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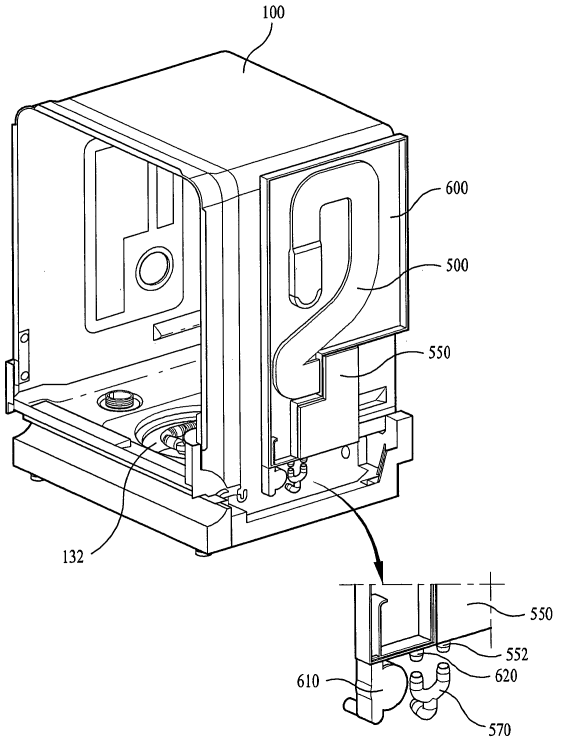
(54) Dish washer

(57) Dish washer is disclosed for efficient removal of humid air formed after drying dishes. The dish washer includes a cabinet (10) which forms an exterior of the dish washer, a tub (100) in the cabinet (10) to form a washing chamber (100a) for washing dishes, a water jacket (600) mounted to one sidewall of the tub to hold water supplied from an outside of the dish washer for condensing moisture in humid air formed after washing and drying of the dishes when the humid air is brought into contact thereto, and a condensing duct (500) mounted to an inside or an outside of the water jacket (600) for guiding the humid air to the water jacket (600) in removing the moisture from the humid air.

Fig. 2



EP 2 241 242 A2

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of the Patent Korean Application No. 10-2009-0032179, filed on April 14, 2009, which is hereby incorporated by reference as if fully set forth herein.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates generally to a dish washer, and more particularly, to a dishwasher including a water jacket.

Description of Related Art

[0003] In general, a dish washer sprays high pressure washing water to dishes by using spray nozzles for washing the dishes. The dish washer has a holding space in a tub for washing the dishes, which, in turn, includes a plurality of dish racks for holding the dishes. The washing water is held in a sump assembly and supplied to the spray nozzles therefrom to be sprayed through the spray nozzles. The washing water used for the dish washing is then collected at the sump assembly and may be used again.

[0004] Air used for drying the dishes contains moisture and is generally at a high temperature. Once washing and drying of the dishes is finished, such high temperature, humid air is discharged partially, or re-circulated to the tub. However, when the user opens a door on the dish washer, the high temperature, humid air can cause inconvenience to the user if the air rushes out at one time. Therefore, in order to prevent accidents caused by the user opening the door to soon, the high temperature, humid air is cooled down to a certain extent after drying the dishes.

[0005] However, the partial discharge of the high temperature, humid air to an outside of the dish washer or re-circulation of the high temperature, humid air to the tub causes condensing of vapor to form water drops in the vicinity of a portion through which the air is being discharged to the outside of the dish washer, or an inside of the tub, respectively. If the water drops are discharged to the outside of the dish washer, or the water drops formed in the tub fall down on the dishes, the user can be inconvenienced.

BRIEF SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention is directed to a dish waster that solves one or more of the foregoing problems. Therefore, an object of the present invention is to provide a dish washer which can dehumidify humid air formed after drying dishes and discharge dehumidified water effectively for reducing an amount of water condensed in the tub.

[0007] Additional advantages, objects, and features of the disclosure will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0008] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a dish washer includes, a cabinet defining an exterior of the dish washer, a tub in the cabinet to provide a washing chamber for washing dishes, a water jacket mounted to a sidewall of the tub to hold water supplied to condense moisture from humid air formed after washing and drying of the dishes when the humid air is brought into contact thereto, and a condensing duct mounted to the water jacket for guiding the humid air to the water jacket in removing the moisture from the humid air.

[0009] In a further aspect, the dish washer may include a water supply unit to supply water to the water jacket from the exterior of the dish washer.

[0010] In a different aspect, the condensing duct may be mounted to an outside of the water jacket such that the water jacket is located between the condensing duct and the washing chamber.

[0011] In yet another aspect, the dish washer may include a condensed water tank located under the water jacket to hold condensed water fallen from the condensing duct. The condensing duct may have one end in communication with the tub, and the other end connected to the condensed water tank.

[0012] In still another aspect, the condensing duct may be smaller than the water jacket, and the condensing duct may be located in the water jacket.

[0013] In another aspect, the condensing duct may include a plurality of nozzles configured to spray water to an inside of the condensing duct.

[0014] In a different aspect, the condensing duct may further include a plurality of fins projected from an inside of the condensing duct. The plurality of fins may be configured such that fins are alternately arranged or the plurality of fins may be configured such that adjacent fins have generally the same curved shape.

[0015] In another aspect, the dish washer may include a water softener mounted under the tub for treating the water supplied thereto. The treated water may be supplied to the water jacket through the water softener.

[0016] In accordance with principles of the present invention, as embodied and broadly described herein, a dish washer includes a cabinet defining an exterior of the dish washer, a tub in the cabinet to provide a washing chamber for washing dishes, a water jacket mounted to a first sidewall of the tub to hold water supplied to con-

dense moisture from humid air formed after washing and drying of the dishes when the humid air is brought into contact thereto, and a circulating duct module mounted to a second sidewall of the tub opposite the first sidewall, the circulating duct module being configured to receive humid air from the tub and spray the humid air toward the first sidewall of the tub having the water jacket mounted thereto.

[0017] In a further aspect, the circulating duct module may include a circulating duct configured to receive humid air from the tub, a fan assembly having a fan and a motor for introducing the humid air to the circulating duct, a heater for heating the humid air, and a spray nozzle for spraying the heated humid air into the tub. The circulating duct may be in communication with the tub. The spray nozzle may radially spray the heated humid air heated toward the first sidewall of the tub.

[0018] Further scope of applicability of the present application will become more apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating exemplary embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention and wherein:

[0020] FIG. 1 illustrates a section of a dish washer in accordance with the exemplary embodiments of the present invention;

[0021] FIG. 2 illustrates a perspective view of a dish washer in accordance with a first exemplary embodiment of the present invention;

[0022] FIG. 3 illustrates a perspective view of an inside of the dish washer of Fig. 2;

[0023] FIG. 4 illustrates a perspective view of a dish washer in accordance with a second exemplary embodiment of the present invention;

[0024] FIG. 5 illustrates an exploded perspective view of the condensing duct shown in FIG. 4;

[0025] FIG. 6 illustrates an exploded perspective view of a part of a tub of the dish washer shown in FIG. 5;

[0026] FIG. 7 illustrates a perspective view of the condensing duct shown in FIG. 4;

[0027] FIG. 8 illustrates a front view of the water jacket shown in FIG. 4;

[0028] FIG. 9 illustrates a schematic diagram of a dish washer in accordance with a third exemplary embodiment of the present invention;

[0029] FIG. 10 illustrates a plan view of a water supply flow passage of the dish washer shown in FIG. 9;

[0030] FIG. 11 illustrates a modification of the condensing ducts in accordance with the exemplary embodiments of the present invention; and

[0031] FIG. 12 illustrates a modification of the condensing ducts in accordance with the exemplary embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0032] Reference will now be made in detail to the specific embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0033] Referring to FIG. 1, the dish washer includes a cabinet 10 which is an exterior of the dish washer, a tub 100 which forms a washing chamber 100a for washing dishes, a door 101 for opening/closing the tub 100, and a machinery room 100b for mounting electric components, such as a sump assembly 130 for supplying and recovering washing water, and the like.

[0034] The washing chamber 100a is formed in the tub 100 for holding the dishes, and the washing chamber 100a has a plurality of racks 110 mounted thereto for placing the dishes thereon. The washing water is sprayed through the spray arm assembly 120 in a state the dishes are placed on the rack 110 for washing the dishes. The spray arm assembly 120 includes an upper arm 122 arranged under an upper rack 112, and a lower arm 124 arranged under a lower rack 114. Each of the upper arm 122 and the lower arm 124 is rotatably mounted and has a plurality of spray nozzles (not shown) for spraying washing water toward the dishes.

[0035] The sump assembly 130 is connected to the upper arm 122 and the lower arm 124 with a connection pipe 200. The sump assembly 130 receives the washing water from a water supply source through a water supply pipe 300, holds the washing water received thus therein, and supplies the washing water to the upper arm 122 and the lower arm 124 through the connection pipe 200 selectively, or at the same time. The washing water used in the washing is drained to an outside of the dish washer through a drain pipe 400.

[0036] The sump assembly 130 includes a sump 132 for holding the washing water, a water supply pump (not shown) for pumping up the washing water from the sump 132, a discharge pump assembly 136 for discharging the washing water to an outside of the dish washer; a filter chamber 134 having a drain filter mounted thereto, and a fan assembly 138 for driving the discharge pump assembly 136.

[0037] The particulars of the exemplary embodiments will be described with reference to FIGS. 2 to 12. In general, each of the exemplary embodiments includes a condensing duct 500 or circulating duct module 500A, a water jacket 600, and a water softener module 700.

[0038] At the time the dishes are washed and dried,

because air supplied from an outside of the dish washer is heated to a high temperature and absorbs moisture in the tub 100 at the time of sterilizing washing, the air becomes high temperature wet vapor or humid air. Hereafter, because the high temperature wet vapor or the humid air requires dehumidification, the terms high temperature wet vapor and humid air will be used interchangeably.

[0039] In general, if water supplied to a home is hard water having a high calcareous or mineral content like that found in many European countries, a water softener 700 is mounted to the dish washer for treating the hard water to provide soft water. While the related art dish washer may use a water jacket filled with cold water for dehumidifying the air being discharged to an outside of the dish water, the cold water held in the water jacket cools down one sidewall surface of the tub for condensing moisture in the humid air in the tub and making water condensed thus to flow down to a bottom of the tub. However, as noted above, if the high temperature, humid air is discharged to an outside of the dish washer partly or re-circulated to the tub, water vapor condenses to form water drops in the vicinity of a portion through which the air is discharged to an outside of the dish washer, or an inside of the tub, which can cause inconveniences for the user.

[0040] Therefore, to provide more effective dehumidification of the air being discharged to the outside of the dish washer or re-circulated to the inside of the tub 100. a condensing duct 500 or circulating duct module 500A is provided to cooperate with the water jacket 600 and/or the water softener module 700. Structures for dehumidifying wet vapor in accordance with the exemplary embodiments of the present invention will be described in detail below.

[0041] A configuration of the dish washer for dehumidifying wet vapor in accordance with a first exemplary embodiment of the present invention will be described in detail with reference to FIGS. 2 and 3. As shown in FIGS. 2 and 3, a water jacket 600 filled with cold water is mounted to one side of a tub 100. In the water jacket 600, there is a condensing duct 500 placed therein for removing moisture from the wet vapor. A condensed water tank 550 is mounted under an outside of the water jacket 600 for holding the condensed water from the condensing duct 500. The condensing duct 500 has one side in communication with the tub 100 and the other side in communication with the condensed water tank 550, for leading the condensed water from the condensing duct 500 to the condensed water tank 550.

[0042] There is a water supply unit 610 on one side of lower side of the water jacket 600 connected to a water supply flow passage which is connected to an external water supply source, for supplying the washing water to the water jacket 600. There is a sump connection portion 620 on the other side of the lower side of the water jacket 600 where the water supply unit is positioned for supplying the water from the water jacket 600 to the sump. Also, there is a condensed water drain portion 552 under the condensed water tank 550 for supplying the condensed water from the condensed water tank 550 to the sump. The water collected at the sump supply pipe 570 by means of the sump connection portion 620 and the condensed water drain portion 552 is supplied to the sump.

[0043] A process for removing moisture from the wet vapor in the dish washer in accordance with the first exemplary embodiment of the present invention will be described. Referring to FIGS. 2 and 3, the condensing duct 500 leads the humid air formed after washing and drying of the dishes to the water jacket 600 holding the cold water (washing water), for dehumidifying the humid air by heat exchange to condense moisture in the humid air.

[0044] That is, since the condensing duct 500 is in communication with the tub 100 at one side thereof, the humid air is introduced to the condensing duct 500 from the tub 100 (the air introduction may be made with an additional fan provided or a fan provided already). Because the condensing duct 500 is in the water jacket 600, a surface where the condensing duct 500 is in contact with the cold water in the water jacket 600 is colder than the air in the tub. Therefore, the humid air introduced to the condensing duct 500 moves along the condensing duct 500 while heat exchanging with the surface to have the moisture therein condensed to remove the moisture from the humid air, making the humid air drier than the air in the tub 100. It is preferable that the condensing duct 500 has extensions of an appropriate combination of meandering and stream lines to make a long flow passage in the water jacket 600 to assist in the removal of the moisture to a certain level.

[0045] The condensed water falls down from the condensing duct 500, along with the extra washing water supplied to the water jacket 600, and is collected at the sump supply pipe 570 through the condensed water drain portion 552 and the sump connection portion 620. The collected water is then returned to the sump 132. The dehumidified air may be introduced to a heater (not shown) via a supplementary duct 150 connected to an upper side (see FIG. 3) of the condensing duct 500, heated by the heater, and introduced to the tub again or discharged to an outside of the tub 100.

[0046] A configuration of the dish washer for dehumidifying wet vapor in accordance with a second exemplary embodiment of the present invention will be described in detail. However, detailed description of parts identical to the first exemplary embodiment will be omitted. Referring to FIGS. 4 to 7, a water jacket 600A is mounted to one sidewall of a tub 100A and a circulating duct module is mounted to an opposite sidewall of the tub 100A. The water jacket 600A filled with cold water therein cools down the one sidewall of the tub 100A. Accordingly, when the humid air in the tub 100A is brought into contact thereto, moisture in the humid air is condensed by heat exchange and flows down to a bottom of the tub 100A.

[0047] The circulating duct module include a circulating duct 500A having one end in communication with the tub 100A, and the other end coupled to a fan assembly

570A. The fan assembly 570A has a fan (not shown) mounted thereto for circulating air from the tub 100A to the circulating duct 500A. Then, the air is introduced to and heated at a heater 574. The air heated thus is lead to the tub 100A through a nozzle 572 in the tub 100A, again.

[0048] The heated air is radially sprayed toward the water jacket 600A through the nozzle 572. Because the humid air in the tub 100A is heated and sprayed, a temperature difference of the humid air with the water jacket 600A becomes greater. According to this, moisture is condensed at a wall surface of the tub 100A having the water jacket 600A mounted thereto, enabling to remove the moisture from the humid air.

[0049] Referring to FIG. 8, a fine flow passage portion 640A having a plurality of fine flow passages is provided on one side of the water jacket 600A. The washing water is introduced to the fine flow passage portion 640A from the water supply unit 610A and held in the water jacket 600A. The fine flow passage portion 640A has an air brake 650A mounted thereto for moving upward from a mounted position at the time of draining to prevent the washing water from being introduced to the water jacket 600A because of a siphon phenomenon in a state such that the water supplied is stopped. The air brake 650A always serves to maintain the atmospheric pressure at the mounted position except during draining.

[0050] Excess water supplied to the water jacket 600A is returned to the tub 100A through a communication hole in the tub 100A, lead to the sump 132 through the sump connection portion 620A, or supplied to the water softener (not shown) through the water softener connection portion 630A. This may be selectively controlled by a valve (not shown).

[0051] A configuration of the dish washer for dehumidifying wet vapor in accordance with a third exemplary embodiment of the present invention will be described in detail. However, detailed description of parts identical to the first exemplary embodiment will be omitted. Referring to FIG. 9, a water jacket 600B and a condensing duct 500B having a size similar to the water jacket 600B are mounted to one side of the tub 100B. The condensing duct 500B may be placed in the water jacket 600B or may be attached to an outside of the water jacket 600B. In this exemplary embodiment, the condensing duct 500B is similar to the condensing duct 500 of the first embodiment except that the contact area between the condensing duct 500B and the water jacket 600B is maximized.

[0052] The large contact area of the condensing duct 500B to the cold water in the water jacket 600B improves dehumidifying efficiency by heat exchange with the wet vapor. Moreover, the large condensing duct 500B enables the reduction flow resistance of the humid air being introduced thereto.

[0053] While in each of the foregoing embodiments, the water is described as being supplied to the water jacket and then proceeding to either the sump or the water softener, it is possible that the water is supplied to the water jacket after the water is lead to the water softener, as shown in FIG. 10. In situations where the water has a high calcareous or mineral content, it may be desirable to have the water be supplied to the water softener first before supplying the water to the sump. That is, referring to FIG. 10, it can be made possible that, after the water is supplied to the water softener 700, the water is transferred to the water jacket 600, 600A, 600B, and thereafter, the water is supplied to the sump (or the tub), or a steam generator, or the like by means of valve control.

[0054] Furthermore, the condensing duct 500, circulating duct 500A, and condensing duct 500B described in the foregoing embodiments can have a variety of shapes as follows. Each of the condensing duct 500, circulating duct 500A, and condensing duct 500B can have a tube of a circular or polygonal cross section, as shown in the exemplary embodiments of FIGS 2-10, or a plate 500' placed in the water jacket 600 having alternate projections from surfaces of the plate without a separate condensing duct 500(See FIG. 11). As a further alternative, the condensing duct 500, circulating duct 500A, and condensing duct 500B can have a shape in which a plurality of fins are projected from a plate in the condensing duct (see FIG. 7). As far as the moisture can be condensed by heat exchange while the humid air moves therein, there is no limitation to shapes of the condensing duct.

[0055] Referring to FIG. 12, in order to improve condensing efficiency of the humid air passing through the condensing duct 500, one or more spray nozzles 500" can be mounted. And, a circulation pump (not shown) can be provided for supplying the washing water to the one or more spray nozzles 500". The circulating pump in a machinery room is connected to an underside to the water jacket for pumping up the washing water from the water jacket to the spray nozzle. The one or more spray nozzles 500" can be mounted to the condensing duct for spraying the washing water from the circulating pump to the condensing duct. The humid air passing through the condensing duct has a temperature higher than the washing water being sprayed, when the humid air is in contact with the washing water being sprayed directly, heat exchange takes place. That is, owing to direct contact (direct cooling type) with the washing water, the moisture in the humid air is condensed, the moisture is removed from the humid air.

[0056] The air having the moisture therein removed by heat exchange with the washing water being sprayed from the spray nozzle as the air is passing through the condensing duct is discharged to the tub 100 or an outside of the cabinet 10, through a circulating discharge duct (not shown) that is provided for this purpose. It is preferable that the circulating discharge duct is mounted to be in communication with an end of the condensing duct, and can be in communication with a discharge duct (not shown) in communication with the tub 100 or an outside of the cabinet 10.

[0057] A heater (not shown) may additionally be mounted to the water jacket 600 for heating the air having the moisture removed therefrom by heat exchange for removing the moisture therefrom completely. The heater can be mounted to the end of the condensing duct, or between the condensing duct and the circulating discharge duct, or an inside of the circulating discharge duct and the like, freely.

[0058] As has been described, since the humid air (wet vapor) formed after washing and drying of the dishes is dehumidified and discharged by using the water jacket and the condensing duct or circulating duct module, the problem of condensed water formed at the time of humid air discharge can be solved. Moreover, noise caused by the humid air discharge can be reduced.

[0059] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. A dish washer comprising:

a cabinet defining an exterior of the dish washer;
a tub in the cabinet to provide a washing chamber for washing dishes;
a water jacket mounted to a sidewall of the tub to hold water supplied to condense moisture from humid air formed after washing and drying of the dishes when the humid air is brought into contact thereto; and
a condensing duct mounted to the water jacket for guiding the humid air to the water jacket in removing the moisture from the humid air.

2. The dish washer of claim 1, further comprising a water supply unit to supply water to the water jacket from the exterior of the dish washer.

3. The dish washer of claim 1, wherein the condensing duct is mounted to an outside of the water jacket such that the water jacket is located between the condensing duct and the washing chamber.

4. The dish washer of claim 1, further comprising a condensed water tank located under the water jacket to hold condensed water fallen from the condensing duct, wherein the condensing duct has one end in communication with the tub, and the other end connected to the condensed water tank.

5. The dish washer of claim 1, wherein the condensing duct is smaller than the water jacket, the condensing duct being located in the water jacket.

6. The dish washer of claim 1, wherein the condensing duct includes a plurality of nozzles configured to spray water to an inside of the condensing duct.

7. The dish washer of claim 1, wherein the condensing duct further includes a plurality of fins projected from an inside of the condensing duct, wherein the plurality of fins is configured such that fins are alternately arranged.

8. The dish washer of claim 7, wherein the plurality of fins is configured such that adjacent fms have generally the same curved shape.

9. The dish washer of claim 1, further comprising a water softener mounted under the tub for treating the water supplied thereto, wherein the treated water is supplied to the water jacket through the water softener.

10. A dish washer comprising:

a cabinet defining an exterior of the dish washer;
a tub in the cabinet to provide a washing chamber for washing dishes;
a water jacket mounted to a first sidewall of the tub to hold water supplied to condense moisture from humid air formed after washing and drying of the dishes when the humid air is brought into contact thereto; and
a circulating duct module mounted to a second sidewall of the tub opposite the first sidewall, the circulating duct module being configured to receive humid air from the tub and spray the humid air toward the first sidewall of the tub having the water jacket mounted thereto.

11. The dish washer of claim 10, wherein the circulating duct module includes:

a circulating duct configured to receive humid air from the tub;
a fan assembly having a fan and a motor for introducing the humid air to the circulating duct;
a heater for heating the humid air; and
a spray nozzle for spraying the heated humid air into the tub.

12. The dish washer of claim 11, wherein the circulating duct is in communication with the tub.

13. The dish washer of claim 11, wherein the spray nozzle radially sprays the heated humid air toward the first sidewall of the tub.

14. The dish washer of claim 10, further comprising a

water softener mounted under the tub to treat the water supplied thereto.

15. The dish washer of claim 14, wherein the treated water is supplied to the water jacket through the water softener.

Fig. 1

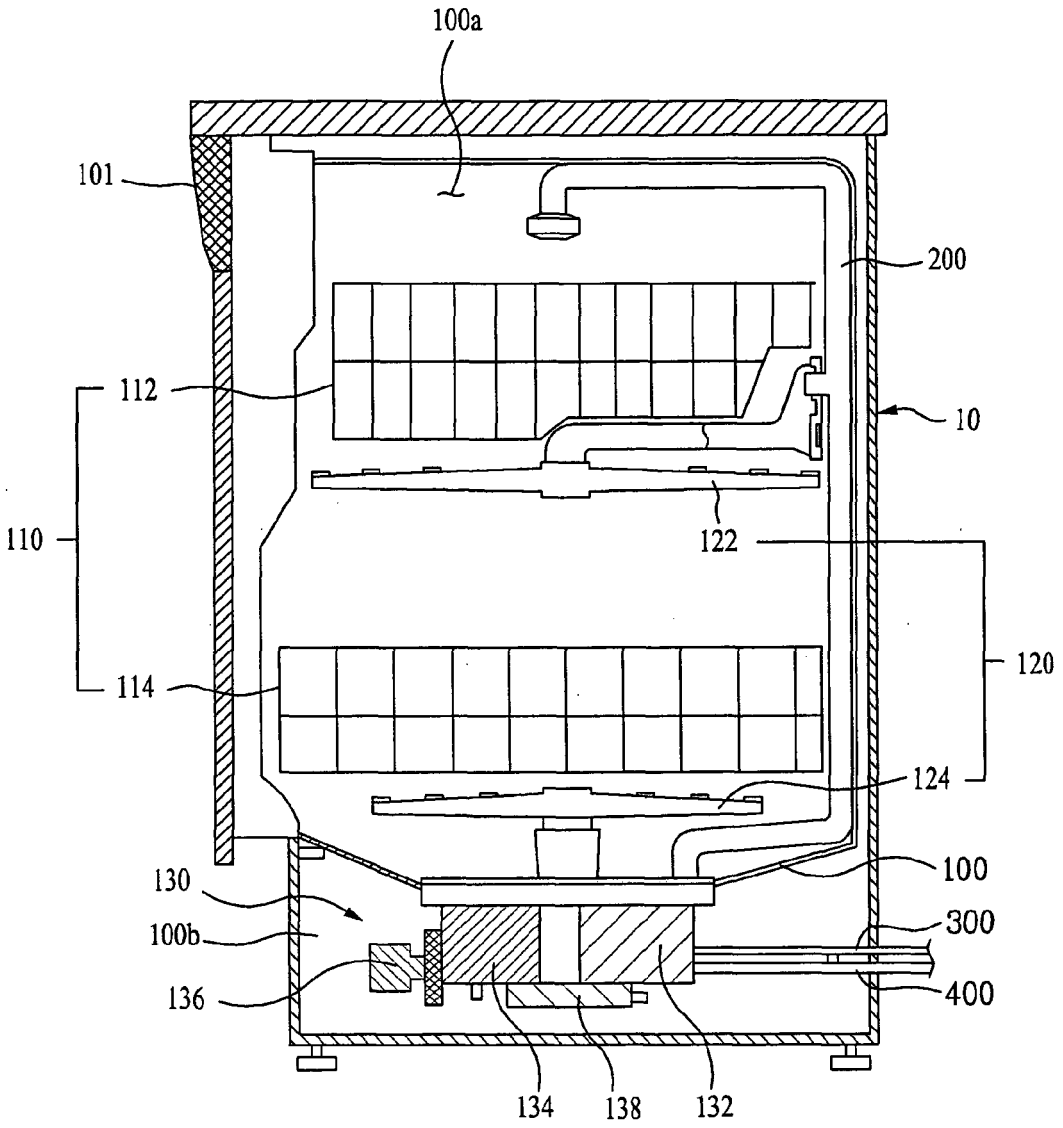

100a
101
200
112
10
110
122
120
114
124
100
130
300
100b
400
136
134
138
132

Fig. 2

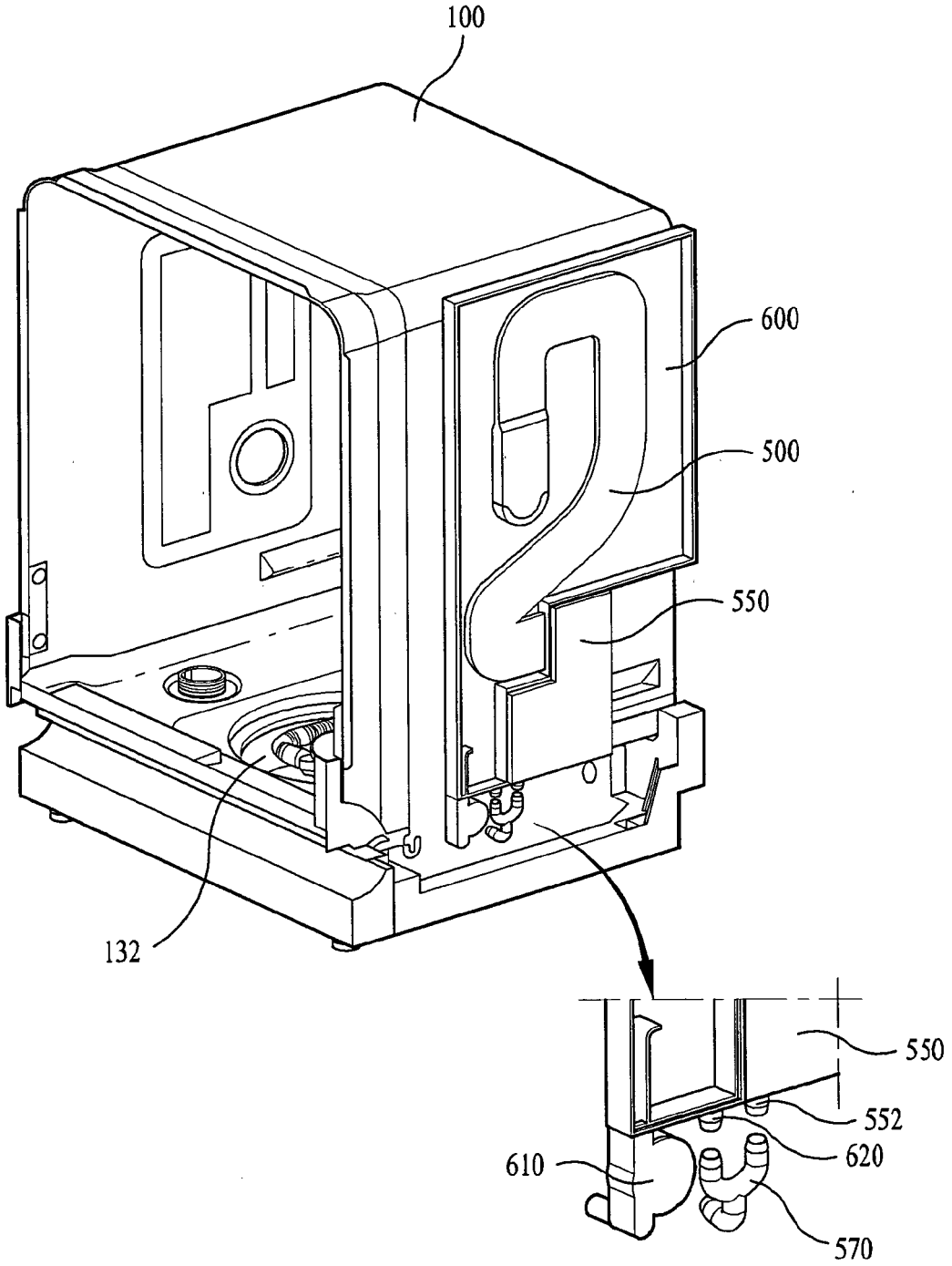


Fig. 3

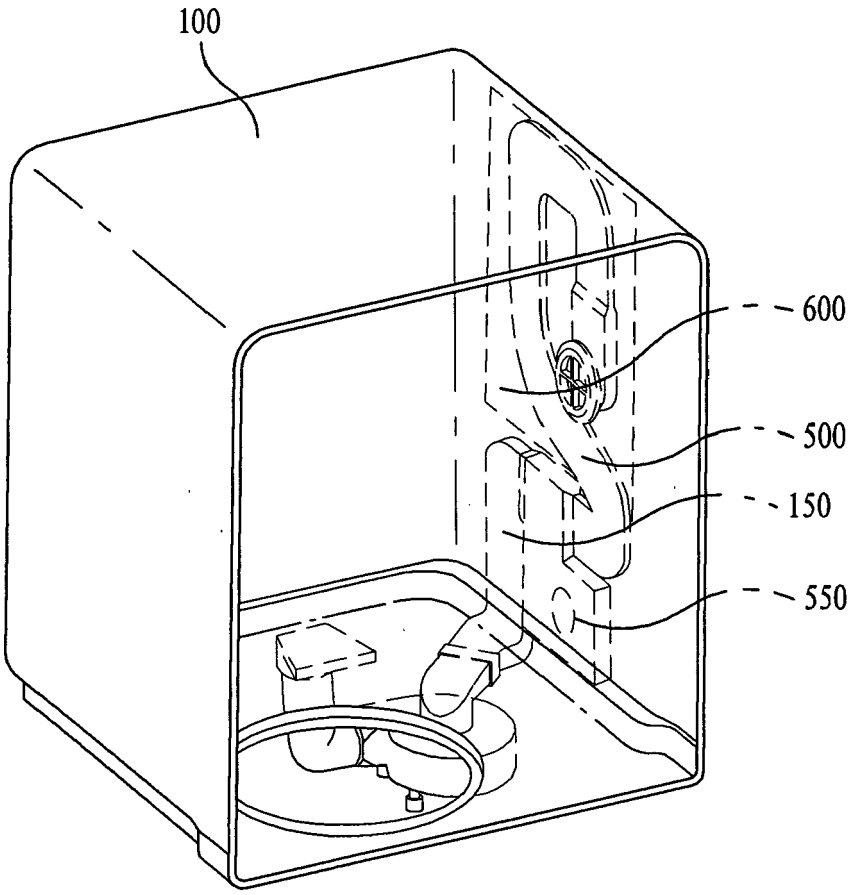


Fig. 4

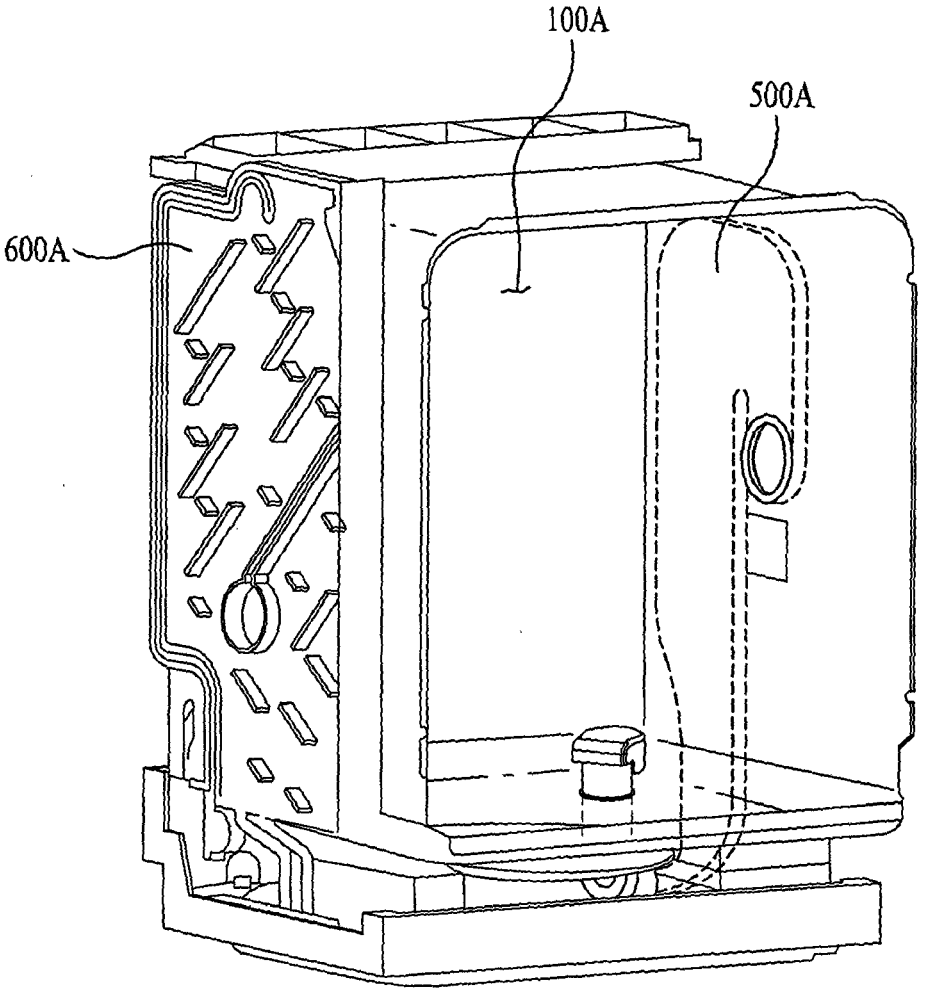


Fig. 5

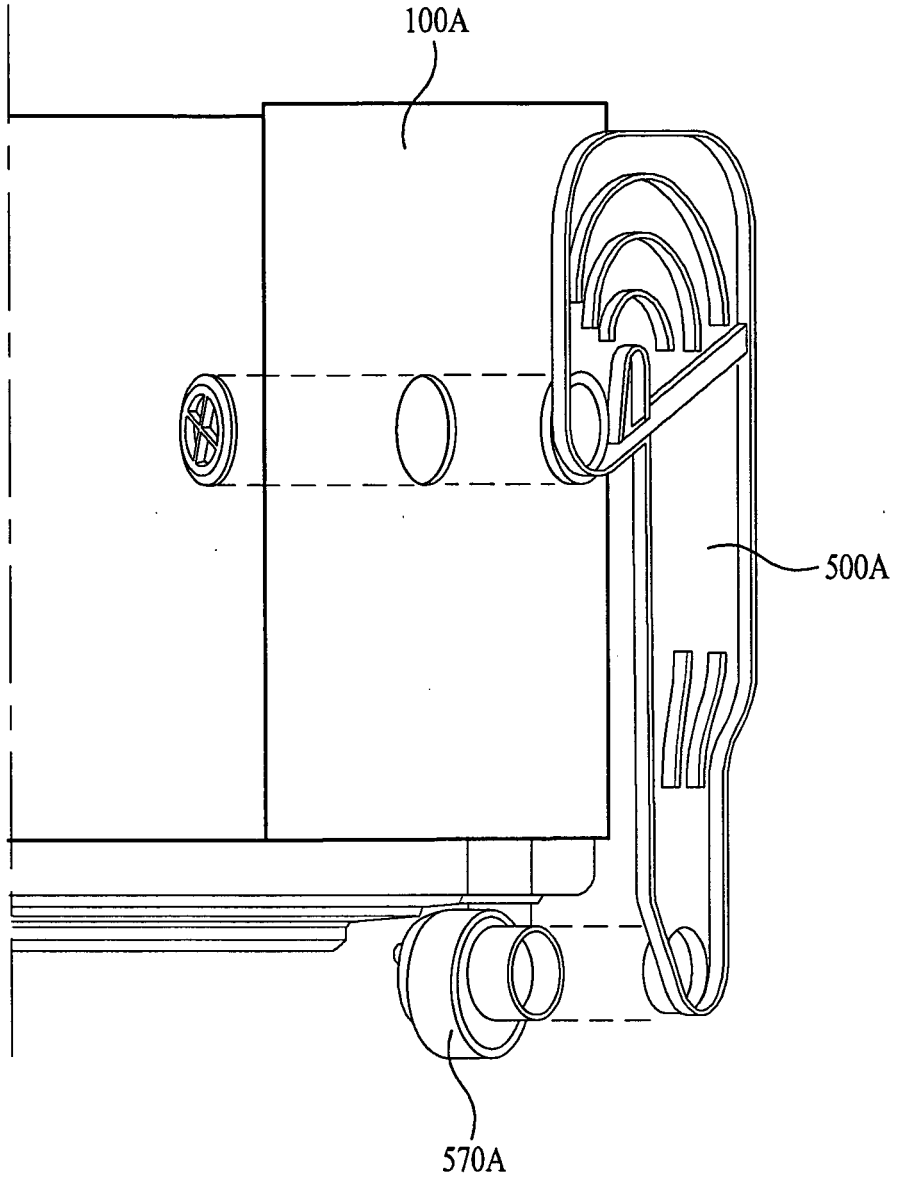


Fig. 6

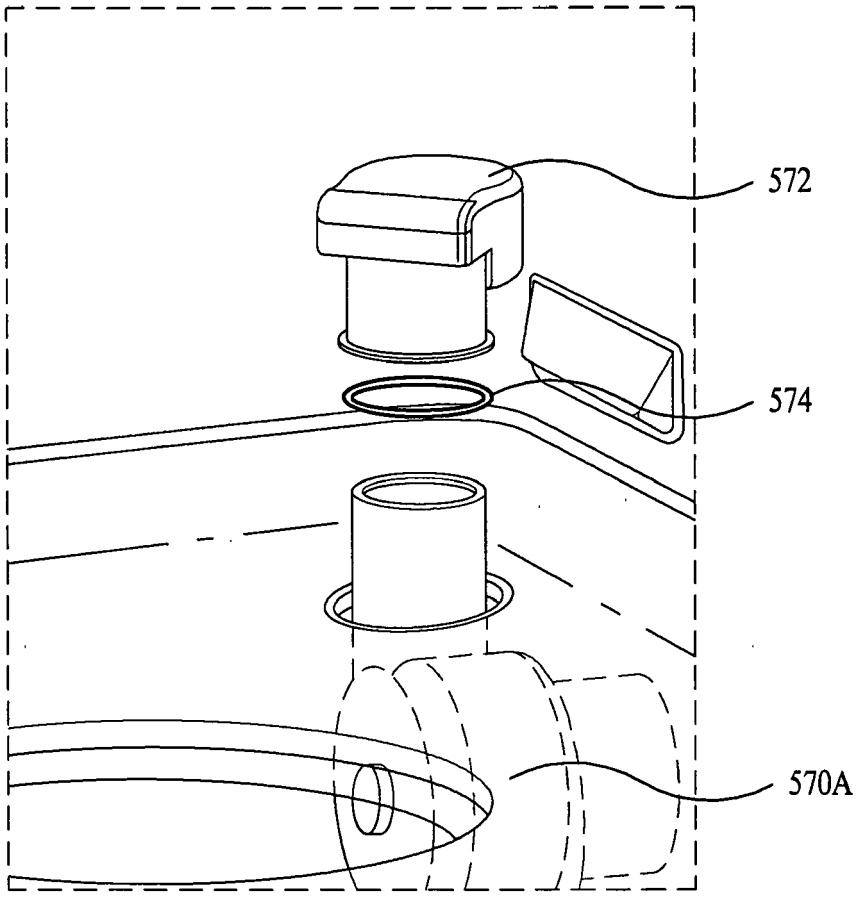


Fig. 7

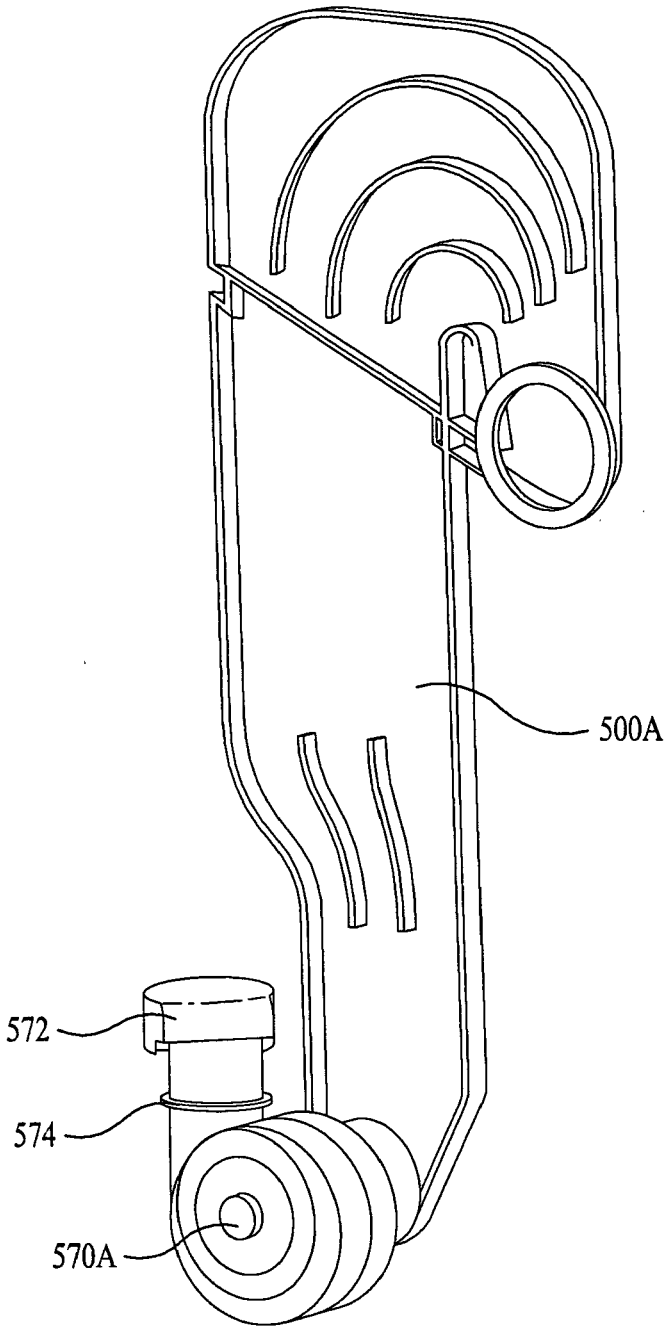


Fig. 8

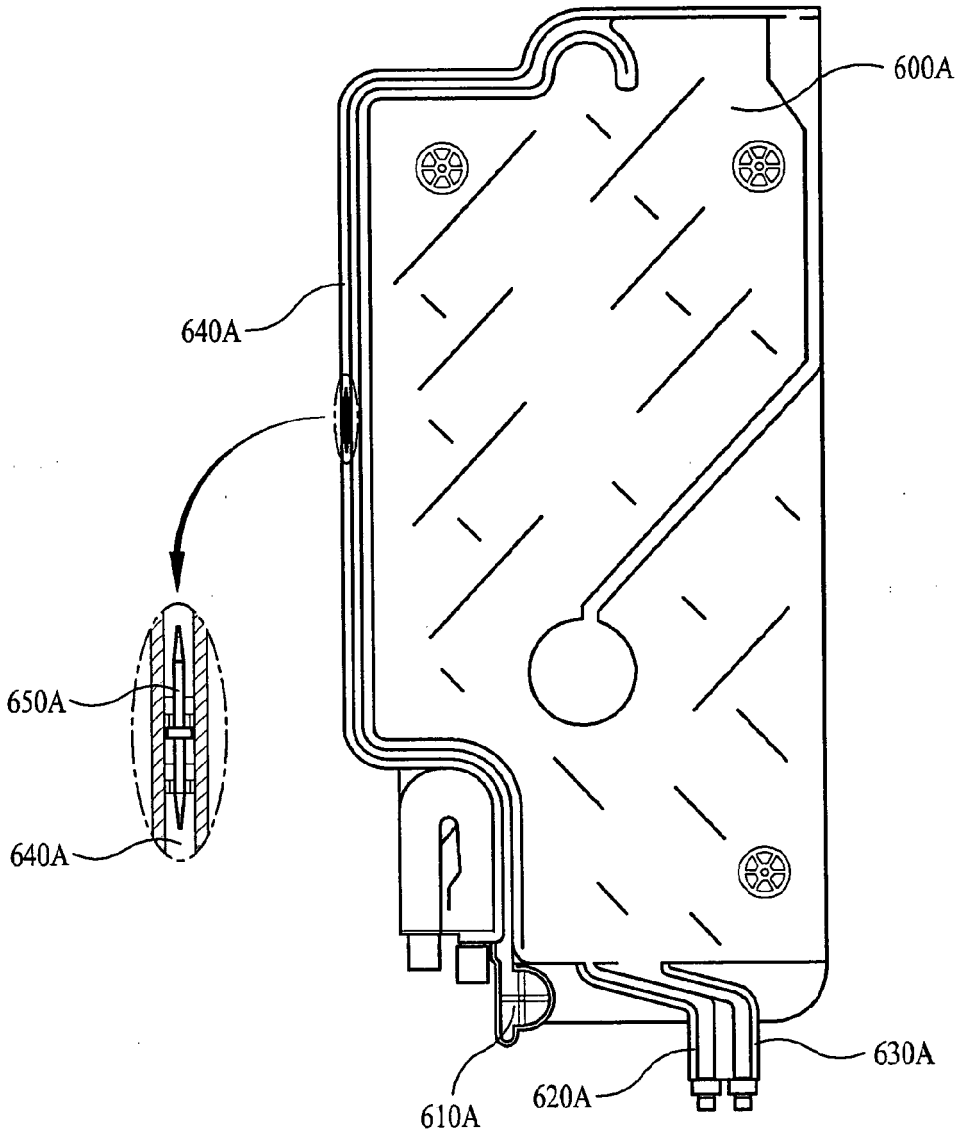


Fig. 9

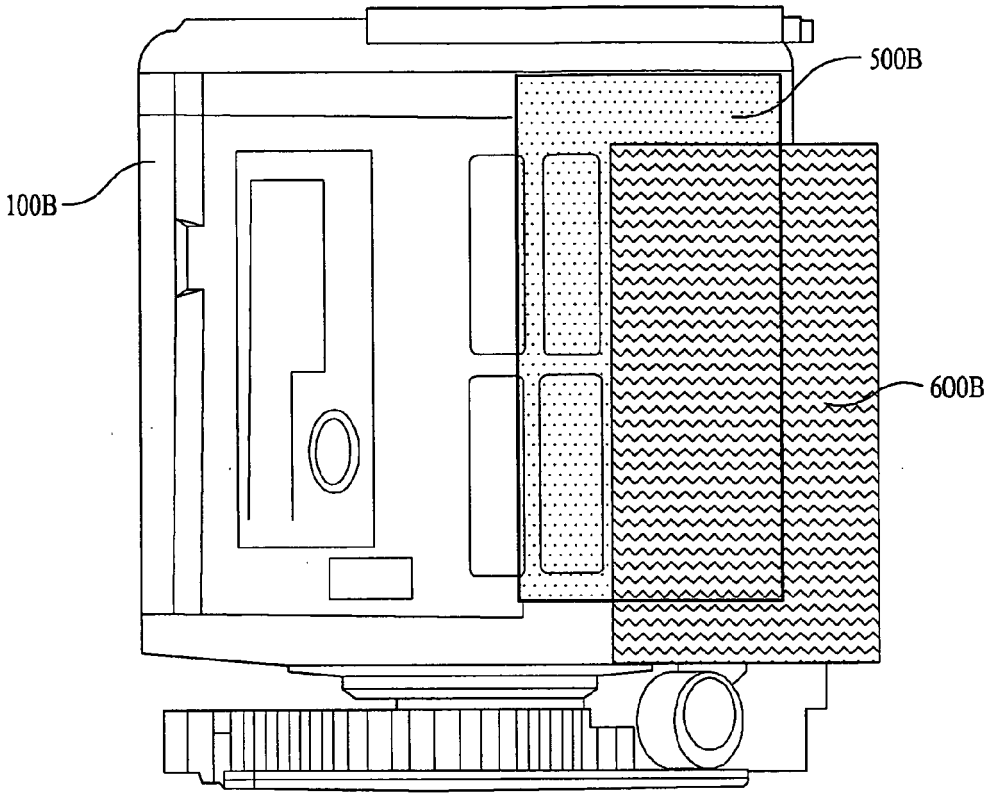


Fig. 10

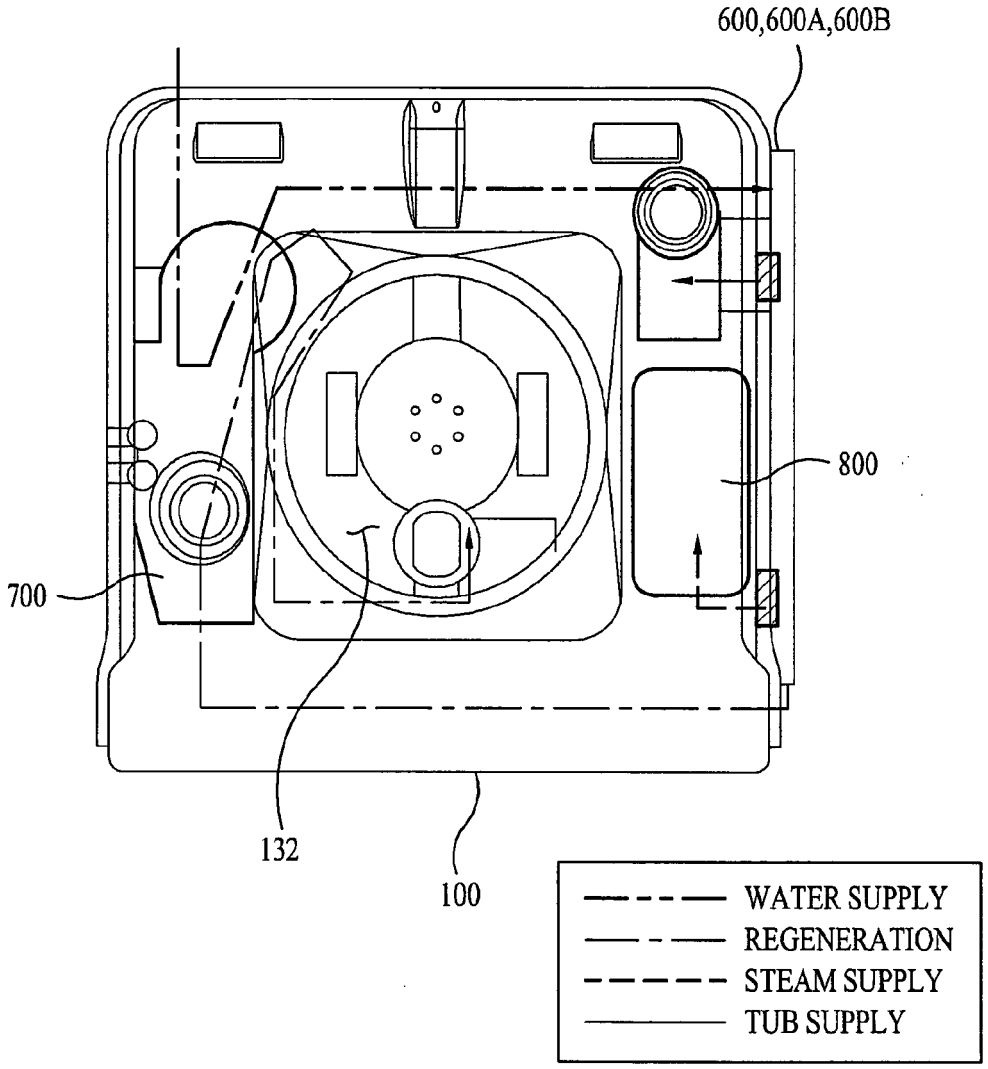

600,600A,600B
800
700
132
100
WATER SUPPLY
REGENERATION
STEAM SUPPLY
TUB SUPPLY

Fig. 11

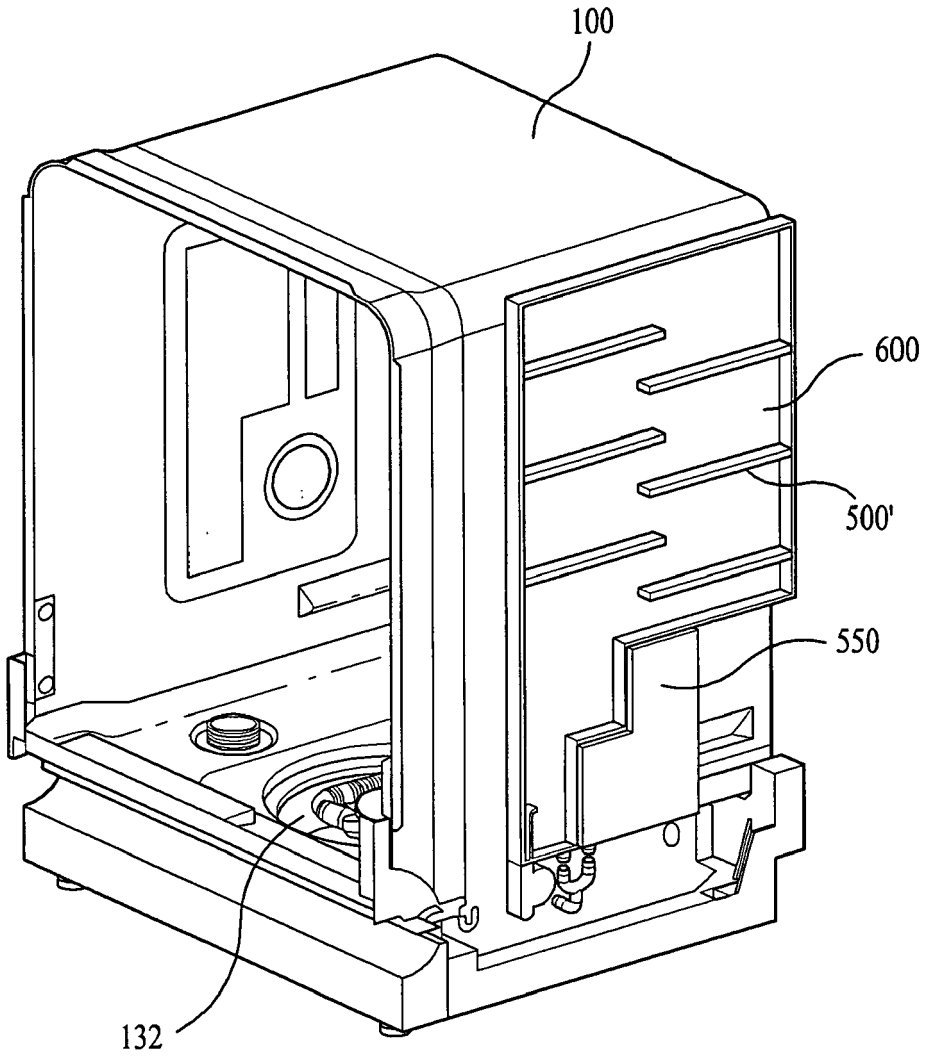
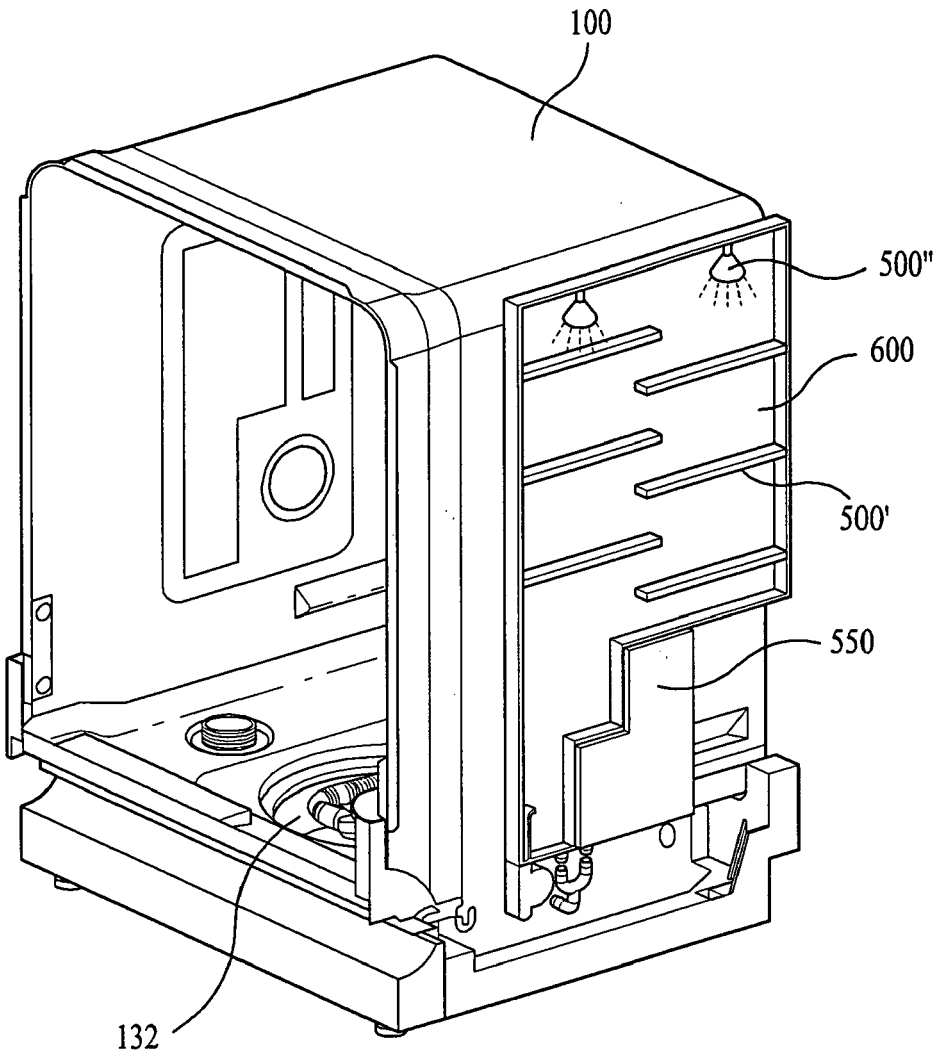


Fig. 12



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 1020090032179 **[0001]**