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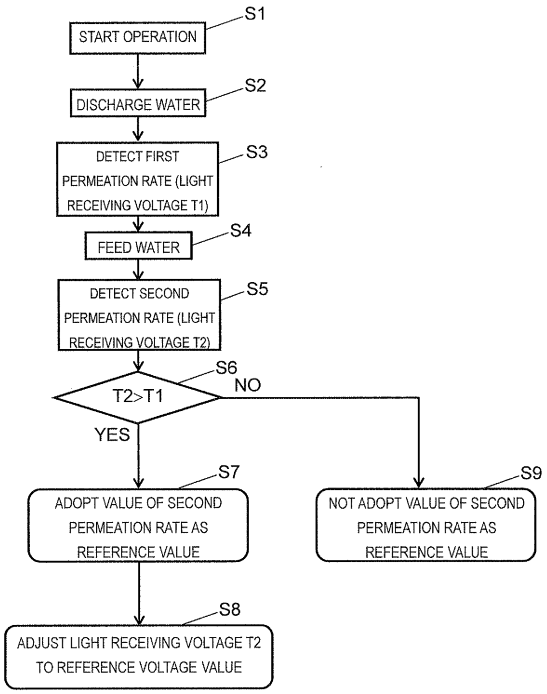
(54) **DISHWASHER**

(57) A dishwasher includes a washing tub for accommodating an item to be washed; a washing section for washing the item to be washed in the washing tub; a water feeding device for feeding washing water into the washing tub; a draining device for discharging the washing water from the washing tub to outside the dishwasher; and a drainage path arranged in communication with the draining device. Also provided are a turbidity detecting unit arranged in the drainage path and for detecting information related to the turbidity of the washing water in the drainage path; and a control unit for changing an operation condition of the washing section according to the information related to the turbidity of the washing water detected by the turbidity detecting unit, and performing control. At the start of the operation, the control unit compares values detected by the turbidity detecting unit in a water-absent state and in a water-present state after the water is fed by the water feeding device. Whether or not to adopt the value detected by the turbidity detecting unit in the water-present state as a reference value of the information related to the turbidity of the washing water then can be determined.

FIG. 6



EP 2 599 423 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a dishwasher for washing an item to be washed such as dishes.

BACKGROUND ART

[0002] A dishwasher including an optical sensor for detecting turbidity (permeation rate) of washing water used to wash dishes is conventionally proposed (refer to PTL 1, for example).

[0003] Such a conventional dishwasher includes a washing tub for accommodating the dishes, a washing nozzle arranged inside the washing tub, and a washing pump for supplying the washing water to the washing nozzle.

[0004] In the conventional dishwasher, a predetermined amount of washing water is supplied into the washing tub with the dishes accommodated in the washing tub when washing the dishes. The washing water reserved at a lower part of the washing tub is then supplied to the washing nozzle by the washing pump. The washing water is sprayed from the washing nozzle onto the dishes accommodated inside the washing tub to wash the dishes. The washing water sprayed onto the dishes is reserved at the bottom of the washing tub, and fed again to the washing nozzle by the washing pump.

[0005] The conventional dishwasher also includes a drainage pump for discharging the washing water of the washing tub to outside the machine, so that the washing water can be discharged to outside the machine through a drainage path. A turbidity detecting unit is arranged in the middle of the drainage path to detect the turbidity of the discharged washing water. The turbidity detecting unit may be a transmissive optical sensor including a light emitting section and a light receiving section. The washing control of the dishes is carried out based on the detection result of the turbidity detecting unit.

[0006] One example of a conventional turbidity detecting method will be described. After feeding of the water is finished, initial water reaches the turbidity detecting unit arranged in the middle of the drainage path. The permeation rate (turbidity) of such initial water is detected, and such a value is set as a reference value. After washing is finished, the permeation rate of the washing water discharged after the washing is finished is detected by the turbidity detecting unit, and the amount of change from the permeation rate of the initial water is detected. To what extent the discharged washing water is polluted is determined, that is, the degree of pollution of the dishes washed in the washing tub is numerically converted for determination by the detected amount of change.

[0007] However, in the conventional dishwasher, the initial water may get polluted by feeding water if a great amount of pollution is input into the washing tub, and the like when detecting the permeation rate of the initial water. In such a case, the polluted initial water reaches the turbidity detecting unit after the feeding of the water is finished. If the permeation rate of the washing water discharged after the washing is finished is detected with the permeation rate of the polluted initial water as the reference value, the amount of change from the reference value becomes smaller than the amount of change in a case where the initial water is not polluted. Thus, the correct pollution degree cannot be determined, and an appropriate washing appropriate to the pollution of the item to be washed such as dishes cannot be carried out.

Citation List

Patent Literatures

[0008] PTL 1: Unexamined Japanese Patent Publication No. 4-319329

SUMMARY OF THE INVENTION

[0009] The present invention provides a dishwasher for detecting turbidity of washing water with a turbidity detecting unit arranged in the middle of a drainage path, such a dishwasher being able to determine the correct pollution degree and appropriately performing washing appropriate to the pollution of the item to be washed even if a great amount of pollution is input into the washing tub and the polluted water reaches the turbidity detecting unit after the feeding of the water is finished.

[0010] A dishwasher of the present invention includes a washing tub for accommodating an item to be washed; a washing section for washing the item to be washed in the washing tub; a water feeding device for feeding washing water into the washing tub; a draining device for discharging the washing water from the washing tub to outside the dishwasher; and a drainage path arranged in communication with the draining device. Also provided are a turbidity detecting unit arranged in the drainage path and for detecting information related to the turbidity of the washing water in the drainage path; and a control unit for changing an operation condition of the washing section according to the information related to the turbidity of the washing water detected by the turbidity detecting unit, and performing control. At the start of the operation, the control unit compares values detected by the turbidity detecting unit in a water-absent state and in a water-present state after the water is fed by the water feeding device. Whether or not to adopt the value detected by the turbidity detecting unit in the water-present state as a reference value of the information related to the turbidity of the washing water then is determined.

BRIEF DESCRIPTION OF DRAWINGS

[0011]

FIG. 1 is a view showing a cross-sectional configu-

ration of a dishwasher according to an exemplary embodiment of the present invention.

FIG. 2 is a view showing a cross-sectional configuration of a pump in the dishwasher according to the exemplary embodiment of the present invention.

FIG. 3 is a perspective view of a turbidity detecting unit of the dishwasher according to the exemplary embodiment of the present invention.

FIG. 4 is a cross-sectional view, seen from a side surface of a projection, of the turbidity detecting unit of the dishwasher according to the exemplary embodiment of the present invention.

FIG. 5 is a cross-sectional view, seen from a front surface of the projection, of the turbidity detecting unit of the dishwasher according to the exemplary embodiment of the present invention.

FIG. 6 is a flowchart showing an initial setting sequence of turbidity detection in the exemplary embodiment of the present invention.

DESCRIPTION OF EMBODIMENT

[0012] An exemplary embodiment of the present invention will be hereinafter described with reference to the drawings. It should be recognized that the present invention is not limited by the exemplary embodiment.

[0013] FIG. 1 is a view showing a cross-sectional configuration of dishwasher 50 according to an exemplary embodiment of the present invention.

[0014] Dishwasher main body 1 interiorly includes washing tub 2. Water feeding device 3 supplies water or hot water (washing water) into washing tub 2. In order to control the water feeding amount, water feeding device 3 is controlled by control unit 13 so as to stop the operation when a predetermined water level is reached by means of water level sensor 4 arranged in communication with washing tub 2. Water reserving unit 2a is arranged at the bottom of washing tub 2. Pump 5 that is communicated to water reserving unit 2a and driven by a motor is also attached. Dishwasher 50 further includes washing nozzle 9, heater 10, washing basket 11, drainage path 12, turbidity detecting unit 14, vertical portion 18, and washing path 17.

[0015] The configuration and operation of pump 5 of dishwasher 50 will be described below.

[0016] FIG. 2 is a view showing a cross-sectional configuration of pump 5 in dishwasher 50 according to the exemplary embodiment of the present invention.

[0017] Pump 5 includes pump casing 6, impeller 7, and switching valve 8. Pump casing 6 includes washing side pipe 6a, which discharges the washing water of water reserving unit 2a to washing nozzle 9, and draining side pipe 6b, which discharges the washing water of water reserving unit 2a to drainage path 12. Switching valve 8 is configured to turn about rotation shaft 8a, and to be able to open and close draining side pipe 6b. Switching valve 8 includes flap portion 8b, and can open and close draining side pipe 6b according to the direction of water flow.

[0018] When impeller 7 rotates in a counterclockwise direction by a motor, the washing water flows toward washing side pipe 6a, and pump 5 functions as a washing pump. In this case, switching valve 8 is pushed against a wall at an entrance of draining side pipe 6b by a pressure caused by the flow of the washing water so that the draining side is closed, and the washing water does not flow toward drainage path 12 side.

[0019] When impeller 7 rotates in a clockwise direction, on the other hand, the washing water applies pressure to open switching valve 8, so that switching valve 8 opens and the washing water flows toward drainage path 12 side. In this case, pump 5 functions as drainage pump (drainage device). Here, if the motor is stopped and impeller 7 is not rotating, switching valve 8 is not in a state of closing draining side pipe 6b.

[0020] Thus, pump 5 functions as a pump for both washing and draining. In the subsequent description, a case in which pump 5 functions as the washing pump is described as washing pump 5a, and a case in which pump 5 functions as the drainage pump is described as drainage pump (drainage device) 5b.

[0021] In the washing step of dishwasher 50, the washing water is circulated in dishwasher main body 1 by washing pump 5a. The washing water supplied into washing tub 2 is suctioned by washing pump 5a from water reserving unit 2a, passed through washing path 17 from washing side pipe 6a by washing pump 5a, and supplied to washing nozzle 9 provided at an inner bottom portion of washing tub 2. The washing water sprayed from washing nozzle 9 is circulated through a path in which the washing water again returns to water reserving unit 2a after washing an item to be washed (dishes, etc.) accommodated in washing tub 2. Washing pump 5a, washing nozzle 9, and washing path 17 configure a washing section.

[0022] Heater 10 for heating washing water is arranged between washing nozzle 9 and the bottom of washing tub 2. Dish basket 11, which is configured to arrange the items to be washed in an orderly manner and to enable the washing water to be effectively sprayed on the items to be washed, is arranged above washing nozzle 9 to perform efficient washing.

[0023] In the draining step, drainage pump 5b discharges the washing water to outside the machine through drainage path 12 from draining side pipe 6b. Here, control unit 13 drives and controls electronic components such as water feeding device 3, pump 5, and heater 10.

[0024] Vertical portion 18, in which the discharged washing water substantially flows upward (vertical direction), is arranged in the middle of drainage path 12 on the outer side of the machine with respect to drainage pump 5b, that is, on a downstream side through which the discharged water flows, and turbidity detecting unit 14 for detecting the turbidity of the washing water is arranged on the outer side of vertical portion 18.

[0025] The configuration and operation of turbidity detecting unit 14 will be described below.

[0026] FIG. 3 is a perspective view of turbidity detecting unit 14 of dishwasher 50 according to the exemplary embodiment of the present invention, FIG. 4 is a cross-sectional view of turbidity detecting unit 14 seen from a side surface of projection 15, and FIG. 5 is a cross-sectional view of turbidity detecting unit 14 seen from a front surface of projection 15.

[0027] Projection 15 that projects out from drainage path 12 is arranged on vertical portion 18 in the middle of drainage path 12. The inner surfaces of lower surface 15a and upper surface 15b of projection 15 are respectively inclined, as shown in FIG. 4. More specifically, the inner surface of lower surface 15a is formed such that the side to be connected to drainage path 12 of lower surface 15a is inclined downward, and the inner surface of upper surface 15b is formed such that the side to be connected to drainage path 12 of upper surface 15b is inclined upward. In other words, the inner surface of lower surface 15a is inclined to the outer side toward the downstream side of drainage path 12, and the inner surface of upper surface 15b is inclined to the inner side toward the downstream side of drainage path 12 (see FIG. 4). Side surfaces 15c on both sides of projection 15 are arranged in a substantially vertical direction so that two surfaces face each other (see FIG. 5).

[0028] Turbidity detecting unit 14 is arranged to cover projection 15, and is arranged on the outer side of side surfaces 15c with light emitting section 14a and light receiving section 14b facing each other (see FIG. 3 and FIG. 5). In this case, the distance between light emitting section 14a and light receiving section 14b is set to an appropriate distance according to the capability. Projection 15 having an appropriate distance with respect to a width of drainage path 12 is provided with a width of projection 15 (distance between side surfaces 15c on both sides of projection 15: W1) smaller than a width (W2) in vertical portion 18 of drainage path 12. Thus, the appropriate distance necessary for detecting turbidity by turbidity detecting unit 14 can be obtained.

[0029] Drainage path 12 has a cross-sectional area necessary for discharging the washing water to outside the machine. A necessary distance also exists between light emitting section 14a and light receiving section 14b of turbidity detecting unit 14 from the input/output relationship thereof. However, when arranging turbidity detecting unit 14 on the outer side of entire drainage path 12, this may not accord with the necessary distance between light emitting section 14a and light receiving section 14b.

[0030] In the present exemplary embodiment, projection 15 having an appropriate distance and smaller than the width of drainage path 12 is provided with the width (W1) of projection 15 smaller than the width (W2) of drainage path 12. Thus, the appropriate distance necessary for detecting the turbidity by turbidity detecting unit 14 can be ensured. Therefore, the draining capability can be ensured and the detection accuracy of turbidity detecting unit 14 can be ensured with a wide cross-sectional area of drainage path 12.

[0031] The inner surfaces of upper surface 15b and lower surface 15a formed at the top and bottom of projection 15 are appropriate inclined surfaces, so that whirls are prevented from producing inside projection 15 from the flow of the washing water at the time of draining. Furthermore, the bubbles generated when the washing water flows by the water feeding or draining operation move upward. When performing the turbidity detection at the time the draining is stopped, the foreign substances of large specific weight drop down and the foreign substances of small specific weight rise up. Therefore, a highly accurate detection can be stably carried out at the time of detection.

[0032] The operations and the effects of dishwasher 50 configured as above will be described below.

[0033] First, in the washing step, water feeding device 3 is opened to start feeding the water. When a predetermined water level is reached according to the control based on the detection of water level sensor 4, water feeding device 3 is closed to complete the feeding of the water. At this time, the motor for driving pump 5 is not rotated, and switching valve 8 is not closing draining side pipe 6b. Thus, the washing water also reaches drainage path 12 communicated to water reserving unit 2a of washing tub 2 through the interior of pump 5. Drainage path 12 at the position of turbidity detecting unit 14 and the inside of projection 15 are also filled with the washing water.

[0034] After the washing step is started, switching valve 8 has the draining side closed by the flow of the washing water so that the washing water does not enter the draining side. Therefore, in this state, the initial washing water is remained enclosed in drainage path 12, and the pollution of the washing water in washing tub 2 cannot be detected.

[0035] After the washing step is finished and the pollution of the washing water in washing tube 2 is to be detected, drainage pump 5b is operated for a short while and then stopped. The polluted washing water in washing tub 2 thus can be entered to the surrounding of projection 15, which is the drainage path portion facing turbidity detecting unit 14, and the turbidity of the washing water can be measured. In this case, the surrounding of projection 15 facing turbidity detecting unit 14 is already filled with the initial washing water from when the feeding of the water is completed. Therefore, discontinuous movement or disturbed movement of the washing water barely exists, and the turbidity can be detected in a stable state.

[0036] Control unit 13 then changes the operation conditions of washing pump 5a, heater 10, water feeding device 3, drainage pump 5b, and the like, for example, changes the number of rinsing operations, for example, according to the measured turbidity. Subsequently, steps such as rinsing and drying steps are carried out, and the operation is terminated.

[0037] The method of detecting the turbidity of the washing water and the method of initially setting a reference value of the turbidity detection will be described in detail bellow. FIG. 6 is a flowchart showing an initial setting sequence of the turbidity detection in the exemplary embodiment of the present invention.

[0038] The outline of the method of detecting turbidity in dishwasher 50 according to the present exemplary embodiment is as described below.

[0039] After starting the operation and feeding the water, the permeation rate (turbidity) of the initial water that is not polluted is detected by turbidity detecting unit 14 when the initial water reaches turbidity detecting unit 14 arranged in the middle of drainage path 12, and the value thereof is assumed as the reference value. After the washing is finished, the permeation rate (turbidity) of the washing water discharged after the washing is finished is detected by turbidity detecting unit 14, and to what extent the discharged water is polluted is determined, that is, the pollution degree of the dishes washed in washing tub 2 is numerically converted for determination based on the amount of change from the reference value. Control unit 13 executes each step of rinsing and drying after the washing step is finished under the condition corresponding to the pollution degree determined in turbidity detecting unit 14.

[0040] In dishwasher 50 of the present exemplary embodiment, the permeation rate detected by turbidity detecting unit 14 has a characteristic of being higher in a water-present state than in a water-absent state. However, if the washing water of turbidity detecting unit 14 is polluted after the feeding of the water is finished, the permeation rate becomes lower in the water-present state than in the water-absent state.

[0041] When detecting the permeation rate of the initial water that becomes the reference value in the turbidity detection, if a great amount of pollution is input into washing tub 2, and the like, the initial water may become polluted by feeding the water, and after feeding of the water is finished, the polluted water may reach the turbidity detecting unit. Assuming the permeation rate of the polluted initial water is the reference value, when the permeation rate of the washing water discharged after the washing is finished is detected, the amount of change from the reference value becomes smaller than when the initial water is not polluted and it becomes difficult to determine the correct pollution degree.

[0042] To solve such a problem, turbidity detecting unit 14 is first assumed as an optical sensor in which light emitting section 14a and light receiving section 14b are arranged facing each other in dishwasher 50.

[0043] As shown in FIG. 6, after starting the operation (step S1), dishwasher 50 supplies a predetermined initial voltage value to light emitting section 14a in the water-absent state before draining or after draining (case after draining (step S2) is described in FIG. 6), and detects light receiving voltage T1 of first permeation rate by light receiving section 14b of turbidity detecting unit 14 arranged in the middle of drainage path 12 (step S3).

[0044] Then, the water feeding step is carried out (step S4), and light receiving voltage T2 of a second permeation rate is detected by light receiving section 14b of turbidity detecting unit 14 with the same voltage value supplied to light emitting section 14a in the subsequent water-present state (step S5).

[0045] Normally, if the initial water is not polluted after feeding the water, the voltage value of light receiving section 14b is greater when the water is present than when the water is not present. If pollution is input into washing tub 2 and the initial water becomes polluted by feeding the water, the pollution degree becomes large even in the water-present state, and the voltage value of light receiving section 14b becomes smaller than the voltage value in the water-absent state. Control unit 13 compares T1 and T2 (step S6), and determines that the initial water is not polluted if $T2 > T1$ and adopts the second permeation rate (light receiving voltage T2) as the reference value (step S7).

[0046] The voltage to supply to light emitting section 14a is adjusted so that light receiving voltage T2 of light receiving section 14b of turbidity detecting unit 14 becomes a predetermined reference voltage value (step S8). Note that in the present exemplary embodiment, the reference voltage value is set as the reference value (reference value of light receiving voltage) of the information related to the turbidity of the washing water to correct the permeation rate of side surface 15c of projection 15 and the individual difference of light emitting section 14a and light receiving section 14b, as well as the influence of change over years, but it is not necessarily limited to such a method. The steps up to step S7 may be executed.

[0047] If $T2 \leq T1$, control unit 13 does not adopt the second permeation rate (light receiving voltage T2) as the reference value as described above, but controls to use the reference value at the time of the previous operation (step S9). In other words, control unit 13 performs control such as using the voltage value supplied to light emitting section 14a at the time of the previous operation.

[0048] The initial setting of the turbidity detection is carried out through the above method. Thus, even if a great amount of pollution is input into washing tub 2, the initial water becomes polluted by feeding the water, and the polluted water reaches turbidity detecting unit 14 after feeding the water, for example, the permeation rate of the polluted water can be prevented from being adjusted to the reference value, and the correct pollution degree can be determined.

[0049] The timing (timing of step S3) of detecting the permeation rate in the water-absent state may be either before draining or after draining at the start of the operation. A state before the draining at the start of the operation is the water-absent state in which the water does not exist at turbidity detecting unit 14. A state after the draining at the start of the operation is also the water-absent state in turbidity detecting unit 14 after the remaining water passes drainage path 12. Therefore, the per-

meation rate in the water-absent state can be detected in both cases by detecting before draining or after draining at the start of the operation.

[0050] In the present exemplary embodiment, pump 5 has been described as a pump for washing and draining that functions as two types of pumps, washing pump 5a and drainage pump 5b, by changing the rotating direction of the motor. However, the present invention is not limited thereto. For example, switching valve 8 may be operated by the driving device to switch the flow of the washing water to washing side pipe 6a or draining side pipe 6b, so that the pump functions as two types of pumps in one rotating direction. In the present exemplary embodiment, pump 5 with switching valve 8 has been described, but pump 5 without switching valve 8 may be used, or a dedicated type of pump may be used for washing pump 5a and drainage pump 5b, respectively.

[0051] As described above, according to dishwasher 50 of the present exemplary embodiment, when detecting the permeation rate of the initial water after feeding the water that becomes the reference value in the initial setting sequence of the turbidity detection, the permeation rate is detected in the water-absent state by turbidity detecting unit 14 arranged in the middle of drainage path 12 at the start of the operation. The permeation rate in the water-absent state and the permeation rate in the water-present state after feeding the water are compared, and if the value of the permeation rate in the water-present state is greater than the value of the permeation rate in the water-absent state, such a value is assumed as the reference value. If the value of the permeation rate in the water-present state is smaller than or equal to the value of the permeation rate in the water-absent state, such a value is not adjusted to the reference value, and the reference value at the time of the previous operation is used.

[0052] Thus, even if a great amount of pollution is input into washing tub 2, the initial water becomes polluted by feeding the water, and the polluted water reaches turbidity detecting unit 14 after feeding the water, for example, the permeation rate of the polluted water can be prevented from being assumed as the reference value. Therefore, the correct pollution degree can be detected and the pollution of the item to be washed can be accurately detected, so that the washing appropriate to the pollution of the item to be washed can be appropriately carried out.

INDUSTRIAL APPLICABILITY

[0053] As described above, according to the present invention, in a dishwasher for detecting the turbidity of the washing water with the turbidity detecting unit arranged in the middle of the drainage path, such a dishwasher has a significant effect in that the correct pollution degree can be determined and the washing appropriate to the pollution of the item to be washed can be appropriately carried out even if a great amount of pollution is input into the washing tub and the polluted water reaches the turbidity detecting unit after feeding of the water is finished. Therefore, the present invention is useful as a dishwasher, and the like for washing an item to be washed such as dishes.

REFERENCE MARKS IN THE DRAWINGS

[0054]

1	dishwasher main body
2	washing tub
2a	water reserving unit
3	water feeding device
4	water level sensor
5	pump
5a	washing pump
5b	drainage pump
6	pump casing
6a	washing side pipe
6b	draining side pipe
7	impeller
8	switching valve
8a	flap portion
8b	rotation shaft
9	washing nozzle
10	heater
11	dish basket
12	drainage path
13	control unit
14	turbidity detecting unit
14a	light emitting section
14b	light receiving section
15	projection
15a	lower surface
15b	upper surface
15c	side surface
17	washing path
18	vertical portion
50	dishwasher

Claims

1. A dishwasher for washing an item to be washed, the dishwasher comprising:

a washing tub for accommodating the item to be washed;
a washing section for washing the item to be washed in the washing tub;
a water feeding device for feeding washing water into the washing tub;
a draining device for discharging the washing water from the washing tub to outside the dish-

washer;
a drainage path arranged in communication with the draining device;
a turbidity detecting unit arranged in the drainage path and for detecting information related to turbidity of the washing water in the drainage path; and
a control unit for changing an operation condition of the washing section according to the information related to the turbidity of the washing water detected by the turbidity detecting unit, and performing control,
wherein at a start of operation, the control unit compares values detected by the turbidity detecting unit in a water-absent state and in a water-present state after the water is fed by the water feeding device, and determines whether or not to adopt the value detected by the turbidity detecting unit in the water-present state as a reference value of the information related to the turbidity of the washing water.

2. The dishwasher according to claim 1,
wherein the turbidity detecting unit is an optical sensor including a light emitting section and a light receiving section; and
when a light receiving voltage indicating the turbidity detection value in the water-present state detected by the light receiving section after the water is fed is higher than a light receiving voltage indicating the turbidity detection value in the water-absent state detected by the light receiving section at the start of operation, the control unit adjusts a supplying voltage to the light emitting section such that the light receiving voltage indicating the turbidity detection value in the water-present state becomes a predetermined reference voltage value.

FIG. 1

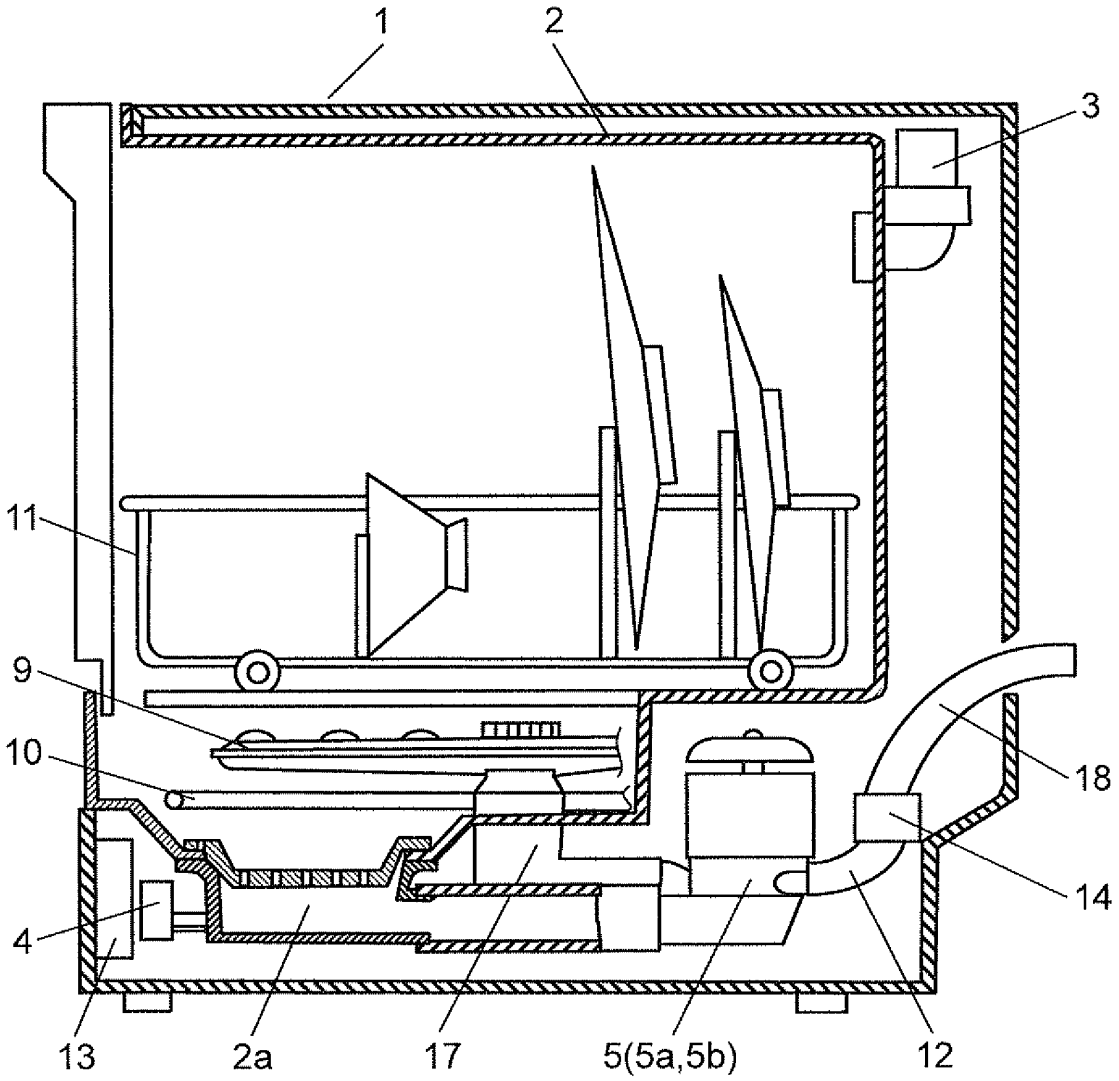


FIG. 2

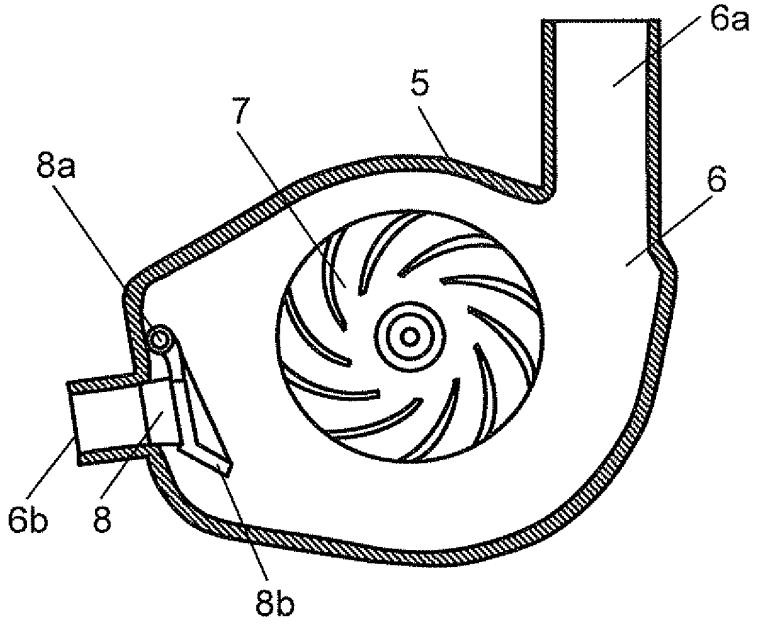


FIG. 3

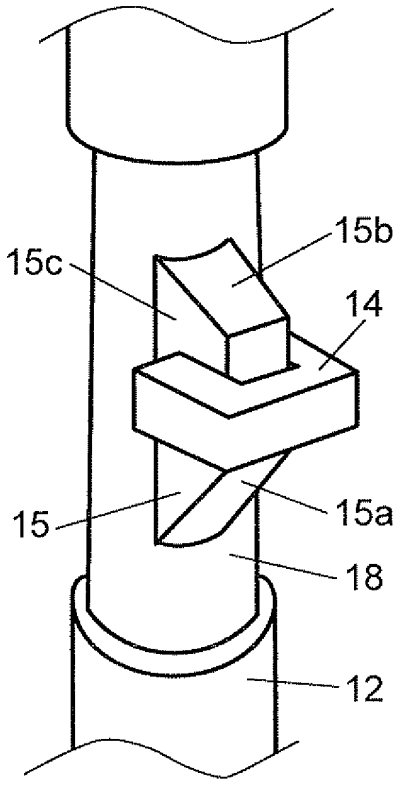


FIG. 4

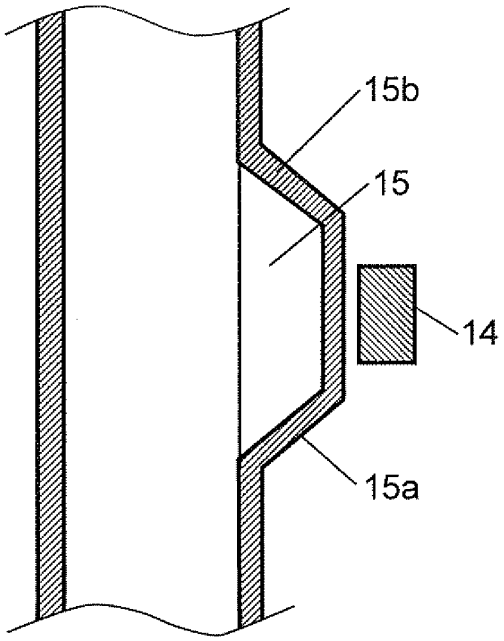


FIG. 5

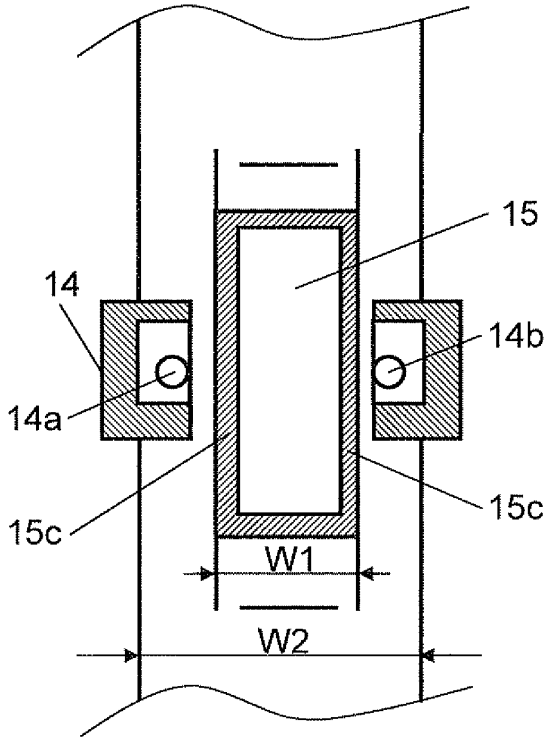
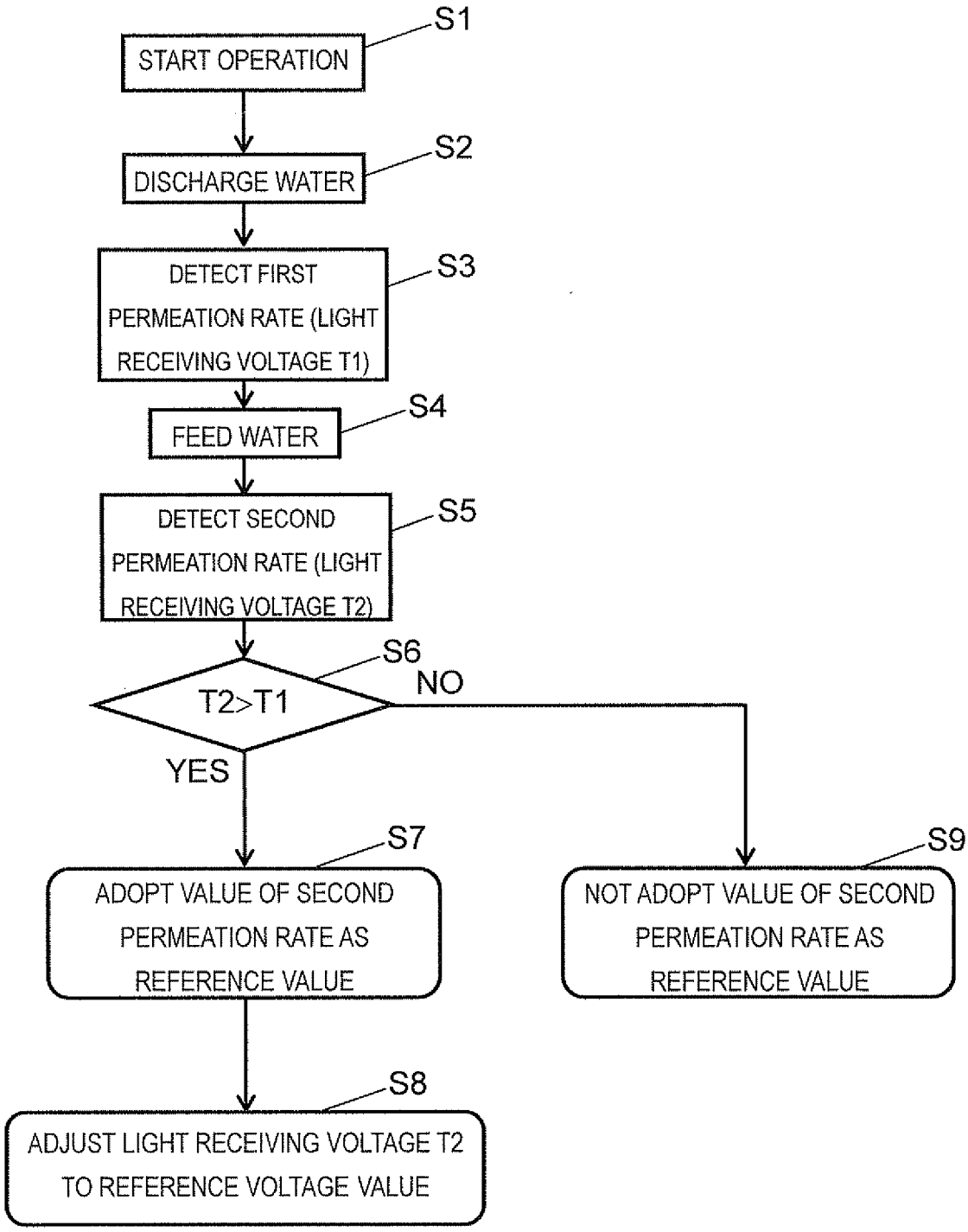


FIG. 6


S1
START OPERATION
S2
DISCHARGE WATER
S3
DETECT FIRST PERMEATION RATE (LIGHT RECEIVING VOLTAGE T1)
S4
FEED WATER
S5
DETECT SECOND PERMEATION RATE (LIGHT RECEIVING VOLTAGE T2)
S6
T2>T1
NO
YES
S7
ADOPT VALUE OF SECOND PERMEATION RATE AS REFERENCE VALUE
S8
ADJUST LIGHT RECEIVING VOLTAGE T2 TO REFERENCE VOLTAGE VALUE
S9
NOT ADOPT VALUE OF SECOND PERMEATION RATE AS REFERENCE VALUE

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/004088

A. CLASSIFICATION OF SUBJECT MATTER
A47L15/46(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47L15/46

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2011
Kokai Jitsuyo Shinan Koho	1971-2011	Toroku Jitsuyo Shinan Koho	1994-2011

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 7-213473 A (Sanyo Electric Co., Ltd.), 15 August 1995 (15.08.1995), entire text; all drawings & US 5545259 A & KR 10-1996-0013156 B	1-2
Y	JP 4-319329 A (Mitsubishi Electric Corp.), 10 November 1992 (10.11.1992), entire text; all drawings (Family: none)	1-2

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search 04 August, 2011 (04.08.11)	Date of mailing of the international search report 16 August, 2011 (16.08.11)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 4319329 A **[0008]**