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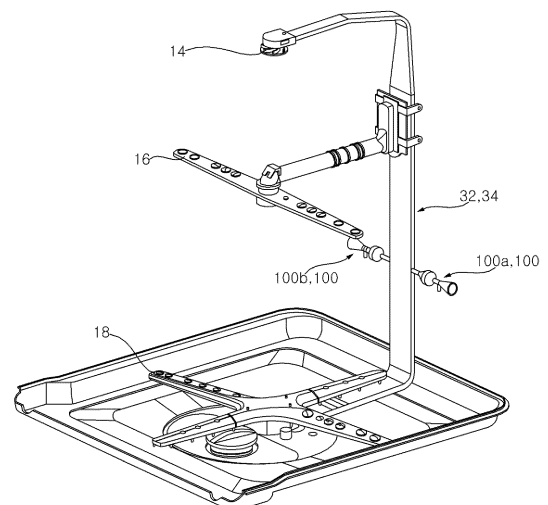
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(54) **DISHWASHER**

(57) The present invention relates to a dishwasher. The dishwasher of the present invention comprises: a tub; a sump which is disposed under the tub and in which washing water is stored; a spray arm which is disposed within the tub and sprays the tub with washing water; a pump which supplies the spray arm with washing water stored in the sump; a washing water flow pipe which supplies the spray arm with washing water discharged from the pump; and a bubble generator which is disposed in the spray arm or connection pipe and has a Venturi-tube shape to generate bubbles in washing water flowing therethrough.

Fig. 2



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Description

[TECHNICAL FIELD]

[0001] The present disclosure relates to a dishwasher, and more specifically, to a dishwasher including a bubble generator.

[BACKGROUND ART]

[0002] A dishwasher is a machine that removes dirt from dishes by spraying washing water. Korean Patent Publication No. KR 10-2018-0015929 discloses a dishwasher including a microbubble generator that generates microbubbles in washing water to increase the washing performance of the dishwasher.

[0003] The above patent intends to improve the washing performance through chemical washing power using detergent activation effect by generating the microbubbles in the washing water sprayed onto the dishes. To this end, a structure that installs the microbubble generator using a driving space in a lower portion of the dishwasher is disclosed.

[0004] However, the above microbubble generator structure discloses a structure that connects a washing pump to a tub using a lower space of the tub. Such a structure is problematic in that a path structure is complex, and the number of parts and material costs related to path connections increase.

[DETAILED DESCRIPTION OF INVENTION]

[TECHNICAL PROBLEMS]

[0005] According to one embodiment of the present disclosure, the present disclosure provides a dishwasher that enhances the performance of washing the dishes using washing water containing microbubbles.

[0006] According to one embodiment of the present disclosure, the present disclosure provides a dishwasher, in which a microbubble generating component efficiently utilizes space occupied in the dishwasher.

[0007] According to one embodiment of the present disclosure, the present disclosure provides a dishwasher that maintains the flow of washing water sprayed from a spray arm and generates microbubbles using some washing water.

[0008] Technical objects to be achieved by the present disclosure are not limited to those described above, and other technical objects that are not mentioned above may also be clearly understood from the descriptions given below by those skilled in the art to which the present disclosure belongs.

[TECHNICAL SOLUTION]

[0009] In order to accomplish the objects, a dishwasher according to an embodiment of the present dis-

closure may include a tub, a sump disposed under the tub and storing washing water therein, a spray arm disposed within the tub and spraying the washing water into the tub, a pump supplying the spray arm with the washing water stored in the sump, a washing water flow pipe supplying the spray arm with the washing water discharged from the pump, and a bubble generator disposed in the spray arm or connection pipe and having a Venturi-tube shape to generate bubbles in the washing water flowing there-through, so that washing water containing microbubbles can be generated using a portion of the washing water sprayed through the spray arm.

[0010] The spray arm may include a lower spray arm, and an upper spray arm disposed above the lower spray arm, the washing water flow pipe may extend along a bottom surface and a side surface of the tub to supply the upper spray arm with the washing water discharged from the pump, and the bubble generator may be disposed to protrude obliquely from a side of the washing water flow pipe, so that microbubbles can be generated using washing water flowing through the washing water flow pipe that supplies the washing water to the spray arm.

[0011] The bubble generator may include a connection pipe branching from the washing water flow pipe, a buffer chamber pipe extending from the connection pipe and forming a buffer chamber therein, a discharge pipe extending from the buffer chamber pipe and discharging the washing water that contains bubbles, and an air inlet pipe disposed between the buffer chamber pipe and the discharge pipe and having an air path through which outside air is introduced, and the air inlet pipe may be disposed on a downstream end of the buffer chamber and may have a structure extending downward, so that it is possible to prevent the washing water scattered through the spray arm from flowing into the air inlet pipe.

[0012] The buffer chamber pipe may include therein an expansion part in which a sectional area of a flow path is expanded, and a reduction part which is disposed downstream of the expansion part and in which the sectional area of the flow path is reduced, and a spiral groove may be formed on an inner circumference forming an internal path of the reduction part, so that a rotary flow can be created in the depressurized washing water.

[0013] A discharge path expanding in a direction where the washing water flows may be formed inside the discharge pipe, and a discharge hole through which the washing water is discharged may be formed at an end of the discharge path. Thereby, as the discharge path expands, bubbles can be micronized while the introduced air is broken.

[0014] The washing water flow pipe may include an upper washing water flow pipe disposed above the bubble generator, and a lower washing water flow pipe disposed under the bubble generator, and a size of a sectional area of a flow path of the upper washing water flow pipe may be formed smaller than a size of a sectional area of a flow path of the lower washing water flow pipe. Thus, the bubble generator is disposed in a portion of the

washing water flow pipe where the path sectional area is reduced, so that the washing water can flow into the bubble generator.

[0015] The spray arm may include a top spray arm that sprays the washing water downward from an upper end of a washing space defined by the tub, and an upper spray arm that is disposed under the top spray arm and sprays the washing water into the washing space, the washing water flow pipe may include a first washing water flow pipe sending the washing water supplied from the pump to the upper spray arm, and a second washing water flow pipe sending the washing water supplied from the pump to the top spray arm, and the bubble generator may include a first bubble generator disposed on a side of the first washing water flow pipe, and a second bubble generator disposed on a side of the second washing water flow pipe. Thus, two bubble generators are included, so that the production amount of microbubbles can be increased.

[0016] The spray arm may include a first blade formed with a first spray path that sprays the washing water into the tub, a second blade formed with a second spray path that sprays the washing water into the tub, and a hub supplying the washing water to each of the first blade and the second blade, and the bubble generator may be disposed on at least one of the first blade and the second blade, so that a spray path and the bubble generator are disposed inside the blade forming the spray arm.

[0017] The spray arm may include a first blade formed with a first spray path for spraying the washing water into the tub and a first bubble generation path for discharging the washing water containing microbubbles to the tub, a second blade formed with a second spray path for spraying the washing water into the tub and a second bubble generation path for discharging the washing water containing microbubbles to the tub, and a hub supplying the washing water to each of the first blade and the second blade, so that a spray path and a bubble generation path are disposed in the two blades, respectively.

[0018] The hub may include a supply path through which the washing water flows upward, a 1-1 branch path connecting the supply path and the first spray path, and a 1-2 branch path connecting the supply path and the second spray path, the 1-1 branch path may be formed in a direction parallel to the first spray path, and the 1-2 branch path may be formed in a direction parallel to the second spray path, so that the washing water flowing through the supply path of the hub can easily flow into the spray path. That is, the amount of the washing water supplied to the spray path can be secured.

[0019] The 1-1 branch path may be formed with a larger sectional area than the first spray path, and the 1-1 branch path may have a shape in which the sectional area thereof decreases from the supply path to the first spray path, and the 1-2 branch path may be formed with a larger sectional area than the second spray path, and the 1-2 branch path may have a shape in which the sectional area thereof decreases from the supply path to the sec-

ond spray path. Thus, the washing water flowing through the supply path of the hub can easily flow into the spray path.

[0020] The hub may include a 2-1 branch path connecting the supply path and the first bubble generation path, and a 2-2 branch path connecting the supply path and the second bubble generation path, the 2-1 branch path may be disposed at an angle with the first bubble generation path, and the 2-2 branch path may be disposed at an angle with the second bubble generation path, so that the amount of the washing water supplied to the bubble generation path can be formed to be relatively small. That is, the amount of the washing water supplied to the spray path can be secured.

[0021] The sectional area of each of the 2-1 branch path and the 2-2 branch path may be formed smaller than the sectional area of the 1-1 branch path or the 1-2 branch path, so that the amount of the washing water supplied to the spray path is secured, and thereby washing water below a certain level is supplied to the bubble generation path.

[0022] The first spray path disposed in the first blade may be located at a rear of the first bubble generator on the basis of a rotating direction of the spray arm, and the second spray path disposed in the second blade may be located at a rear of the second bubble generator on the basis of the rotating direction of the spray arm, so that the spray arm can rotate by placing the spray path and the bubble generation path.

[0023] Each of the first bubble generation path and the second bubble generation path may include therein a connecting path connected to the supply path, a buffer chamber connected to the connecting path and having a path sectional area expanded or reduced, an air inlet path which is connected to the buffer chamber and through which outside air is sucked in, and a discharge path connected to the air inlet path and discharging washing water in which microbubbles are created. Therefore, washing water flowing through each bubble generation path can generate microbubbles while flowing through the buffer chamber, the air inlet path, and the discharge path.

[0024] The buffer chamber may include an expansion part in which a sectional area of a flow path is expanded, a maintenance part in which the sectional area of the flow path is maintained, and a reduction part in which the sectional area of the flow path is reduced, an inlet connected to the connecting path and an outlet connected to the air inlet path may be formed in the buffer chamber, and central positions of the inlet and the outlet formed in the buffer chamber may be formed differently from each other. Therefore, a change in pressure can be created in the washing water flowing through the buffer chamber.

[0025] The air inlet path may be connected at a side thereof to an air path, and the air path allows outside air to flow in through a suction hole formed in a lower surface of the spray arm, thereby preventing the washing water scattered to the spray arm from being introduced through

the air path.

[0026] Specific details of other embodiments are included in the detailed description and drawings.

[EFFECT OF INVENTION]

[0027] A dishwasher according to the present disclosure has one or more effects as follows.

[0028] First, a bubble generator can be placed on a side of a washing water flow pipe that supplies washing water to a spray arm, thereby generating microbubbles using a portion of the washing water supplied to the spray arm. Further, a bubble generation path can be disposed in the spray arm, so that washing water containing microbubbles can be supplied to the washing water discharged to a tub.

[0029] Washing water containing microbubbles, which is supplied to the tub, can be circulated through a sump to be sprayed onto the dishes. The washing water containing the microbubbles is advantageous in that it is possible to effectively wash away dirt from the dishes.

[0030] Second, it is possible to minimize space in a dishwasher occupied by a bubble generator, by placing a bubble generation path in a spray arm. Further, a bubble generator can be placed on a side of a washing water flow pipe that supplies washing water to a spray arm, so that space in a tub can be utilized.

[0031] Third, a bubble generator generating microbubbles secures the amount of washing water supplied to a spray path of a spray arm while securing the amount of washing water flowing into the bubble generator. Therefore, chemical washing power through microbubbles can be added while securing physical washing power through the washing water spray of a spray arm.

[0032] Effects of the present disclosure are not limited to the above-mentioned effects, and other effects that are not mentioned above will be clearly understood by those skilled in the art from the following claims.

[BRIEF DESCRIPTION OF THE DRAWING]

[0033]

FIG. 1 is a schematic view of a dishwasher according to an embodiment of the present disclosure.

FIG. 2 is a perspective view showing some components of a dishwasher including a bubble generator, a spray arm, and a washing water flow pipe according to a first embodiment.

FIG. 3 is a front view of FIG. 2.

FIG. 4 is a sectional view illustrating the configuration of the washing water flow pipe and the bubble generator.

FIG. 5 is a sectional view illustrating the configuration of a washing water flow pipe and a bubble generator according to a modification of FIG. 4.

FIG. 6 is a front view of a spray arm including a bubble generator according to a second embodi-

ment of the present disclosure.

FIG. 7 is a plan view of FIG. 6.

FIG. 8 is a sectional view illustrating the internal configuration of the bubble generator according to the second embodiment of the present disclosure.

[BEST MODE FOR CARRYING OUT THE INVENTION]

[0034] The above and other objectives, features, and other advantages of the present disclosure will be more clearly understood from the following detailed description when taken conjointly with the accompanying drawings. The present disclosure may, however, be embodied in many different forms and should not be construed as being limited to only the embodiments set forth herein. These embodiments are provided solely to ensure that this disclosure is complete and will fully convey the scope of the invention to those skilled in the art. The present disclosure is defined solely by the claims. The same reference numerals are used throughout the drawings to designate the same or similar components.

[0035] Hereinafter, dishwashers according to embodiments of the present disclosure will be described with reference to the accompanying drawings.

[0036] First, referring to FIG. 1, the overall configuration of the dishwasher of the present disclosure will be described in brief.

[0037] Referring to FIG. 1, the dishwasher includes a tub 10 defining a washing space 10a in which the dishes are washed, a door 11 opening or closing an open side of the tub 10, a sump 12 disposed in a lower portion of the tub 10 and storing washing water, spray arms 14, 16, and 18 spraying the washing water into the tub 10, a pump 20 supplying the washing water stored in the sump 12 to the spray arms 14, 16, and 18, and racks 28 and 30 disposed in the tub 10 and holding the dishes.

[0038] The pump 20 further includes an impeller 22 that rotates to pump the washing water, and a heater 24 that heats the washing water.

[0039] The dishwasher further includes a steam nozzle 26 that supplies steam produced from the pump 20 to the tub 10.

[0040] The racks 28 and 30 may include an upper rack 28 and a lower rack 30. The upper rack 28 is disposed above the lower rack 30. The spray arms 14, 16, and 18 may include a top spray arm 14, an upper spray arm 16, and a lower spray arm 18. The top spray arm 14 may be disposed above the upper rack 28 of the tub 10 to spray the washing water downward. The upper spray arm 16 may be disposed under the upper rack 28 to spray the washing water upward. The lower spray arm 18 may be disposed under the lower rack 30 to spray the washing water upward.

[0041] The dishwasher may include washing water flow pipes 32 and 34 that supply the washing water fed from the pump 20 to the plurality of spray arms 14 and 16, respectively.

[0042] The washing water flow pipe may include a first washing water flow pipe 32 that supplies washing water fed from the pump 20 to the upper spray arm 16, and a second washing water flow pipe 34 that supplies the washing water fed from the pump 20 to the top spray arm 14. The washing water flow pipe may further include a third pipe (not shown) that supplies the pump 20 fed from the pump 20 to the lower spray arm 18. The dishwasher may include a valve 36 that supplies the washing water fed from the pump 20 to at least one of the top spray arm 14, the upper spray arm 16, and the lower spray arm 18.

[0043] The dishwasher of the present disclosure may include a bubble generator 100 that forms a bubble generation path 110 therein to generate microbubbles using the washing water supplied from the pump 20. The bubble generator 100 may generate washing water containing the microbubbles by passing a portion of the washing water flowing from the pump 20 through a path of a Venturi-tube structure. The bubble generator 100 may be disposed as a separate configuration or may be disposed to be included in another configuration.

<First Embodiment>

[0044] Hereinafter, the bubble generator 100 according to a first embodiment of the present disclosure will be described with reference to FIGS. 2 to 5.

[0045] The bubble generator 100 according to the first embodiment is disposed as a separate configuration inside the tub 10. The bubble generation path 110 is formed in the bubble generator 100.

[0046] Referring to FIG. 2, the bubble generator 100 according to the first embodiment is disposed on a side of the first washing water flow pipe 32 and/or the second washing water flow pipe 34. Referring to FIG. 4, the first washing water flow pipe 32 and the second washing water flow pipe 34 may be disposed on the left and right sides. The sectional area of the flow path of the first washing water flow pipe 32 connected to the upper spray arm 16 may be formed to be larger than the sectional area of the flow path of the second washing water flow pipe 34 connected to the top spray arm 14.

[0047] Referring to FIGS. 2 to 5, the dishwasher may include a first bubble generator 100a disposed on a side of the first washing water flow pipe 32, and a second bubble generator 100b disposed on a side of the second washing water flow pipe 34.

[0048] The first bubble generator 100a may be disposed at an angle to the first washing water flow pipe 32. Referring to FIG. 4, the first bubble generator 100a may be disposed to be perpendicular to the first washing water flow pipe 32. Although not shown in the drawing, the first bubble generator 100a may be disposed on a side of the first washing water flow pipe 32, and may also be disposed to be inclined upward.

[0049] Referring to FIG. 5, the first washing water flow pipe 32 may include a first upper washing water flow pipe

32a disposed above the first bubble generator 100a, and a first lower washing water flow pipe 32b disposed under the first bubble generator 100a. The sectional area of the flow path of the first upper washing water flow pipe 32a may be formed to be smaller than the sectional area of the flow path of the first lower washing water flow pipe 32b. Thus, a portion of the washing water flowing through the first washing water flow pipe 32 may be supplied to the first bubble generator 100a.

[0050] Referring to FIG. 5, the second washing water flow pipe 34 may include a second upper washing water flow pipe 34a disposed above the second bubble generator 100b, and a second lower washing water flow pipe 34b disposed under the second bubble generator 100b. The sectional area of the flow path of the second upper washing water flow pipe 34a may be formed to be smaller than the sectional area of the flow path of the second lower washing water flow pipe 34b.

[0051] The first bubble generator 100a may include a connection pipe 102 that forms a connecting path 112 branched from the first washing water flow pipe 32, a buffer chamber pipe 104 that extends from the connection pipe 102 and forms the buffer chamber 114 therein, a discharge pipe 108 that extends from the buffer chamber pipe 104 and discharges the washing water containing bubbles, and an air inlet pipe 106 which is disposed between the buffer chamber pipe 104 and the discharge pipe 108 and in which an air path 116 is formed to introduce outside air.

[0052] The buffer chamber 114 includes an expansion part 114a in which a sectional area of a flow path is expanded, a maintenance part 114b in which the sectional area of the flow path is maintained, and a reduction part 114c in which the sectional area of the flow path is reduced.

[0053] Some washing water flowing through the first washing water flow pipe 32 may flow through the connection pipe 102 to the first bubble generator 100a. Referring to FIG. 4, the sectional area of the internal path formed by the connection pipe 102 is formed to be smaller than the sectional area of the internal path formed by the first washing water flow pipe 32. The sectional area of the internal path formed by the first washing water flow pipe 32 may be formed to be 10 times larger than the sectional area of the internal path formed by the connection pipe 102. Thus, it is possible to prevent the amount of the washing water flowing through the upper spray arm 16 from decreasing. The connection pipe 102 is configured to form a relatively small path sectional area with the first washing water flow pipe 32, thereby securing a smaller flow rate of washing water than that of the washing water flowing through the first washing water flow pipe 32.

[0054] The expansion part 114a is a structure in which the flow path in the discharge pipe 108 forms a Venturi-tube structure with the reduction part 114c. Outside air may be introduced into the Venturi-tube through the Venturi-tube structure and an air intake tube connected therebetween. The expansion part 114a may be ex-

panded considering the reduction ratio of the inner radius of the reduction part 114c. As the internal path of the reduction part 114c is reduced, the pressure of the washing water flowing therein is reduced to a level lower than the pressure of the external space of the first bubble generator 100a, so that a negative pressure is formed in the washing water flowing through the downstream end of the reduction part 114c. Therefore, outside air may be introduced from the air inlet pipe 106 located at the downstream end of the reduction part 114c.

[0055] The air inlet pipe 106 is located at the downstream end of the reduction part 114c. The air inlet pipe 106 is disposed between the reduction part 114c and the discharge pipe 108. The air inlet pipe 106 may be configured to extend downward. The air inlet pipe 106 has a structure that is open downward. Thus, it is possible to minimize the washing water scattered in the washing space 10a inside the tub 10 from flowing into the air inlet pipe 106.

[0056] Referring to FIG. 5, a spiral groove 115 may be formed on the inner circumference forming the internal path of the reduction part 114c. Therefore, the washing water flowing in the reduction part 114c may form a rotary flow.

[0057] A discharge path 118 formed in the discharge pipe 108 may form an expansion path that expands in the flow direction of the washing water. Therefore, air introduced through the air inlet pipe 106 may be broken as it flows inside the discharge pipe 108.

[0058] A discharge hole 119 may be formed on a side of the discharge pipe 108. The discharge hole 119 may be formed at an end where the flow path of the discharge pipe 108 expands. The discharge hole 119 may be disposed on an end of the discharge path 118.

[0059] The second bubble generator 100b may have the same configuration as the first bubble generator 100a. The second bubble generator 100b may be disposed on a side of the second washing water flow pipe 34. The second washing water flow pipe 34 may also be formed so that an upper flow path area on the basis of the second bubble generator 100b is smaller than a lower flow path area.

[0060] The second bubble generator 100b may be disposed at an angle to the second washing water flow pipe 34. Referring to FIG. 4, the second bubble generator 100b may be disposed to be perpendicular to the second washing water flow pipe 34. The second bubble generator may be disposed to be inclined upward.

[0061] The second bubble generator 100b may include a connection pipe 102, a buffer chamber pipe 104, and a discharge pipe 108. Further, the second bubble generator 100b may include an air inlet pipe 106 through which air is introduced from the outside.

<Second Embodiment>

[0062] Hereinafter, the bubble generator according to a second embodiment of the present disclosure will be

described with reference to FIGS. 6 to 8.

[0063] Bubble generators 200a and 200b according to the second embodiment may be disposed to be included in the spray arms 16 and 18. The bubble generators 200a and 200b may be disposed in the upper spray arm 16 or the lower spray arm 18. The bubble generators 200a and 200b may be disposed in the lower spray arm 18.

[0064] The spray arms 16 and 18 may include at least two blades 50 and 52. The spray arms 16 and 18 may include a pair of blades 50 and 52 in which spray paths 56 and 58 and bubble generation paths 210a and 210b are formed, respectively, and a hub 54 which supplies washing water to each of the pair of blades 50 and 52.

[0065] Referring to FIG. 6, the spray arms 16 and 18 include a first blade 50 in which a first spray path 56 for spraying the washing water to the tub 10 and a first bubble generation path 210a for generating microbubbles using the flowing washing water are formed, and a second blade 52 in which a second spray path 58 for spraying the washing water to the tub 10 and a second bubble generation path 210b for generating microbubbles using the flowing washing water are formed. The spray arms 16 and 18 include the hub 54 which supplies the washing water to each of the first blade 50 and the second blade 52.

[0066] The first blade 50 and the second blade 52 may extend in opposite directions with respect to the hub 54. The spray path and the bubble generation path disposed inside each of the first blade 50 and the second blade 52 may be formed symmetrically in a diagonal direction.

[0067] Referring to FIG. 7, when seen from the top, the first spray path 56 disposed in the first blade 50 may be disposed at the rear of the first bubble generator 200a or 200b on the basis of the rotating direction of the spray arms 16 and 18. Referring to FIG. 7, when seen from the top, the second spray path 58 disposed in the second blade 52 may be disposed at the rear of the second bubble generator 200a or 200b on the basis of the rotating direction of the spray arms 16 and 18.

[0068] A supply path 64 through which the washing water flows upward, a first branch path 60a or 60b which connects the supply path 64 and the first spray path 56 or the second spray path 58, and a second branch path 62a or 62b which connects the supply path 64 and the first bubble generation path 210a or the second bubble generation path 210b are formed in the hub 54.

[0069] The supply path 64 has a cylindrical shape. The supply path 64 supplies the washing water fed from the pump 20 upward. At the upper end of the supply path 64, the first branch paths 60a and 60b and the second branch paths 62a and 62b are disposed.

[0070] The first branch paths 60a and 60b include a 1-1 branch path 60a connecting the supply path 64 and the first spray path 56, and a 1-2 branch path 60b connecting the supply path 64 and the second spray path 58.

[0071] The 1-1 branch path 60a may be formed in a direction parallel to the first spray path 56. The 1-1 branch path 60a may be formed with a larger sectional area than

that of the first spray path 56. The 1-1 branch path 60a may have a shape in which the sectional area decreases in a direction from the supply path 64 to the first spray path 56.

[0072] The 1-2 branch path 60b may be formed in a direction parallel to the second spray path 58. The 1-2 branch path 60b may be formed with a larger sectional area than that of the second spray path 58. The 1-2 branch path 60b may have a shape in which the sectional area decreases in a direction from the supply path 64 to the second spray path 58.

[0073] The second branch paths 62a and 62b include a 2-1 branch path 62a connecting the supply path 64 and the first bubble generation path 210a, and a 2-2 branch path 62b connecting the supply path 64 and the second bubble generation path 210b.

[0074] The 2-1 branch path 62a may be formed at an angle to the first bubble generation path 210a. The 2-2 branch path 62b may be formed at an angle to the second bubble generation path 210b. The sectional area of the 2-1 branch path 62a or the 2-2 branch path 62b may be formed to be smaller than the sectional area of the 1-1 branch path 60a or the 1-2 branch path 60b.

[0075] Hereinafter, the configuration of the first blade 50 will be described. The configuration and shape of the first spray path 56 and the first bubble generation path 210a described in the first blade 50 may be identical to the internal configuration of the second blade 52.

[0076] The first spray path 56 and the first bubble generation path 210a may be disposed to be spaced apart from each other in a direction perpendicular to a direction in which the first blade 50 extends. The size of the sectional area of a flow path formed in an inflow end of the first spray path 56 is formed to be larger than the size of the sectional area of a flow path formed in an inflow end of the first bubble generation path 210a. The size of the sectional area of the flow path formed in the inflow end of the first spray path 56 may be formed to be at least 5 times larger than the size of the sectional area of the flow path formed in the inflow end of the first bubble generation path 210a.

[0077] A plurality of first spray nozzles 19a are disposed above the first spray path 56 to spray the washing water to the washing space 10a of the tub 10. The plurality of first spray nozzles 19a may be arranged to be spaced apart from each other in a direction where the first spray path 56 is formed. Likewise, a plurality of second spray nozzles 19b may be disposed above the second spray path 58 to be spaced apart from each other and to spray the washing water to the washing space 10a of the tub 10.

[0078] The first bubble generation path 210a includes a connecting path 212 which is connected to the supply path 64 of the hub 54, a buffer chamber 214 which is connected to the connecting path 212 and in which the sectional area of a flow path expands, an air inlet path 215 which is connected to the buffer chamber 214 and into which outside air is introduced, and a discharge path 218 which is connected to the air inlet path 215 and dis-

charges washing water containing microbubbles.

[0079] The connecting path 212 is connected to the supply path 64 of the hub 54. The connecting path 212 may supply the washing water flowing from the supply path 64 to the buffer chamber 214.

[0080] The buffer chamber 214 includes an expansion part 214a in which the sectional area of the flow path is expanded, a maintenance part 214b in which the sectional area of the flow path is maintained, and a reduction part 114c in which the sectional area of the flow path is reduced.

[0081] The sectional area of the flow path defined in the expansion part 214a may be formed to be larger than the sectional area of the connecting path 212. When the washing water flowing through the connecting path 212 is introduced into the buffer chamber 214, a flow rate may decrease rapidly. In addition, as the expansion part 214a moves in the flow direction of the washing water, the sectional area of the flow path expands rapidly, so the flow rate of the washing water may decrease. That is, the pressure of the washing water flowing through the connecting path 212 to the buffer chamber 214 may be lowered.

[0082] The maintenance part 214b may maintain the sectional area of the expanded flow path in the expansion part 214a.

[0083] The reduction part 114c extends in the flow direction of the washing water from the end of the maintenance part 214b. The reduction part 114c is connected at an outflow end to the air inlet path 215. Here, the outflow end of the reduction part 114c may be an outlet 213b of the buffer chamber 214.

[0084] Since the sectional area of the flow path is reduced in the flow direction of the washing water, the pressure of the washing water flowing along the reduction part 114c is lowered. Since the sectional area of the flow path is reduced in the flow direction of the washing water, the flow rate of the washing water flowing along the reduction part 114c is increased.

[0085] The flow path defined in the buffer chamber 214 may be formed with the same length in a vertical direction over an entire area. The flow path defined in the buffer chamber 214 may form a flow path that is expanded, maintained, and reduced in a direction perpendicular to the flow direction of the washing water.

[0086] An inlet 213a connected to the connecting path 212 and an outlet 213b connected to the air inlet path 215 may be formed in the buffer chamber 214. The inlet 213a may be a hole or path that is formed at the inflow end of the buffer chamber 214. The outlet 213b may be a hole or path that is formed at the outflow end of the buffer chamber 214.

[0087] The central positions of the inlet 213a and the outlet 213b formed in the buffer chamber 214 may be formed to be different from each other. Here, the center of the inlet 213a may mean the center of the hole or path defined by the inlet 213a. Similarly, the center of the outlet 213b may mean the center of the hole or path defined by

the outlet 213b.

[0088] The sizes of the inlet 213a and the outlet 213b formed in the buffer chamber 214 may be formed differently from each other. The size of the inlet 213a formed in the buffer chamber 214 may be formed smaller than the size of the outlet 213b.

[0089] The size of the outlet 213b formed in the buffer chamber 214 may be formed to a size corresponding to the air inlet path 215. The size of the outlet 213b formed in the buffer chamber 214 may be formed at a level where the pressure of the washing water flowing through the air inlet path 215 may form a negative pressure.

[0090] The size of the inlet 213a formed in the buffer chamber 214 may be formed to correspond to the sectional area of the connecting path 212. The size of the inlet 213a formed in the buffer chamber 214 may be formed to a size that allows the flow rate of the washing water flowing through the connecting path 212 to be adjusted. The flow rate of the washing water flowing through the connecting path 212 may be formed to be relatively smaller than the flow rate of the washing water flowing through the spray paths 56 and 58.

[0091] The air inlet path 215 is connected on a side thereof to the air path 216. The air path 216 may allow outside air to be introduced through a suction hole (not shown) formed on a side of the spray arm 16 or 18. The suction hole may be formed in the lower surface of the spray arm 16 or 18.

[0092] The air path 216 may be connected to the downstream end of the air inlet path 215. The air path 216 may be connected to the peripheral surface of the air inlet path 215. The air path 216 may be disposed on the peripheral surface of the air inlet path 215 at a portion where the outflow end of the air inlet path 215 is formed. Therefore, it is possible to prevent air introduced into the air inlet path 215 from flowing into the buffer chamber 214.

[0093] The suction hole may be formed in the lower surface of the spray arm 16 or 18. Therefore, it is possible to prevent washing water falling from an upper side from flowing through the suction hole into the air path 216. The air path 216 may include at least one bending portion in which the flow direction of the flow path is changed.

[0094] The air path 216 may be connected perpendicularly to the air inlet path 215. Therefore, air flowing from the air path 216 into the air inlet path 215 may be introduced perpendicularly to the flow direction of the washing water flowing through the air inlet path 215. Since the air flowing into the air inlet path 215 flows perpendicularly to the flow direction of the washing water flowing through the air inlet path 215, the air may be primarily broken by friction with the flowing washing water.

[0095] The discharge path 218 is connected to the air inlet path 215. The sectional area of the discharge path 218 may be increased in the flow direction of the washing water from the inflow end connected to the air inlet path 215.

[0096] The discharge path 218 may have a shape in which the sectional area of the flow path is expanded as it

moves in the flow direction of the washing water. Therefore, air contained in the washing water flowing along the discharge path 218 may be additionally broken. The discharge path 218 may form an expanded flow path in which the sectional area of the path increases in the flow direction of the washing water.

[0097] A discharge hole 219 is formed in the discharge path 218 to discharge the washing water containing microbubbles into the tub 10. The discharge hole 219 may be formed in the upper surface and/or the lower surface of the spray arm 16 or 18.

[0098] Although the present disclosure was provided above in relation to specific embodiments shown in the drawings, it is apparent to those skilled in the art that the present disclosure may be changed and modified in various ways without departing from the scope of the present disclosure, which is described in the following claims.

Claims

1. A dishwasher comprising:

a tub;
a sump disposed under the tub and storing washing water therein;
a spray arm disposed within the tub and spraying the washing water into the tub;
a pump supplying the spray arm with the washing water stored in the sump;
a washing water flow pipe supplying the spray arm with the washing water discharged from the pump; and
a bubble generator disposed in the spray arm or connection pipe and having a Venturi-tube shape to generate bubbles in the washing water flowing therethrough.

2. The dishwasher of claim 1, wherein the spray arm comprises:

a lower spray arm; and
an upper spray arm disposed above the lower spray arm,
wherein the washing water flow pipe extends along a bottom surface and a side surface of the tub to supply the upper spray arm with the washing water discharged from the pump, and
wherein the bubble generator is disposed to protrude obliquely from a side of the washing water flow pipe.

3. The dishwasher of claim 2, wherein the bubble generator comprises:

a connection pipe branching from the washing water flow pipe;

a buffer chamber pipe extending from the connection pipe and forming a buffer chamber therein;

a discharge pipe extending from the buffer chamber pipe and discharging the washing water that contains bubbles; and

an air inlet pipe disposed between the buffer chamber pipe and the discharge pipe, and having an air path through which outside air is introduced, and

wherein the air inlet pipe is disposed on a downstream end of the buffer chamber, and has a structure extending downward.

4. The dishwasher of claim 3,

wherein the buffer chamber pipe comprises therein an expansion part in which a sectional area of a flow path is expanded, and a reduction part which is disposed downstream of the expansion part and in which the sectional area of the flow path is reduced, and

wherein a spiral groove is formed on an inner circumference forming an internal path of the reduction part.

5. The dishwasher of claim 3,

wherein a discharge path expanding in a direction where the washing water flows is formed inside the discharge pipe, and

wherein a discharge hole through which the washing water is discharged is formed at an end of the discharge path.

6. The dishwasher of claim 2,

wherein the washing water flow pipe comprises:

an upper washing water flow pipe disposed above the bubble generator; and

a lower washing water flow pipe disposed under the bubble generator, and

wherein a size of a sectional area of a flow path of the upper washing water flow pipe is formed smaller than a size of a sectional area of a flow path of the lower washing water flow pipe.

7. The dishwasher of claim 1,

wherein the spray arm comprises a top spray arm that sprays the washing water downward from an upper end of a washing space defined by the tub, and an upper spray arm that is disposed under the top spray arm and sprays the washing water into the washing space,

wherein the washing water flow pipe comprises:

a first washing water flow pipe sending the

washing water supplied from the pump to the upper spray arm; and

a second washing water flow pipe sending the washing water supplied from the pump to the top spray arm, and

wherein the bubble generator comprises:

a first bubble generator disposed on a side of the first washing water flow pipe; and

a second bubble generator disposed on a side of the second washing water flow pipe.

8. The dishwasher of claim 1,

wherein the spray arm comprises a first blade formed with a first spray path that sprays the washing water into the tub, a second blade formed with a second spray path that sprays the washing water into the tub, and a hub supplying the washing water to each of the first blade and the second blade, and

wherein the bubble generator is disposed on at least one of the first blade and the second blade.

9. The dishwasher of claim 1,

wherein the spray arm comprises:

a first blade formed with a first spray path for spraying the washing water into the tub, and a first bubble generation path for discharging the washing water containing microbubbles to the tub;

a second blade formed with a second spray path for spraying the washing water into the tub, and a second bubble generation path for discharging the washing water containing microbubbles to the tub; and

a hub supplying the washing water to each of the first blade and the second blade.

10. The dishwasher of claim 9,

wherein the hub comprises:

a supply path through which the washing water flows upward;

a 1-1 branch path connecting the supply path and the first spray path; and

a 1-2 branch path connecting the supply path and the second spray path,

wherein the 1-1 branch path is formed in a direction parallel to the first spray path, and

wherein the 1-2 branch path is formed in a direction parallel to the second spray path.

11. The dishwasher of claim 10,

wherein the 1-1 branch path is formed with a larger sectional area than the first spray path, and the 1-1 branch path has a shape in which the sectional area thereof decreases from the supply path to the first spray path, and
 wherein the 1-2 branch path is formed with a larger sectional area than the second spray path, and the 1-2 branch path has a shape in which the sectional area thereof decreases from the supply path to the second spray path.

12. The dishwasher of claim 10, wherein the hub comprises:

a 2-1 branch path connecting the supply path and the first bubble generation path; and
 a 2-2 branch path connecting the supply path and the second bubble generation path,
 wherein the 2-1 branch path is disposed at an angle with the first bubble generation path, and
 wherein the 2-2 branch path is disposed at an angle with the second bubble generation path.

13. The dishwasher of claim 12, wherein the sectional area of each of the 2-1 branch path and the 2-2 branch path is formed smaller than the sectional area of the 1-1 branch path or the 1-2 branch path.

14. The dishwasher of claim 9,

wherein the first spray path disposed in the first blade is located at a rear of the first bubble generator on the basis of a rotating direction of the spray arm, and
 wherein the second spray path disposed in the second blade is located at a rear of the second bubble generator on the basis of the rotating direction of the spray arm.

15. The dishwasher of claim 9, wherein each of the first bubble generation path and the second bubble generation path comprises therein a connecting path connected to the supply path, a buffer chamber connected to the connecting path and having a path sectional area expanded or reduced, an air inlet path which is connected to the buffer chamber and through which outside air is sucked in, and a discharge path connected to the air inlet path and discharging washing water in which microbubbles are created.

16. The dishwasher of claim 15,

wherein the buffer chamber comprises an expansion part in which a sectional area of a flow path is expanded, a maintenance part in which the sectional area of the flow path is maintained, and a reduction part in which the sectional area

of the flow path is reduced, wherein an inlet connected to the connecting path and an outlet connected to the air inlet path are formed in the buffer chamber, and wherein central positions of the inlet and the outlet formed in the buffer chamber are formed differently from each other.

17. The dishwasher of claim 15,

wherein the air inlet path is connected at a side thereof to an air path, and wherein the air path allows outside air to flow in through a suction hole formed in a lower surface of the spray arm.

Fig. 1

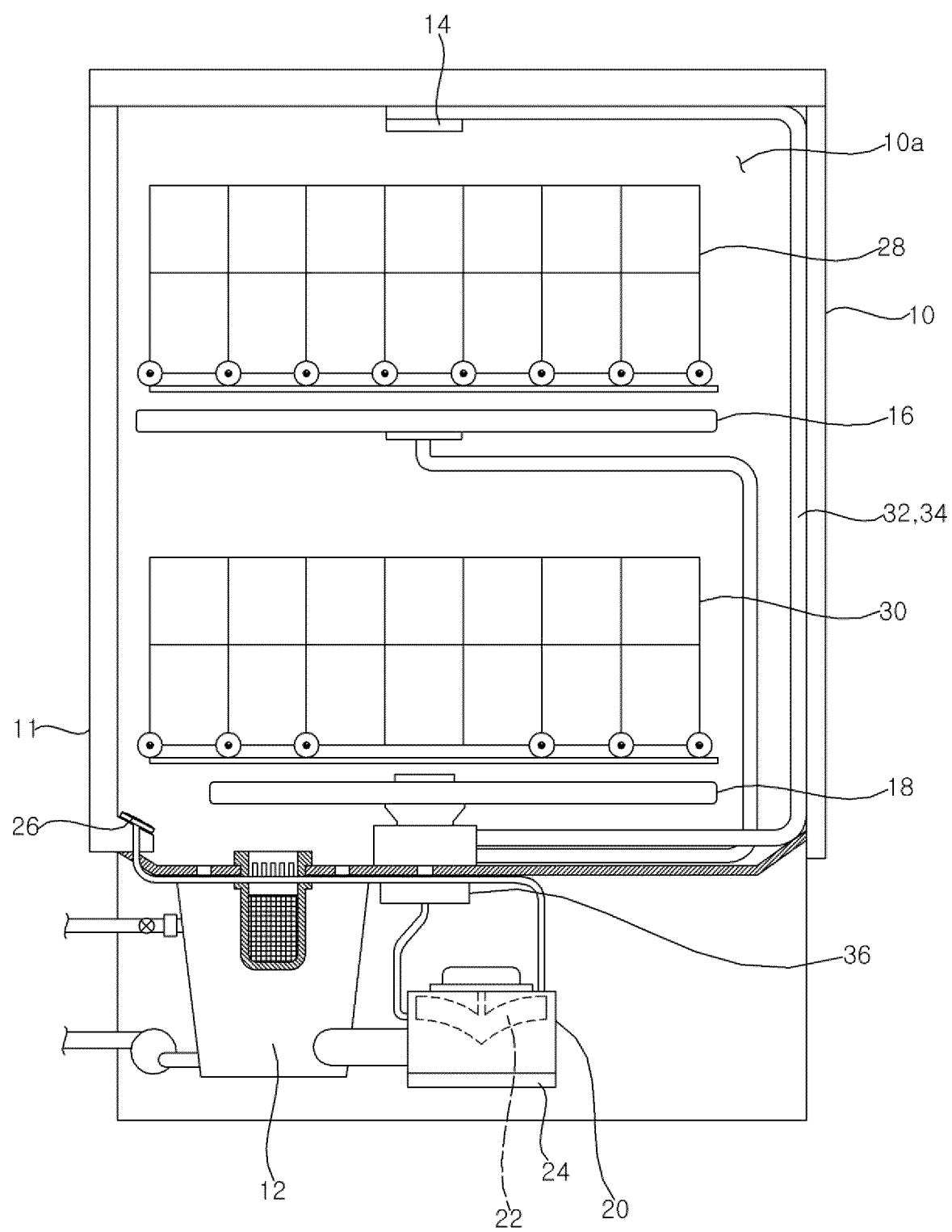


Fig. 2

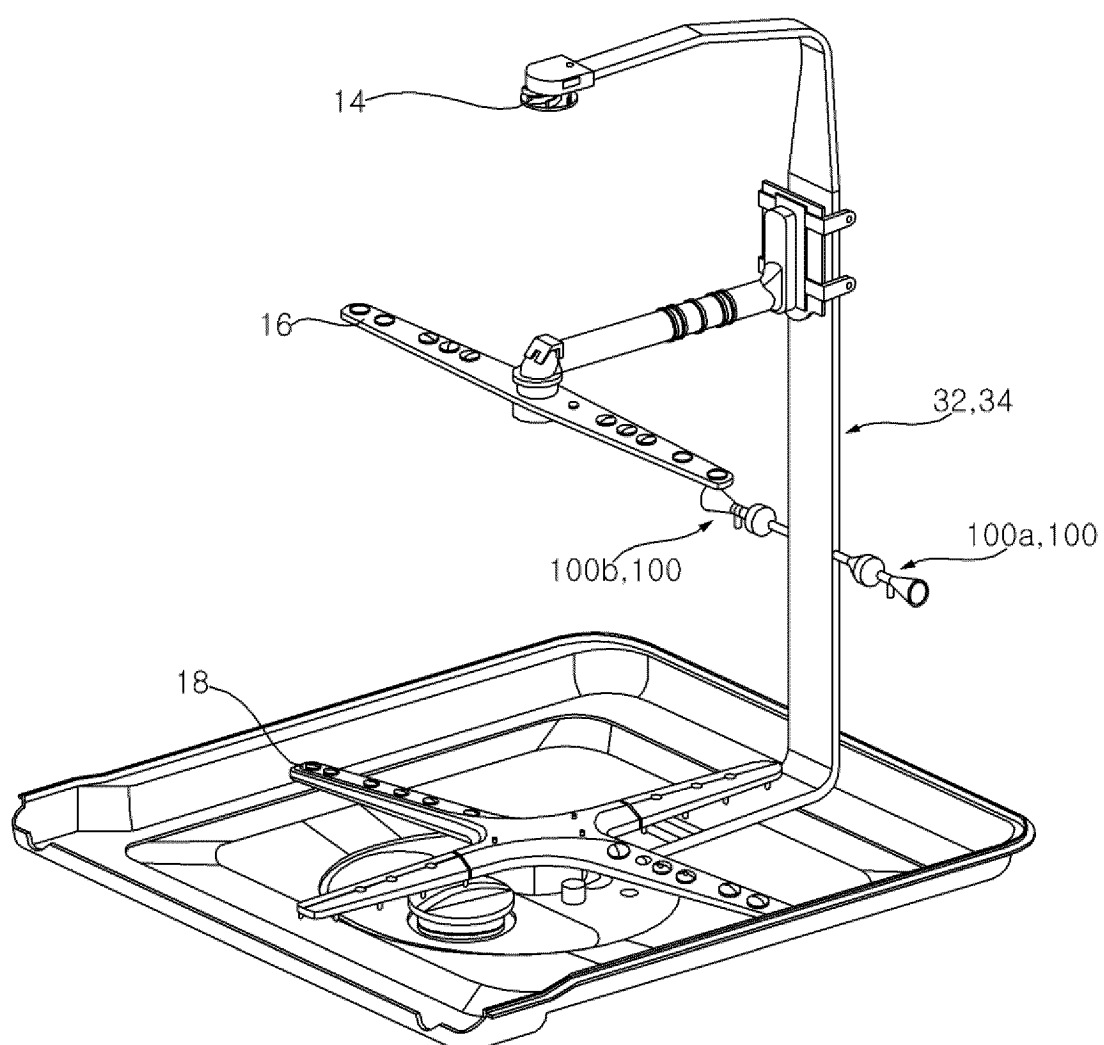


Fig. 3

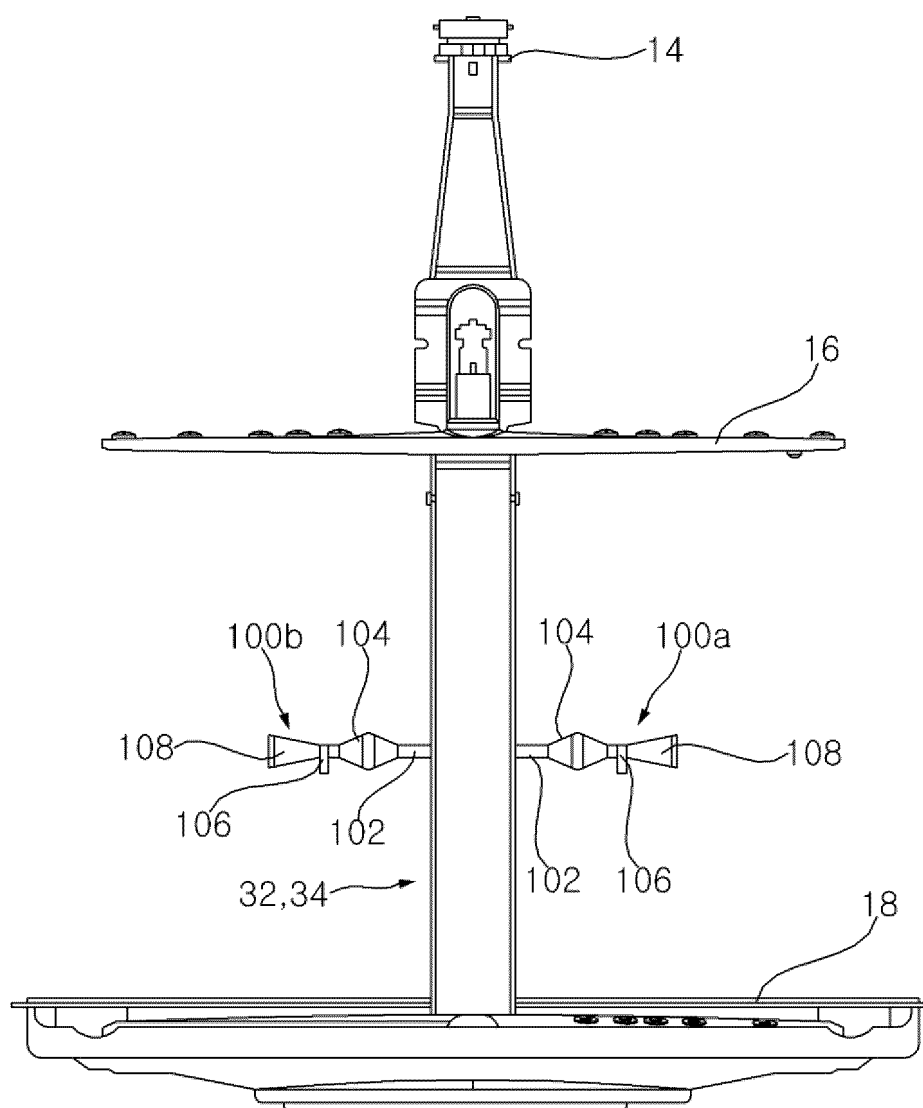


Fig. 4

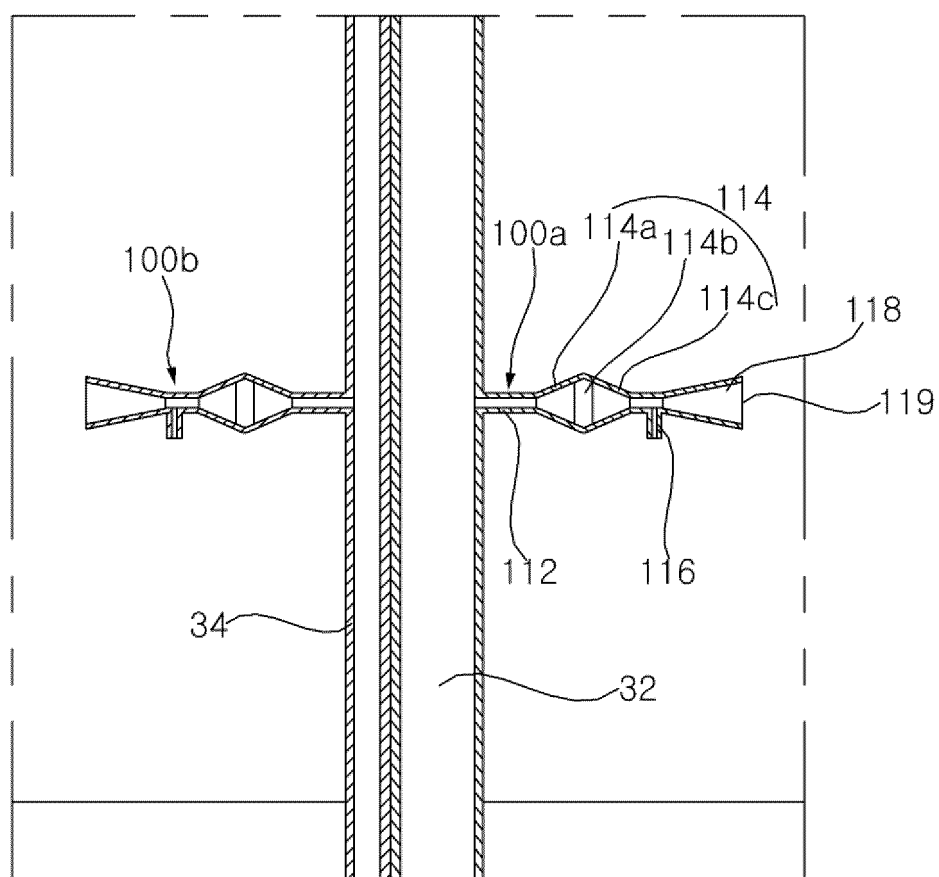


Fig. 5

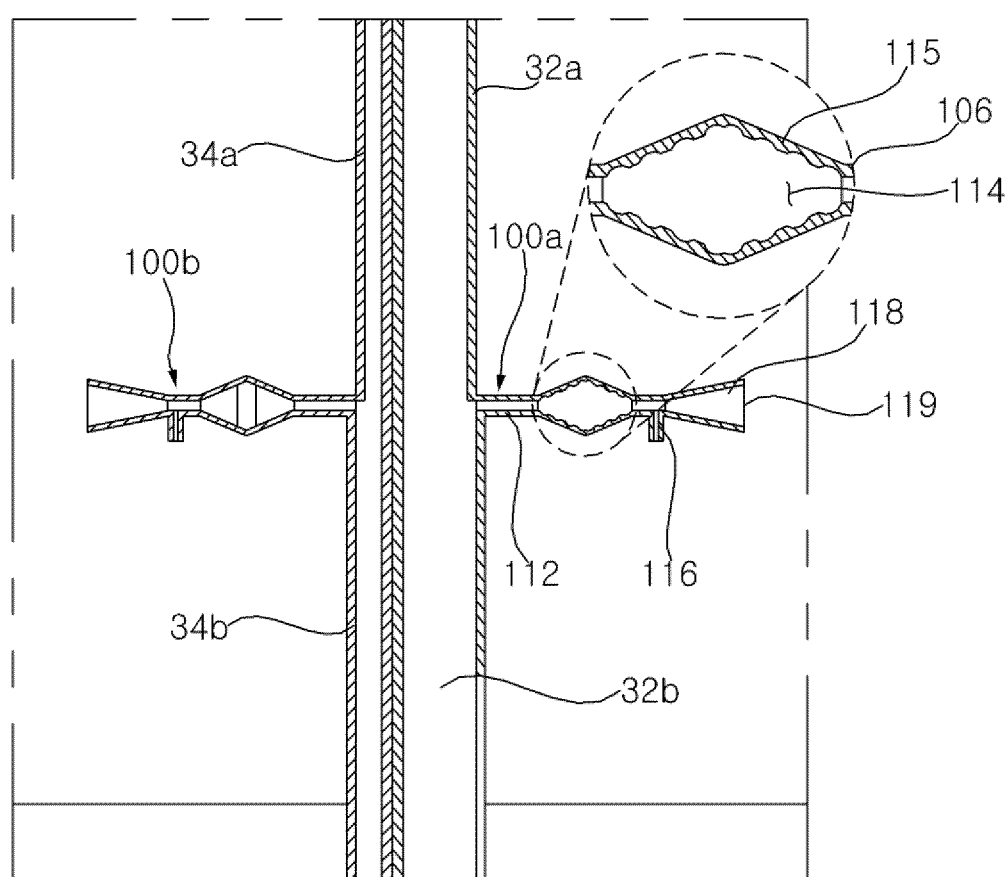


Fig. 6

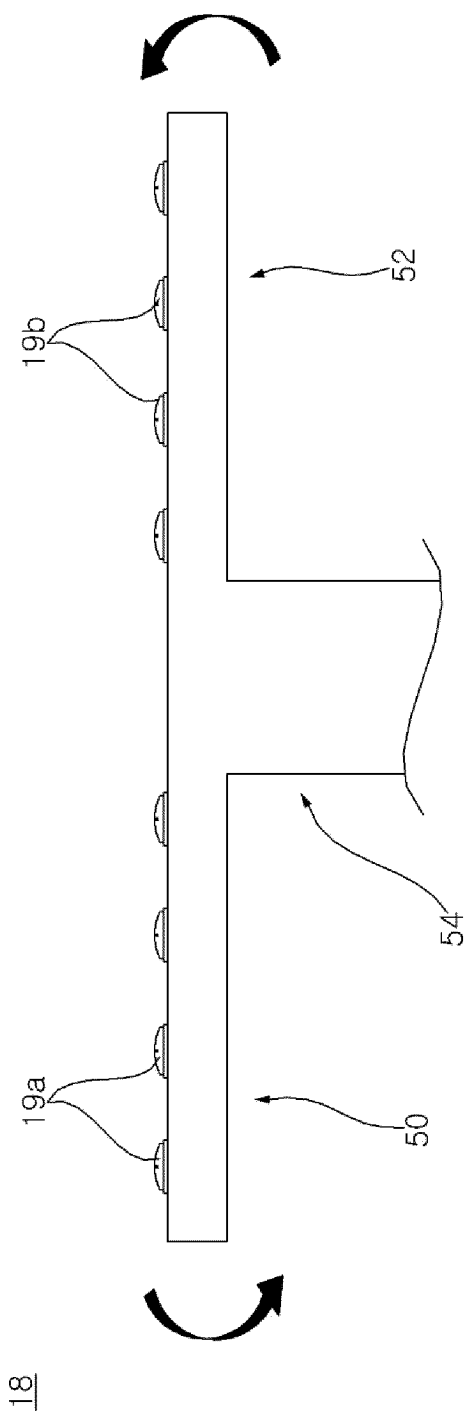


Fig. 7

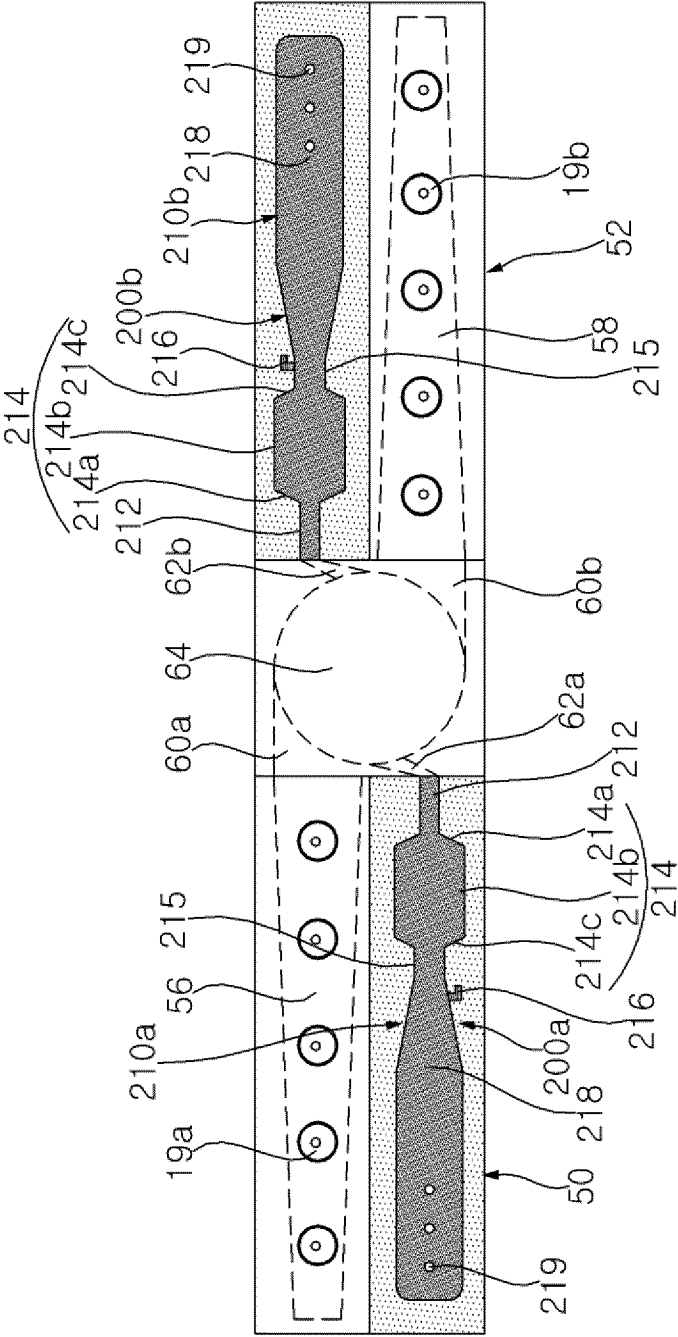
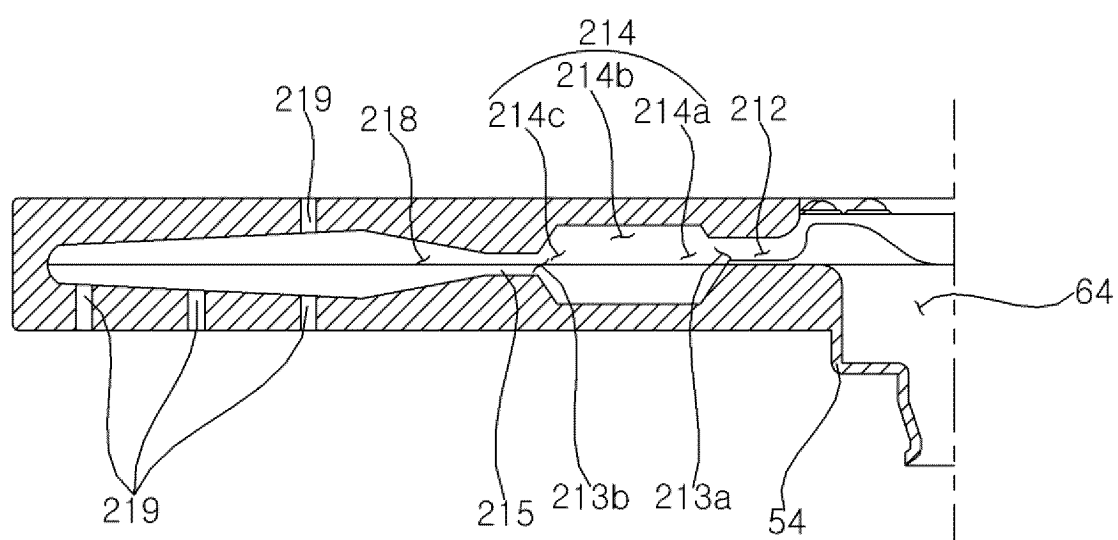


Fig. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2023/001606

A. CLASSIFICATION OF SUBJECT MATTER

A47L 15/10(2006.01)i; A47L 15/22(2006.01)i; A47L 15/42(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)

A47L 15/10(2006.01); A47L 15/00(2006.01); A47L 15/22(2006.01); A47L 15/23(2006.01); A47L 15/42(2006.01);
B01F 3/04(2006.01)

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

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 식기세척기(dishwasher), 노즐(nozzle), 분사암(spray arm), 버블(bubble), 확장(expansion), 축소(reduction), 공기유입관(air inlet), 블레이드(blade)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2018-0076103 A (LG ELECTRONICS INC.) 05 July 2018 (2018-07-05) See paragraphs [0020]-[0032] and [0046]-[0072] and figures 1-7.	1-7
Y		8-10,14-15,17
A		11-13,16
Y	CN 210541428 U (NINGBO FOTILE KITCHEN WARE CO., LTD.) 19 May 2020 (2020-05-19) See paragraphs [0024]-[0029] and figures 2-5.	8-10,14-15,17
A	CN 113951793 A (TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORP.) 21 January 2022 (2022-01-21) See claims 1-4 and figures 1 and 19-26.	1-17
A	CN 214632061 U (GUANGDONG VANWARD ELECTRIC CO., LTD.) 09 November 2021 (2021-11-09) See claims 1-10 and figures 1-9.	1-17

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

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

24 May 2023

Date of mailing of the international search report

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Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

International application No

PCT/KR2023/001606

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 214484441 U (NINGBO FOTILE KITCHEN WARE CO., LTD.) 26 October 2021 (2021-10-26) See claims 1-10 and figures 1-5.	1-17

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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CN 214632061 U	09 November 2021	None	
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Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

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