially established fluid connection and a target value that represents the selected fluid connection,

wherein the actuator element (21) is operated until the target value is measured.

15. Method according to claim 11,

characterized in that

the control unit (10) causes the diverter (13) to establish different fluid connections (15a, 15b, 15a-15b) in a row, wherein the control unit (10), in particularly constantly, identifies the presently established fluid connection (15a, 15b, 15a-15b) by an evaluation of the present pump unit (12) parameter.

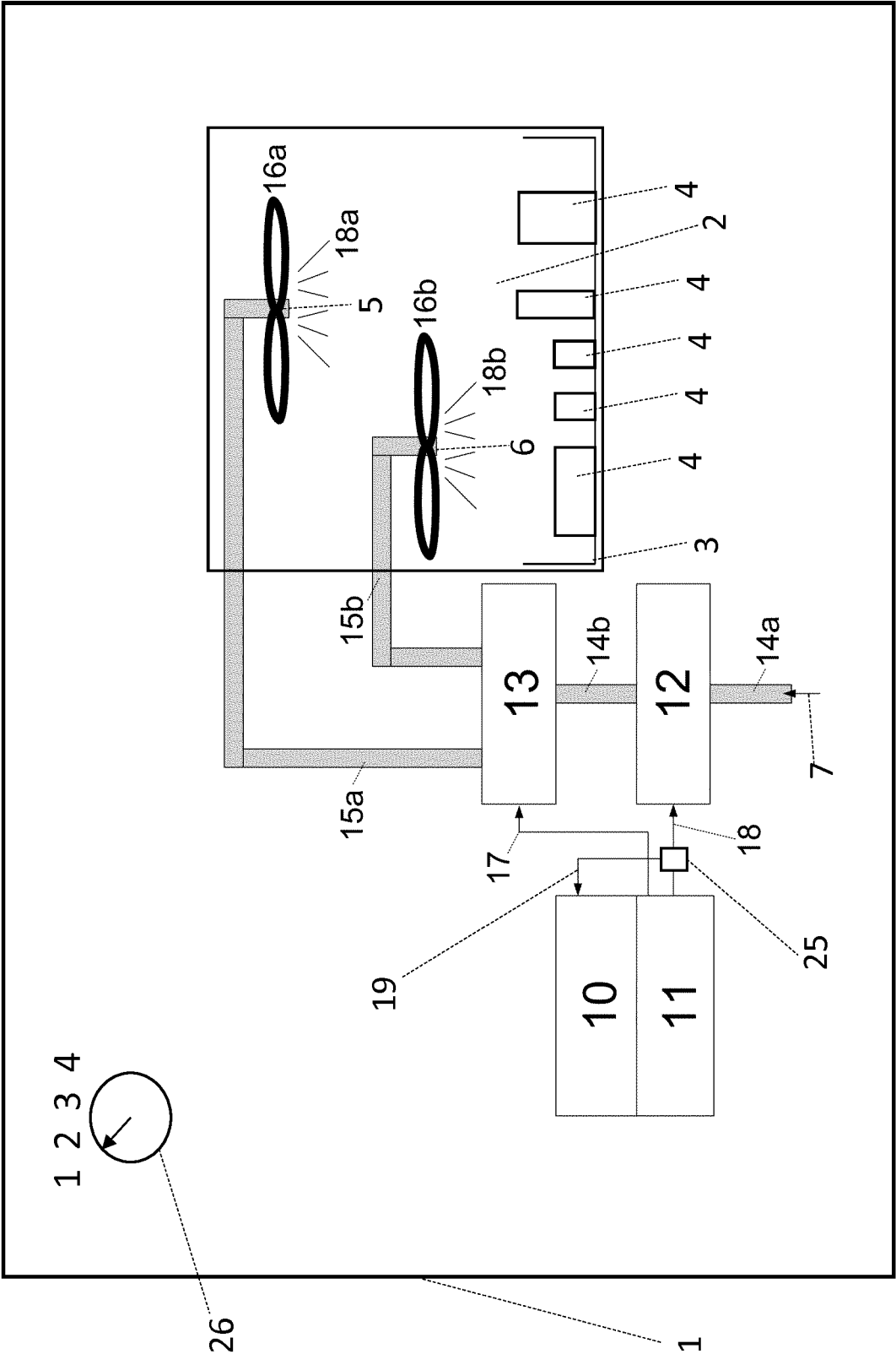


Fig. 1

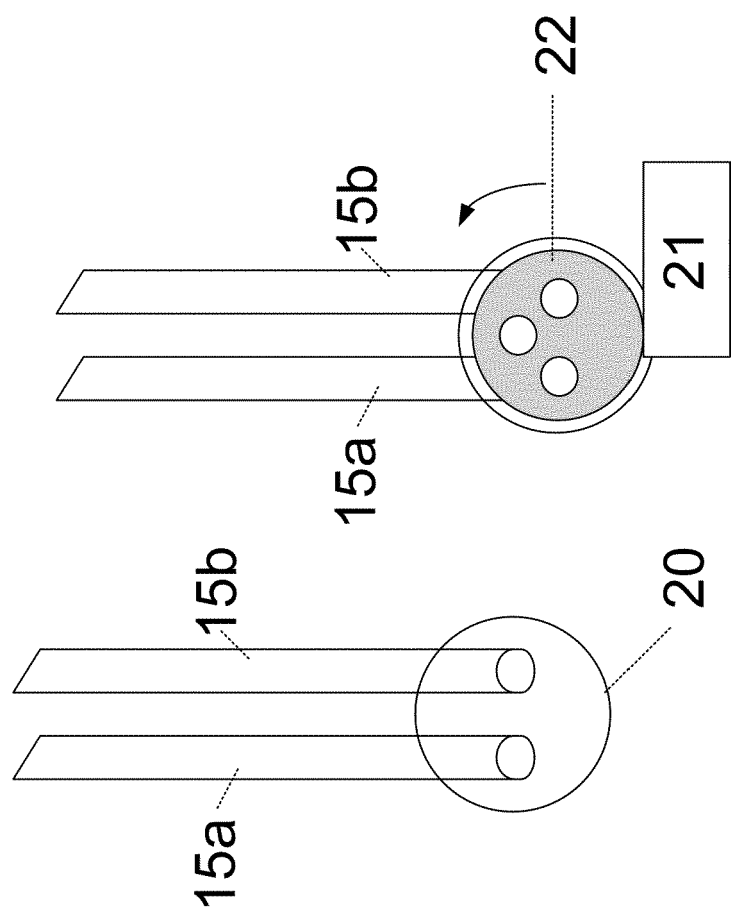


Fig. 2



EUROPEAN SEARCH REPORT

 Application Number
 EP 16 18 2932

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
Place of search		Date of completion of the search	Examiner
Munich		9 September 2016	Jezierski, Krzysztof
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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 EPO FORM 1503 03.02 (P04C01)

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

EP 16 18 2932

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
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